Performance/Composition Synthesizer
Musician’s Manual
Version 3.0
Please record the following information:
Your Authorized ENSONIQ Dealer:___________________________ Phone:_______________
Your Dealer Sales Representative:_________________________________________________
Serial Number of Unit:___________________________ Date of Purchase:_________________

Your Authorized ENSONIQ Dealer is your primary source for service and support. The above information will be helpful in communicating with your Authorized ENSONIQ Dealer, and provide necessary information should you need to contact ENSONIQ Customer Service. If you have any questions concerning the use of this unit, please contact your Authorized ENSONIQ Dealer first. For additional technical support, or to find the name of the nearest Authorized ENSONIQ Repair Station, call ENSONIQ Customer Service at (610) 647-3930 Monday through Friday 9:30 AM to 12:15 PM and 1:15 PM to 6:30 PM Eastern Time. Between 1:15 PM and 5:00 PM we experience our heaviest call load. During these times, there may be delays in answering your call.

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Although every effort has been made to ensure the accuracy of the text and illustrations in this Manual, no guarantee is made or implied in this regard.

IMPORTANT:
“This equipment generates and uses radio frequency energy and if not installed and used properly, that is, in strict accordance with the manufacturer’s instructions, may cause interference to radio and television reception. It has been designed to comply with the limits for a Class B computing device in accordance with the specifications in Subpart J of Part 15 of FCC rules, which are designed to provide reasonable protection against such interference in a residential installation. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures.”
* reorient the receiving antenna
* relocate the instrument with respect to the receiver
* move the instrument away from the receiver
* plug the instrument into a different outlet so that the instrument and receiver are on different branch circuits

“If necessary, the user should consult the dealer or an experienced radio/television technician for additional suggestions. The user may find the following booklet prepared by the Federal Communications Commission helpful: ‘How to Identify and Resolve Radio-TV Interference Problems.’ This booklet is available from the U.S. Government Printing Office, Washington, D.C. 20402 Stock No. 004-000-00345-4.”

In order to fulfill warranty requirements the TS-12 should be serviced only by an Authorized ENSONIQ Repair Station.

The ENSONIQ serial number label must appear on the outside of the Unit or the ENSONIQ warranty is void.

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Welcome!

Congratulations, and thank-you for your purchase of the ENSONIQ TS-12 Performance/Composition Synthesizer. The TS-12 offers the most complete set of features for the performing and recording musician ever offered. From the great feeling 76-note weighted-action keyboard to the great sounding 300 Programs and 300 Performance Presets, you’ll find the TS-12 a wonderful instrument to play. The intuitive and musical sequencer design in the TS-12 will help you go from initial inspiration to a completely mixed song without getting in your way.

To expand your sound palette the TS-12 comes with 2 Megabytes of Sample RAM, expandable to 8 Megabytes with industry-standard SIMMs. This RAM can be used to load in any Sample Sounds created for ENSONIQ’s EPS/EPS-16 PLUS, and ASR-10 samplers, giving you access to the largest library of sampled sounds anywhere! And with the SP-4 SCSI kit option installed, you can read Sampled Sound files stored on CD-ROM libraries and other SCSI devices. In addition to having access to this versatile library of sounds (from ENSONIQ and many third-party companies from around the world), you can incorporate vocals, drum loops, and any sound imaginable into your music. Just use an ENSONIQ sampler, or your friend’s ENSONIQ sampler, to make new sounds to use in your music. No expandable waveform synthesizer offers you this much versatility at such an affordable price.

The Sounds

The sound of the TS-12 is based on 254 waveforms encompassing all the possible instrument groups; acoustic, electric, digital and analog synthesis, sound effects and more. The acoustic instrument waves have been carefully crafted from ENSONIQ’s huge library of source recordings, including many sounds from our ground-breaking Signature Series. For the more imaginative possibilities the unique TransWaves™ give you the moving, dynamic sound of swept wavetables. The new Hyper-Wave™ voice architecture breaks open new sonic ground with the ability to create wave-lists that can sound like evocative, ever-changing pads to “jam-loop” drum and percussive grooves that can change pitch without ever changing tempo.

Each Program in the TS-12 is actually six independent sound sources each with their own parameters and programming. Now you can combine sampled sounds with analog synthetic sounds, and exotic digital textures at the push of a button -- no MIDI cables needed! And with 32-note polyphony you can layer sounds or sequence freely, without worrying about losing voices while you play.

Up to three sounds can be combined into a preset, which contains its own effects set-up and special performance parameters. Presets can be thought of as handy “performance memories” which allow you to create and save sound combinations, splits, layers, patch select variations, etc.

The TS-12’s 24-bit dynamic effects are incorporated as an integral component of each sound, and any effects parameter can be modulated by any of 13 modulation sources. Programs of similar types can be selected using ENSONIQ’s SoundFinder feature, and the TS-12 has Patch Select buttons, giving you expressive control over your sounds and unparalleled flexibility as a MIDI controller.
The Sequencer
To capture and expand on a creative idea, the TS-12 has an over 30,000 note, 24-track sequencer with extensive editing control. And with the addition of the optional SQX-70, the TS-12 can have over 97,000 notes of sequencer memory. Record in real-time or step entry, looped or linear mode, even transfer sequences from external MIDI devices with Multi-Track record. Sequence internal and/or external sound sources with a clock resolution of 96 PPQ for accurate timing resolution.

A variety of editing options gives you control over your sequenced parts: scale volume or controllers, edit specific notes or events, transpose, quantize, shift clocks, and more. Edits can be performed over ranges that can be specified by bar, beat, clock and/or note range for utmost accuracy, and every edit can be auditioned against the original part so you can decide which one to keep. During mixdown you can pan sounds in stereo to any of four individual outputs. MIDI Automated Mixdown remembers all volume and panning information, and the TS-12’s disk drive allows you to store your sounds, sequence data, even MIDI Sys-Ex data on inexpensive floppy disks.

MIDI Control
As a MIDI controller the TS-12 can use Song/Sequence “headers” to become a 24-zone controller with different MIDI channels, status, key zones, volume, transposition, and other performance parameters defined for each region. Stacking sounds is as easy as “double-clicking” a button, and the large display on the TS-12 gives you information in a clear, uncrowded layout.

The power of a complete MIDI production facility coupled with the benefits of a single integrated keyboard environment. It’s the latest refinement from the company that pioneered the concept of the synthesizer-based workstation. The TS-12 Performance/Composition Synthesizer… from ENSONIQ.

Clean Up and Maintenance
Only clean the exterior of your TS-12 with a soft, lint-free, dry (or slightly damp) cloth. You can use a slightly dampened cloth (with a mild neutral detergent) to remove stubborn dirt, but make sure that the TS-12 is thoroughly dry before turning on the power. Never use alcohol, benzene, volatile cleaners, solvents, abrasives, polish or rubbing compounds.

Center Supported Stands
With the TS-12, or any weighted-action keyboard, we highly recommend that you do not use center-supported column-type keyboard stands. Weighted keyboards are too heavy, too long, and usually require greater playing force to be exerted on them. They will be unstable on center-supported column-type stands.

The Manual
This manual is your guide to unlocking the full power of the TS-12. At this point, you’re probably anxious to plug your TS-12 in and get playing. After the initial “I just gotta hear it” phase has passed and you’re ready to utilize the full potential of the TS-12, please take the time to read the sections on programming, sequencing, and storage. They’ll provide valuable information and tips, as well as speed up the learning process and enjoyment of the instrument.

Thank you again for choosing ENSONIQ. Enjoy the music!
Power

Insert the line cord into the line receptacle on the back of the TS-12 (2), next to the power switch (1). Plug the other end of the cable into a grounded AC outlet. The proper voltage for your TS-12 is listed on the Serial Number label on the rear panel. Turn the TS-12 power on and make sure the display lights up. If not, check your connections and power source. The first thing the TS-12 does when it starts up is calibrate the keyboard. Be sure not to touch the keyboard while the display reads CALIBRATING KEYBOARD - DO NOT TOUCH.

Note: Because the TS-12 can automatically load Sampled Sounds previously loaded from a connected SCSI Storage Device, we recommend powering on the SCSI Storage Device(s) first before powering on the TS-12.

Power — Polarization and Grounding

Like many modern electrical devices, your ENSONIQ product has a three-prong power cord with earth ground to ensure safe operation. Some products have power cords with only two prongs and no earth ground. To ensure safe operation, modern products with two-prong power cords have polarized plugs which can only be inserted into an outlet the proper way.

Some products, such as older guitar amplifiers, do not have polarized plugs and can be connected to an outlet incorrectly. This may result in dangerous high voltages on the audio connections that could cause you physical harm or damage any properly grounded equipment to which they are connected, such as your ENSONIQ product.

To avoid shock hazards or equipment damage, we recommend the following precautions:

- If you own equipment with two pronged power cords, check to see if they are polarized or non-polarized. You might consider having an authorized repair station change any non-polarized plugs on your equipment to polarized plugs to avoid future problems.

- Exercise caution when using extension cords or plug adapters. Proper polarization should always be maintained from the outlet to the plug. The use of polarized extension cords and adapters is the easiest way to maintain proper polarity.

- Whenever possible, connect all products with grounded power cords to the same outlet ground. This will ensure a common ground level to prevent equipment damage and minimize hum in the audio output.

AC outlet testers are available from many electronic supply and hardware stores. These can be used to check for proper polarity of outlets and cords.
Ground Loops

Sometimes currents flowing through the ground line generate a signal seen by another part of the circuit sharing the same ground. In other words, if there are two identical signal paths within a circuit, they can form a loop which can result in hum and/or noise. If you are using equipment that has 3-prong “grounded” AC power cords, you may suffer from a ground loop resulting from the interconnection of this equipment. The following diagram shows how cascading or “chaining” the output of one 3-prong grounded system into the input of another 3-prong grounded system with a standard unbalanced 2 conductor cord (like a 1/4” guitar cable) can result in a ground loop.

![Diagram of Ground Loops](image)

**Fig. 1**

Unbalanced Output to Unbalanced Input. Single conductor shielded cable

**Fig. 2**

Unbalanced Output to Unbalanced Input. Single conductor shielded cable

Fig. 1 depicts a system interconnection where a ground loop can exist. Fig. 2 depicts a system interconnection where a ground loop does NOT exist. When interconnecting 3-prong grounded systems, you can use signal isolation transformers to prevent ground loops. This coupling transformer effectively isolates two interconnected system signal grounds, while still allowing the signal to pass through.

AC Line Conditioning

As with any computer device, the TS-12 is sensitive to sharp peaks and drops in the AC line voltage. Lightning strikes, power drops or sudden and erratic surges in the AC line voltage can scramble the internal memory and, in some cases, damage the unit’s hardware. Here are a few suggestions to help guard against such occurrences:

- **A Surge/Spike Suppressor.** The cheaper of the options, a surge/spike suppressor absorbs surges and protects your gear from all but the most severe over-voltage conditions. You can get multi-outlet power strips with built-in surge/spike suppressors for little more than the cost of unprotected power strips, so using one is a good investment for all your electronic equipment.

- **A Line Conditioner.** This is the best, but by far the more expensive, way to protect your gear. In addition to protecting against surges and spikes, a line conditioner guards the equipment against excessively high or low line voltages. If you use the TS-12 in lots of different locations with varying or unknown AC line conditions, you might consider investing in a line conditioner.
Temperature Guidelines
The inner workings of the TS-12 contain a substantial amount of computerized and electronic circuitry that can be susceptible to damage when exposed to extreme temperature changes. When the TS-12 is brought inside after sitting in a cold climate (i.e. the back seat of your car), condensation builds up on the internal circuitry in much the same way a pair of glasses fogs up when you come inside on a cold day. If the unit is powered up as this condensation occurs, components can short out or be damaged. Excessively high temperatures also pose a threat to the unit, stressing both the internal circuits as well as the case. With this in mind, it is highly advisable to follow these precautions when storing and setting up your TS-12:

- Avoid leaving the TS-12 in temperatures of less than 50 degrees Fahrenheit or more than 100 degrees Fahrenheit.

- When bringing the TS-12 indoors after travel, allow the unit at least twenty minutes to reach room temperature before powering up. In the case of excessive outdoor temperatures (below 50 degrees Fahrenheit or above 100 degrees Fahrenheit), allow an hour or more before power up.

- Avoid leaving the TS-12 inside a vehicle exposed to direct sunlight.

Amplification
Connect the Main Audio Outputs of the TS-12 to the line level inputs of a mixer, instrument amplifier, stereo, or any other sound system, using 1/4 inch audio cables. For an additional set of dry outputs, connect the AUX Outputs to two more mixer channels. If your system is stereo, connect the Left and Right Main Outputs to two channels of your mixer, stereo, etc. If it’s mono, use either of the Audio Outputs, but make sure nothing is plugged into the other output. For listening through headphones, plug the phones into the rear-panel jack marked Phones. If you’re running the TS-12 through a mixer, in stereo, be sure to pan the left mixer input fully left, and the right input fully right.

It is a good idea to make sure your audio system is turned off (or down) when making connections, to avoid damaging speakers or other components.
Be Careful!

The TS-12 outputs are line-level, and are intended to be connected only to line-level inputs, such as those on a mixer, stereo pre-amp, keyboard amp, etc. Connecting the TS-12 audio outputs to a mic-level input, such as a guitar amp or the microphone jacks on a tape deck, is not recommended, and might result in damage to the device input.

Move the Volume Slider all the way up. As with any digital musical instrument, the TS-12 will give the best results if you keep the volume slider full on, and use the volume control on your mixer or amp to adjust its level.

Switch the audio system on, and adjust the amplifier volume for normal listening levels. If you hear no sound while playing the keyboard, switch the audio system off and check your connections.

Amplifying Your TS-12 Through a Home Stereo System

If you are thinking about amplifying your TS-12 through your home stereo, a word of caution. A home stereo is great for playing CDs, albums, tapes — the dynamic range of these media is limited, and your speakers aren’t usually subjected to extreme volume changes and frequency transients. While the dynamic range of CDs is significantly greater than albums or tapes, the output of a CD player is still conservative compared to the uncompressed, unlimited line-level output of a pro-level keyboard. Running your TS-12, or any pro-level keyboard through a home stereo at high volume levels can damage your speakers, not to mention the impedance mismatch this can create. If your only means of amplification is your home stereo, then try to keep your levels on the conservative side.

Powering Up Your TS-12 In a MIDI Configuration

Just as you would power up the individual components before turning on the amplifier in your home stereo system, you should first turn on the MIDI data transmitting source (keyboards, modules, etc.) before you power up the receiving MIDI source. This will prevent any unwanted MIDI information from being “spit” out of the transmitting source during power up, which could confuse the MIDI receivers, thereby disabling them. If this should occur, turn off the receiving module, and then turn it back on.

About the Auto-Load Feature

The Auto-Load feature allows you to automatically load Sampled Sounds back into the same Bank location(s). If you have loaded any Sampled Sounds or Sample Edits into the TS-12 and then powered down, the display shows the following prompt:

```
AUTO-LOAD ALL SAMPLED-SOUNDS

*YES*

*NO *
```

If you answer *NO* to the Auto-Load prompt, the TS-12 will display the last Sounds or Preset Bank page, and no Sampled Sounds will be automatically loaded.

If you answer *YES* to the Auto-Load prompt, “WORKING...” is momentarily displayed when the TS-12 is preparing to load Sampled Sound files, then it will automatically load any needed files from the current disk in the disk drive, and from any connected SCSI Storage Devices.

For more information about the Auto-Load feature, see Section 14 — Understanding Sampled Sounds.
Care and Feeding of the Disk Drive

The TS-12's built-in disk drive is used to store all your Programs, Sampled Sounds, Presets, System set-up, and Sequencer data, as well as System Exclusive messages from other MIDI devices. The TS-12 uses a Quad-density disk drive that can store 1600 Kilobytes of data on a Double-Sided High-Density (DSHD) 3.5” micro-floppy disk and 800 Kilobytes of data on a Double-Sided Double-Density (DSDD) 3.5” micro-floppy disk. The disks are enclosed in a protective plastic carrier with an automatic shutter to protect the diskette from physical damage. It is important not to alter this carrier in any way.

The 3.5” disks have a sliding write-protection tab so that you can protect your sounds and sequences against accidental erasure. Sliding the write-protection tab in the lower left corner of the disk so that the window is closed will allow you to store information on the disk. Sliding the tab so that the window is open will protect the disk against being accidentally reformatted or having files deleted. Double-Sided High Density disks can be easily identified because they have an additional window (with no write-protection tab) located on the lower right corner of the disk.

Floppy disks are a magnetic storage medium, and should be treated with the same care you’d give important audio tapes. Just as you would use high quality audio tapes for your important recording needs, we recommend using high quality floppy disks for your TS-12. Here are a few Do’s and Don’t’s concerning disks and the disk drive.

Do’s:
- Use either Double-Sided High-Density (DSHD) or Double-Sided Double-Density (DSDD) 3.5 inch Micro-floppy disks. Both types are available from almost any computer store and many music stores carry them as well.
- Keep your disks and the disk drive clean and free of dust, dirt, liquids, etc.
- Label your disks and keep a record of what is saved on each.
- Only transport your unit with nothing in the drive.

Don’t’s:
- Don’t use Single-Sided (SSDD or SSSD) disks. These disks have not passed testing on both sides. While a single-sided disk might work successfully with the TS-12, it is possible that you will eventually lose important data to a disk error if you try using Single-Sided disks.
- Don’t put anything other than a disk or the plastic sheet in the disk drive.
- Don’t transport the unit with a disk in the drive.
- Don’t expose disks to extremes of temperature. Temperatures below 50˚ F and above 140˚ F can damage the plastic outer shell.
- Don’t expose your disks to moisture.
- Don’t dry your disks in a microwave oven.
- Don’t subject disks to strong magnetic fields. Exposure to magnetic energy can permanently damage the information on the disk. Keep disks away from speaker cabinets, tape decks, power cables, airline x-ray equipment, power amplifiers, TV sets, and any other sources of magnetic energy.
- Don’t eject the disk while the drive is operating (i.e. when the disk drive light is on).
Reinitializing the TS-12

The great power and flexibility of the TS-12 lies in the fact that it is really a computer disguised as a keyboard instrument, but a computer nonetheless. The software that operates the TS-12 is very sophisticated. If you have ever used a computer, you should be familiar with the need to occasionally re-boot your system when you get an error message, etc. Reinitializing the TS-12 is the equivalent of re-booting your computer.

There are a number of things that can happen to the TS-12 (or any computer system) which might scramble the system software — voltage surges, power failures, static electricity, etc. As with any computer, very infrequently some unforeseeable event or combination of events can cause the software to become confused, with strange and unpredictable results. Sometimes, computers that appear to be broken have no hardware problem, just corrupted data in the internal RAM (Random Access Memory). In some cases, simply turning the TS-12 power off and then on again will cure the problem. If that doesn’t work, perhaps what is needed is to reinitialize the unit.

When to Reinitialize

If your TS-12 begins to behave in peculiar ways; if the display shows words or lines that shouldn’t be there; if you start getting unexplained System Error messages; if the sequencer and edit functions start doing unpredictable things; try reinitializing the TS-12 before you seek factory service.

Be Careful!

When you reinitialize your TS-12, all your custom sounds, presets, and sequences in RAM will be lost. Therefore good backup habits should be an important part of your routine. Save any important data to disk before reinitializing the TS-12.

To Reinitialize the TS-12:

- While holding down the Presets button, press the “soft” button in the top left corner above the fluorescent display.
- The following message appears on the display: “ERASE MEMORY AND REINITIALIZE”
- Select *YES*. After selecting *YES*, the TS-12 erases its internal memory and then starts up just as it does when you turn the power on, and initialization is complete.

If reinitializing your TS-12 does not correct the problem, then contact an Authorized ENSONIQ Repair Station.

Low Battery Voltage — When to Replace the Battery

The reason that the TS-12 “remembers” programs, presets and other parameters, even when the power is off, is that all of its internal RAM is “battery-backed-up.” The battery that keeps the TS-12 memory intact is located inside the TS-12, and when it becomes discharged, it must be replaced by an Authorized ENSONIQ Repair Station.

The battery that came in your TS-12 is good for up to five years of life. You will know when it needs replacing, because the TS-12 will tell you so. One day you will switch the power on, and instead of its usual wake-up message, the display will read:

```
WARNING -- LOW BATTERY VOLTAGE
SAVE DATA - SEE USER MANUAL *CONTINUE*
```

Press *CONTINUE* (or any button) to commence normal operation. Then, make sure that all presets, programs, and sequences are saved to disk, and take the TS-12 to an Authorized ENSONIQ Repair Station as soon as possible to have the battery replaced.
Available Options for your TS-12
These optional accessories are available from your Authorized ENSONIQ Dealer:

- **ENSONIQ Model SW-10 Dual Foot Switch** — For voice sustain, sostenuto, hands-free patch select control, preset advance, effect modulation control, or starting, stopping, and continuing the internal sequencer. For ultimate foot control, we recommend using two SW-10 Dual Foot Switches.

- **Model CVP-1 CV PEDAL** — A Control Voltage Foot Pedal which can be assigned as a modulator within the voice section of the ASR-10 or used as a volume pedal.

- **AS – Series Sound Libraries** — The AS Sound Library sounds can be loaded and edited by the TS-12, provided on five High Density disks.

- **SL, SLT, and ESS Sound Libraries** — The TS-12 can read all of the sound files on the disks designed for the EPS Series. These disks offer the largest, most accurate, responsive, and musical sampled sounds available anywhere. These sounds are divided into three separate libraries: SL, a series of five-disk sets featuring sounds specifically designed for the EPS–16 PLUS, compatible with the TS-12; SLT, a series of ten-disk packs originally designed by top sound programmers for the EPS, also compatible with the TS-12; and ESS, three-disk “Signature Series” sets designed by renowned industry performers and producers like Joey DeFrancesco, Jason Miles, Maurice White, The System, Nile Rodgers, David Hentschel, and others.

- **SP-4 SCSI Kit** — This SCSI (Small Computer Serial Interface) allows the TS-12 to read Sampled Sound files from a hard drive, CD ROM player, or computer. The SP-4 must be installed by an Authorized ENSONIQ Repair Station.

- **CDR Series** — These CD ROMs offer a vast array of Sampled Sounds arranged in directories by file types. The CDR Series also features Direct Macros, which allows instant access (direct-dial) to any Sampled Sound file (the TS-12 can only read Sampled Sound files, and not ASR/EPS banks and sequence/song files).

- **SQX-70** — Sequence Expander. Increases the capacity of the TS-12 sequencer to over 97,000 notes. Contact your Authorized ENSONIQ Repair Station for installation details.

Need More Help?
Whether you’re an aspiring programmer looking for additional information about basic synthesizer techniques and MIDI theory, or a professional sound designer working with advanced applications, you may want more detailed information that is beyond the scope of this manual. The following books can help enhance your understanding of sampling, synthesis, MIDI, and related topics. These, in addition to the numerous monthly magazines, provide a wealth of information. While we don’t endorse any one of these publications, we offer this partial list as a resource for you to draw on.

The Mix Bookshelf
For prices and more information call: 1-800-233-9604

**MIDI**
- *MIDI FOR MUSICIANS*, Craig Anderton
- *THE MIDI MANUAL*, David Huber
- *THE MIDI HOME STUDIO*, Howard Massey
- *THE NEXT MIDI BOOK*, Rychner & Walker
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Appendix

TS-12 MIDI Implementation

I

Registered Parameters

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TS-10 Index
Section 1 — Controls & Basic Functions

This section provides an introduction to the TS-12’s many controls and rear panel connections, a conceptual overview of the system, and a discussion of editing various types of parameters. We suggest you read this section carefully — it will help you get the most out of your TS-12.

Rear Panel Connections

1) MIDI Thru
   “Passes on” all MIDI (Musical Instrument Digital Interface) information received by the TS-12 to other MIDI devices. Information generated by the TS-12 itself does not go to this jack — the Thru jack merely echoes what comes into the MIDI In jack.

2) MIDI Out
   Sends out MIDI information generated by the TS-12 keyboard and/or sequencer to other instruments and computers.

3) MIDI In
   This jack receives MIDI information from other MIDI instruments or computers.

4) Foot Switch 2
5) Foot Switch 1
   These two independent foot switch jacks support either a single (mono) or dual (stereo) foot switch, and can be assigned to a number of different functions, allowing a total of four independent foot switch controllers (when two optional SW-10 Dual Foot Switches are connected).

When either type of foot switch is plugged into the Foot Switch 1 or 2 jack, it is completely programmable (on the System page), and can be used for sustain, sostenuto, Patch Select control, preset up/down, effect modulation, or sequencer control.

When the SW-2 is connected to either Foot Switch jack:

When the SW-10 is connected to either Foot Switch jack:

It functions as the right foot switch and is completely programmable.

Both the left and right Foot Switches are completely and independently programmable.

There are four parameters on the System page that let you assign the foot switches to a variety of functions. When a single foot switch is connected, set the left foot switch to *UNUSED* on the
System sub-page. For more information about assigning the foot switches, refer to Section 2 — System Page Parameters.

**Note:** If you are using a single foot switch (SW-2 or SW-6) in either of the Foot Switch jacks, the FOOT-SW1-L and/or SW2-L values on the System page should always be set to *UNUSED*. This will prevent note drones. Remember that the Foot Switch jacks are optimized for use with a stereo Foot Switch (SW-10), and when a single foot switch is connected, it behaves like the right foot switch.

6) **Pedal-CV**

This jack is for connecting an optional ENSONIQ Model CVP-1 Control Voltage Foot Pedal, which is assignable as a modulator to various parameters within the TS-12. The pedal gives you a handy alternative modulation source when, for example, you would want to use the Mod Wheel but both hands are busy.

A CV pedal plugged into this jack can also act a volume pedal, controlling the volume of the currently selected sound(s). A parameter on the System page (press System twice, then underline PEDAL=VOL/MOD) determines whether the CV pedal will act as a modulator or as a volume pedal. Set to PEDAL=VOL to use the CV pedal to control volume.

Pedal/CV Specs: 3-conductor (Tip= control voltage input, Ring=510 ohm resistor to +5 Volts, Sleeve= ground). 36 KOhm input impedance, DC coupled. Input voltage range=0 to 3 volts DC. Scan rate=32mS (maximum recommended modulation input= 15 Hz). For use with an external control voltage, use a 2-conductor cable with the voltage on the tip and the sleeve grounded.

7) **AUX Out Right/Mono**
8) **AUX Out Left/Mono**

The AUX Outputs provide an additional stereo output for use in mixing down sequences, etc. The AUX Outputs contain the dry (no effects) signal only, allowing you to process and mix certain sounds separately. TS-12 sounds can be routed to the AUX Outputs from the Track Effects page, or individual voices can be set to the AUX Outputs from the Output page. When using the AUX Outputs in stereo, connect these outputs to two separate channels of your mixer and pan them left and right. If you want to have a mono AUX Output, make sure that only one of the AUX Out jacks is connected.

9) **Main Out — Right/Mono**
10) **Main Out — Left/Mono**

The Main Out jacks contain the wet (effected) output of the TS-12’s effects processor. Any sounds or individual voices routed to FX1, FX2, or DRY will be routed to the Main Outs. To operate the TS-12 in stereo, connect these outputs to two discrete channels of your mixer and pan them left and right. **Note that either** of the Main Outs can be used as a mono output. If you want to listen to the main output in mono, make sure that only one of the Main Out jacks is connected.

11) **Phones**

To listen to the TS-12 in stereo through headphones, plug the phones into this jack. The **Phones** output contains a mix of the signal from the Main Outputs and the AUX Outputs. Headphone volume is controlled by the **Volume Slider** on the front panel. **Note that plugging headphones into this jack does not automatically turn off the audio in the Main or AUX Outputs.**
Front Panel Controls

Almost everything you do on the TS-12, whether it’s selecting a sound, editing that sound, adjusting the tuning, etc., is controlled from the front panel using the following controls:

1) Volume Slider
This controls the overall volume of the TS-12 audio outputs.

2) Data Entry Controls
The Data Entry Slider and the Up and Down Arrow buttons to the left of the display are primarily used to select and modify things — sounds, parameters, keyboard touch, MIDI Control functions, etc. — all depending on which front panel button you press.

3) Mode Buttons
These 3 buttons are used to select the current mode; you will always be in one of these modes:

- **Sequencer Mode** — The Seqs/Songs button is used to put the TS-12 into Sequencer mode. The ten Bank buttons (labeled 0-9) will select Sequencer banks. Each bank contains six sequencer locations, any of which can contain a sequence or a song, or may be blank. When the TS-12 is in Sequencer mode, the LED above the Seqs/Songs Button will light. Note that when the sequencer is playing, you cannot enter either Sounds or Presets mode.

- **Presets Mode** — The Presets button is used to put the TS-12 into Presets mode. The BankSet button will scroll through the five different Preset BankSets. The ten Bank buttons will select Preset Banks within each BankSet. Each Preset Bank contains six different presets. Add all this up, and you get a total of 300 different presets (120 User-programmable and 180 ROM)! Each Preset contains three sound locations called “Tracks”, any of which can contain a User RAM Program, ROM Program, or Sampled Sound. When the TS-12 is in Presets mode, the LED above the Presets Button will light, and the bottom left-hand corner of the display will show PSET.

- **Sounds Mode** — The Sounds button is used to put the TS-12 into Sounds mode. The BankSet button will scroll through the different Sound BankSets. The ten Bank buttons will select Sound Banks within each BankSet. Each User RAM and ROM Program Bank contains six different programs. Sampled Sound Banks contain one Sampled Sound per Bank. When the TS-12 is in Sounds mode, the LED above the Sounds button will light.

4) BankSet Button
A BankSet is a collection (or “set”) of 10 Banks of Sounds or Presets. The BankSet button is used to select different BankSets in Sound and Preset Modes. Repeated presses of the BankSet button will scroll through all of the available BankSets.

Tip: There is a quick way to “direct-dial” between different BankSets in both Sounds and Preset modes. Simply press the BankSet button and while holding it down, press the appropriate Bank button. Bank buttons 0 and 1 select User RAM BankSets, and Bank buttons 2, 3, and 4 select ROM BankSets. Bank button 8 (and if expansion SIMMs are installed, Bank button 9) selects the Sampled Sound BankSet (in Sounds mode only). This enables you to “call up” the BankSets rapidly, in any order.
Tip: Because you can use the BankSet button and the ten Bank buttons to “shop around” in various banks before selecting a sound or preset, it is possible to lose track of where the currently selected sound or preset (the one you are hearing) is located. There is a shortcut for getting back to the BankSet and Bank that contains the currently selected sound or preset: rapidly double-click the Sounds button or the Presets button to instantly go to the Bank that contains the currently selected sound or preset.

5) Display
The 80-character fluorescent display makes it possible to show information in Pages. Each time you press one of the front panel buttons, you are in effect “turning to” that function’s page. Once you have turned to the page you want, the display shows you which parameters are controlled from that page. Try pressing a few of the buttons — System, Mix/Pan, LFO, or Filters, for example, and watch the display. Notice that for each button you press, the display changes to show you information relating to that function. Each of these different display configurations is called a Page.

6) Soft Buttons
The six soft buttons above and below the display have a new function each time you select a new page — that is, each time you press one of the dedicated front panel buttons. Each of the six soft buttons is used to select whatever is directly above or below it on the display. Because their function varies depending on what is displayed, we refer to these buttons as Soft Buttons, to distinguish them from buttons which have fixed “hard” functions, such as the Track Parameter buttons to the right of the display.

7) Bank Buttons
In Sequencer mode, the ten Bank buttons (labeled 0-9) will select Sequencer banks. Each bank contains six sequencer locations, any of which can contain a sequence or a song, or may be blank.

In Presets Mode, the ten Bank buttons (labeled 0-9) will select Preset banks within the current BankSet. Each bank contains six preset locations. Pressing the BankSet button will change the current BankSet, and the Bank buttons will now select Preset banks within the newly selected BankSet. There are five different BankSets of Preset Banks (two in User RAM, three in ROM), for a total of 300 different presets.

In Sounds Mode, the ten Bank buttons (labeled 0-9) will select Sound banks within the current BankSet. There are three different kinds of sound banks within the TS-12. Each User RAM program bank contains six sound locations. Each ROM program bank contains six sound locations. Each Sampled Sound bank contains one sound location. We call these Sound Bank pages. Pressing the BankSet button will change the current BankSet, and the Bank buttons will now select Sound banks within the newly selected BankSet.

Double-Click Symbol
✓ This symbol appears in several places on the front panel, and helps to identify buttons that offer a special “double-click” (pressing twice rapidly) feature. These are:
• Rapidly double-click the Sounds button or the Presets button to instantly go to the BankSet and Bank that contains the currently selected sound or preset.
• Rapidly double-click the Track Effects button to bypass the effect for all sounds in a song, sequence or preset.
• Rapidly double-click the Replace Track Sound button to replace the sound on a track with another sound, and install the new sound’s effect settings.
• Rapidly double-click the Select Voice button to edit all of the unmuted voices within a Program.
• When a song is selected, rapidly double-click the Seq/Song Track 1-6 and/or 7-12 to toggle between the sequence and song tracks.
Parametric Programming

The method used to modify or edit sounds, presets and system parameters is called *Page-driven Parametric Programming*, which sounds like a mouthful, but don’t worry. Once you’ve grasped a few basic concepts, you’ll find that operating the TS-12 is quite simple, given its many capabilities.

It is likely that you have already encountered some form of parametric programming on other synthesizers. What this means is that instead of having a separate knob or slider for each function, you have one master **Data Entry Slider**, and two **Arrow** buttons, which adjust the value of whichever parameter you select. This approach has many advantages, the most obvious is that it greatly reduces the amount of hardware — knobs, switches, faders, etc. — needed to control a wide variety of functions. (If the TS-12 had a separate control for each function, it would literally have hundreds of knobs.)

Sub-pages

Some of the TS-12 pages contain more that one screen of information. Repeatedly pressing the same page button will cycle through the sub-pages.

Changing a Parameter

Suppose you want to adjust the master tuning of the TS-12. Press the front panel button labeled **System**. The display now shows the System page:

```
SYSTEM TUNE=+00  PITCH-BEND=02
TOUCH=SYN-VEL3  VEL-MAX=127  PRESS=MED
```

In the top left-hand corner of the display you will always find the *name* of the page that corresponds to the button you pressed. To the right and below the page name are various parameters and commands that can be selected and modified from this page.

To raise or lower the tuning of the TS-12, press the soft button directly above where it says TUNE=+00. This segment of the display will now be **underlined**, telling you that it has been **selected**, and can be modified.

*The currently selected parameter on a page is always underlined.*

Once you have selected a parameter to be modified, use the **Data Entry Slider** and the **Up/Down Arrow** buttons to the left of the display to adjust its value:

- Moving the slider will scroll the entire range of available values. If you move the slider slowly, it will edit the parameter relative to its current value. Moving it quickly will cause the parameter to jump to the absolute value that corresponds to the position of the slider.
- Pressing the **Up/Down Arrow** buttons will increase or decrease the value one step at a time. Continuing to hold down either button will cause it to accelerate and run quickly through the values.

**Tip:** There is a quick way to center or “zero out” the value of any parameter which has a center value, as the ATTACK parameter does. Press the **Down Arrow** button, and while holding it down, press the **Up Arrow** button, then quickly release both buttons. This automatically sets the parameter value to +00.
To select and modify another parameter on the same page, press the soft button above or below its name. That parameter will now be underlined, and its value can be adjusted as before, with the **Data Entry Slider** and the **Up/Down Arrow** buttons.

If you select another page, change some parameter on that page, and then return to the System page, the parameter you had last selected will still be underlined. The TS-12 always “remembers” which parameter was last selected on a given page (including each sub-page).

Be sure that the parameter you want to edit is selected before moving the **Data Entry Slider** and/or the **Up/Down Arrow** buttons. There is always a parameter selected on any given programming page.

Sometimes the soft buttons are used to select values in “multi-field” parameters. For instance, in Sounds or Presets mode, press the **Tuning** button. Press the soft button beneath the Transpose parameter for any sound. Notice that the first field of the Transpose parameter (the Octave field) is selected. Press the same soft button again. This selects the Semitone field of the parameter. Successive presses of the soft button closest to the values moves the cursor from one field to another.

**Performance Controllers**

The TS-12 features a number of real-time performance controllers which are used to modify sounds as you play for maximum expressiveness. Three of the most important controllers are located to the left of the keyboard:

- **PATCH SELECT BUTTONS** — These two buttons are used to select alternate groups of voices within a sound. The TS-12 can be programmed so that the sound changes (sometimes in subtle ways, sometimes radically) when you play notes with one or both Patch Select buttons held down. As you play the sounds in the TS-12, make sure you explore what these buttons do to each sound.

- **PITCH BEND WHEEL** — This wheel bends the pitch of a note up or down. The wheel is normally centered, where it has no effect on the pitch — moving the wheel up or down will bend the note by the amount specified in the **BEND** parameters contained on the **System** page (for global bend range) and on the **Pitch Mods** page (for setting each individual voice’s bend range separately).
• MODULATION WHEEL — Perhaps the most common use of the Mod Wheel is to add vibrato, but it can also be assigned as a modulator anywhere within the TS-12 voice architecture to alter the pitch, brightness, volume, effect parameters, and a great many other aspects of the sound.

Pressure (After-touch)
Another important controller is Pressure. Pressure (often called after-touch) is a modulator that allows you to change the sound in various ways by pressing down harder on a key or keys after the initial keystrike. The TS-12 keyboard is capable of generating Channel Pressure and can receive Poly-Key™ Pressure via incoming MIDI.

Like the mod wheel or foot pedal, pressure is a modulator, and can be chosen wherever a modulator is selected in the Programming section of the TS-12. Pressure can be assigned to alter the pitch or volume of voices, the filter cutoff frequency, LFO rate or depth, pan location, etc.

There are two types of Pressure:

• Channel Pressure, also called Mono pressure, affects all notes that are playing when you exert pressure on any of the keys. For example, if you play a three-note chord, pressing down harder on any of the three notes of the chord will modulate all three notes. This type of pressure is the more common of the two types.

• Poly-Key Pressure, also referred to as polyphonic pressure, affects each key independently. For example, if you play a three-note chord, pressing down harder on any of the three notes of the chord will modulate only that note. The other two notes will remain unaffected. Although the TS-12 keyboard will not generate Poly-key pressure, it will receive it via incoming MIDI.

Each preset or sequencer track can be programmed to receive Poly-Key pressure, channel pressure or none at all. If you wish to change the pressure type for a given track, you can do so on the second sub-page of the Performance Options page in the Track Parameters section of the TS-12.

Note that pressure generates a tremendous amount of data, and will consume sequencer memory much faster than other types of events, such as notes and program changes. You should turn pressure off when sequencing instruments which do not respond to pressure, such as piano and drum sounds.
Playing Sounds and Presets

Sound Memory

Each TS-12 internal sound (ROM and User RAM) is a complex structure consisting of up to six voices per key and a programmable effects setup. We refer to these internal sounds as Programs. Sounds that were created with a sampling keyboard (and are not internal—i.e.: must be loaded from disk after power-on) are referred to as Sampled Sounds. In this manual, we will use the word sound to describe both Programs (ROM and User RAM), as well as Sampled Sounds.

As it comes from the factory, the standard TS-12 has 300 different sounds:

- User RAM — 2 BankSets of 60 programs each are stored in Static RAM.
- ROM (Read Only Memory)— 3 BankSets of 60 programs each are permanently stored in ROM. Like the User RAM programs, the ROM programs are contained within the TS-12; but unlike the User programs, they cannot be modified or replaced.

Sampled Sound Options:

- Sampled Sounds — 1 BankSet of 10 Sampled Sounds each are stored in Dynamic RAM. Sampled Sounds are not internal sounds. This means that when the TS-12 power is turned off, any Sampled Sounds will need to be reloaded. Note that when Sampled Sounds are selected, polyphony is reduced to 31 voices.
- Expanded Sampled Sounds — When optional expansion SIMMs are installed (by an Authorized ENSONIQ Repair Station), 2 BankSets of 10 Sampled Sounds each are stored in Dynamic RAM.

Sampled Sounds:

- BankSet S8:
  - 10 Sampled Sound Banks (from the factory)
- BankSet S9:
  - 10 Sampled Sound Banks (requires expansion SIMMs)

ROM:

- BankSet R2:
  - 60 Programs
  - 60 Presets
- BankSet R3:
  - 60 Programs
  - 60 Presets
- BankSet R4:
  - 60 Programs
  - 60 Presets

User RAM:

- BankSet U0:
  - 60 Programs
  - 60 Presets
- BankSet U1:
  - 60 Programs
  - 60 Presets

Sounds and Presets stored in User RAM Memory can be played, edited, and replaced with other sounds or presets.

Sounds and Presets stored in the ROM Memory locations can be played and edited, but cannot be erased. Edited versions can be stored in User RAM.

Sampled Sounds are stored in Dynamic RAM, and will not be saved internally when the TS-12 is turned off.
Using the BankSet Button

The BankSet button is used to scroll through the available BankSets. The display will change with each press, showing the currently selected BankSet. In the top left corner of the display, you will find the BankSet type and location, and the currently selected bank page.

Tip: There is a quick way to “direct-dial” between different BankSets in both Sounds and Preset modes. Simply press the BankSet button and while holding it down, press the appropriate Bank button. Bank buttons 0 and 1 select User RAM BankSets, Bank buttons 2, 3, and 4 select ROM BankSets, and Bank button 8 selects the Sampled Sound BankSet. If SIMMs are installed, Bank buttons 8 and 9 select Sampled Sound BankSets (in Sounds mode only). This enables you to “call up” the BankSets rapidly, in any order.

Once you have selected a User RAM, ROM, or Sampled Sound BankSet, select a sound using the ten Bank buttons and the soft button closest to the sound name as shown previously.

Selecting a Preset
To select a TS-12 preset:
- If you are in any mode other than Presets mode, press Presets (the Presets LED should be lit).
- Press one of the 10 Bank buttons below the display (numbered 0-9) to select a bank of six sounds. The display shows you the names of the six presets in each bank.
- Press the soft button above or below any of the six preset names to select that preset. Try selecting and playing a few different presets. Notice that when you select a preset, its name is underlined. The currently selected preset is always underlined.

Selecting a Sound
To select a TS-12 sound:
- Press Sounds.
- Press one of the 10 Bank buttons below the display (numbered 0-9) to select a bank of six programs. The display shows you the names of the six programs in each bank.
- Press the soft button above or below any of the six program names to select that program as the current sound. Try selecting and playing a few different programs. Notice that when you select a program, its name is underlined. The name of the currently selected sound is always underlined.
Layering (Stacking) a Sound with the Selected Sound

To layer (or stack) any sound with the currently selected sound, double-click the soft button corresponding to the sound name on the display. The underline beneath the name of the layered sound will flash and you will hear both sounds playing together.

Up to three sounds (one selected and two layered with it) can be active at once. To de-select a layered sound, press its soft button again and the flashing underline will disappear. If you already have two sounds layered with the primary sound, and you double-click on a fourth sound, that sound will replace the most recently layered sound in the stack.

If two tracks are layered, selecting a new primary track that has a KEY ZONE that does not overlap the layered track will not de-select the layered track. You can layer any combination of User RAM, ROM, or Sampled Sounds. Also, the sounds that are layered do not have to be in the same BankSet or bank.

Primary Sound vs. Layered Sounds

We refer to the sound which is currently selected (solidly underlined on the display) as the primary sound. Any other sounds that you double-click are considered to be layered with the primary sound. Only one sound is ever selected at a time. Whenever you select a new sound it becomes the primary sound.

This is an important concept, because the primary sound determines which Effects set-up will be used for layers and presets. Whenever you select a new primary sound in Sounds mode, a new effects algorithm is loaded along with it (unless the new sound has the same effect and settings as the previous one). Note however that layering a sound or selecting a different sound in Presets mode does not change the current effects set-up.

The SoundFinder™ Feature

When you press the Replace Track Sound button (its LED is lit), you can press the Up or Down Arrow buttons to scroll through Programs that have the same defined Program Type (as defined on the Program Control page). This is a great way to hear all available variations of a particular type of sound, and it is very useful in auditioning similar sounds for a sequence or song track. Note that you can audition the sounds as the sequencer plays, but to make the changes permanent, you must first stop the sequencer.

Note: Because a Sampled Sound cannot be assigned a Program Type, the SoundFinder feature will not work with Sampled Sounds or Sample Edits.

Note: You must load the 120-PROGRAMS file called USERBNKS V2 from the TSD-200 disk in order for this feature to work properly with the User RAM Programs.

Tip: By double-clicking the Replace Track Sound button (LED flashing), you can use the Up/Down Arrow buttons to select Programs by type along with their effect settings, just as you would in Sounds mode.

Tip: On the Program Control page, the TYPE=CUSTOM setting can be used to define your own special purpose sound type to help you quickly find your own sounds with SoundFinder. ENSONIQ sounds will never be released with TYPE=CUSTOM. For more information about the Program TYPE parameter, see Section 9 — Program Parameters.
Using SoundFinder in Sounds Mode

Here’s how to select Programs that have the same defined Program Type in Sounds mode. For this example, load the 120-PROGRAMS file called USERBNKS V2 from the TSD-200 disk that came with your TS-12 before continuing with the following steps:

- Press the Sounds button.
- While holding down the BankSet button, press the Bank 0 button. This selects User RAM BankSet U0.
- Press the Bank 0 button to select the first Bank in User RAM BankSet U0. The display shows:

```
U0-0  GENESIS  GRAND-PIANO  ELEC-KEYS
MIST  MULTI-BASS  THE-GROOVE
```

- Press the upper middle soft button above GRAND-Piano (it should now be underlined). We’ll be listening to some of the TS-12 sounds that are assigned the same Program Type as GRAND-Piano.
- If you want to see which Program Type is assigned to a particular Program, press the Program Control button. For GRAND-Piano, the display shows:

```
PROGRAM TYPE=ACPIANOS  OPTION=**-NONE-**
PRESS=CHAN  PATCH=LIVE  RESTRIKE=20
```

- This display shows the PROGRAM TYPE assigned to the currently selected Program. The Program Type assigned to GRAND-Piano is ACPIANOS, which denotes acoustic pianos. See Section 9 — Program Parameters for a complete listing of Program Types.

When GRAND-Piano is selected, SoundFinder will allow us to view all Programs assigned to the AC PIANOS Program Type.
- Press the Bank 0 button. GRAND-Piano should still be selected (underlined). If it is not, select it at this time.
- Double-click the Replace Track Sound button. Its LED should be lit.
- Press the Up Arrow button. The display now shows:

```
R2-0  BABY-GRAND  FULL-BODY  BRITE-PNO
STEREO-PNO  WARM-GRAND  ALL-PURPOSE
```

- BABY-GRAND (now underlined) is the next Program in the TS-12 assigned to the AC PIANOS Program Type. You can play it if you wish.
• Press the Up Arrow button again. The display now shows:

![Display Screen]

- R2-0 BABY-GRAND
- FULL-BODY
- BRIT-PNO
- STEREO-PNO
- WARM-GRAND
- ALL-PURPOSE

• FULL-BODY (now underlined) is the next Program in the TS-12 assigned to the AC PIANOS Program Type. Continued presses of the Up or Down Arrow buttons will scroll through all of the Programs within the TS-12 assigned to the ACPIANOS Program Type.

• When you’ve found the Program that you want, press Sounds to exit the SoundFinder feature. The Replace Track Sound LED will no longer be lit.

Understanding Tracks

There are two main performance modes in the TS-12; Preset mode, which has 3 tracks, and Sequencer mode, which has 12 tracks. In the TS-12, the term track refers to a “channel” that contains a sound and a complete set of track performance parameters, including mix, pan, controller settings, MIDI channel, keyboard zone, and others. The 3 tracks in a preset, and 12 in a sequence, give you access to 15 internal tracks, each one independent of the others. Song mode offers 24 tracks (combined with the presets mode, you can have a total of 27 tracks). The difference between sequence and preset tracks is that you can record data on sequencer tracks and not on preset tracks.

Multi-channel audio tape recorders have numerous physical tape tracks onto which you can magnetically record complex polyphonic information. Sequencers simulate this by recording events which describe a performance onto similar tracks in computer memory. When these sequence tracks are played back, the recorded information can either play local sounds or can be sent to remote MIDI devices to recreate the performance. Multi-timbral MIDI instruments can respond to inbound information from such sequencers on multiple channels, with each channel responding independently to a track from the sequencer.

When the TS-12 is used as a multi-timbral sound generator, played from its own sequencer, the various tracks of the sequencer control the sounds played by the TS-12. Similarly, the sequencer and/or the keyboard of the TS-12 can be used to transmit on MIDI channels to which external MIDI devices are connected.

When the TS-12 is controlled from an external MIDI sequencer, the various tracks of the sequencer can be assigned to different MIDI channels, which in turn control the programs played by the TS-12. Each MIDI channel that the TS-12 responds to can be thought of as an extension of the sequencer’s track.

Whether it is playing locally, sending MIDI to a remote device, or receiving MIDI from an external sequencer, we describe this logical construct, comprised of a sound, a MIDI channel, and various performance parameters, as a track.
Sampled Sounds and SIMMs

The TS-12 has the ability to read and edit sample sound files created for the EPS, EPS–16 PLUS, and the ASR-10 samplers. Sampled Sounds (as they are called in the TS-12) are stored in Dynamic RAM, and are not saved when the TS-12 power is turned off. From the factory, the TS-12 has two internal SIMMs, and provide 2 Megabytes of 16-bit sample RAM.

For more information about loading, selecting, and using Sampled Sounds in Presets, Sequences and Songs, see Section 14 — Understanding Sampled Sounds.

How Many SIMMs?

The TS-12 offers two SIMM options:

- With two 1m x 8 non-parity SIMMs (as it ships from the factory) — 1 BankSet (S8) is available (1 BankSet consists of 10 Sampled Sound Banks). The BankSet will hold 1MWord of Sampled Sound information, equivalent to 4018 blocks of memory.

- With two expansion 4m x 8 non-parity SIMMs — 2 BankSets (S8 and S9) of 10 Sampled Sound Banks each are available. Each BankSet will hold 2MWords of Sampled Sound information, for a total of 4 MWords, offering 8114 blocks of memory for BankSet S8, and 8191 blocks for BankSet S9.

Warning!

Because adding expansion SIMMs requires opening the TS-12 casing (which voids the ENSONIQ Warranty), SIMMs are not user-installable, and must be installed by an Authorized ENSONIQ Repair Station. To prevent damaging your TS-12, and/or causing bodily injury, do not attempt to install the SIMMs yourself.
Section 2 — System Page Parameters

These parameters control instrument-wide system functions. The settings of these parameters will remain in effect at all times and are preserved while the power is off. You can back-up the settings of the System Page parameters for quick recall by saving the System Set-up on the Storage page (see Section 13 - Storage for more information). The System Page has three sub-pages. Press the System button to display the first sub-page:

- **TUNE**
  - Range: -99 to +99 cents
  - Adjusts the overall master tuning of the keyboard up or down as much as one semitone. A value of +00 will set the TS-12 to concert A= 440 tuning.

- **PITCH-BEND**
  - Range: 00 to 12 semitones
  - Held Range: 00H to 12H semitones
  - Adjusts the system pitch bend range, which is the maximum amount of pitch bend that can be applied with the pitch wheel. Each increment represents a semitone.
  - The bend range will apply to all programs except those which have been programmed to override the system bend range. If you adjust the system bend range, and a program does not seem to pitch-bend the correct amount, check the setting of the BEND parameter on the Pitch Mods page for each voice in that particular program. If BEND=SYS, then the program uses the system bend range. Otherwise, the program has its own bend range and will ignore the system bend range.
  - The “H” suffix on the semitone value indicates that Held Pitch Bend mode is active. In this mode, only keys that are actually being held down will be affected by the pitch bend wheel.

- **TOUCH**
  - Range: (described below)
  - Allows you to adjust the velocity response of the keyboard to match your playing style and technique. All velocity curves affect both internal dynamic response and the velocity values transmitted via MIDI. There are 14 velocity response (Touch) settings:
    - PNO-VEL1
    - PNO-VEL2
    - PNO-VEL3
    - PNO-VEL4
    - PNO-VEL5
    - PNO-VEL6
    - SYN-VEL1
    - SYN-VEL2
    - SYN-VEL3
    - SYN-VEL4
    - SYN-VEL5
    - SYN-VEL6
    - FIXED-64
    - FIXED127

  - Note: When using a Piano velocity curve (PNO), pressing a key down very slowly and softly will yield no sound. This is exactly how a real piano key would respond. When using a Synth velocity curve (SYN), pressing a key down very slowly and softly will always yield a sound. This is the only difference between a PIANO velocity curve and a SYNTH velocity curve.
The Velocity Response Curves (Touch) offer a lot of control for a wide range of playing styles, as detailed in the following pages:

- PNO/SYN-VEL1 — This is for someone with a light touch. On this setting, it is easier to reach the maximum level of any velocity controlled parameter.

- PNO/SYN-VEL2 — Slightly harder key strikes are required for average playing, but this still allows a softer touch to reach maximum velocity levels.
• PNO/SYN-VEL3 — This default setting represents average velocity sensitivity. This setting should be right for most players.

• PNO/SYN-VEL4 — This velocity best represents the “classically-trained” player with strong fingers, and offers the widest dynamic range for skilled pianists.

• PNO/SYN-VEL5 — This setting offers a smooth curve for players with strong fingers who desire a softer sound. It requires strong playing to reach the top velocity levels.
• PNO/SYN-VEL6 — This velocity setting is for the player who wants a lot of control over their softer playing. The curve dedicates most of its range to a gradual increase in volume, with a quick “spike” at the end to still allow full volume accents.

• FIXED-64 — With this setting the velocity curve always generates a fixed value, set at the halfway point. This may be useful in simulating old synth sounds that originally had no velocity control.

• FIXED127 — This setting is also a fixed velocity curve, with full volume. This is good for playing drum/percussion parts when you want a part without dynamic changes.

**Note:** We recommend starting with the default setting (SYN-VEL3), then going up or down to find your optimal setting.
VEL-MAX  

Range:  001 to 127

This parameter determines the maximum keyboard velocity value that will be recognized and transmitted by the TS-12. The default setting is 127, which allows for the normal full range of velocity values. Lower settings limit the maximum value that will be used internally and sent out via MIDI. This can be useful when controlling devices which do not respond to the full range of velocity values, or can be used in conjunction with the TOUCH parameter to control just the top part of the velocity response curve. When TOUCH=FIXED-64 or 127, this parameter can be used to set the fixed velocity to any value.

PRESS  

Range:  SOFT, MED, FIRM, and HARD

Allows you to adjust the pressure threshold of the keyboard to match your playing style and technique. PRESS affects both internal pressure response and the pressure values transmitted via MIDI. When set to SOFT, the least amount of pressure is required to generate channel pressure. Similarly, HARD requires the greatest amount of pressure to generate channel pressure.

Press the System button again to display the second sub-page:

FOOT-SW1-L — Foot Switch 1, Left Pedal  
R — Foot Switch 1, Right Pedal  

SW2-L — Foot Switch 2, Left Pedal  
R — Foot Switch 2, Right Pedal

When the optional SW-10 Dual Foot Switch is plugged into either Foot Switch jack, the settings of these parameters will control the function of the pedals. You can even use two SW-10 Dual Foot Switches plugged into both Foot Switch jacks, and have four completely independent controllers.

If you are using the single SW-2 Foot Switch which came with the TS-12, you should keep both left foot switch parameters set to *UNUSED*, and assign the right foot switch parameters to the desired function. The list of available parameters are:

- *UNUSED* — makes the TS-12 ignore the Foot Switch.
- SUSTAIN — holding the Foot Switch down will cause notes to sustain after a key has been released, much like the sustain pedal on a piano. Transmitted via MIDI as Controller #64.
- SOSTENUTO — makes the Foot Switch act similar to the sostenuto pedal on a piano. Any keys that are held down when you press the Foot Switch are sustained until you release the Foot Switch, but subsequent keys are not affected. Transmitted via MIDI as Controller #66.
- PATCH R — makes the Foot Switch act like the right patch select button.
- PATCH L — makes the Foot Switch act like the left patch select button.
- FX-SW-MOD — makes the Foot Switch into an assignable effect modulator. Setting SRC=FX-SW on any Effect MOD page allows you to use the Foot Switch to modulate the assigned parameter. Transmitted via MIDI as Controller #12.
- PRESET-UP — each time the Foot Switch is pressed, the TS-12 advances to the next Preset. When the next preset is in a different BankSet and/or bank, the preset BankSet and/or bank will also be switched. For example, at preset #59 of User RAM Bank U0-9, it jumps to preset #00 of User RAM Bank U1-0. At preset #59 of User RAM Bank U1-9, it jumps to preset #00 of ROM Bank R2-0. At the end of the ROM banks, it jumps back to User RAM Bank U0-0.
- PRESET-DN — each time the Foot Switch is pressed, the TS-12 selects the previous Preset (functioning just the opposite to PRESET-UP).
- PLAY/STOP — the Foot Switch will play and stop the sequencer, exactly reproducing the...
actions of the **Play** and **Stop** buttons on the front panel.

- **STOP/CONT** — the Foot Switch will stop and continue the sequencer, exactly reproducing the actions of the **Stop/Continue** button on the front panel.
- **STEP-REC** — this setting allows the Foot Switch to be used in Sequencer Step Entry record mode to advance the track location by the amount set in the step size parameter on the Step Entry page. This is the same as using the "STEP*" command on that page.
- **SONG-STEP** — if a song step has been programmed with REPS=FS, each time you press the Foot Switch, the TS-12 will select the sequence that is the next step in the song.

**Tip:**
Both the Sustain and Sostenuto pedals can be used to dynamically “latch” the current amount of pressure being exerted on the keyboard. Here’s how:

1) Select a sound that responds to pressure. Ideally choose a sustaining sound like an oboe.
2) Play a key and press into the keyboard until you can hear the pressure modulation affect the sound of the note.
3) Press and hold the Sustain or Sostenuto pedal.
4) Release the key. You will hear that the sound continues to be modulated by pressure at the depth to which you were pressing.
5) Play a different key. Notice that the new note is **not** modulated. You can now press into the keyboard and modulate the new note independent of the note that is sustained. When the current pressure output exceeds the latched level, pressure on the new note will modulate both notes.
6) To release the “latched” pressure value on the sustained note, either press the “latched” key again, or release the Sustain or Sostenuto pedal.

**PEDAL**

<table>
<thead>
<tr>
<th>Range: VOL or MOD</th>
</tr>
</thead>
<tbody>
<tr>
<td>VOL — will control the volume of the currently selected or stacked Track(s). Transmitted via MIDI as Controller #7.</td>
</tr>
<tr>
<td>MOD — will affect any modulation destination that has PEDAL assigned as a modulation source. Transmitted via MIDI as Controller #4.</td>
</tr>
</tbody>
</table>

Press the **System** button again to show the third sub-page:

**SLIDER**

<table>
<thead>
<tr>
<th>Range: NORMAL, TIMBRE, or XCTRL</th>
</tr>
</thead>
<tbody>
<tr>
<td>NORMAL — the <strong>Data Entry Slider</strong> will act normally, and will be disabled while on any Sounds or Presets bank page.</td>
</tr>
<tr>
<td>TIMBRE — the <strong>Data Entry Slider</strong> will control the Track Timbre setting of the primary selected sound while any Sounds or Presets bank page is displayed. As a performance controller, the slider will only affect the primary sound.</td>
</tr>
<tr>
<td>XCTRL — the <strong>Data Entry Slider</strong> will control the Track XCTRL setting of the primary selected sound.</td>
</tr>
</tbody>
</table>
sound while any Sounds or Presets bank page is displayed. As a performance controller, the slider will only affect the primary sound.

**Note:** If you play and hold a note, modulate the sound with the Timbre or XCTRL Slider, and then select another sound, the Timbre slider will no longer affect the sound of the held note.

### VOICE-MUTING

**Range:** OFF or ON

This parameter controls whether or not all voices currently playing will shut off when a new program or preset is selected. This lets you avoid any audible “glitch” or discontinuity as the new sound’s effect is loaded, but at the expense of being able to sustain a note from one sound while selecting and playing another.

- **ON** — Whenever you select a new sound or preset, any voices that might be sustaining from the previous sound will be stopped.
- **OFF** — When you select a new sound or preset, voices that are sustaining from previous sounds will continue to play as long as the key(s) are held down. The old voices will go through the effect of the new sound or preset, so they might sound different, especially if the new sound uses a radically different effect.

### MIDI-TRK-NAMES

**Range:** OFF or ON

This parameter determines whether preset and sequencer tracks will show the sound name or show *MIDI-CHAN-# instead of the sound name.

- **OFF** — When a track’s MIDI STATUS is set to VOICE-OFF, LOCAL-OFF or MIDI-LOOP on the Track MIDI page, any displays that would normally show the track’s sound name (the Tracks 1-6 and 7-12 pages in sequence mode, and all Track Parameter pages in Presets mode) will show *MIDI-CHAN-# instead of the name. This is helpful when using the TS-12 as a MIDI controller, or when sequencing remote MIDI devices, as it shows you at a glance which tracks will play only over MIDI, and on which MIDI channels.
- **ON** — The track’s sound name will always appear on the Tracks 1-6 and 7–12 pages (in Sequencer Mode), and the Track Parameter pages (in Presets mode), no matter what the track’s MIDI STATUS is set to.

### KBD-NAMING

**Range:** OFF or ON

When this switch is ON, the keyboard can be used for name data entry. Whenever a naming field is active, pressing a key on the keyboard will enter the character assigned to that key, or move the cursor. The 36 white keys are the digits 0..9 and letters A..Z, while the black keys provide a repeating set consisting of cursor left, cursor right, and 3 punctuation marks (space, dash, and plus). Period, slash and star are only available using the **Data Entry Slider** or the **Up/Down Arrow** buttons.

When **KBD-NAMING=OFF**, the characters on naming pages will be affected only by the Data Entry Controls and the Cursor Left/Right soft buttons.
Press the **System** button again to show the third sub-page:

![System Page Parameters](image)

**PITCH-TABLE**

*Range: NORMAL, CUSTOM, U1-PROGRAMS, ROM*

This parameter allows you to set the system pitch-table to either a NORMAL (western 12-tone equal-temperament) or a CUSTOM (user-definable) pitch-table and affects all voices that have been programmed to use the SYSTEM pitch-table. For more information on pitch-tables, please refer to *Section 8 — Understanding Programs.*

- **NORMAL** — the TS-12 will use the western 12-tone equal-temperament tuning instead of the custom system pitch-table. Setting the System pitch-table to NORMAL does *not* affect the custom pitch-table.
- **CUSTOM** — the system pitch-table is set to a user-definable tuning. This is installed by creating a pitch-table in a program, and using the Copy function to copy it into the System. This is useful when you have one alternate tuning scheme that you want to use for many sounds.
- **U1-PROGRAMS** — This setting enables dynamic Pitch-Table Selection, allowing you to easily switch between different system pitch-tables in performance situations. When PITCH-TABLE=U1-PROGRAMS you can instantly load new CUSTOM system pitch-tables without affecting the sound you are playing by selecting pitch-table programs loaded into BankSet U1. This allows you to change the tuning while playing, without having to select a different sound.

In order for this feature to work correctly, you must set the system pitch-table switch to PITCH-TABLE=U1-PROGRAMS on the System page before “selecting” a new pitch-table program. If the program you indicate contains a valid pitch-table, it will be installed into the CUSTOM System pitch-table, and you will immediately hear the new tuning. If it does not, nothing will happen. In either case there will be no visible indication of your action. The program name will not be underlined when you “select” it, which is a good indication that you are using a pitch-table from a program in BankSet U1.

You may save programs (with or without pitch-tables) onto BankSet U1 in the normal way. It is suggested that you name programs that are to be used to install pitch-tables with names that describe the pitch-table they contain. For example, naming a program PT-PYTHA-F describes it as follows: PT for pitch-table program; PYTHA for Pythagorean tuning; and F for the tone center. This naming scheme is useful in making pitch-table programs easily recognizable.

In MIDI reception modes OMNI, POLY, and MONO A, incoming MIDI program changes 0 to 59 will select pitch-tables from BankSet U1, if PITCH-TABLE=U1-PROGRAMS on the System page. For more information about the MIDI MODE parameter, see *Section 3 — MIDI Control Page Parameters.*

**Tip:** When this parameter is selected (underlined), you can move the Data Entry Controls in real-time to change the pitch-tables while the sequencer is playing. This can create some interesting and fun effects.
Various ROM System Pitch-Tables

By using the data entry controls, you can select from a large assortment of traditional, modern, ethnic, and exotic pitch-tables for use as the System pitch-table. These ROM pitch-tables are:

- **PYTHAGRN-C** — Early tuning derived by calculating 12 perfect fifths and adjusting the octaves downward as necessary. Leaves all fifths except the one between G# and D# very pure. The entire mathematical anomaly encountered by tuning up 12 perfect fifths (called the Pythagorean comma) is accounted for in the interval between G# and D#.

- **JUST INT-C** — Designed so that the major intervals in any scale are very pure, especially the third and fifth.

- **MEANTONE-C** — One of the earliest attempts to derive a tuning which would accommodate music played in a variety of keys. The major third interval is very pure.

- **WRKMEISTR-C** — Derived by Andreas Werkmeister, a contemporary of Bach, this is a further attempt to create a temperament which would accommodate music played in any key.

- **VALLOTTI-C** — A variation of Pythagorean tuning in which the first 6 fifths in the circle of fifths are flat by 1/6 of the Pythagorean Comma. This is probably close to the tuning used by Bach for his Well-Tempered Clavier.

- **GRK-DIATONC** — The basic building block of ancient Greek music (in which most modern western music has its roots) was the tetra chord - four notes and three intervals spanning a perfect fourth. The placement of the two inner notes of the tetra chord determined its genus - diatonic, chromatic or enharmonic. This pitch-table is derived from two diatonic tetra chords, combined to form a seven-note scale similar to the modern diatonic scale. It is to be played only on the white keys. Tone center is E.

- **GRK-CHROMAT** — This pitch-table is derived from two chromatic tetra chords (the intervals are, roughly, quarter-tone, half-step, major third), combined to form a seven-note scale. It is meant to be played on the white keys. Tone center is E.

- **GRK-ENHARM** — This pitch-table is derived from two enharmonic tetra chords (the intervals are, more or less, two quarter-tones followed by a major third), combined to form a seven-note scale. It is meant to be played on the white keys. Tone center is E.

- **TURKISH-A** — This is a typical Turkish octave-based scale using only one quarter tone. The second note in the scale is tuned 40 cents flat from the equal-tempered equivalent; in this tuning B is 40 cents flatter from B natural. The scale rises from A.

- **ARABIC-1** — The intervals in this table form the basis for much Middle Eastern music. Here the octave is divided into 17 intervals, corresponding to the fret intervals of some stringed instruments used in this area. The scale rises from the base pitch of C4 in a series of three repeating intervals (in cents) of 90, 90, 24; and so on. From C4 to F5 represents an octave.

- **ARABIC-2** — Similar to Arabic 1, except that here the octave is divided into 24 intervals. This makes one pitch octave cover two keyboard octaves, meaning that the fingering will be the same in any octave. This scale rises from the base pitch of C4 in a series of four repeating intervals (in cents) of 24, 66, 24, 90; and so on.

- **ARABIC-3** — This is a 12-tone scale using quarter tones (notes tuned sharp or flat by 50 cents from their equal-tempered equivalents) on the C#, E, G# and B keys.

- **ARABIC-4** — Another octave-based scale with an Arabic flavor. In this case the “quarter tones” are not perfectly equal, imparting a distinctive character to the notes.
• JAVA-PELOG1 — One of the two main scales of the gamelan orchestras of Java and Bali is the seven-tone scale called Pelog. The notes C, D, F, G, and A (which are reproduced on the black keys) are considered primary, with E and B used for grace notes. The octaves are stretched (tuned a little sharp) due to the harmonic content of the instruments in the gamelan. (Note that there are many subtle variations of these tunings, almost as many as there are gamelan ensembles. The tunings we have included here are to be considered typical, not definitive.)

• JAVA-PELOG2 — This is another version of the seven-tone Pelog scale used in gamelan music. The notes C, D, F, G, and A (which are reproduced on the black keys) are considered primary, with E and B used for grace notes. The octaves are stretched (tuned a little sharp) due to the harmonic content of the instruments in the gamelan.

• JAVA-PELOG3 — A third version of the seven-tone Pelog scale used in gamelan music. The notes C, D, F, G, and A (which are reproduced on the black keys) are considered primary, with E and B used for grace notes.

• JAVA-SLNDRO — This is a 15-tone equal tempered tuning from Java. Playing every third note (as in a diminished chord) yields a typical 5-tone scale of the gamelan. Other notes can be used as passing tones.

• JAVA-COMBI — This is actually two pitch-tables in one. The white keys play the seven-tone Pelog scale, same as the table JAVA-PELOG1. The black keys play a five-tone scale called Slendro, which is close to a five-tone equi-tempered scale. Both tunings have their octaves stretched (tuned a little sharp) due to the harmonic content of the instruments in the gamelan.

• INDIAN-RAGA — Indian scale used to play ragas, based on 22 pure intervals called Srutis. This pitch-table uses two keyboard octaves to play one octave in pitch. The 22 Srutis are mapped to keys in this two octave range omitting the A#s, which play the same pitch as the adjacent A.

• TIBETAN — This tuning is based on a pentatonic scale from Tibet. Notice that playing the black keys yields a scale similar to the 5-tone Slendro tuning from Indonesia.

• CHINESE-1 — This is a seven-tone scale used widely in China. It is meant to be played on the white keys.

• CHINESE-2 — This is a seven-tone scale based on an ancient Chinese lute tuning. It is meant to be played on the white keys.

• THAILAND — This is a seven-tone equi-tempered scale from Thailand. It is meant to be played on the white keys.

• 24-TONE-EQU — Centered on C4, this scale has an even quarter tone (50 cents) between each keyboard note, and each pitch octave covers 2 keyboard octaves. This tuning has been used by many contemporary composers and can be used in some Middle Eastern music.

• 19-TONE-EQU — Centered on C4, this scale divides the octave into 19 equal steps. From C4 to G5 forms an octave. This scale yields very pure thirds and sixths, but not fifths. Like the 24-tone scale, this has been used by some modern composers.

• 31-TONE-EQU — Centered on C4, this scale divides the octave into 31 equal steps. From C4 to G6 forms an octave. Similar to 19-tone in the purity of its intervals.

• 53-TONE-EQU — This scale divides the octave into 53 equal steps. From C2 to F6 forms an octave. It yields very pure thirds, fourths and fifths.
• **HARMONIC-C** — This is a mathematically generated scale based on the relationships of the partials in the harmonics of the fifth octave of the linear harmonic spectrum. It is interesting mostly from a theoretical standpoint.

• **CARLOSALPHA** — The first of three scales derived mathematically by Wendy Carlos in the search for scales with the maximum purity of primary intervals, Alpha is based on the division of the octave into 15.385 equal steps (78 cents per key). One pitch “octave” covers 16 keys, though because the Carlos scales are asymmetric (not based on whole number divisions of the octave) they do not yield pure octaves.

• **CARLOS-BETA** — Wendy Carlos’ Beta scale is based on the division of the octave into 18.809 equal steps (63.8 cents per key). One pitch “octave” covers 19 keys, though, again, being asymmetric it yields no pure octaves.

• **CARLOSGAMMA** — Wendy Carlos’ Gamma scale is based on the division of the octave into 34.188 equal steps (35.1 cents per key). This scale has essentially perfect major thirds, fourths and fifths. One pitch “octave” covers 35 keys, though, again, being asymmetric it yields no pure octaves.

• **PARTCH-43** — Harry Partch was a pioneer of micro tonality in the early 20th century. He developed this 43-tone-per-octave scale of pure intervals, and even designed an entire orchestra of instruments for music using this scale. The tonal center is found on key D2 (the low D on the 61-note keyboard). This pitch-table has been transposed up an octave to bring the notes into a more usable range.

• **REVERSE** — This pitch-table simply reverses the pitch-tracking of the keyboard, putting the highest notes at the bottom of the keyboard and the highest notes at the top. Lots of fun.

**Selecting ROM Pitch-Tables**

Here’s how to select and use the Internal ROM pitch-tables:

1) Start by selecting a sound from the internal memory of the TS-12. We recommend using a piano, organ, or guitar sound. Do not select a drum kit or percussion sound, as these sounds use the TS-12 Drum-Map and will not respond to pitch-tables.

2) Once you have found a sound you like, press the **System** button four times. The display will read **SYSTEM  PITCH-TABLE=NORMAL**. The NORMAL pitch-table is the default pitch-table of the TS-12 and is known as the western twelve tone equal-tempered tuning. Play a scale on the keyboard and listen to the pitch of each note.

3) Press the **Up Arrow** button three times to display the first ROM pitch-table (PYTHAGRN-C) and play the keyboard. Notice that the TS-12 is now using an alternate tuning. The first several ROM pitch-tables will make subtle changes in tuning, while the remainder of the ROM pitch-tables will have a more obvious affect.

4) Press the **Up Arrow** button again and play the keyboard. Continue scrolling through the remaining pitch-tables and listen to the tuning variations offered.

If you would like to continue using a particular pitch-table with other sounds, press the **Sounds** button to return to the TS-12’s internal sound banks. The currently selected System pitch-table will remain in effect even after turning the TS-12 power off and back on. In this way, if your music requires the same pitch-table all the time, you can simply turn on the TS-12 and start playing.
Using the U1-Programs Pitch-Tables

Note: You will need the TSD-100 floppy disk that was included with the TS-12 to complete the following exercise. This disk contains two files of pitch-tables. They are stored as 60-PROGRAMS file types. The first pitch-table file is called HIST PTABLS and contains five different Historical pitch-tables with twelve root key versions of each scale. The second file is called ETH/MOD PTS and contains a variety of Ethnic and Modern pitch-tables:

- Insert the TSD-100 floppy disk into the disk drive and press the Storage button twice.

Tip: Pressing the Storage button twice will automatically take you to the Disk Load Page.

- Press the Up or Down Arrow button until the display reads TYPE=60-PROGRAMS.
- Press the upper left soft button above the words LOAD FILE=________. Using the Up or Down Arrow button, find the file named ETH/MOD PTS.
- Press the bottom middle soft button beneath the words BANKSET U0, and press the Up Arrow button once so the display reads BANKSET U1.
- Press the upper right soft button above the word *YES*. This will load 60 new pitch-table Programs into User RAM BankSet 1.

When the file has been loaded, the display will show DISK COMMAND COMPLETED.

- Press the System button four times until the display reads SYSTEM PITCH-TABLE=<last selected pitch-table>. Press the Up or Down Arrow button to set this value to PITCH-TABLE=U1-PROGRAMS.
- Press the Sounds button and select a sound of your choice from any BankSet other than BankSet U1.
- While holding down the BankSet button, press the Bank 1 button, then release both buttons. You have now selected User RAM BankSet U1.

Note: At this point when you select locations in BankSet U1, you will be selecting from 60 pitch-tables instead of 60 Programs. The Programs that were originally stored in BankSet U1 have been replaced by the newly loaded pitch-table file.

- Press the Bank 0 button and then press the upper left soft button. Play the keyboard. This selects the first of the 60 pitch-tables that are instantaneously available.

Try the other pitch-tables in Bank 0 by pressing the other soft buttons. Continue by selecting pitch-tables in Banks 1 through 9. Each Bank contains six pitch-tables.

Using the above procedure, you can load the file named HIST PTABLS to try more pitch-tables.

Loading a full set of 60 pitch-tables into the TS-12 internal memory in this way gives you the ability to select a variety of keyboard tunings in real-time while in the middle of a performance! Pitch-tables can even be remotely selected via incoming MIDI Program Changes.
PRESS-MODE

This parameter determines the default Track Pressure setting for sounds as they are selected in Sounds mode, or as they are assigned to a Track using the Replace Track Sound function in Presets or Seqs/Songs. It also determines the default Track Pressure mode for all three Preset Tracks when a Preset is selected. When PRESS-MODE=CHAN, all Sounds and Preset Tracks that are set to KEY will have their Track Pressure mode automatically set to CHAN; Sounds and Preset Tracks that have their Pressure mode set to OFF will be unaffected. The PRESS-MODE=PSET setting disables this function, and installs the Sound and Preset Track Pressure settings as stored in the Sounds or Presets.

The TS-12’s keyboard generates Channel pressure (Track PRESSURE=CHAN), but Sounds and Presets can be programmed so that they respond to Poly-Key pressure via incoming MIDI (Track PRESSURE=KEY). However, when Track PRESSURE=KEY, the sounds will not respond to the Channel pressure generated by the TS-10’s own keyboard. The PRESS-MODE parameter automatically compensates for this when PRESS-MODE=CHAN, ensuring that sounds created with Poly-Key pressure will respond to Channel pressure generated by the TS-12’s keyboard.

WAKE-UP-MODE

This parameter determines which mode the TS-12 will “wake-up” in after power-on.

- SOUNDS — Power-on in Sounds mode with the last Sound selected before power-off selected.
- PRESETS — Power-on in Presets mode with the last Preset selected before power-off selected.
- SEQ/SONG — Power-on in Sequencer mode with the last Sequence or Song selected.
- DEFAULT — Power-on in Sounds mode showing Program Bank U0-0. The default sound in ROM will be selected.
- PREVIOUS — Power-on in the same mode the TS-12 was in when it was powered-off. Note that if the TS-12 was in General MIDI mode when it was powered-off, it will wake-up in Sounds mode.
- LASTPAGE — Power-on showing the last page that the TS-12 was on when it was powered-off. This does not apply to some editing sub-pages. Note that if the TS-12 was in General MIDI mode when it was powered-off, it will wake-up showing the last page that the TS-12 was on before entering General MIDI mode.
- GEN-MIDI — Power-on in General MIDI mode.

Note: When WAKE-UP-MODE=GEN-MIDI, and Sampled Sounds had previously been loaded, the Auto-Load prompt will be displayed before the TS-12 enters General MIDI. To prevent this, you can first erase all Sampled Sounds from memory, as described in Section 14 — Understanding Sampled Sounds.
Section 3 — MIDI Control Page Parameters

These parameters set instrument wide MIDI parameters, such as the Base Channel number and MIDI Reception mode, and control what types of MIDI messages are received and transmitted. The settings of these parameters will remain in effect at all times and are preserved while the power is off. The MIDI Control Page has three sub-pages. This section also offers an introduction and overview of General MIDI, and explains how to use it with the TS-12.

Whether you are simply linking two keyboards together, playing a synth from a guitar controller, or driving a rack of samplers from the TS-12, MIDI makes it all possible.

• Press the MIDI Control button. This takes you to the top level MIDI Control Page:

<table>
<thead>
<tr>
<th>BASE-CHAN=01</th>
<th>GMIDI=OFF</th>
<th>SEND=TRACK</th>
</tr>
</thead>
<tbody>
<tr>
<td>BASE</td>
<td>MMIDI</td>
<td>Multi</td>
</tr>
<tr>
<td>VELs/XPOS=BOTH</td>
<td>XCTRL=002</td>
<td></td>
</tr>
</tbody>
</table>

BASE-CHAN
Range: 01 to 16
Selects the Base Channel on which the TS-12 transmits and receives MIDI messages. System Exclusive messages are always sent and received on the base channel.

Any of 16 MIDI channels may be selected as the basic MIDI channel of the TS-12. The effect of setting the base channel varies depending on the MIDI Mode and whether data is being sent or received.

Transmit If SEND=BASE, then the TS-12 only transmits keys, controllers, and program changes on the base channel. If SEND=TRACK, then keys, controllers, and program changes are transmitted on the channel defined in the preset or sequencer track.

Receive In Poly mode — keys, controllers, and program changes are only recognized if received on the base channel. In Mono A mode, program changes are received only on the base channel. The base channel is also used in both Mono modes as the first channel of the 12 channel range.

GMIDI
Range: OFF or ON
This is used to enter General MIDI mode. The TS-12 completely conforms to the full General MIDI Specification. This allows you to play back any General MIDI-based sequence via incoming MIDI and always get predictable results. The General MIDI Sounds in ROM (listed later) are also provided on the in-box disk (TSD-300) that came with your TS-12.

For a complete description of this mode, see Section 12 — Sequencing/MIDI Applications.

SEND
Range: BASE or TRACK
Controls the MIDI channel on which the TS-12 will transmit performance information such as key and controller events, as well as program changes.

• BASE — The TS-12 will transmit only on the Base Channel, and will ignore the channel assignments contained in the tracks. When Presets are selected, they will transmit the MIDI Program Change for the Preset, and not the Program Change values for the three Tracks.

• TRACK — The settings on the Track MIDI page determine the MIDI transmission channel. The TS-12 will transmit on the channel(s) assigned to the track(s) being played, either from the keyboard or the sequencer, depending on the Track MIDI Status (i.e. nothing will be sent if a track is assigned to the - - - /RECV or MIDI-OFF status). Each track can have its own MIDI channel.
Note: When a Sequence or Song Track is selected, SEND will automatically be set to TRACK. Sequence and Song Tracks always transmit on their Track MIDI Channel.

MODE

This parameter determines how MIDI information will be received by the TS-12. MODE has no effect on what MIDI information is transmitted.

There are five MIDI modes implemented in the TS-12:

- **OMNI** — In this mode, the TS-12 will receive on any or all of the 16 MIDI channels. This mode is useful when you are only using a few instruments, and you are not concerned with setting up different channels for each device.
- **POLY** — In this mode, the TS-12 will receive only on the Base MIDI channel. MIDI information on all other channels will be ignored.
- **MULTI** — An ENSONIQ innovation, MULTI mode is the key to unlocking the potential of the TS-12 as a multi-timbral receiver from an external MIDI sequencer. In MULTI mode, the 12 Tracks of the current song or sequence can receive MIDI information independently and polyphonically on up to 12 different MIDI channels. The Preset Tracks will not receive incoming MIDI in MULTI mode.

In MULTI mode, different MIDI channels must be selected for each Sequence Track that you want to receive via MIDI. This can be accomplished on the Track MIDI page. If more than one Sequence Track is set to the same MIDI channel, only the lowest numbered track will receive via MIDI.

In MULTI mode, independent of what tracks are stacked or selected on the front panel, the sounds you hear will depend entirely on what MIDI channel(s) the MIDI data is received on.

**About Mono Mode**

Mono mode is particularly useful for driving the TS-12 from a guitar controller, or any other application where having up to twelve independent, monophonic channels is desirable. The TS-12 offers two types of Mono mode operation. In both types, the TS-12 will receive monophonically on twelve consecutive MIDI channels (the Base channel through Base channel +11). The difference has to do with how those MIDI channels are routed within the TS-12.

- **MONO-A** — This is another ENSONIQ development intended to make using multi-channel controllers like guitars easier. All notes and controllers received via MIDI will play whatever sounds are selected or stacked on the front panel, just as if the notes were played from the keyboard. You have the advantage of multiple tracks which will respond independently to controllers received on multiple channels, but you do not have to set up the sounds for each track separately.
- **MONO-B** — This is the more conventional type of Mono mode. It allows you to set up each track of the current song or sequence as a monophonic synthesizer. Each track can have a different sound assigned to it. This is how you get a different sound on each string when using a MIDI guitar controller.
Global Controllers in Mono Mode

Global controllers are controllers sent on one channel that affect all other channels simultaneously. They can be useful in reducing the number of MIDI events required to achieve particular effects, and can thereby reduce the delays sometimes associated with overloading MIDI. Some guitar controllers can transmit global controllers, and the TS-12 can respond to them.

In Mono mode (A or B) the base channel minus one becomes the MIDI channel for global controllers (pitch bend, pressure, etc.). For example, if the base channel is channel 3, any controllers received on channel 2 will be interpreted as global controllers and will affect all voices being played. If the base channel is channel 1, channel 16 becomes the channel for global controllers. Each track will also respond independently to controllers sent on its own channel. For example, each guitar string on a MIDI guitar can send independent pitch bend, while the “whammy bar” controller could be sent on the global channel to affect all voices.

VELS/XPOS — MIDI Transpose Enable

Range: SEND, RECV, or BOTH
Controls whether track transpose will affect the transmission/reception of MIDI key numbers, giving you more control over how the Track Parameter TRANSPOSE function will affect notes played on a track.

XPOS also controls how the Track VELS setting will affect MIDI transmission/reception of velocity, in accordance with the same rules that govern the Track TRANSPOSE parameter.

- **SEND** — Will transmit the transposed key numbers of a track, but notes received via incoming MIDI will not be transposed. This setting is useful for sending transposed key numbers to an external MIDI device, without affecting the pitch of notes received via incoming MIDI.
- **RECV** — The key number transmitted by the TS-12 will always be the same key that was actually played on the TS-12 keyboard, but notes received via incoming MIDI will be transposed. In this mode, the TS-12 will respond properly when transposed data sent to an external sequencer is transmitted back to the TS-12.
- **BOTH** — Will transmit and receive the transposed key numbers of a track. Useful for sending transposed key numbers to an external MIDI device, while also affecting the pitch of notes received via incoming MIDI.

<table>
<thead>
<tr>
<th>Setting</th>
<th>Local Voices Affected</th>
<th>MIDI Reception Affected</th>
<th>MIDI Transmission Affected</th>
</tr>
</thead>
<tbody>
<tr>
<td>SEND</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>RECV</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>BOTH</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

XCTRL - External Controller

Range: 000 to 127
Use XCTRL to assign an external MIDI Controller number to be both transmitted and received by the TS-12. The number that is assigned here will be used as the MIDI Controller number that the XCTRL Track parameter will transmit on.

Most controllers on a synthesizer—mod wheel, channel pressure, or breath controller for example—have a MIDI controller number associated with them: this parameter can be set to match the MIDI Controller number of any controller in your rig. Doing so will make a particular external controller available as a modulator in any of your sounds.

One of the modulation sources that can be selected in the programming section is XCTRL. The value of the XCTRL parameter is a MIDI controller number, ranging from 000 to 127. When the Track XCTRL value is edited, parameters that have XCTRL assigned as a mod source will be modulated, and the TS-12 will transmit the edited value(s) on the MIDI Controller number assigned to this parameter. When the TS-12 receives MIDI Controller messages corresponding to this controller number, they will be routed to all parameters that have been programmed with XCTRL as a modulation source.
Suppose for example, you are playing the TS-12 from a keyboard with a breath controller (or want to use a breath controller as a modulator when playing the TS-12 keyboard). You can set up a program on the TS-12 in which the filter cutoff frequency is modulated by XCTRL. If you then set XCTRL=02, the breath controller will now be able to modulate the filter, or whatever else has its modulation source set to XCTRL, in the program you have created.

The following controller numbers are commonly supported:

<table>
<thead>
<tr>
<th>Number</th>
<th>Controller</th>
<th>Number</th>
<th>Controller</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Modulation Wheel</td>
<td>64</td>
<td>Sustain</td>
</tr>
<tr>
<td>2</td>
<td>Breath Controller</td>
<td>66</td>
<td>Sostenuto</td>
</tr>
<tr>
<td>4</td>
<td>Foot Pedal</td>
<td>70</td>
<td>Sound Variation (Patch Selects)</td>
</tr>
<tr>
<td>6</td>
<td>Data Entry MSB</td>
<td>71</td>
<td>Harmonic Content (Timbre)</td>
</tr>
<tr>
<td>7</td>
<td>Volume</td>
<td>72</td>
<td>Release Time</td>
</tr>
<tr>
<td>10</td>
<td>Pan</td>
<td>73</td>
<td>Attack Time</td>
</tr>
<tr>
<td>12</td>
<td>Effect Modulation</td>
<td>74</td>
<td>Brightness</td>
</tr>
</tbody>
</table>

• Press MIDI Control again. The display shows the second sub-page:

```
MIDI LOOP=OFF CNTRLS=ON SONG=SEL=OFF
ALL-OFF=OFF START/STOP=ON PROG-CHG=ON
```

**LOOP**  
Range: OFF or ON  
The MIDI LOOP parameter controls how volume information is handled when a track’s status is set to LOCAL-OFF or MIDI-LOOP. It controls whether or not the Track MIX parameter, as adjusted in the Track Parameter section, will transmit via MIDI. It only affects tracks that have their MIDI status set to LOCAL-OFF or MIDI-LOOP. It is normally OFF, but in a MIDI loop setup, it should be ON.

• OFF — This is the default setting. When changes are made to the Track MIX parameter (on tracks with STATUS=LOCAL-OFF or MIDI-LOOP), or when the volume pedal is moved, the TS-12 will transmit MIDI volume (controller 7) messages that combine the Track MIX setting with the current setting of the volume pedal.

• ON — The TS-12 will not transmit changes made to the Track MIX parameter on tracks with STATUS=LOCAL-OFF or MIDI-LOOP. Volume pedal changes will be transmitted directly and are unaffected by the MIX setting.

When LOOP=OFF, then the MIX parameter is combined (multiplied) with the volume pedal setting to create a composite volume, which is then transmitted to external sound modules as MIDI controller 7. In a MIDI loop situation with a computer, this is undesirable, because lowering the MIX value will send controller messages that are indistinguishable from volume pedal messages. When this information is echoed by the computer, the TS-12 receives it as volume pedal, lowering the volume on that track even further. Eventually this causes the volume to spiral down to zero, which in turn causes the track to be silenced, even though the displayed volume setting is greater than zero. Setting LOOP=ON will prevent this problem from occurring.

Note that the volume pedal is only active if PEDAL=VOL on the System page, and that volume pedal changes will always be transmitted as MIDI volume (controller 7).
Working with MIDI Loops
With a MIDI loop setup, the MIDI Out of the TS-12 is either directly or indirectly (through an external device such as a computer) connected to the MIDI In of the TS-12. The MIDI-LOOP Track STATUS is optimized for use in a MIDI loop in which the TS-12 will play back into itself.

*Do not use the SEND/RECV Track STATUS setting with a MIDI loop present.* To connect a TS-12 track to a computer sequencer, the MIDI-LOOP setting should be used. In this type of setup, a computer in MIDI Thru mode forms a loop which echoes the MIDI information back into the TS-12. See Section 5 — Preset/Track Parameters for more information about the Track MIDI STATUS parameter. See Section 10 — Understanding the Sequencer for information on recording into the TS-12 sequencer in a MIDI loop.

Using Presets with MIDI Loops
Tip: For best results, set SEND=BASE and MODE=POLY on the MIDI Control page. Be aware that when you select a new preset, program changes with the preset’s number are transmitted via MIDI; Program changes are not transmitted from the individual tracks in the preset. Receiving from MIDI while on a Preset bank page or Preset Track parameter page will minimize problems.

**CNTRLS — Controllers**
This switch controls whether or not the TS-12 will transmit and receive MIDI controllers — pitch bend, mod wheel, pressure, volume, sustain pedal, etc.

**SONG-SEL — Song Select**
This determines whether the TS-12 will send and receive MIDI Song Select messages.

- **OFF** — The TS-12 will not transmit MIDI Song Select messages, and will ignore incoming Song Select messages received via MIDI.
- **ON** — Incoming Song Selects will select the corresponding TS-12 sequencer location. Incoming MIDI Song Selects # 00-59 will select TS-12 Sequencer locations # 00-59. Selecting Sequencer locations # 00-59 will always cause the TS-12 to transmit MIDI Song selects # 00-59.

**ALL-OFF**
The All Notes Off message enable switch controls how the system will react to MIDI All Notes Off messages received on any MIDI channel.

- **OFF** — The TS-12 will ignore any All Notes Off messages that are received.
- **ON** — The TS-12 will shut down all currently sounding internal voices unless the MODE parameter is set to OMNI, in which case the message is ignored.

**START/STOP**
This parameter determines whether pressing the Play and Stop/Continue buttons will transmit MIDI Start, Stop and Continue messages from the TS-12 MIDI Out port. The TS-12 will always receive Play Stop, and Continue messages via MIDI, regardless of the setting of this parameter, if CLOCK=MIDI on the Sequencer Control page. Some older drum machines have no way of disabling reception of these messages, and will always start playing their internal patterns when they receive a Start message. Set this parameter to OFF when you want to use such a drum machine simply as a voice module, played from a TS-12 sequencer track, without starting its internal sequencer playing each time you press the Play button on the TS-12.

- **ON** — When you press the Play or Stop/Continue buttons to start, stop or continue the TS-12 sequencer, a corresponding MIDI Start, Stop or Continue message will be sent.
- **OFF** — When you press the Play or Stop/Continue buttons to start, stop or continue the TS-12 sequencer, a MIDI Start, Stop or Continue message will not be sent.
PROG-CHG — Program Changes

Range: OFF or ON

This switch controls how the TS-12 handles transmission and reception of MIDI program change messages.

- OFF—the TS-12 will not transmit or receive MIDI program changes.
- ON—the TS-12 will transmit and receive program changes over MIDI.
- NEW—the TS-12 will transmit program changes only if they are different than the previous program change sent out on the particular channel. Program changes will be received normally.

Refer to the Track MIDI parameter description in Section 5 — Preset/Track Parameters and Section 10 — Understanding the Sequencer for more information on how program changes are handled.

Receiving MIDI Program Changes

The way in which the TS-12 receives program changes is slightly more complex than some other systems, because of the large number of programs and presets that are available to be selected from MIDI program changes. The following chart shows how the TS-12 receives MIDI program changes:

In OMNI, POLY and MONO-A modes (puts unit into Sounds/Presets mode):

<table>
<thead>
<tr>
<th>When...</th>
<th>Incoming MIDI Program Changes...</th>
<th>Will Select...</th>
</tr>
</thead>
<tbody>
<tr>
<td>BankSet U0 is selected</td>
<td>00-59</td>
<td>User RAM Programs 00-59</td>
</tr>
<tr>
<td>BankSet U1 is selected</td>
<td>00-59</td>
<td>User RAM Programs 00-59</td>
</tr>
<tr>
<td>BankSet R2 is selected</td>
<td>00-59</td>
<td>ROM Programs 00-59</td>
</tr>
<tr>
<td>BankSet R3 is selected</td>
<td>00-59</td>
<td>ROM Programs 00-59</td>
</tr>
<tr>
<td>BankSet R4 is selected</td>
<td>0-9</td>
<td>Sampled Sounds 0-9</td>
</tr>
<tr>
<td>BankSet S8 is selected</td>
<td>0-9</td>
<td>Sampled Sounds 0-9</td>
</tr>
<tr>
<td>BankSet S9 is selected</td>
<td>60-119</td>
<td>User RAM Presets 00-59</td>
</tr>
<tr>
<td>BankSet U0 is selected</td>
<td>60-119</td>
<td>User RAM Presets 00-59</td>
</tr>
<tr>
<td>BankSet U1 is selected</td>
<td>60-119</td>
<td>ROM Presets 00-59</td>
</tr>
<tr>
<td>BankSet R2 is selected</td>
<td>60-119</td>
<td>ROM Presets 00-59</td>
</tr>
<tr>
<td>BankSet R3 is selected</td>
<td>60-119</td>
<td>ROM Presets 00-59</td>
</tr>
<tr>
<td>BankSet R4 is selected</td>
<td>60-119</td>
<td>nothing...</td>
</tr>
<tr>
<td>BankSet S8 is selected</td>
<td>10-127</td>
<td>nothing...</td>
</tr>
<tr>
<td>BankSet S9 is selected</td>
<td>10-127</td>
<td>nothing...</td>
</tr>
</tbody>
</table>

In MULTI and MONO-B modes (received on Seq/Song Tracks only):

<table>
<thead>
<tr>
<th>When...</th>
<th>Incoming MIDI Program Changes...</th>
<th>Will Select...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Track BANK=000 (BankSet U0)</td>
<td>00-59 (without FX)</td>
<td>User RAM Programs 00-59</td>
</tr>
<tr>
<td>Track BANK=001 (BankSet U1)</td>
<td>00-59 (without FX)</td>
<td>User RAM Programs 00-59</td>
</tr>
<tr>
<td>Track BANK=002 (BankSet R2)</td>
<td>00-59 (without FX)</td>
<td>ROM Programs 00-59</td>
</tr>
<tr>
<td>Track BANK=003 (BankSet R3)</td>
<td>00-59 (without FX)</td>
<td>ROM Programs 00-59</td>
</tr>
<tr>
<td>Track BANK=004 (BankSet R4)</td>
<td>00-59 (without FX)</td>
<td>ROM Programs 00-59</td>
</tr>
<tr>
<td>Track BANK=008 (BankSet S8)</td>
<td>0-9 (without FX)</td>
<td>Sampled Sounds 0-9</td>
</tr>
<tr>
<td>Track BANK=009 (BankSet S9)</td>
<td>0-9 (without FX)</td>
<td>Sampled Sounds 0-9</td>
</tr>
<tr>
<td>Track BANK=000 (BankSet U0)</td>
<td>60-119 (with FX)</td>
<td>User RAM Programs 00-59</td>
</tr>
<tr>
<td>Track BANK=001 (BankSet U1)</td>
<td>60-119 (with FX)</td>
<td>User RAM Programs 00-59</td>
</tr>
<tr>
<td>Track BANK=002 (BankSet R2)</td>
<td>60-119 (with FX)</td>
<td>ROM Programs 00-59</td>
</tr>
<tr>
<td>Track BANK=003 (BankSet R3)</td>
<td>60-119 (with FX)</td>
<td>ROM Programs 00-59</td>
</tr>
<tr>
<td>Track BANK=004 (BankSet R4)</td>
<td>60-119 (with FX)</td>
<td>ROM Programs 00-59</td>
</tr>
<tr>
<td>Track BANK=008 (BankSet S8)</td>
<td>60-69 (with FX)</td>
<td>Sampled Sounds 0-9</td>
</tr>
<tr>
<td>Track BANK=009 (BankSet S9)</td>
<td>60-69 (with FX)</td>
<td>Sampled Sounds 0-9</td>
</tr>
</tbody>
</table>

Note: Incoming MIDI Bank Select messages 0 thru 9 will select BankSets 0 thru 9, changing which Programs will be selected by incoming MIDI Program Changes. In all cases Program Change numbers above 120 to 127 are ignored.
Selecting a New Sequence or Song Effect from MIDI Program Changes

As indicated in the above chart, in MULTI and MONO-B modes, adding 60 to the MIDI Program Change number for the desired sound will select the new sound and also install the effect from that sound into the sequence (or song) effect. This can be useful when controlling the TS-12 from an external sequencer. Note that changing the effect will briefly silence the audio output and will cut off any sounding voices if VOICE-MUTING=ON on the System page.

- Press MIDI Control again. The display shows the third sub-page:

![MIDI Control Screen]

**SYS-EX**
Range: OFF, ON, or OLD
This switch determines whether the TS-12 is able to receive incoming MIDI System Exclusive messages:

- When SYS-EX=OFF, the TS-12 is not able to receive any MIDI System Exclusive messages.
- When SYS-EX=ON, the TS-12 will receive MIDI System Exclusive messages in the post-2.0 SYS-EX data format.
- When SYS-EX=OLD, the TS-12 will receive MIDI System Exclusive messages in both the pre-2.0 SYS-EX data format, and the post-2.0 SYS-EX data format. The OLD setting allows data saved from pre-2.0 software to be loaded into the TS-12.

The Sys-Ex Dump messages that are sent from the Storage, Sys-Ex, Send Dump pages can always be transmitted regardless of the setting of this switch. (Refer to the Appendix for more information about the TS-12's Sys-Ex implementation).

**DEVICE-ID**
Range: 01 to 16
Allows Remote MIDI Devices to address the TS-12 via incoming MIDI Sys-Ex without changing the base channel number. Think of this parameter as a higher level of identification. This is also used to identify Sys-Ex messages transmitted by the TS-12.

**SEND-PARAMS**
Range: OFF or ON
When SEND-PARAMS=ON, the TS-12 allows the transmission of parameter values via Sys-Ex messages. When OFF, there is no transmission of parameter values. For example, if you are editing a sound, set this parameter to OFF, to prevent a stream of MIDI Sys-EX information from flowing between the TS-12 and any connected Remote MIDI Devices.
Section 4 — Understanding Presets

This section offers a basic overview of the concepts involved in selecting, creating, editing, and understanding TS-12 Presets. For more detailed descriptions of the actual parameters, refer to Section 5—Preset/Track Parameters.

What is a Preset?

A *Preset* is a combination of three sounds and an effects set-up that can be instantly recalled for use in performance. Presets are handy “performance memories” which allow you to create and save sound combinations, splits, layers, patch select variations, etc.

The three sounds in a preset reside on three *Tracks*. For each of these three tracks, the TS-12 remembers:

- which sound is assigned to the track
- whether or not the sound is selected or layered
- the values of all the *Track* parameters for that track

A preset also has one Effects algorithm which is common to all three tracks.

The most common context for the TS-12 to be in is *Preset mode*. Unless the TS-12 is in Sequencer mode, you may assume that you are in a preset. Aside from the presets that are saved, there is a *preset buffer* that is always active. A preset buffer is a kind of storage location that is used to temporarily store information.

Whenever you select, layer or edit the Track Parameters for a sound, you are working within the preset buffer. The information in the preset buffer is temporary until you save it into one of the internal preset locations, and then it becomes permanent (it can be recalled). The track parameters of the preset, including mix, pan, transpose, etc. are always active and you should make sure that their settings are correct if you think that your programs are behaving strangely. Whenever you select a new sound from the Sound Bank pages, the track parameters are reset to their standard default settings. If you wish to change a program without resetting these parameters, use the Replace Track Sound feature described later in this section.

What is the Difference between Preset Mode and Sequencer Mode?

There are three Tracks in a “normal” preset and twelve tracks in a sequence or song. A sequence or song, in addition to its ability to record data on its tracks, can be thought of as a giant twelve-track “preset.” However, this giant “preset” is not available simultaneously with normal three-track presets. The twelve tracks of a sequence or song are available from the keyboard only while in Sequencer mode — indicated by the LED above either *Seq/Song Tracks 1-6* or *7–12* button being on. The twelve sequence or song tracks are always playable via incoming MIDI when the MIDI mode is set to MULTI (on the MIDI Control page).

Selecting Presets

Press *Presets*. The LED above the *Presets* button lights, indicating that you are in Preset mode. The display shows you the currently selected bank of six presets, and the bottom left-hand corner of the display will show PSET. You can press the *BankSet* button and the ten *Bank* buttons (labeled 0-9) to select the various banks within Preset mode. Take a moment to select different presets by pressing the soft button closest to the preset (either above or below the preset name).

Since Preset and Program banks look very similar (both Presets and Programs have six 11-character names per page), the bottom left-hand corner of the display will show PSET when you are in Presets mode. This helps to differentiate between the two modes, as shown below:
Tip: Because you can use the BankSet button and the ten Bank buttons to “shop around” in various banks before selecting a preset, it is possible to lose track of where the currently selected preset (the one you are hearing) is located. Try this shortcut for getting to the BankSet and Bank that contains the selected preset: rapidly double-click the Preset button. This will instantly return you to the location that contains the currently selected preset.

Press the Presets button again. Across the top line, the display shows the names of the three sounds that are on the three tracks. On the lower line you see “context” information about the current preset. The illustration below shows the relationship of the preset and its three tracks to what you see on the display:

 Whenever the Presets LED is lit, it means that the TS-12 is in Preset mode, and the ten Bank buttons beneath the display will select Preset Banks when you press them (rather than selecting Sound Banks, as they do when the Sounds LED is lit).

**How Many Presets are in the TS-12?**

The TS-12 offers 300 internal Presets:
- 120 presets in User RAM — 60 in BankSet U0 and 60 in BankSet U1.
- 180 presets in ROM — 60 in BankSet R2, 60 in BankSet R3, and 60 in BankSet R4.
Editing a Preset

In addition to the presets stored in memory, there is one more preset that you are using most of the time whether you know it or not. Whenever you are selecting or layering sounds in Sounds mode, you are also creating a preset. The TS-12 automatically “remembers” the last three sounds you selected and stores them in a special memory buffer called the Preset Edit Buffer. Try this:

- Press Sounds and select a sound by pressing its soft button.
- Layer another sound with the first by double-clicking its soft button.
- Layer a third sound by double-clicking on it.

You have created a preset with three sounds playing simultaneously. Suppose you wanted to adjust their relative volumes, or shorten the release time, or change the pan location of one of the sounds without losing the combination. You can do all of these things and a lot more with presets.

In Preset mode, whenever you are hearing the Preset Edit Buffer, the preset name is shown as *-EDITED--*. You can always toggle between the edited and currently selected preset by pressing the soft button closest to the preset name.

As we have already discussed, a preset consists of three tracks, each of which has a sound and a set of track parameters. The track parameters are found in the Track Parameters section of the front panel. Presets can be saved, so that you can call them up at any time, or you can use the Preset Edit Buffer in real-time as a powerful performance tool.

While you still have three programs layered, press the Mix/Pan button in the Track Parameter section. The display shows:

```
MIX MEGASTRINGS HYPER-LOOP TENOR-SAX
127 127 127
```

- Across the top line you see the name of the last three sounds you selected, one with a solid underline and the other two with flashing underlines, just as they appeared on the sound bank pages. A flashing line means that it is a layered sound.
- On the lower line you see the mix levels for each sound. You can select which one you want to adjust by pressing the soft button beneath the value, then adjust the value with the data entry controls.
- Note that you can select a track for editing (using the lower three soft buttons) independent of what is selected or layered on the upper line of the display. This means that you can adjust the volume of any of the three sounds in the layer without having to un-layer them.

On this and all Track Parameter pages, selecting or layering sounds from the upper line determines what sound(s) you hear, and selecting parameters on the lower line determines which track will be modified if you move the Data Entry Slider or the Up/Down Arrow buttons. Try pressing some of the other Track Parameter buttons — Tuning, Brightness, Key Zone, etc. — and adjusting the track parameters on those pages. You will soon see that within a preset, it’s easy to create splits and layers, transpose a sound, change the pan and many other useful things. You can even assign one or more tracks in a preset to play only over MIDI, making presets a great tool for controlling remote MIDI instruments in combination with TS-12 sounds.
What are Preset/Track Parameters?

Preset/Track Parameters provide easy access and control for track and sound attributes, and are used in mixing/manipulating sequencer tracks and in creating presets.

A group of Preset/Track Parameters is associated with each preset and sequencer track. These parameters control various aspects of the track, including some important and useful sound controls which may be easily adjusted during performance, or recorded into the sequencer. The settings of these parameters are saved with every preset. These instantly recallable presets include an effect setup and three programs on three tracks with a full set of programmable performance parameters, including key zones, transpositions, release times, timbral variations and others. The settings of all performance parameters on sequencer tracks are saved for each track while the power to the TS-12 is off, and are always available.

The buttons which control the pages containing these parameters are found in the Track Parameters section of the front panel to the right of the display.

To view or adjust the setting of a particular type of track parameter, press the appropriate button in the Track Parameter section. The selected parameter type is indicated in the top-left corner of the display.

On the Track Parameter pages, the top line of the display will show the names of three programs and their current layering status. The name of the parameter type is abbreviated to four characters in order to make room for the program names, and is shown in the top left corner of the display. The bottom line of the display shows the current values of the selected parameter for the three tracks of the preset.

In Sequencer mode the current values of parameters for the six tracks (Tracks 1-6 or 7-12) will be displayed. You can press the Tracks 1-6 or 7-12 button again to toggle back and forth between the TRAX page which shows the names of the programs on the tracks and the last selected track parameter page which shows parameter values.

The currently selected track parameter will be underlined. This is the active parameter which will be modified. You may select a parameter for a different track by using the soft buttons. When programming performance presets, the lower row of soft buttons is used to select tracks. For sequencer or song tracks, both upper and lower soft buttons are used.

Remember that you can edit parameters on tracks that you are not hearing. The tracks that you can hear are indicated with solid or flashing underlines on their names.

Saving a Preset

Once you have created a preset you like, you can save it to one of the 120 Preset locations in the User RAM memory (you cannot save presets or sounds to the ROM memory — it is read only). Saving a preset to a User RAM location will erase the one that is currently there, so be careful.

To save a preset, first decide which User RAM BankSet and Bank location you want to save it to, then:

• Press the Presets button twice to view your edited preset. If the display does not show your edited preset, press the soft button in the lower left corner of the display. The display should show “*-EDITED-*” in the lower left corner.
• Press the lower right soft button underneath the word “*WRITE*.”
• The display shows the current name of the preset with a cursor (underline) beneath the first character. If you want to give the preset a new name, do so at this time. Use the Up/Down Arrow buttons and the Data Entry Slider to change the underlined character, and press the Left/Right Cursor (soft buttons) to move the underline.

• After you’ve named your preset, press and hold down the Presets button. The word SAVE flashes in the lower left corner of the display. The display shows the names of the presets in the currently selected BankSet and Bank. If you let go of the Presets button, the display will return to show the Preset Write page.

Currently selected BankSet & Bank location

U0-0 -PRESET-00- -PRESET-01- -PRESET-02-
SAVE -PRESET-03- -PRESET-04- -PRESET-05-

• Press and hold any of the Bank buttons (0-9) to view the different preset banks. This allows you to select a Bank location within the current BankSet for your edited preset. While holding down a Bank button, press the BankSet button to toggle between the two User RAM BankSets.

While holding down the BankSet button…

Press & hold any of the 10 bank buttons

• Once you’ve selected a BankSet and a Bank location for your edited preset, while holding down either the Presets button or the appropriate Bank button, press the soft button for the preset location into which you want to save your preset. Your edited Preset will be saved into that location, erasing the existing preset.

If you need to listen to a few presets in order to decide which one to replace, simply press the soft button beneath *EXIT* and then select presets just as you normally would. The word *EDITED* disappears from the screen, indicating that you are listening to saved presets. Your new preset is safe in the Preset Edit Buffer. But make sure you don’t edit anything in any of the presets you audition, including selecting or layering sounds in Sound mode, or this will create a new Edit Preset, erasing the one you created.

When you are ready to save the new preset, press the Presets button, and then the lower left soft button. You will be returned to the Edit Preset (the word *EDITED* should return on the display). Now you can save the preset as described above.
Avoiding Confusion when using Presets

Whenever you create and save a preset, the TS-12 only “remembers” the location of the three sounds in memory — not the actual sounds themselves. This is important to remember when you use User RAM programs in presets. If you move a sound, put another in its place, or transfer an entire BankSet of sounds, the preset might still be “pointing to” a location that no longer contains the sound you had in mind.

For example, if you create and save a preset containing a brass sound, a string sound and a piano sound, and you then write over the piano sound with a flute sound, the flute sound will now appear in the location originally occupied by the piano in your preset.

Using the Replace Track Sound Function in Presets Mode

The Replace Track Sound function is primarily used for:

- Assigning sounds to tracks without changing the effects or other Track Parameters
- Determining the exact placement of sounds in a preset

Normally, when sounds are selected from the sound bank pages, they are transferred to a track in the Preset Edit Buffer, and many of the track parameters for that track are reset to standard default settings. However, you may wish to change which sound is assigned to a track in a preset without changing any of the other settings for that track. This is done using the Replace Track Sound feature in Presets Mode. The Replace Track Sound button is located next to the Seq/Song Tracks 1-6 and 7-12 buttons on the bottom row in the Track Parameters section.

Replacing a Sound in a Preset

- Press one of the Track Parameter buttons, such as Mix/Pan, to display the current preset, and make sure that the correct track is selected. The track whose sound will be replaced is indicated by the underlined parameter value on the lower line of the display. It does not matter which Track Parameter page is displayed. Use the bottom three soft buttons below the display to select the correct track.

- Press the Replace Track Sound button. The last selected sound bank page will be displayed and the LED above the Sounds button will start to flash, indicating that you are in Replace Track Sound mode.

- Locate the sound that you wish to install into the track and press the soft button nearest to it. This sound is now installed on the track, and will acquire the status of the sound that was replaced if it was selected or layered. You may change BankSets, Banks, and/or continue to select replacement sounds until you are satisfied that you have found the right one. If you replace the sound on a track that is not currently selected or layered in the preset, you will be immediately returned to the preset page that you were on.

- Press Replace Track Sound again to exit Replace Track Sound mode and return to the preset page to verify that your change was correct. Pressing Sounds or any other page button will also exit Replace Track Sound mode.

The method described above is also used to change the sound assigned to a track in the current sequence or song. Unlike using Replace Track Sound in a Preset, using it in Sequencer Mode will update the track Program and Bank Select number to the correct value for the sound selected. See Section 10 — Understanding the Sequencer for more information.
Using SoundFinder in Presets Mode

Here’s how to scroll through Programs that have the same defined Program Type in Presets mode. For this example, load the 120-PROGRAMS file called USERBNKS V2 from the TSD-200 disk:

- Press the Presets button.
- While pressing the BankSet button, press the Bank 3 button. This selects ROM BankSet R3.
- Press the Bank 0 button. This selects the first Bank in ROM BankSet R3. The display shows:

```
R3-0  AC-BS/PIANO  AC-BS/ORGAN  AC-BS/ELPNO
PSET  AC-BS/NYLON  AC-BS/VIBES  AC-BS/VOICE
```

- Press the upper left soft button to select AC-BS/PIANO (an upright bass and piano split).
- Press the Mix•Pan button (pressing any Track Parameter button will allow you to view the three tracks that make up a Preset). The display shows:

```
MIX  UPRITE-BASS  FULL-BODY  SCORING-STR
100   999        100
```

In this Preset, FULL-BODY is the primary sound (solid underline) and UPRITE-BASS is layered (flashing underline) with it. In this scenario, we will use SoundFinder to audition other Programs that have the same Program Type as the FULL-BODY Program.

- Press the lower center soft button so that the cursor (underline) is beneath the FULL-BODY MIX value (090). The display should look like this:

```
MIX  UPRITE-BASS  FULL-BODY  SCORING-STR
100   999        100
```

- Press the Replace Track Sound button. Its LED should be lit.
- Press the Up Arrow button. The display now shows:

```
R2-0  BABY-GRAND  FULL-BODY  BRITE-PNO
STEREO-PNO  WARM-GRAND  ALL-PURPOSE
```

- BRITE-PNO is underlined because it is the next Program that has the same Program Type as FULL-BODY.
- Press the Up Arrow button again. Notice that SoundFinder has moved from BRITE-PNO to
the STEREO-PNO Program. STEREO-PNO is also defined with the same Program Type as FULL-BODY.

- Continued presses of the **Up Arrow** will scroll forward through all of the Programs with the same Program Type. Continued presses of the **Down Arrow** button will scroll backward through all of the Programs with the same Program Type.
- When you’ve found the sound that you want, press the **Replace Track Sound** button to exit SoundFinder. The **Replace Track Sound** LED will no longer be lit, and you will be returned to the MIX page with the last sound selected replacing FULL-BODY.

### Replacing a Sound and the Effect in a Preset
You can replace the sound on a track and make its effect become the preset’s effect by double-clicking the **Replace Track Sound** button:

- Select a preset and select the track whose sound you want to replace.
- Double-click **Replace Track Sound**. The last selected sound bank page will be displayed and the LEDs above the **Replace Track Sound** and the **Sounds** button will both start to flash, indicating that you are in Replace Track Sound mode.
- Use the **BankSet**, **Bank** buttons, and soft buttons to pick a sound as before; but now each time you pick a new sound, its effect will become the preset effect.
- Press **Replace Track Sound** again to exit Replace Track Sound mode and return to the preset page to verify that your change was correct.

### Display Location
The following short cut for finding the locations of the sounds assigned to each Preset Track also shows the Display Location for each Program. For any Program or Preset Bank, the Display Locations are numbered as follows:

![Display Location Diagram](image)

### Finding the BankSet, Bank, and Display Location for Sounds on Preset Tracks
To find the BankSet, Bank and Display location (U0-1.5, U1-3.1, R2-7.4, etc.) for the sounds assigned to Preset tracks:

- Select a Preset to view (it should be underlined). For this example, we’ll use the DIGIWARMTH preset located in R2-0.
- Press **Presets**.
- While holding down the **BankSet** button, press the **Bank 2** button.
- Press the **Bank 0** button.
- Press the upper left soft button in the display. The display now shows the Preset Bank page:
• Press and hold **Presets**, and then press **Sounds**. The display will show:

<table>
<thead>
<tr>
<th>Program BankSet Location</th>
<th>Program Bank Location</th>
<th>Program Display Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSET R3-0.3</td>
<td>R3-0.6</td>
<td>R2-3.5</td>
</tr>
<tr>
<td>DIGIWARMTH</td>
<td>BANK R2-0.1</td>
<td><em>WRITE</em></td>
</tr>
</tbody>
</table>

The BankSet, Bank, and Display location for each of the track sounds are shown on the top line of the display.

• Release both buttons and the track names will be redisplayed:

<table>
<thead>
<tr>
<th>Program BankSet Location</th>
<th>Program Bank Location</th>
<th>Program Display Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSET GLASS-KEYS</td>
<td>BEST-PAD</td>
<td>OL-FAITHFUL</td>
</tr>
<tr>
<td>DIGIWARMTH</td>
<td>BANK R2-0.1</td>
<td><em>WRITE</em></td>
</tr>
</tbody>
</table>

Preset BankSet Location
Using Effects With Performance Presets

All three tracks in each preset, and all twelve tracks in each sequence or song, share the same effects algorithm and settings. The effects settings for each preset is inherited from the primary (non-layered) selected sound, and any layered sounds in the preset will use that same effect. The effects settings for each sequence or song are inherited from the current sequencer effect at the time the sequence or song was created. If this effect is incompatible with other programs in the preset, sequence or song, there are several options:

- set the effects bus routing to -DRY- for any of the programs that are incompatible
- set the effects bus routing to -AUX- for programs that you want to process separately by sending them to the AUX Outputs
- change the preset/sequence/song effect to be something more suitable

When you press the Track Effects button from preset or sequencer mode, the first page that appears is the Track Effects Bus Routing page. On this page you can override the normal effects routing of the sound on each track. Subsequent sub-pages let you edit the effect for use in a preset, sequence, or song; these pages are identical to the effects programming pages under the Program Effects button. See Section 6 — Understanding Effects for more information on effect selection and programming.
Section 5 — Preset/Track Parameters

This section offers detailed descriptions of the commands and parameters used in selecting, creating, and editing Performance Presets as well as sequencer tracks. For an overview of the concepts involved, refer to Section 4 — Understanding Presets.

The default settings for several of the Track Parameters are stored with Programs. These default settings are installed whenever a Program is put on the Track. Editing these values at the track level will not edit the default settings stored with the program. If you want to edit the values that are stored with a Program, they are available on the first sub-page of the Program Control page.

Unless otherwise noted in the detailed descriptions which follow, use the Up/Down Arrow buttons or the Data Entry Slider to adjust the value of the parameter.

- Press the Mix/Pan button to get to the Mix page:

Mix Page

<table>
<thead>
<tr>
<th>MIX</th>
<th>MEGASTRINGS</th>
<th>TAMBOUR</th>
<th>LOW-TAIKO</th>
</tr>
</thead>
<tbody>
<tr>
<td>127</td>
<td>127</td>
<td>57</td>
<td></td>
</tr>
</tbody>
</table>

The Mix Page enables you to make volume changes to the individual tracks, allowing you to balance the TS-12 sounds and/or control the volume of external MIDI devices. In sequencer mode, the MIX page has a special function which allows you to click or double-click on specific tracks to mute or solo them during playback of sequences or songs.

All tracks whose MIDI Status is set to SEND/RECV, SEND/----, VOICE-OFF, or LOCAL-OFF will send a MIDI Volume Change message (controller 7) with the indicated value whenever this parameter is edited. Sequencer and preset tracks will also send the current volume for each track when a sequence or preset is selected.

- Press the Mix/Pan button again to get to the Pan page:

Pan Page

<table>
<thead>
<tr>
<th>PAN</th>
<th>MEGASTRINGS</th>
<th>HYPER-LOOP</th>
<th>GRUNGE-ORG</th>
</tr>
</thead>
<tbody>
<tr>
<td>-64</td>
<td>STEREO</td>
<td>+06</td>
<td>-MONO-</td>
</tr>
<tr>
<td></td>
<td>STEREO</td>
<td></td>
<td>+00</td>
</tr>
</tbody>
</table>

The Pan Page gives you control over the placement of the track’s sound in a stereo field. A PAN setting of -64 is hard left, and +63 is hard right.

Press the soft button underneath the PAN value again to select either STEREO or -MONO-. When -MONO- is selected, it will override the settings originally programmed on the Output page and force ALL of the voices of the sound to the new pan location. -MONO- is the optimal setting when using parallel effects, because it allows for discrete routing into the two components of the FX-1 effect. When this is set to STEREO, and the PAN is set to +00, the voices of a sound are panned according to the settings originally programmed on the Output page.

All tracks whose MIDI Status is set to SEND/RECV, SEND/----, LOCAL-OFF or VOICE-OFF will send a MIDI Continuous Controller message (controller 10) with the indicated value whenever this parameter is edited. Preset tracks will also send this controller message when a preset is selected.
Section 5 — Preset/Track Parameters

Press the **Attack/Release** button to get to the Attack page:

**Attack Page**

<table>
<thead>
<tr>
<th>ATCK</th>
<th>MEGASTRINGS</th>
<th>HYPER-LOOP</th>
<th>TENOR-SAX</th>
</tr>
</thead>
<tbody>
<tr>
<td>-64</td>
<td>+08</td>
<td>+63</td>
<td></td>
</tr>
</tbody>
</table>

The Attack Page allows you to increase or decrease the attack time of the sound on a selected track. Attack time is the time it takes for the sound to be heard when the key is pressed. This is useful when you need to adjust the attack characteristics of a sound for a particular application without getting more deeply into programming. Higher values offer a longer attack time, and could be used to create a fade in effect.

In order for a Program to be controlled by this parameter, one or more of the envelopes in the Program must be programmed with the Envelope ATTACK parameter set to a value with a star (*) suffix. For example, if a voice’s ENV3 TIMES - ATTACK=50* instead of simply 50, then the attack time of Envelope 3 can be adjusted from the Track Attack parameter. It is typical to have at least Envelope 3 controlled by the parameter on this page.

The current value of Attack is saved with the sound whenever a sound is written, and is restored whenever the sound is selected or placed on a track.

All tracks whose MIDI Status is set to SEND/RECV, SEND/----, LOCAL-OFF or VOICE-OFF will send a MIDI Continuous Controller message (controller 73) with the indicated value whenever this parameter is edited. Preset tracks will also send this controller message when a preset is selected.

The default value of Attack is stored with the Program, and is restored whenever the Program is selected or placed on a track. The default value can be edited on the Program Control page. This parameter does not affect Sampled Sounds.

Press the **Attack/Release** button again to get to the Release page:

**Release Page**

<table>
<thead>
<tr>
<th>RELS</th>
<th>MEGASTRINGS</th>
<th>HYPER-LOOP</th>
<th>TENOR-SAX</th>
</tr>
</thead>
<tbody>
<tr>
<td>+00</td>
<td>+08</td>
<td>+63</td>
<td></td>
</tr>
</tbody>
</table>

The Release Page enables you to increase or decrease the release time of the sound on a selected track. Release time is the time it takes for the sound to fade away when the key is released. This is useful when you need to adjust the release characteristics of a sound for a particular application without getting more deeply into programming. Higher values lengthen release time, lower values shorten release time.

In order for a Program to be controlled by this parameter, one or more of the envelopes in the Program must be programmed with the Envelope RELEASE parameter set to a value with a star (*) suffix. For example, if a voice’s ENV3 TIMES - RELEASE=50* instead of simply 50, then the release time of that Envelope 3 can be adjusted from the Track Release parameter. It is typical to have at least Envelope 3 controlled by the parameter on this page.
All tracks whose MIDI Status is set to SEND/RECV, SEND/----, LOCAL-OFF or VOICE-OFF will send a MIDI Continuous Controller message (controller 72) with the indicated value whenever this parameter is edited. Preset tracks will also send this controller message when a preset is selected.

The default value of Release is stored with the Program, and is restored whenever the Program is selected or placed on a track. The default value can be edited on the Program Control page.

- Press the Brightness/Timbre button to get to the Brightness page:

**Brightness Page**

<table>
<thead>
<tr>
<th>BRIT MEGASTRINGS</th>
<th>HYPER-LOOP</th>
<th>TENOR-SAX</th>
</tr>
</thead>
<tbody>
<tr>
<td>+00</td>
<td>+00</td>
<td>+00</td>
</tr>
</tbody>
</table>

The Brightness page enables you to increase or decrease the filter cutoff frequency for each voice within the sound on a selected track. This is useful when you need to adjust the brightness of a sound for a particular application without getting more deeply into programming. Generally, higher BRIT values increase brightness, lower values decrease brightness (when Filter2=HI-PASS on the Filters Page, the functionality of the Brightness parameter is reversed).

In order a Program to be controlled by this parameter, at least one of the two Filter CUTOFF parameters for at least one voice in the Program must be programmed with the CUTOFF parameter set to a value with a star (*) suffix. For example, if a voice’s FILTER1 CUTOFF=125* instead of simply 125, then the brightness of that voice can be adjusted from the Track Brightness parameter.

All tracks whose MIDI Status is set to SEND/RECV, SEND/----, LOCAL-OFF, or VOICE-OFF will send a MIDI Continuous Controller message (controller 74) with the indicated value whenever this parameter is edited. Preset tracks will also send this controller message when a preset is selected.

The default value of Brightness is stored with the Program, and is restored whenever the Program is selected or placed on a track. The default value can be edited on the Program Control page.
• Press the **Brightness/Timbre** button again to get to the Timbre page:

**Timbre Page**

<table>
<thead>
<tr>
<th>TIMB MEGASTRINGS</th>
<th>HYPER-LOOP</th>
<th>TENOR-SAX</th>
</tr>
</thead>
<tbody>
<tr>
<td>000</td>
<td>127</td>
<td>000</td>
</tr>
</tbody>
</table>

The Timbre page provides an easy way to make useful changes to the character of a sound without getting into more complex programming. This performance parameter uses the **Data Entry Slider** or **Up/Down Arrow** buttons to control various aspects of the sound, depending on what the programmer has decided would be useful.

As one of the voice modulation sources, Timbre can be assigned to any parameter that can be modulated in a sound or effect. The Timbre control can be connected to parameters such as filter cutoff, waveform modulation, LFO rate, and others. It is a good idea to experiment with the Timbre setting to hear what it has been programmed to do in each sound.

The Timbre parameter also controls the *relative* volume modulation amounts for each of the six program voices (assigned on the TIMBRE sub-page found on the Program Control Page). This allows you to determine how much louder or softer each voice will become as the Timbre modulation controller is increased or decreased.

All tracks whose MIDI Status is set to SEND/RECV, SEND/----, LOCAL-OFF or VOICE-OFF will send a MIDI Continuous Controller message (controller 71) with the indicated value whenever this parameter is edited. Preset tracks will also send this controller message when a preset is selected. This parameter does not affect Sampled Sounds.

The default value of Timbre is stored with the Program, and is restored whenever the Program is selected or placed on a track. The default value can be edited on the Program Control page.

• Press the **Brightness/Timbre** button a third time to get to the External Control page:

**External Control Page**

<table>
<thead>
<tr>
<th>XCTL MEGASTRINGS</th>
<th>HYPER-LOOP</th>
<th>TENOR-SAX</th>
</tr>
</thead>
<tbody>
<tr>
<td>000</td>
<td>000</td>
<td>091</td>
</tr>
</tbody>
</table>

The External Control parameter transmits on a user-definable MIDI Controller number (set on the MIDI Control Page), and transmits the full range of 000 to 127. It will also modulate any voice or effect parameters that have XCTRL selected as a Mod Source. Any remote MIDI device that can transmit the same MIDI Controller number can act as a modulator by sending controller messages to the TS-12.

All tracks whose MIDI Status is set to SEND/RECV, SEND/----, LOCAL-OFF or VOICE-OFF will send a MIDI Continuous Controller message (on the controller number assigned to the XCTRL parameter on the MIDI Control page) with the indicated value whenever this parameter is edited. Preset tracks will also send this controller message when a preset is selected.

The default value of XCTRL is stored with the Program, and is restored whenever the Program is selected or placed on a track. The default value can be edited on the Program Control page.
Press the Key Zone/Velocity button to get to the Key Zone page:

Each track has its own independent key zone within which the track will play. Key zones can be used to create simple two-program splits or to create more complex keyboard layouts. Key zones control which keys will be sent out via MIDI as well as which keys will play on the local voices of the TS-12.

You can divide the keyboard into as many as twelve different key zones by using the twelve sequencer tracks. In addition, you can set the key zone so that each zone overlaps the next, producing “layered” zones in which you would hear the sounds from more than one track.

The illustration below shows an example of three tracks with overlapping key zones. The Piano is layered with, and partially overlaps, the Cellos on the lower end and the Flute on the upper end. The Key Zone settings for this example are shown in the sample display above.

In order to set a Key Zone:
1) Select the track by pressing the soft button underneath the zone you wish to set. This will result in the Low Key of the zone (the left key number) becoming underlined.
2) Play the key on the keyboard that you want to be the lowest key of the zone. The underline will automatically move to the right for the High Key of the zone.
3) Play the key for the highest key of the zone. The new values for the zone will be displayed and the underline will disappear. With the underline gone, you can play the keyboard without continually resetting the key zone range. This allows you to “audition” the newly created key range.

If you wish to change the zone, simply repeat the process.

The key zone is automatically reset to full range whenever you select a sound from one of the Sound Bank pages. When you select a sound using the Replace Track Sound feature, the key zone setting is left unchanged.

Changing the key zone will not affect the playback of sequencer tracks (though it does affect what is recorded). Sequencer tracks will play all keys that were recorded, regardless of the key zone at the time of playback. To eliminate a key range from a track, use the Erase function on the Edit Track page (explained in Section 11 — Sequencer Parameters).

Be Careful!
If the key zone is accidentally set to a range where the High Key is below the Low Key, then the track will not play. To correct this situation, you can re-program the zone manually or you can reselect the sound from the Sound bank page, which will automatically reset the key zone to the sound’s original range.
• Press the **Key Zone/Velocity** button again to get to the Velocity Range page:

**Velocity Range Page**

Ranges: 000 to 127

<table>
<thead>
<tr>
<th>VELR</th>
<th>MEGASTRINGS</th>
<th>HYPER-LOOP</th>
<th>TENOR-SAX</th>
</tr>
</thead>
<tbody>
<tr>
<td>000-063</td>
<td>000-127</td>
<td>064-127</td>
<td></td>
</tr>
</tbody>
</table>

The Velocity Range page enables you to determine the amount of velocity for each sound on a selected track. The velocity range affects both local playing and MIDI transmission/reception. The first value sets the LO velocity range, and the second value sets the HI velocity range. The soft button beneath the velocity ranges is used to toggle between the LO and HI settings. This is useful when you need to adjust the velocity of a sound for a particular application without getting more deeply into programming.

In the example above, a soft velocity will only play the MEGASTRINGS sound, and a harder velocity will only play the TENOR-SAX sound. HYPER-LOOP is not layered (underlined), so it will not be heard. If you could double-click on the soft button above HYPER-LOOP, you would hear HYPER-LOOP with both soft and hard velocity.

**Note:** This parameter will not regulate what notes are recorded into the Sequencer, but will affect Sequencer playback. VELR acts as a filter on Sequencer playback.

• Press the **Key Zone/Velocity** button again to get to the Velocity Sensitivity page:

**Velocity Sensitivity Page**

Ranges: -16 to +16
**Press the Tuning button to get to the Transpose page:**

**Transpose Page**

- Octave Range: -4 to +4 octaves
- Semitone Range: -11 to +11 semitones

Each track can have its pitch transposed (raised or lowered) by octaves and semitones within an eight octave range. The transpose setting affects both the pitch played by local TS-12 voices and the key number transmitted via MIDI, depending on how the VELS/XPOS parameter is set on the MIDI Control page.

Pressing the soft button for an already selected track will toggle the underline (showing the active field) between octave and semitone.

**Tip:** It is possible to extend the transposition outside of the normal range by using the Up/Down Arrow buttons to edit the semitone value to a maximum of + or - 9 octaves and 11 semitones, although this may cause unexpected results.

In Sequencer mode, the Transpose function provides a way to transpose tracks in real-time without changing the data in the track. However, you should take care never to transpose a track whose status is SEND/RECV, SEND/----, VOICE-OFF, or LOCAL-OFF while holding keys down or while the sequencer is running. This could cause the key-up events to be missed by the receiving MIDI device, causing notes to “hang.”

**Press the Tuning button again to get to the Detune page:**

**Detune Page**

- Range: -99 to +99

Each track can have its pitch detuned (fine-tuned) within a range of -99 to +99 semitones. The detuning screen allows you to fine tune each track, without getting into more complex programming.
- Press the **Tuning** button a third time to get to the Rate page:

**Rate Page**

<table>
<thead>
<tr>
<th>Rate</th>
<th>MegasStrings</th>
<th>Hyper-Loop</th>
<th>Tenor-Sax</th>
</tr>
</thead>
<tbody>
<tr>
<td>-64</td>
<td>+63</td>
<td>+00</td>
<td>-64</td>
</tr>
</tbody>
</table>

The Rate page provides an easy way to change the rate of the LFO’s within a sound. LFO’s are most often used to create a vibrato effect. This parameter defines how much the LFO rate will increase or decrease for any voice within a sound that has LFO selected as a Mod Source.

In order for LFO’s in a Program to be controlled by this parameter, one or more of the LFO’s in the Program must be programmed with the LFO RATE parameter set to a value with a star (*) suffix. For example, if a voice’s LFO RATE=50* instead of simply 50, then the rate of that LFO can be adjusted from the Track Rate parameter.

When one or more voices in a Program are assigned to play a Wave List in a HyperWave Program, the Track Rate parameter will modulate the DURATION and XFADE times relative to one another. This allows you to fine tune the rate of Wave List playback to conform to a particular musical context. It is often useful to disable the Track LFO Rate control (i.e.: turn off the star) in voices that are assigned to play a Wave List; this will avoid unwanted LFO Rate modulation when adjusting Wave List times.

All tracks whose MIDI Status is set to SEND/RECV, SEND/----, LOCAL-OFF or VOICE-OFF will send a MIDI Continuous Controller message (controller 75) with the indicated value whenever this parameter is edited. Preset tracks will also send this controller message when a preset is selected.

The default value of Rate is stored with the Program, and is restored whenever the Program is selected or placed on a track. The default value can be edited on the Program Control page.

- Press the **Controllers On/Off** button to get to the Sustain page:

**Sustain Page**

<table>
<thead>
<tr>
<th>Sustain</th>
<th>MegasStrings</th>
<th>Hyper-Loop</th>
<th>Tenor-Sax</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON</td>
<td>ON</td>
<td>OFF</td>
<td></td>
</tr>
</tbody>
</table>

The Sustain page allows you to determine whether each of the individual tracks will respond to sustain controller events. The effect of all sustain events, whether from the SW-2 Foot Switch (when the corresponding foot switch is set to SUSTAIN on the System page) or sustain commands received from MIDI, is controlled by this switch.

- **ON** — sustain events will affect all notes played within the active key zone for this track.
- **OFF** — sustain events will have no effect on the notes played on this track.
For example, it may be useful to turn off sustain events on a track set up as a bass sound in a split keyboard configuration. This allows you to play staccato bass lines on the lower part of the keyboard while playing chords on the upper part of the keyboard and using the sustain pedal. The bass notes will not be affected by the sustain pedal because the track is set to OFF, but the chords will sustain.

Sustain Pedal Off events are always transmitted via MIDI (except if track status is set to ---/RECV or MIDI-OFF) whenever the Sustain Pedal Enable switch setting on the track is changed. This is done to ensure that external MIDI devices are not left with the sustain pedal controller “stuck” in the held down state.

• Press the **Controllers On/Off** button again to get to the Sostenuto page:

**Sostenuto Page**

<table>
<thead>
<tr>
<th>SOST</th>
<th>NEGRASING</th>
<th>HYPER-LOOP</th>
<th>TENOR-SAX</th>
</tr>
</thead>
<tbody>
<tr>
<td>OFF</td>
<td>ON</td>
<td>OFF</td>
<td></td>
</tr>
</tbody>
</table>

The Sostenuto Page, similar to the Sustain page, allows you to determine whether each of the individual tracks will respond to sostenuto controller events. The effect of all sostenuto events, whether from the SW-2 Foot Switch (when the corresponding foot switch is set to SOSTENUTO on the System page) or sostenuto commands received from MIDI, is controlled by this switch.

• ON — sostenuto events will affect all notes played within the active key zone for this track.
• OFF — sostenuto events will have no effect on the notes played on this track.

Sostenuto Pedal Off events are always transmitted via MIDI (except if track status is set to ---/RECV or MIDI-OFF) whenever the Sostenuto Pedal Enable switch setting on the track is changed. This is done to ensure that external MIDI devices are not left with the sostenuto pedal controller “stuck” in the held down state.

• Press the **Controllers On/Off** button a third time to get to the Pitch Bend page:

**Pitch Bend Page**

<table>
<thead>
<tr>
<th>Pitch Bend Page</th>
<th>Range: OFF or ON</th>
</tr>
</thead>
</table>

The Pitch Bend Page is used to determine which track(s) will respond to the Pitch Bend Controller.
• Press the **Controllers On/Off** button a fourth time to get to the Mod Wheel page:

**Mod Wheel Page**

<table>
<thead>
<tr>
<th>MODE</th>
<th>MEGA STRINGS</th>
<th>HYPER-LOOP</th>
<th>TENOR-SAX</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ON</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>OFF</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>ON</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The Mod Wheel Page is used to determine which track(s) will respond to the Modulation Wheel, when assigned as a controller for any of the modulatable parameters.

• Press the **Controllers On/Off** button a fifth time to get to the All-Notes-Off page:

**All-Notes-Off Page**

<table>
<thead>
<tr>
<th>AOFF</th>
<th>MEGA STRINGS</th>
<th>HYPER-LOOP</th>
<th>TENOR-SAX</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>OFF</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>ON</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>OFF</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The All-Notes-Off Track parameter determines how the sequencer will handle note-off transmission. This parameter is visible on Preset Tracks, but does not really apply to Presets. When OFF, the TS-12 will transmit key-up messages for every note currently sounding when the Sequencer **Stop/Continue** button is pressed to stop the Sequencer. When ON, the TS-12 will send an ALL-NOTES-OFF message in addition to all of the key-ups when the Sequencer **Stop/Continue** button is pressed to stop the sequencer.

• Press the **Controllers On/Off** button a sixth time to get to the Reset Controllers page:

**Reset Controllers**

<table>
<thead>
<tr>
<th>RSET</th>
<th>MEGA STRINGS</th>
<th>HYPER-LOOP</th>
<th>TENOR-SAX</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>OFF</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>OFF</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>OFF</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The RSET parameter determines whether or not the TS-12 will transmit the MIDI Reset Controllers message, in addition to transmitting a default value for every controller on each Track, in the following instances:

1) each time the Sequencer **Stop/Continue** button is pressed to stop the Sequencer
2) each time a Song Step ends
3) each time a Song loops back to the beginning.

This parameter is visible on Preset Tracks, but does not really apply to Presets.
• Press the Performance Options button to get to the Patch Select page:

**Patch Select Page**

<table>
<thead>
<tr>
<th>Patch Select button state</th>
<th>PSEL</th>
<th>MEGASTRINGS</th>
<th>HYPER-LOOP</th>
<th>TENOR-SAX</th>
</tr>
</thead>
<tbody>
<tr>
<td>current</td>
<td>00</td>
<td>-0*-</td>
<td>HELD</td>
<td>LIVE</td>
</tr>
</tbody>
</table>

This Page gives you control over the Patch Select button assignments for each track.

**Setting** | **Patch used by track**
--- | ---
LIVE | uses the current state of the buttons to select a patch
-00- | always uses the 00 patch (no buttons down)
-0*- | always uses the 0* patch (right button down)
-*0- | always uses the *0 patch (left button down)
-**- | always uses the ** patch (both buttons down)
HELD | uses the patch set by the first key hit while touching the patch select buttons

The HELD setting is special because it lets you easily hold a patch select variation by playing a key on the keyboard while touching the patch select button(s). The first key you play after touching the patch select buttons will hold that patch select variation as the current patch for the track. You may then continue to play without having to touch the patch select buttons, which makes two-handed playing easier. If you wish to return to the 00 patch, touch either of the patch select buttons and release it before you play the next note. This will hold the 00 patch.

When programming patch variations, you can set the mute status of the various voices in different patches without leaving the Select Voice page by using the HELD feature.

The default value of Patch Select Mode (LIVE or HELD) is stored with the Program, and is restored whenever the Program is selected or placed on a track. The default value can be edited on the Program Control page.

**Latching Patch Selects**

Latching is more permanent than holding because once latched, the patch will remain assigned to the track even if the patch select buttons are touched again later.

While the Patch Select page is being displayed in either Preset or Sequencer modes, it is possible to instantly “latch” the current state of the patch select buttons into a track by pressing the soft button for the currently selected track. If neither of the patch select buttons are being held down when this function is performed, the parameter setting will revert to LIVE status. If you wish to set the status to 00, then use the Up/Down Arrow buttons to change the fixed setting. To latch the patch select setting for a different track, first press the soft button to select the track, then press it again while holding one or both patch select buttons to latch the setting.

For more information on programming the Patch Selects, refer to Section 8 — Understanding Programs.
Press the **Performance Options** button again to get to the Pressure page:

**Pressure Page**

<table>
<thead>
<tr>
<th>Preset</th>
<th>Megastings</th>
<th>Grand-Piano</th>
<th>Tenor-Sax</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chan</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Key</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The Pressure page enables you to assign one of three pressure modes to each Track.

- **OFF** — Pressure information will not be transmitted via MIDI or recorded by the sequencer, nor will the sound assigned to the track respond to pressure locally.

- **KEY** — This setting enables the track to receive Poly-Key™ pressure via incoming MIDI. Poly-Key pressure lets you add pressure modulation to each note independently. If you press down on any particular key within a chord, only that note will be affected by pressure — all others remain unaffected. Although the TS-12’s keyboard does not generate Poly-Key pressure, it does receive it via incoming MIDI.

  When PRESS-MODE=CHAN on the System page, all Sounds and Preset Tracks that are set to KEY will have their Track Pressure mode automatically set to CHAN; Sounds and Preset Tracks that have their Pressure mode set to OFF will be unaffected. The PRESS-MODE=PSET setting disables this function, and installs the Sound and Preset Track Pressure settings as stored in the Sounds or Presets.

- **CHAN** — This enables the track to send and receive via MIDI the most common type of pressure — channel pressure. With channel pressure, after a note is played, pressing down harder on a key modulates *every* note currently playing. Like a mod wheel, channel pressure is “global,” it affects the entire keyboard when activated. When a sequencer track is set to CHAN, Channel pressure will be recorded into the track, even if the sound is not programmed to respond to it (see the note below about conserving sequencer memory).

You should consult the MIDI implementation chart of the remote MIDI device you will be using in conjunction with the TS-12 to see which (if any) type of pressure it responds to and transmits. For best results, set the TS-12 Pressure parameter to match the type of pressure supported by the external MIDI device which will send to or receive from the track you are setting.

The default value of Pressure Mode is stored with the Program, and is restored whenever the Program is selected or placed on a track. The default value can be edited on the Program Control page.

**Note:** You should select Track PRES=OFF whenever you don’t want or need pressure for a given sound, particularly when sequencing. Pressure data eats up sequencer memory rapidly, so whenever you record a track with a sound that doesn’t respond to pressure, set this parameter to OFF. This will avoid wasting valuable sequencer memory, and will avoid clogging up the MIDI data stream with a lot of unnecessary pressure information. Existing pressure information can also be removed from a track using the Filter command on the Edit Track page.
• Press the **Performance Options** button again to get to the Pedal page:

**Pedal Page**

<table>
<thead>
<tr>
<th>PEDL</th>
<th>MEGASTRINGS</th>
<th>HYPER-LOOP</th>
<th>TENOR-SAX</th>
</tr>
</thead>
<tbody>
<tr>
<td>OFF</td>
<td>VOL-</td>
<td>VOL+</td>
<td></td>
</tr>
</tbody>
</table>

The Pedal parameter disables (when OFF) or controls the polarity of the CV•Pedal, when PEDAL=VOL on the System page. Inverted polarity can be used to crossfade between layered tracks with the volume pedal.

• Press the **Track/MIDI** button to get to the MIDI Status page:

**MIDI Status Page**

<table>
<thead>
<tr>
<th>STAT</th>
<th>MEGASTRINGS</th>
<th>HYPER-LOOP</th>
<th>TENOR-SAX</th>
</tr>
</thead>
<tbody>
<tr>
<td>----</td>
<td>SEND/RECV</td>
<td>SEND/-----</td>
<td>MIDI-OFF</td>
</tr>
</tbody>
</table>

This page determines the MIDI Status of a track (i.e. whether it will play locally, only over MIDI, or both). The six possible settings are:

**SEND/RECV**
Keys, controllers, etc., will play locally and will be sent via MIDI over a selected MIDI channel. Incoming MIDI will play internal voices. This is the default setting for Presets.

**SEND/----**
Similar to SEND/RECV, keys, controllers, etc., will play locally and will be sent via MIDI over a selected MIDI channel. However, incoming MIDI will not play internal voices.

**----/RECV**
The track will only play internal voices, and will not send any data out MIDI. Incoming MIDI will play internal voices. This is the default setting for sequencer tracks.

**MIDI-OFF**
The track will only play internal voices, and will not send any data out MIDI. Incoming MIDI will not play internal voices.

**VOICE-OFF**
Keys, controllers, etc., will be sent out via MIDI when the track is played from the keyboard. However, keys played on the local keyboard will not play TS-12 voices at all. Incoming MIDI and sequencer playback will not play internal voices. This is useful when using the TS-12 as a controller with an external sequencer and a number of other remote MIDI devices. It is also good for turning off certain tracks when using the TS-12 as a multi-timbral receiver in MULTI Mode, thereby limiting the number of channels to which the TS-12 will respond.

**LOCAL-OFF**
Keys, controllers, etc., will be sent out via MIDI when the track is played from the keyboard. However, keys played on the local keyboard will not play TS-12 voices at all. Incoming MIDI and sequencer playback will play TS-12 voices. Use this status when you want to create MIDI-only tracks for sequencing or playing remote MIDI devices.

**MIDI-LOOP**
This track STATUS is optimized for use in a MIDI loop. It functions just like LOCAL-OFF, except that the sequencer will not play local voices. This ensures that sounds will not play twice (once locally and again via incoming MIDI) when sequencing in a MIDI loop. See Section 10 — *Understanding the Sequencer* for information about recording into the sequencer in a MIDI loop.
Note: When MIDI-TRK-NAMES=OFF on the System page, Tracks with a MIDI Status of VOICE-OFF or LOCAL-OFF or MIDI-LOOP will display *MIDI-CH-## in place of the name of the sound on the track.

This chart details the behavior of sequencer tracks for each MIDI status:

<table>
<thead>
<tr>
<th>Track Status</th>
<th>SEND/RECV</th>
<th>SEND/----</th>
<th>----/RECV</th>
<th>MIDI-OFF</th>
<th>VOICE-OFF</th>
<th>LOCAL-OFF</th>
<th>MIDI-LOOP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Playing the keyboard plays local voices</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
<td></td>
</tr>
<tr>
<td>Playing the keyboard sends out MIDI</td>
<td>YES</td>
<td>YES</td>
<td>NO</td>
<td>NO</td>
<td>YES</td>
<td>YES</td>
<td></td>
</tr>
<tr>
<td>Playing the keyboard will be recorded by the sequencer</td>
<td>YES</td>
<td>NO</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td></td>
</tr>
<tr>
<td>Incoming MIDI data plays local voices</td>
<td>YES</td>
<td>NO</td>
<td>YES</td>
<td>NO</td>
<td>YES</td>
<td>YES</td>
<td></td>
</tr>
<tr>
<td>Incoming MIDI data will be recorded by the sequencer</td>
<td>YES</td>
<td>NO</td>
<td>YES</td>
<td>NO</td>
<td>YES</td>
<td>YES</td>
<td></td>
</tr>
<tr>
<td>Playing the sequencer track (pressing Play) plays local voices</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>NO</td>
<td>YES</td>
<td>NO</td>
<td></td>
</tr>
<tr>
<td>Playing the sequencer track sends out MIDI</td>
<td>YES</td>
<td>YES</td>
<td>NO</td>
<td>NO</td>
<td>YES</td>
<td>YES</td>
<td></td>
</tr>
</tbody>
</table>

- Press the Track/MIDI button again to get to the MIDI Channel page:

**MIDI Channel Page**

<table>
<thead>
<tr>
<th>CHAN</th>
<th>NEamongstrings</th>
<th>HYPER-LOOP</th>
<th>TENor-SAX</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>02</td>
<td>03</td>
<td></td>
</tr>
</tbody>
</table>

Use the MIDI Channel page to determine which MIDI channel a track will use to transmit and receive data. The differences in how this parameter controls the track for transmitting and receiving are important to understand and are described below. You may also wish to refer to Section 3 — MIDI Control Page Parameters, and Section 12 — Sequencing/MIDI Applications.

Transmit Controls which channel the three tracks of a preset will send data on only if SEND=TRACK is selected on the MIDI Control Page. Otherwise, in Preset mode, the TS-12 keyboard will send only on the base MIDI channel no matter which preset track is selected. Sequencer tracks which have SEND/RECV, SEND/----, VOICE-OFF, LOCAL-OFF, or MIDI-LOOP Status will always transmit only on the MIDI channel defined on this page.

Receive Controls which channel an individual sequencer track will receive data on if MODE=MULTI or MONO B mode is selected on the MIDI Control Page. In POLY or MONO A modes, the TS-12 will receive only on the base MIDI channel no matter which track, program, or preset is selected. Individual preset tracks will not receive on different MIDI channels; for presets, this is a send-only function.

Note: If several tracks have the same MIDI channel, only the lowest-numbered track (1 to 12) will receive the incoming MIDI events. See Section 12 — Sequencing/MIDI Applications for more information about MULTI mode.
• Press the Track/MIDI button a third time to get to the MIDI Program Number page:

MIDI Program Number Page

Range: 000 through 127

This sub-page lets you choose which MIDI Program Change number will be transmitted via MIDI when the track is selected. Editing this value will transmit MIDI Program Changes in real-time. If the track MIDI status has been set to ----/RECV or MIDI-OFF, the track will not transmit MIDI Program Changes.

The default Program Change number that appears is usually the number of the internal TS-12 sound assigned to the track. This number is automatically set whenever a sound is selected from the Sound Bank pages. Assigning a new sound to a Preset track from Replace Track Sound mode does not change the Program Change number automatically, but sequencer tracks will acquire the new sound’s Program Change number. When sequencer playback loops back to the beginning of a track, all Track Program Change values will be restored to their stored values.

You can set this number to any other legal Program number if you wish to override the default value. This can be useful in presets and sequencer tracks, which will transmit a MIDI Program Change message for every MIDI-enabled track when selected.

Entering Program Change Numbers Directly

While this page is displayed (or from the Tracks 1-6 and 7-12 pages in sequencer mode), it is possible to send MIDI program change messages by holding the soft button nearest the track sound name and then entering the MIDI program change number using the numbered Bank buttons. When you release the soft button, the program change will be sent, and the program number will be updated in the display. The range of acceptable numbers is 000 to 127. You do not have to enter leading zeroes (for example, to send 003, simply press 3 and release the soft button).

• Press the Track/MIDI button again to get to the MIDI Bank Select page:

MIDI Bank Select Page

Range: 000 through 127, LSB or MSB

This sub-page lets you choose which MIDI Bank Select number will be transmitted via MIDI when the track is selected or when program changes are transmitted. If the track MIDI status has been set to ----/RECV or MIDI-OFF, the track will not transmit MIDI Bank Selects.

You can set this number to any other legal Program number if you wish to override the default value. This can be useful in presets and sequencer tracks, which will transmit a MIDI Program Change message for every MIDI-enabled track when selected.
The second field determines whether the BANK value represents the LSB or MSB of the MIDI Bank Select controller message. It defaults to LSB (Least Significant Byte), but can be set to MSB (Most Significant Byte) to accommodate other keyboard manufacturer's products. It should always be set to LSB for ENSONIQ products.

The default Bank Select number that appears is usually the number of the internal TS-12 sound assigned to the track. This number is automatically set whenever a sound is selected from the Sound Bank pages. Assigning a new sound to a Preset track from Replace Track Sound mode does not change the Bank Select number automatically, but sequencer tracks will acquire the new sound's Bank Select number. When sequencer playback loops back to the beginning of a track, all Track Bank Select values will be restored to their stored values.

You can set this number to any other legal Bank Select number if you wish to override the default value. This can be useful in presets and sequencer tracks, which will transmit a MIDI Bank Select message for every MIDI-enabled track when selected.

Program Changes and Bank Selects in the TS-12
When sounds are assigned to a track from a Sound Bank page, their Program Change number and Bank Select number are automatically set according to the following scheme:

• User RAM programs (BankSet U0) are numbered from 000 to 059; Bank Select is 000 LSB.
• User RAM programs (BankSet U1) are also numbered from 000 to 059; Bank Select is 001 LSB.
• ROM programs (BankSet R2) are numbered from 000 to 059; Bank Select is 002 LSB.
• ROM programs (BankSet R3) are also numbered from 000 to 059; Bank Select is 003 LSB.
• ROM programs (BankSet R4) are also numbered from 000 to 059; Bank Select is 004 LSB.
• Sampled Sounds* (BankSet S8) are numbered from 000 to 009; Bank Select is 008 LSB.
• Sampled Sounds* (BankSet S9) are also numbered from 000 to 009; Bank Select is 009 LSB.

Refer to Section 3 — MIDI Control Page Parameters for more information on how the TS-12 receives program changes.

• Press the Track Effects button to get to the Effects Bus Routing page:

On the Effects Bus Routing page, you can re-route the voices for each track without editing the sound itself. This may be useful when two sounds are split or layered, and the effect is not appropriate for both. Also this is used to assign a track to the AUX Outputs for separate processing or mixing. The available Effects Bus Routing options are:

• VOICE — uses the normal voice routing from the sound on the track
• FX1 — forces all voices to FX1
• FX2 — forces all voices to FX2
• DRY — forces all voices in a track to the DRY bus
• AUX — This bypasses the effects on all voices in a track, and allows you to process them separately by sending them directly to the AUX Outputs. Any track that has -AUX- selected will not be heard out of the Main outputs.
• Press the Track Effects button again to get to the Effects Controller page:

**Effects Controller Page**

<table>
<thead>
<tr>
<th>Effects Option</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>MDS</td>
<td>NO-CNTRL or CNTRL-FX</td>
</tr>
<tr>
<td>MEGASTRINGS</td>
<td></td>
</tr>
<tr>
<td>HYPER-LOOP</td>
<td></td>
</tr>
<tr>
<td>TENOR-SAX</td>
<td></td>
</tr>
<tr>
<td>CONTRL-FX</td>
<td></td>
</tr>
<tr>
<td>NO-CNTRL</td>
<td></td>
</tr>
<tr>
<td>NO-CNTRL</td>
<td></td>
</tr>
</tbody>
</table>

In effects which allow real-time control, it is sometimes desirable to limit which tracks send controller information to the effect. This is particularly true when using multiple MIDI input channels from a sequencer. If more than one track is set to CNTRL-FX, “controller fights” can occur. If set to NO-CNTRL, a track will remain routed to the effects, but its controllers (such as TIMBRE, WHEEL, PEDAL, etc.) will not modulate the effect.

• Press the Track Effects button again to get to the Effect Selector page. Here you can redefine the Effect Algorithm for use in the preset, sequence, or song.

  Continued presses of the Track Effects button will scroll through the parameters related to the currently selected Effect Algorithm. These are identical to the effects parameters in the Programming section of the TS-12 (see Section 7 — Effects Parameters for descriptions of these parameters).

**Tip:** By double-clicking the Track Effects button, you can instantly bypass the effect. The effect bus routing is temporarily set to *BYP* on all tracks except those set to AUX. Only the dry signal will be heard. Double-clicking again will restore the previous effect bus routing settings.
Section 6 — Understanding Effects

This section offers a basic overview of the concepts involved in selecting, creating, editing, and understanding Effects. For more detailed descriptions of the actual effect parameters, refer to the following section.

Understanding TS-12 Effects

The TS-12 has a powerful built-in signal processor that can produce a variety of effects. More important, its functions are integrated into, rather than added onto, the rest of the synthesizer. The flexible bus routing scheme and extensive real-time control give the TS-12 its dynamic effects capability.

The TS-12 is equipped with an advanced digital signal processing system based on the ENSONIQ Signal Processor (ESP) chip. The ESP is designed specifically for digital audio signal processing, and in the TS-12 it works in tandem with a fourth-generation version of the Digital Oscillator Chip (DOC IV a.k.a. OTTO) and an external 16-bit digital-to-analog converter to provide a very high-quality output signal.

Digital effects processing capability has been designed to complement the advanced performance features of the TS-12, and all of the effects can have any parameter modulated by various performance controllers such as the Mod Wheel, channel pressure, and other user-definable controllers.

All effects are fully programmable and may be customized for particular applications. Effects are most often stored as part of a sound, although each preset may also have its own override effect, independent of the effects contained by the sounds within the preset. Each individual sequence and song also has an independent effect. The following sections describe each type of effect.

Program and Sampled Sound Effects

Each sound in the TS-12 contains an effect and a complete set of parameter values which determine how that effect will sound. The effect is present even if none of the voices in the sound are routed through the effect (e.g. all voices are sent to the DRY or AUX destination bus - see the Output page in Section 9 — Program Parameters). Whenever you save or write a sound, the effect settings are also saved with the sound.

The sound effect is displayed and edited by pressing the Program Effects button. These Effect Parameter pages are described in detail in Section 7 — Effect Parameters.

If the preset effect that is currently loaded and being heard is different than the sound effect that is being shown, then a flashing MUTE will appear in the lower left corner of the display.

Preset Effects

Each preset in the TS-12 also contains an effect and a complete set of effect parameter values. The effect is present even if none of the tracks in the preset are routed through the effect (e.g. all tracks are sent to the DRY or AUX destination bus - see Section 5 — Preset/Track Parameters). Whenever you save or write a preset, the effect settings are also saved with the preset.

The preset effect is the same as the effect contained in the primary selected sound in the preset, but can easily be changed to suit the needs of the preset more closely. This effect applies to all preset tracks (or their program voices) that are routed to either the FX1 or FX2 destination bus.

The preset effect is displayed and edited by pressing the Track Effects button in the Track Parameters section of the front panel, when the TS-12 is in either Sounds or Presets mode.

The top level page controls the re-routing of the voices without editing the sound itself, and is described in Section 5 — Preset/Track Parameters. The next page allows you to define which tracks
will send controller information to the effect. The remaining pages contain the effect parameters, which are specific to the effect type. These effect parameter pages are described in Section 7 — Effect Parameters.

Sequencer Effect
Like each of the presets in the TS-12, each sequence and song contains an effect and a complete set of effect parameter values. The effect is present even if none of the tracks in the sequence are routed through the effect (e.g. all tracks are sent to the DRY or AUX destination bus - see Section 5 — Preset/Track Parameters). This effect applies to all sequencer tracks (or their program voices) which are routed to either the FX1 or FX2 destination bus.

The effect is saved with each sequence or song. It will remain unaffected until a new song or sequence is selected, unless it is specifically edited. A special incoming MIDI program change message may be used to load new effects into a sequence in MULTI mode (see Section 3 — MIDI Control Page Parameters). The Copy function and a special mode of Copy Preset to Sequence can be used to replace the Sequence effect.

The sequencer effect is displayed and edited by pressing the Track Effects button in the Track Parameters section of the front panel, when the TS-12 is in Sequencer mode.

Selecting Effects
The first parameter of the Effects page is the effects selector. Changing this parameter causes a new effect to be selected, which in turn changes the type of parameters that will be available on the rest of the pages. Selecting a new effect algorithm will automatically set all of the effect parameters to their default values for the new effect. The available effects algorithms are:

<table>
<thead>
<tr>
<th>Effect Selector</th>
<th>Effect Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>00</td>
<td>DRY/BYPASSED</td>
</tr>
<tr>
<td>01</td>
<td>DDL+CHORUS+REV</td>
</tr>
<tr>
<td>02</td>
<td>EQ- -DDL+CHORUS+REV</td>
</tr>
<tr>
<td>03</td>
<td>DELAYLFO+CHORUS+REV</td>
</tr>
<tr>
<td>04</td>
<td>ROTOSPKR+CHORUS+REV</td>
</tr>
<tr>
<td>05</td>
<td>DISTORT+CHORUS+REV</td>
</tr>
<tr>
<td>06</td>
<td>PARAM EQ+CHORUS+REV</td>
</tr>
<tr>
<td>07</td>
<td>ENV VCF+CHORUS+REV</td>
</tr>
<tr>
<td>08</td>
<td>DDL+PHLANGR+REV</td>
</tr>
<tr>
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## What is an Algorithm?
An algorithm is the basic signal processing building block in the TS-12. The word “effect” could be used instead of algorithm, but some algorithms can produce several sonic effects simultaneously. Each algorithm has a set of parameters used to control the effect(s) it produces. The values of these parameters are saved with the algorithm. Wherever applicable, we will refer to the TS-12 effects as algorithms.

### Signal Routing Between Effects
If the algorithm consists of two or more different types of effects, the algorithm name has symbols that show how these different effect types are routed together. The routing symbols are:

- `-` indicates a serial connection from the effect on the left into the effect on the right.
- `+` indicates a parallel connection between the effect on the left and the effect on the right.

For example, the EQ--TREMOLO + DELAY algorithm has a serial routing from the EQ into the tremolo effect (i.e. the output of the EQ always feeds into the Tremolo), and a parallel routing between the tremolo and the digital delay (i.e. there is an input into the delay line).

### Sounds and Presets
The complete effects setup, including the values of all effect parameters, is saved when you save a sound. It is also saved when you save a preset. The TS-12 tries to be smart about switching effects, since all sound must stop for an instant when it changes effects.

### When are New Algorithms loaded into the ESP Chip?
Whenever a new algorithm is loaded into the ESP, the audio output will pause briefly, allowing the instructions which create the new algorithm to be loaded into the ESP. If an algorithm differs only by variation in parameter values, then this pause may not occur.

These are the rules that the TS-12 follows in deciding when to change algorithms:
1) When you select a primary sound from one of the Sound Bank pages, the algorithm saved in that sound will be loaded into the ESP, and you will hear the sound with its algorithm. If you layer a sound by double-clicking, its algorithm will not be loaded.
2) When you select or layer sounds/tracks from a preset or Track Parameter page, the algorithm is not changed.
3) When you change the sound on a track from Replace Track Sound mode (e.g. with the Sounds LED flashing), the algorithm will not be changed.
4) When you change the sound on a track by double-clicking the **Replace Track Sound** button (e.g. with the **Sounds** and the **Replace Track Sound** LED flashing), the algorithm will be changed.

5) When you select a preset, the algorithm saved in that preset will be loaded into the ESP.

6) When you select a song or sequence, the algorithm saved in that song or sequence will be loaded into the ESP.

7) Whenever you go from Sounds mode to Sequencer mode (by pressing **Seqs/Songs**) the sequencer algorithm is loaded. The same is true when going from Sequencer mode to Sounds mode (by pressing **Sounds**).

8) Saving either the sound or the preset will save the current algorithm.

9) Should you start editing a sound while an algorithm other than its own is active, a warning will appear, reminding you that you are not hearing the algorithm you are seeing or editing. This warning appears as MUTE, flashing in the lower left corner of the display.

10) When MIDI program changes 60-119 are received in MULTI or MONO B modes, the sequence or song effect algorithm will be loaded with the one in the program change.

### Performance Control of Tracks in Preset or Sequencer Mode

When the TS-12 is in Presets or Sequencer mode, all the instruments in the internal memory are routed through the same global effect. In order to gain some individual control for each track, two additional sub-pages on the Track Effect page determine how each instrument will interact with the algorithm. The algorithm for the current preset, song, or sequence is edited by pressing the **Track Effects** button in the Track Parameters section of the front panel.

The first time it is pressed, it shows the Effects Output Routing parameter for each of the three tracks in a performance preset (or for 6 of the 12 tracks of the current song or sequence in Sequencer mode). The Effects Output Routing sub-page determines which of the Output Busses the track will be sent through. By using this parameter, you can give individual instruments different Dry/Wet or multiple effect mixes.

The second press shows the Effect Mod Controller page. This parameter determines whether or not the controllers of a particular track will be routed to control the effect. This is an important setting when in Presets or Sequencer mode; since all tracks are routed through the same effect, it could be confusing to have multiple instruments sending conflicting controller information to the effect. If more than one track is set to CNTRL-FX, “controller fights” can occur. If set to NO-CNTRL, a track will remain routed to the effects, but its controllers (such as the TIMBRE, PBEND, WHEEL, etc.) will not affect the track.

Subsequent presses reveal the effects programming parameters, which are identical to those found on the Program Effects page.

### Programming Effects

The TS-12 algorithms are fully programmable. The first sub-page contains the effect selector. The effect selector is a little different than all of the other parameters. It controls how all of the other effect pages will be configured and displayed. When this parameter is changed, a new algorithm is selected which causes several important things to occur:

- a new algorithm is loaded, causing a brief pause in the audio output
- the effect parameter pages are redefined for the particular effect selected
- the effect parameter values are reset to their default settings for the effect

**Tip:** When editing the effect selector, it is possible to change the new effect type quickly and avoid the brief delay caused by the actions described above. Pass rapidly over the types between the old type and the new type, and then pause. The new effect will be recalled only after you stop changing the type.

### Effect Variations
The first effect parameter page is similar for all of the effects (the display shows VARIATION=). It selects an Effect Variation, which feature various “preset” patches, letting you quickly access several set-ups within the same effect. Each algorithm has a predetermined amount of variations. Each of these variations is individually editable and can act as independent effect edit buffers. Each Effect Variation can have two different Modulation Sources, Destination parameters, and defined modulation ranges.

**The Effects Busses**

The output of every voice in the TS-12 is assigned to a stereo bus. A bus, like the bus of a mixing board, mixes together all the voices assigned to that bus into a single stereo pair. Of the four busses on the TS-12, two are inputs into the signal processor (FX1 and FX2), another is a direct path to the Main outputs which bypasses all effect processing (DRY) and the fourth is a direct path to the AUX outputs which also bypasses all effect processing (AUX). The Destination Bus assignment for each Voice is set on the Output page. The voice settings in a program can be overridden for each preset and sequencer track on the top-level of the Track Effects page.

**Tip:** By double-clicking the **Track Effects** button, you can bypass the effect. However, any tracks routed to the AUX outputs will not be bypassed.
**Effects Mixing**

Almost all of the effects have separate mixing controls for the FX1 and FX2 busses. They are found on the next sub-page within the Effects page, and will have slightly different wording depending on the effect they’re contained within.

When an effect having a single processing function (such as reverb only) is selected, both busses FX1 and FX2 are routed to it. When using a dual or multi-effect, FX1 will generally route the signal through both or all effects, with FX2 routing only through the second effect. In all cases, a third bus labeled DRY is a dedicated dry path to the Main Outputs.

---

**Single Function Effect Mixer**

![Diagram of a single function effect mixer]

The above illustration shows the effects busses and the output mixing. Every voice is assigned to one of the four stereo busses, which go around or through the effects processing. In all of the effects routing diagrams, the heavy lines are stereo paths.

---

**Multiple Function Effect Mixer**

![Diagram of a multiple function effect mixer]

When the selected algorithm is a combined effect that has more than one signal processing function (such as chorus and reverb), the FX1 bus feeds Effect 1, and the FX2 bus feeds Effect 2. The FX2 Mix control sets the amount of Effect 2 (usually reverb) for voices assigned to that bus. FX1 Mix controls the amount of the output from Effect 1 sent to Effect 2 rather than directly to the output. By setting this control to its extremes, you can arrange the two effects to be either in series or in parallel. The majority of combined effects follow this topology. If a specific algorithm uses a different topology, it will be explained in the Effect Parameters section.
Parallel Effect Mixer

All of the parallel effect algorithms follow the topology shown in the illustration above. The heavy lines are stereo paths. Voices assigned to FX1 (on the Output Page) will be sent to Effect A, if the PAN parameter is set to -99 (hard left) or sent to Effect B, if the PAN parameter is set to +99 (hard right). Note that by setting the PAN parameter to 50, you can create a parallel routing between Effect A and Effect B. There is a SEND parameter allowing a serial connection from Effect A into Effect B. There is a SEND parameter allowing a serial connection from Effect A into the Reverb, and another parameter allowing a serial connection from Effect B into the Reverb. Voices assigned to FX2 (on the Output Page) will send a stereo signal to the reverb. The FX--REVRB parameter allows you to define how much of the signal you want sent into the Reverb. There is also a DRY parameter (on the SEND sub-page) from FX2 allowing you to define how much of the FX2 signal you want to completely bypass the Reverb. Any voices assigned to the DRY Destination-Bus (on the Output page) will go through the mixer to the Main Output jacks. Any voices assigned to the AUX Destination-Bus will go directly to the AUX Output jacks, without any effects processing.

Selectable Effect Modulation Parameters

All of the algorithms allow real-time control of selectable parameters and share common modulation control parameters. The Modulation Control parameters are always the last parameters on the algorithm sub-pages:

- **MOD-1 SRC — Modulation Source 1**
  - Range: (described below)
- **MOD-2 SRC — Modulation Source 2**
  - Range: (described below)

These parameters select the modulation sources used to modulate the parameter Destinations. Each Effect Variation has a choice of two discrete mod sources.
Modulators that can be applied to the Effects
The following modulation sources are available to alter the effects in performance:

<table>
<thead>
<tr>
<th>Mod Source</th>
<th>Modulation effect derived from</th>
</tr>
</thead>
<tbody>
<tr>
<td>WHEEL</td>
<td>the value of the mod wheel</td>
</tr>
<tr>
<td>PBEND</td>
<td>the value of the pitch wheel</td>
</tr>
<tr>
<td>PEDAL</td>
<td>the value of the Pedal*CV input</td>
</tr>
<tr>
<td>TIMBR</td>
<td>the value of the TIMBRE parameter for the track</td>
</tr>
<tr>
<td>XCTRL</td>
<td>the value of the XCTRL (external MIDI controller) parameter for the track</td>
</tr>
<tr>
<td>PRESS</td>
<td>the channel pressure value for the track</td>
</tr>
<tr>
<td>KEYBD</td>
<td>the number of the last key played</td>
</tr>
<tr>
<td>VELOC</td>
<td>the average velocity of all keys played</td>
</tr>
<tr>
<td>KEYDN</td>
<td>on when any keys are pressed; otherwise off</td>
</tr>
<tr>
<td>PATCH</td>
<td>four values (0, 32, 64, 127) for the four button states</td>
</tr>
<tr>
<td>SUSTN</td>
<td>on when the assigned foot switch is held down (and SUSTAIN is selected as a FOOT-SW controller on the System sub-page); otherwise off</td>
</tr>
<tr>
<td>SOSTU</td>
<td>on when the assigned foot switch is held down (and SOSTENUTO is selected as a FOOT-SW controller on the System sub-page); otherwise off</td>
</tr>
<tr>
<td>FX-SW</td>
<td>on when assigned foot switch is held down (and FX-SW-MOD is selected as a FOOT-SW controller on the System sub-page); otherwise off</td>
</tr>
<tr>
<td><em>OFF</em></td>
<td>no modulation</td>
</tr>
</tbody>
</table>

For more information about the Modulation Sources, see Section 8 — Understanding Programs.

<table>
<thead>
<tr>
<th>DEST — Mod1 Destination Parameter</th>
<th>Range: varies (selected parameter name)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEST — Mod2 Destination Parameter</td>
<td>Range: varies (selected parameter name)</td>
</tr>
</tbody>
</table>

The Destination parameters select which effect parameters will be modulated by the modulation sources. The choice of parameters varies depending on the selected effect. Any parameter within an algorithm can be selected. Each Effect Variation has a choice of two different mod destinations. You cannot edit a parameter when it is assigned as a modulator destination. Disabling modulation of a parameter will restore its saved value.

| MIN — Mod 1 Param Range Minimum | Range: varies (based on DEST parameter range) |
| MAX — Mod 1 Param Range Maximum | Range: varies (based on DEST parameter range) |
| MIN — Mod 2 Param Range Minimum | Range: varies (based on DEST parameter range) |
| MAX — Mod 2 Param Range Maximum | Range: varies (based on DEST parameter range) |

These four parameters set the minimum and maximum amount (based on the selected Destination parameter’s range) that the Mod Destination will be modulated by the Mod Source. Inverting the amounts will also invert the Mod effect.

Remember
In order for the effect modulation to work for the selected track, the Effect Mod Control parameter on the Track Effects sub-page must be set to CNTRL-FX.

Note: When an effect algorithm parameter is selected to be modulated, that parameter can no longer be edited. If you want to edit the parameter, set the Modulation Source (SRC) to *OFF*. To see the current value that the modulator has set it to, reselect the parameter.
Section 7 — Effect Parameters

This section offers detailed descriptions of the sub-pages and parameters used in selecting, creating, and editing effects. For a basic overview of the concepts involved, refer to the previous section.

About Effect Parameters
The effect algorithms (shown in reverse type) described in this section have various sub-pages. Sub-pages are a group of parameters associated with the effect algorithm. Some of the parameters are common to many effect algorithms and some are specific to a particular effect algorithm. The first sub-page of parameters is almost identical for all of the algorithms. It contains the name of the effect algorithm and variations of this algorithm. The remaining sub-pages are variable and contain specific parameters that are relevant only to that effect. All of these parameters are programmable and can be used to customize each effect algorithm.

Effect Modulation Parameters
The Effect Modulation parameters are identical for all the algorithms, and are explained in detail in Section 6 — Effect Concepts.

00 DRY/BYPASSED
This utility algorithm routes FX-1 and FX-2 permanently dry without any effects processing. This is useful when you want to hear a sound without any effects coloration.

MIX  FX-1 and FX-2  Ranges: 00 to 99
These parameters control the mix of silence with a dry audio signal. The FX-1 and FX-2 parameters can be assigned different levels, and used as volume mix controllers for each track in a preset, sequence, or song. 00 is silent and 99 is full volume. By assigning the modulation controllers to these parameters, you can change volume mixes of the tracks in real-time.

Parallel Effects
The first 21 algorithms in the TS-12 are called “parallel effects” and allow several effect types to be used at the same time. These algorithms can be very useful in Presets and Sequencer mode, where you would like different effects processing for each track. The key to parallel effects is how the voices are routed and how they are panned (on the Output page). Many of the parallel effect parameters are identical, and are described the first time they appear.

01 DDL+CHORUS+REV
This parallel effect combines a digital delay with a chorus and a plate reverb. The second sub-page (not user-programmable) shows how this parallel effect is routed:

• Voices assigned to FX1 (and panned left) are sent to Effect A (DDL)
• Voices assigned to FX1 (and panned right) are sent to Effect B (CHORUS)
• Voices assigned to FX2 are sent to a plate reverb (REV)

For more information about parallel effects routing, refer to the previous section.
SENDS A- -B  Range: 00 to 99
Controls the amount of Effect A (DDL) being sent into Effect B (the chorus). A setting of 99 would yield a serial connection between Effect A and the chorus for voices sent to FX1 and panned hard left (on the Output page).

B- -REVRB  Range: 00 to 99
Controls the amount of Effect B (CHORUS) being sent into the reverb. This would allow you to add reverb to voices assigned to FX1 and panned hard right. A setting of 99 would yield a serial connection between the CHORUS and the reverb for voices sent to FX1 and panned hard right (on the Output page).

A- -REVRB  Range: 00 to 99
Controls the amount of Effect A (DDL) being sent into the reverb. This would allow you to add reverb to voices assigned to FX1 and panned hard left, without having to add any chorusing.

FX2- -REVRB  Range: 00 to 99
Defines how much of the voices assigned to FX2 (on the Output page) will be sent into the Reverb. This allows you to fine tune the amount of reverb coloration you want to add to your voices.

DRY  Range: 00 to 99
This parameter allows you to define how much of the FX2 signal you want to completely bypass the Reverb. By setting this parameter to 99 and the FX2- -REVB parameter to 00, you can assign voices to be completely dry.

DDL MIX  Range: 00 to 99
Controls the mix between the original signal and the delay. Setting this parameter to 00 will allow only the unprocessed signal to be heard, while a setting of 99 will eliminate it completely, with only the delay portion remaining.

LEVEL  Range: 00 to 99
Adjusts the volume of the delayed signals against the original dry signal. A level of 00 will offer no audible delay.

PAN  Range: -99 to +99
Determines the location of the delays in the stereo spectrum. A value of -99 is panned hard left, and +99 is hard right. If set to either hard left or hard right, the delayed signal for the opposite side is inaudible.

DDL REGEN L  Range: -99 to +99
Determines the amount of signal that will be fed from the output of the left delay back into the input, increasing the number of repeats in the delay. A setting of 99 would offer an infinite delay.

DAMPING  Range: 00 to 99
Controls the cutoff of a low pass filter on the feedback signal, which adjusts the amount of damping to the feedback signals. The higher the number, the more the signals are dampened.

DELAY TIME L and R  Ranges: 0000 to 1000 msec
Sets the amount of delay time for the independent delays. Each value increases the delay time by 1 millisecond. Experiment with different settings to find the right mix for your sound source and application. Some interesting effects can be implemented by using a real-time modulation controller for these parameters.
**CHORUS MIX**
Range: 00 to 99
Controls the Dry/Wet mix within the chorus itself. For starters, we recommend settings of 50.

**LEVEL**
Range: 00 to 99
Adjusts the volume of the chorused signal. A level of 00 will offer no audible signal.

**WET PAN**
Range: -99 to +99
Determines the location of the chorused signal in the stereo spectrum. A value of -99 is panned hard left, and +99 is hard right.

**DRY PAN**
Range: -99 to +99
Determines the location of the dry signal in the stereo spectrum. A value of -99 is panned hard left, and +99 is hard right.

**CHORUS CENTER**
Range: 000 to 127
Controls the nominal delay time of the chorus about which the delay modulation occurs. Adjusting this parameter will change the tonal character of the effect. This delay time is not related to the REGEN or the DDL delays.

**RATE**
Range: 000 to 127
Controls the four rates of modulation of the delay time of the chorus. The delay modulation produces vibrato and tremolo.

**WIDTH**
Range: 000 to 127
Controls the depth of vibrato and tremolo.

**LFO SPREAD**
Range: 000 to 128
Controls the depth of the detuning, that is, how much the pitch will change. Low values yield a metallic sound. Some voices sound best with very low values.

**REGEN**
Range: -99 to +99
Controls the amount of feedback applied to the chorus. The sign of the value determines the polarity of the feedback. Feedback accentuates the complexity of the “swept” signal.

**REVERB DECAY TIME**
Range: 0.40 to 140.0
Controls the amount of time it takes for the reverberation to decay to a low level (-60 dB) after the input signal stops.

**PRE-DLY TIME**
Range: 0000 to 0300 msec
This parameter creates a time delay before the original signal is fed into the reverb. The range is based in milliseconds.

**HF - DAMPING**
Range: 00 to 99
Controls the rate of attenuation of high frequencies in the decay of the reverberation. As natural reverb decays, some high frequencies tend to get absorbed by the environment. Increasing the value of this parameter will filter out increasing amounts of high-frequency energy.

**BANDWIDTH**
Range: 00 to 99
Acts as a low pass filter on the signal going into the reverb, controlling the amount of high frequencies that will pass into the effect. The higher the setting, the more high frequencies are allowed to pass.

**DEFINITION**
Range: 00 to 99
Controls the rate at which echo density increases with time. Higher values can cause the echo
density to build at a rate that exceeds the decay rate. For the best performance, try to select the highest value that works with your sound source.

DIFFUSION  Ranges:  00 to 99
These parameters determine whether the early reflections will appear as a series of discrete echoes (lower values) or will be more diffused (higher values).

02 EQ- -DDL+CHORUS+REV
This parallel effect combines a parametric EQ and a DDL with a chorus and a reverb. The second sub-page (not user-programmable) shows how this parallel effect is routed:

- Voices assigned to FX1 (and panned left) are sent to Effect A (EQ- -DDL)
- Voices assigned to FX1 (and panned right) are sent to Effect B (CHORUS)
- Voices assigned to FX2 are sent to the reverb (REV)

For a complete description of the SENDS parameters, refer to the DDL+CHORUS+REV algorithm found earlier in this section.

EQDDL MIX  Range:  00 to 99
Controls the mix between the original signal and the EQ into the delay. Setting this parameter to 00 will allow only the unprocessed signal to be heard, while a setting of 99 will eliminate it completely, with only the delay portion remaining.

LEVEL  Range:  00 to 99
Adjusts the volume of the delayed signals against the original dry signal. A level of 00 will offer no audible delay.

PAN  Range:  -99 to +99
Determines the location of the delays in the stereo spectrum. A value of -99 is panned hard left, and +99 is hard right. If set to either hard left or hard right, the delayed signal for the opposite side is inaudible.

EQ FC  Range:  0 Hz to 15 KHz
Sets the center frequency of the parametric EQ.

BW  Range:  0 Hz to 15 KHz
Sets the bandwidth for the center frequency.

LEVEL  Range:  -99 to +48
Sets the amount of boost or cut applied to the parametric.

EQDDL REGEN  Range:  -99 to +99
Controls the amount of regen (regeneration) applied to the delay time taps. The sign of the value determines the polarity of the regen.

DAMPING  Range:  00 to 99
Adjusts the cutoff of a low pass filter on the feedback signal, which controls the amount of damping to the feedback signals. The higher the number, the more the signals are damped.

TIME  Range:  1 msec to 1K (1 sec)
Determines the amount of time between the input signal and the delay outputs.

For a complete description of the remaining parameters, refer to the DDL+CHORUS+REV algorithm found earlier in this section.
03 DELAYLFO+CHORUS+REV

This parallel effect combines a digital delay that provides LFO modulation with a chorus and a reverb. The second sub-page (not user-programmable) shows how this parallel effect is routed:

- Voices assigned to FX1 (and panned left) are sent to Effect A (DELAYLFO)
- Voices assigned to FX1 (and panned right) are sent to Effect B (CHORUS)
- Voices assigned to FX2 are sent to the reverb (REV)

For a complete description of the SENDS parameters, refer to the DDL+CHORUS+REV algorithm found earlier in this section.

DELAYLFO LEVEL
Range: 00 to 99
Controls the volume level of the original signal and the delay. Setting this parameter to 00 will eliminate the audio signal.

PAN
Range: -99 to +99
Determines the location of the delays in the stereo spectrum. A value of -99 is panned hard left, and +99 is hard right. If set to either hard left or hard right, the delayed signal for the opposite side is inaudible.

WET
Range: 00 to 99
This parameter controls the volume of the delayed signal only. Setting this parameter to 00 will eliminate the delay portion completely.

DRY
Range: 00 to 99
This parameter allows you to define how much of the FX1 signal you want to completely bypass the Delay LFO. Setting this parameter to 00 will eliminate the dry signal. By setting this parameter to 99 and the WET parameter to 00, you can assign voices to be completely dry.

DELAY LFO CENTER
Range: 000 to 127
Controls the nominal delay time of the LFO about which the delay modulation occurs. Adjusting this parameter will change the tonal character of the effect. Higher values offer a longer delay time.

RATE
Range: 000 to 127
Controls the rate of pitch modulation which is the LFO. To achieve a chorusing effect, this rate must be very slow.

WIDTH
Range: 000 to 127
Controls the excursion of pitch modulation. Since the rate is usually very slow, the width is usually large.

R LFO PHASE
Range: 00 to 99
When set to 00, the left and right choruses will modulate their detunes together. When set to 99 the detune on the right channel will go up while the detune on the left will go down, creating an out-of-phase effect.

REGEN
Range: -99 to +99
Controls the amount of regen (regeneration) applied to the delay time taps. The sign of the value determines the polarity of the regen.

For a complete description of the remaining parameters, refer to the DDL+CHORUS+REV algorithm found earlier in this section.

04 ROTOSPKR+CHORUS+REV
This parallel effect combines a rotary speaker with a chorus and a reverb. The second sub-page (not user-programmable) shows how this parallel effect is routed:

- Voices assigned to FX1 (and panned left) are sent to Effect A (ROTOPKPK)
- Voices assigned to FX1 (and panned right) are sent to Effect B (CHORUS)
- Voices assigned to FX2 are sent to the reverb (REV)

For a complete description of the SENDS parameters, refer to the DDL+CHORUS+REV algorithm found earlier in this section.

**STEREO**  
Range: OFF or ON  
When set to OFF, the same roto-speaker signal is heard in both channels. When set to ON, the signal is 180° out-of-phase, to create stereo movement.

**LEVEL**  
Range: 00 to 99  
Adjusts the volume of the rotary speaker signal. A level of 00 will offer no audible signal.

**PAN**  
Range: -99 to +99  
Determines the location of the rotary speaker signal in the stereo spectrum. A value of -99 is panned hard left, and +99 is hard right.

**AM DEPTH**  
Range: 00 to 99  
Controls how much the volume will fade away as the speaker rotates away from the listener. Higher values will create a deeper rotating speaker effect.

**FM DEPTH**  
Range: 00 to 99  
Controls the amount of detuning applied to the rotating speaker. This can be used to create a “doppler” effect.

**ROTO SLOW**  
Range: 00 to 99  
Determines the rate of the rotary speaker when in the “Slow” setting. ROTO SLOW determines the manual level for the rotary speaker rate when SPEED = SLOW, or when the selected modulator is at zero output level. Again, the higher the value, the faster the rate.

**FAST**  
Range: 00 to 99  
Determines the rate of the rotary speaker when in the “FAST” setting. The higher the value, the faster the rate.

**INERTIA**  
Range: 00 to 99  
Determines how long it will take for the rotor effect to speed up and slow down after switching from fast to slow or vice versa. Adjust this parameter to simulate the effect of the rotary speaker gradually picking up speed.

**SPEED**  
Range: SLOW or FAST  
Determines how the rotary speaker will switch between slow and fast speeds. The behavior of the switch accurately reflects an actual rotary speaker, taking time to speed up or slow down, based on the value of the INERTIA parameter (see previous description). Any effect modulator can act as the SPEED controller. How the modulators will switch the rotor speed fall into two categories:

- **WHEEL, PBEND, PEDAL, TIMBR, XCTRL, PRESS, KEYBD, and VELOC** — These modulation sources act like a switch to turn on or off the fast rotor speed. To reverse the polarity of the switch, set ROTOR SLOW faster than ROTOR FAST.
- **KEYDN, PATCH, SUSTN, SOSTU, FX-SW** — These modulation sources toggle the rotor speed between slow and fast. Every time the modulation source moves from zero in a positive direction, the rotating speaker effect changes speeds from slow to fast or fast to slow.
For a complete description of the remaining parameters, refer to the DDL+CHORUS+REV algorithm found earlier in this section.

05 DISTORT+CHORUS+REV

This parallel effect combines a raspy distortion with a chorus and a reverb. The second sub-page (not user-programmable) shows how this parallel effect is routed:

- Voices assigned to FX1 (and panned left) are sent to Effect A (DISTORT)
- Voices assigned to FX1 (and panned right) are sent to Effect B (CHORUS)
- Voices assigned to FX2 are sent to the reverb (REV)

For a complete description of the SENDS parameters, refer to the DDL+CHORUS+REV algorithm found earlier in this section.

DIST MIX

Controls the mix between the original signal and the distortion. Setting this parameter to 00 will allow only the unprocessed signal to be heard, while a setting of 99 will eliminate it completely, with only the distortion portion remaining.

LEVEL

Controls the input level to the pre-amp, to eliminate the possibility of clipping boosted signals.

PAN

Determines the location of the distortion in the stereo spectrum. A value of -99 is panned hard left, and +99 is hard right.

PREAMP

Adjusts the amount of boost or cut applied to the incoming signal. We recommend lower settings, since these emulations were optimized for distortion there. Lower preamp gains will result in less distortion, while higher preamp gains will yield clipping distortion. For low preamp gain, it may be desirable to use low tube bias values.

MAIN

Controls the output level of the main amp after saturation, but before the filter.

BIAS

Controls the emphasis of even to odd harmonics which determines the tone of the amp; mid values emphasize even harmonics and offer a warmer (“glowing tube”) sound, while the highest values may sound like tubes going bad. For low preamp gain, it may be desirable to use low tube bias values, because this more closely imitates the operation of a real amplifier.

TONE

Controls the cutoff frequency. This is much like a tone control on a guitar amp. By applying a real-time controller to modulate this parameter, you can create a wah-pedal effect.

RESONANCE

Controls the bandwidth of the filter. Higher settings yield a narrower bandwidth.

For a complete description of the remaining parameters, refer to the DDL+CHORUS+REV algorithm found earlier in this section.
06 PARAM EQ+CHORUS+REV

This parallel effect combines a parametric EQ with a chorus and a reverb. The second sub-page (not user-programmable) shows how this parallel effect is routed:

- Voices assigned to FX1 (and panned left) are sent to Effect A (PARAM EQ)
- Voices assigned to FX1 (and panned right) are sent to Effect B (CHORUS)
- Voices assigned to FX2 are sent to the reverb (REV)

For a complete description of the SENDS parameters, refer to the DDL+CHORUS+REV algorithm found earlier in this section.

**INPUT**

Range: 00 to 99
Allows you to adjust the input level trim to the EQs to eliminate the possibility of clipping boosted signals.

**OUTPUT**

Range: 00 to 99
Adjusts the output volume after the parametric EQ. With the LEVEL, BASS LEVEL, and TREBLE LEVEL set to high values, the OUTPUT parameter could be used to create a raspy distortion effect.

**PAN**

Range: -99 to +99
Determines the location of the EQ in the stereo spectrum. A value of -99 is panned hard left, and +99 is hard right.

**MID FC**

Range: 00000 to 15000
Sets the center of the mid-frequency parametric.

**BW**

Range: 0 to 15K
This parameter is a bandwidth control that determines the width of the resonant peak at the mid-frequency band. By lowering the value, you can produce a narrower bandwidth.

**LEVEL**

Range: -99 to +48 dB
Sets the amount of boost or cut applied to this mid-frequency parametric.

**BASS LEVEL**

Range: -99 to +48 dB
Sets the amount of boost or cut applied to a 0 to 80Hz low-shelving filter.

**TREBLE LEVEL**

Range: -99 to +48 dB
Sets the amount of boost or cut applied to a 10 to 15K high-shelving filter.

For a complete description of the remaining parameters, refer to the DDL+CHORUS+REV algorithm found earlier in this section.

07 ENV VCF+CHORUS+REV

This parallel effect combines a voltage control filter with a chorus and a reverb. The second sub-page (not user-programmable) shows how this parallel effect is routed:

- Voices assigned to FX1 (and panned left) are sent to Effect A (ENV VCF)
- Voices assigned to FX1 (and panned right) are sent to Effect B (CHORUS)
- Voices assigned to FX2 are sent to the reverb (REV)

For a complete description of the SENDS parameters, refer to the DDL+CHORUS+REV algorithm found earlier in this section.
VCF FC  Range:  000 to 127
Determine the filter cut off-frequency. Higher values have a brighter sound. This parameter can
be modulated, using a CV Pedal for a wah-wah pedal effect. To use as an EQ, set the desired
value and make sure the ENV AMT is 0. To use as the auto-wah, set this parameter to a low
value and turn on ENV AMT.

LEVEL  Range:  00 to 99
Controls the output level of the Voltage control filter.

PAN  Range:  -99 to +99
Determine the location of the VCF in the stereo spectrum. A value of -99 is panned hard left,
and +99 is hard right.

BW  Range:  00 to 99
Determines the level and width of the resonant peak at the filter cutoff point. While the VCF FC
parameter determines where (at what frequency) this peak will occur, the BW setting controls the
presence of the peak. This setting is important for the auto-wah effect.

ENV AMT  Range:  0 to 15
Controls the peak frequency at the highest point of the attack. When set to 0, the ATTACK,
DECAY, SUSTN, REL, and TRIG parameters have no effect.

KBD AMT  Range:  0 to 15
Keyboard tracking amount — the cutoff frequency will track based on the KYB AMT range. Set
this parameter to work with your signal.

ATTACK  Range:  50 µsec to 10.0 sec
Sets the attack of the envelope follower (i.e. determines how closely the attack is followed) once
the incoming signal has been detected. Generally the attack should be short.

DECAY  Range:  50 µsec to 10.0 sec
Determines the amount of time after the attack time that the VCF will decay.

SUSTN  Range:  00 to 63
Determines the amount of time the VCF will sustain before it decays.

RELEASE  Range:  50 µsec to 10.0 sec
Sets the amount of time after the incoming signal has ceased for the envelope follower to shut
down. Generally these times are longer than the attack times.

TRIG  Range:  SINGLE or MULTI
Determines whether the VCF will retrigger with each key-event or not.

For a complete description of the remaining parameters, refer to the DDL+CHORUS+REV
algorithm found earlier in this section.

08 DDL+PHLANGR+REV
This parallel effect combines a digital delay with a phlanger (a combination phaser and flanger
effect) and a reverb. The second sub-page (not user-programmable) shows how this parallel
effect is routed:

• Voices assigned to FX1 (and panned left) are sent to Effect A (DDL)
Voices assigned to FX1 (and panned right) are sent to Effect B (PHLANGR)
Voices assigned to FX2 are sent to the reverb (REV)

**SEDDS A- -B**
Controls the amount of Effect A (DDL) being sent into Effect B (the phlanger). A setting of 99 would yield a serial connection between Effect A and the PHLANGR for voices sent to FX1 and panned hard left (on the Output page).

**B- -REVRB**
Controls the amount of Effect B (PHLANGR) being sent into the reverb. This would allow you to add reverb to voices assigned to FX1 and panned hard right. A setting of 99 would yield a serial connection between the PHLANGR and the reverb for voices sent to FX1 and panned hard right (on the Output page).

**A- -REVRB**
Controls the amount of Effect A (DDL) being sent into the reverb. This would allow you to add reverb to voices assigned to FX1 and panned hard left, without having to add any phasing/flanging.

**FX2- -REVRB**

**DRY**

**DDL MIX**

**LEVEL**
For a complete description of these parameters, refer to the DDL+CHORUS+REV algorithm found earlier in this section.

**PHLANGR MIX**
Controls the Dry/Wet mix within the phlanger itself.

**LEVEL**
Adjusts the volume of the phlanger signal. A level of 00 will offer no audible signal.

**PAN**
Determines the location of the phlanger signal in the stereo spectrum. A value of -99 is panned hard left, and +99 is hard right.

**RATE**
Controls the rates of modulation of the phlanger.

**REGEN**
Controls the amount of feedback applied to the phlanger. The sign of the value determines the polarity of the feedback.

**PHASE CENTER**
Controls the center of the phaser width.

**WIDTH**
Controls the range of modulation applied to phaser poles.

**FLANGER CENTER**
Controls the center of the flanger width.

**WIDTH**
Controls the range of the high to low-frequency sweep in the flanger effect.
For a complete description of the remaining Reverb parameters, refer to the DDL+CHORUS+REV algorithm found earlier in this section.

09 EQ- -DDL+PHLANGR+REV

This parallel effect combines a parametric EQ into a digital delay with a phlanger (a combination phaser and flanger effect) and a reverb. The second sub-page (not user-programmable) shows how this parallel effect is routed:

- Voices assigned to FX1 (and panned left) are sent to Effect A (EQ- -DDL)
- Voices assigned to FX1 (and panned right) are sent to Effect B (PHLANGR)
- Voices assigned to FX2 are sent to the reverb (REV)

For a complete description of the SENDS parameters, refer to the DDL+PHLANGR+REV algorithm found earlier in this section.

For a complete description of the EQ- -DDL parameters, refer to the EQ- -DDL+CHORUS+REV algorithm found earlier in this section.

For a complete description of the PHLANGR parameters, refer to the DDL+PHLANGR+REV algorithm found earlier in this section.

For a complete description of the remaining Reverb parameters, refer to the DDL+CHORUS+REV algorithm found earlier in this section.

10 DELAYLFO+PHLANGR+REV

This parallel effect combines a digital delay that provides LFO modulation with a phlanger (a combination phaser and flanger effect) and a reverb. The second sub-page (not user-programmable) shows how this parallel effect is routed:

- Voices assigned to FX1 (and panned left) are sent to Effect A (DELAYLFO)
- Voices assigned to FX1 (and panned right) are sent to Effect B (PHLANGR)
- Voices assigned to FX2 are sent to the reverb (REV)

For a complete description of the SENDS parameters, refer to the DDL+PHLANGR+REV algorithm found earlier in this section.

For a complete description of the DELAYLFO parameters, refer to the DELAYLFO+CHORUS+REV algorithm found earlier in this section.

For a complete description of the PHLANGR parameters, refer to the DDL+PHLANGR+REV algorithm found earlier in this section.

For a complete description of the remaining Reverb parameters, refer to the DDL+CHORUS+REV algorithm found earlier in this section.
11 ROTOSPKR+PHLANGR+REV

This parallel effect combines a rotary speaker with a phlanger (a combination phaser and flanger effect) and a reverb. The second sub-page (not user-programmable) shows how this parallel effect is routed:

- Voices assigned to FX1 (and panned left) are sent to Effect A (ROTOPKR)
- Voices assigned to FX1 (and panned right) are sent to Effect B (PHLANGR)
- Voices assigned to FX2 are sent to the reverb (REV)

For a complete description of the SENDS parameters, refer to the DDL+PHLANGR+REV algorithm found earlier in this section.

For a complete description of the ROTOSPKR parameters, refer to the ROTOSPKR+CHORUS+REV algorithm found earlier in this section.

For a complete description of the PHLANGR parameters, refer to the DDL+PHLANGR+REV algorithm found earlier in this section.

For a complete description of the remaining Reverb parameters, refer to the DDL+CHORUS+REV algorithm found earlier in this section.

12 DISTORT+PHLANGR+REV

This parallel effect combines a distortion with a phlanger (a combination phaser and flanger effect) and a reverb. The second sub-page (not user-programmable) shows how this parallel effect is routed:

- Voices assigned to FX1 (and panned left) are sent to Effect A (DISTORT)
- Voices assigned to FX1 (and panned right) are sent to Effect B (PHLANGR)
- Voices assigned to FX2 are sent to the reverb (REV)

For a complete description of the SENDS parameters, refer to the DDL+PHLANGR+REV algorithm found earlier in this section.

For a complete description of the DISTORT parameters, refer to the DISTORT+CHORUS+REV algorithm found earlier in this section.

For a complete description of the PHLANGR parameters, refer to the DDL+PHLANGR+REV algorithm found earlier in this section.

For a complete description of the remaining Reverb parameters, refer to the DDL+CHORUS+REV algorithm found earlier in this section.

13 PARAM EQ+PHLANGR+REV

This parallel effect combines a parametric EQ with a phlanger (a combination phaser and flanger effect) and a reverb. The second sub-page (not user-programmable) shows how this parallel effect is routed:

- Voices assigned to FX1 (and panned left) are sent to Effect A (PARAM EQ)
- Voices assigned to FX1 (and panned right) are sent to Effect B (PHLANGR)
- Voices assigned to FX2 are sent to the reverb (REV)
For a complete description of the SENDS parameters, refer to the DDL+PHLANGR+REV algorithm found earlier in this section.

For a complete description of the PARAM EQ parameters, refer to the PARAM EQ+CHORUS+REV algorithm found earlier in this section.

For a complete description of the PHLANGR parameters, refer to the DDL+PHLANGR+REV algorithm found earlier in this section.

For a complete description of the remaining Reverb parameters, refer to the DDL+CHORUS+REV algorithm found earlier in this section.

### 14 ENV VCF+PHLANGR+REV

This parallel effect combines a voltage control filter with a phlanger (a combination phaser and flanger effect) and a reverb. The second sub-page (not user-programmable) shows how this parallel effect is routed:

- Voices assigned to FX1 (and panned left) are sent to Effect A (ENV VCF)
- Voices assigned to FX1 (and panned right) are sent to Effect B (PHLANGR)
- Voices assigned to FX2 are sent to the reverb (REV)

For a complete description of the SENDS parameters, refer to the DDL+PHLANGR+REV algorithm found earlier in this section.

For a complete description of the ENV VCF parameters, refer to the ENV VCF+CHORUS+REV algorithm found earlier in this section.

For a complete description of the PHLANGR parameters, refer to the DDL+PHLANGR+REV algorithm found earlier in this section.

For a complete description of the remaining Reverb parameters, refer to the DDL+CHORUS+REV algorithm found earlier in this section.

### 15 DDL+ROTOSPKR+REV

This parallel effect combines a digital delay with a rotary speaker effect and a reverb. The second sub-page (not user-programmable) shows how this effect is routed:

- Voices assigned to FX1 (and panned left) are sent to Effect A (DDL)
- Voices assigned to FX1 (and panned right) are sent to Effect B (ROTOSPKR)
- Voices assigned to FX2 are sent to the reverb (REV)

**SENDS A-B**

Range: 00 to 99

Controls the amount of Effect A (DDL) being sent into Effect B (the rotary speaker). A setting of 99 would yield a serial connection between Effect A and the rotary speaker effect for voices sent to FX1 and panned hard left (on the Output page).

**B-REVRB**

Range: 00 to 99

Controls the amount of Effect B (ROTOSPKR) being sent into the reverb. This would allow you to add reverb to voices assigned to FX1 and panned hard right. A setting of 99 would yield a serial connection between the ROTOSPKR and the reverb for voices sent to FX1 and panned hard right (on the Output page).
A-REVRB
Range: 00 to 99
Controls the amount of Effect A (DDL) being sent into the reverb. This would allow you to add reverb to voices assigned to FX1 and panned hard left, without having to add any of the rotary speaker effect.

FX2-REVRB
DRY
DDL MIX
LEVEL
PAN
DDL REGEN L
DAMPING
DELAY TIME L and R
For a complete description of these parameters, refer to the DDL+CHORUS+REV algorithm found earlier in this section.

ROTO STEREO
Range: OFF or ON
Selects either a stereo or mono rotary speaker effect.

LEVEL
Range: 00 to 99
Adjusts the volume of the rotary speaker signal. A level of 00 will offer no audible signal.

PAN
Range: -99 to +99
Determines the location of the rotary speaker signal in the stereo spectrum. A value of -99 is panned hard left, and +99 is hard right.

AM DEPTH
Range: 00 to 99
Controls how much the volume will fade away as the speaker rotates away from the listener. Higher values will create a deeper rotating speaker effect.

FM DEPTH
Range: 00 to 99
Controls the amount of detuning applied to the rotating speaker. This can be used to create a “doppler” effect.

ROTO SLOW
Range: 00 to 99
Determines the rate of the rotary speaker when in the “Slow” setting. ROTO SLOW determines the manual level for the rotary speaker rate when SPEED= SLOW, or when the selected modulator is at zero output level. Again, the higher the value, the faster the rate.

FAST
Range: 00 to 99
Determines the rate of the rotary speaker when in the “Fast” setting. The higher the value, the faster the rate.

INERTIA
Range: 00 to 99
Determines how long it will take for the rotor effect to speed up and slow down after switching from fast to slow or vice versa. Adjust this parameter to simulate the effect of the rotary speaker gradually picking up speed.

SPEED
Range: SLOW or FAST
Determines how the rotary speaker will switch between slow and fast speeds. The behavior of the switch accurately reflects an actual rotary speaker, taking time to speed up or slow down, based on the value of the INERTIA parameter (see previous description). Any effect modulator can act as the SPEED controller. How the modulators will switch the rotor speed fall into two categories:

- WHEEL, PBEND, PEDAL, TIMBR, XCTRL, PRESS, KEYBD, and VELOC — These modulation sources act like a switch to turn on or off the fast rotor speed. To reverse the polarity of the switch, set ROTO SLOW faster than ROTO FAST.
• KEYDN, PATCH, SUSTN, SOSTU, FX-SW — These modulation sources toggle the rotor speed between slow and fast. Every time the modulation source moves from zero in a positive direction, the rotating speaker effect changes speeds from slow to fast or fast to slow.

For a complete description of the remaining Reverb parameters, refer to the DDL+CHORUS+REV algorithm found earlier in this section.

16 EQ- -DDL+ROTOPKR+REV

This parallel effect combines a parametric EQ into a digital delay with a rotary speaker effect and a reverb. The second sub-page (not user-programmable) shows how this effect is routed:

• Voices assigned to FX1 (and panned left) are sent to Effect A (EQ- -DDL)
• Voices assigned to FX1 (and panned right) are sent to Effect B (ROTOPKR)
• Voices assigned to FX2 are sent to the reverb (REV)

For a complete description of the SENDS parameters, refer to the DDL+ROTOPKR+REV algorithm found earlier in this section.

For a complete description of the EQ- -DDL parameters, refer to the EQ- -DDL+CHORUS+REV algorithm found earlier in this section.

For a complete description of the ROTO parameters, refer to the DDL+ROTOPKR+REV algorithm found earlier in this section.

For a complete description of the remaining Reverb parameters, refer to the DDL+CHORUS+REV algorithm found earlier in this section.

17 DELAYLFO+ROTOPKR+REV

This parallel effect combines a digital delay that provides LFO modulation with a rotary speaker effect and a reverb. The second sub-page (not user-programmable) shows how this effect is routed:

• Voices assigned to FX1 (and panned left) are sent to Effect A (DELAY LFO)
• Voices assigned to FX1 (and panned right) are sent to Effect B (ROTOPKR)
• Voices assigned to FX2 are sent to the reverb (REV)

For a complete description of the SENDS parameters, refer to the DDL+ROTOPKR+REV algorithm found earlier in this section.

For a complete description of the DELAYLFO parameters, refer to the DELAYLFO+CHORUS+REV algorithm found earlier in this section.

For a complete description of the ROTO parameters, refer to the DDL+ROTOPKR+REV algorithm found earlier in this section.

For a complete description of the remaining Reverb parameters, refer to the DDL+CHORUS+REV algorithm found earlier in this section.
18 **ROTOPSPKR+ROTOPSPKR+REV**

This parallel effect combines a rotary speaker with another rotary speaker effect and a reverb. The second sub-page (not user-programmable) shows how this effect is routed:

- Voices assigned to FX1 (and panned left) are sent to Effect A (ROTOPSPKR)
- Voices assigned to FX1 (and panned right) are sent to Effect B (ROTOPSPKR)
- Voices assigned to FX2 are sent to the reverb (REV)

For a complete description of the SENDS and the ROTO parameters, refer to the DDL+ROTOPSPKR+REV algorithm found earlier in this section.

For a complete description of the remaining Reverb parameters, refer to the DDL+CHORUS+REV algorithm found earlier in this section.

19 **DISTORT+ROTOPSPKR+REV**

This parallel effect combines a raspy distortion with a rotary speaker and a reverb. The second sub-page (not user-programmable) shows how this effect is routed:

- Voices assigned to FX1 (and panned left) are sent to Effect A (DIST)
- Voices assigned to FX1 (and panned right) are sent to Effect B (ROTOPSPKR)
- Voices assigned to FX2 are sent to the reverb (REV)

For a complete description of the SENDS parameters, refer to the DDL+ROTOPSPKR+REV algorithm found earlier in this section.

For a complete description of the DISTORT parameters, refer to the DISTORT+CHORUS+REV algorithm found earlier in this section.

For a complete description of the ROTO parameters, refer to the DDL+ROTOPSPKR+REV algorithm found earlier in this section.

For a complete description of the remaining Reverb parameters, refer to the DDL+CHORUS+REV algorithm found earlier in this section.

20 **PARAM EQ+ROTOPSPKR+REV**

This parallel effect combines a parametric EQ with a rotary speaker and a reverb. The second sub-page (not user-programmable) shows how this effect is routed:

- Voices assigned to FX1 (and panned left) are sent to Effect A (PARAM EQ)
- Voices assigned to FX1 (and panned right) are sent to Effect B (ROTOPSPKR)
- Voices assigned to FX2 are sent to the reverb (REV)

For a complete description of the SENDS parameters, refer to the DDL+ROTOPSPKR+REV algorithm found earlier in this section.

For a complete description of the PARAM EQ parameters, refer to the PARAM EQ+CHORUS+REV algorithm found earlier in this section.

For a complete description of the ROTOSPKR parameters, refer to the DDL+ROTOPSPKR+REV algorithm found earlier in this section.
For a complete description of the remaining Reverb parameters, refer to the DDL+CHORUS+REV algorithm found earlier in this section.

21 ENV VCF+ROTOSPKR+REV

This parallel effect combines a voltage control filter with a rotary speaker and a reverb. The second sub-page (not user-programmable) shows how this effect is routed:

- Voices assigned to FX1 (and panned left) are sent to Effect A (ENV VCF)
- Voices assigned to FX1 (and panned right) are sent to Effect B (ROTOSPKR)
- Voices assigned to FX2 are sent to the reverb (REV)

For a complete description of the SENDS parameters, refer to the DDL+ROTOSPKR+REV algorithm found earlier in this section.

For a complete description of the ENV VCF parameters, refer to the ENV VCF+CHORUS+REV algorithm found earlier in this section.

For a complete description of the ROTO parameters, refer to the DDL+ROTOSPKR+REV algorithm found earlier in this section.

For a complete description of the remaining Reverb parameters, refer to the DDL+CHORUS+REV algorithm found earlier in this section.

Dual Effects

The next two algorithms in the TS-12 are called dual effects and allow two effect types to be used at the same time. Dual effect algorithms are similar to parallel effects in that they require you to assign the voices to either FX1 or FX2 (on the Output page). Dual effects offer two discrete effect processing paths, and are also ideal for Seq/Song mixdowns.

22 PLATE + PLATE REVERBS

This dual effect algorithm combines two plate reverbs, allowing you to create two discrete plate reverb effects.

**FX1--PLATE REVERB1**

Range: 00 to 99
Controls the Dry/Wet mix for sounds routed to the first plate reverb (FX1 on the Output page).

**FX1 DRY**

Range: 00 to 99
Controls the volume of a dry path around the first plate reverb.

**FX2--PLATE REVERB2**

Range: 00 to 99
Controls the Dry/Wet mix for sounds routed to the second plate reverb (FX2 on the Output page).

**FX2 DRY**

Range: 00 to 99
Controls the volume of a dry path around the second plate reverb.

**REVERB1 - DECAY TIME**

Range: 0.40 to 140.0 sec
Controls the amount of time it takes for the reverberation to decay. Lower values of decay time sound good on drum and percussion tracks.
PRE-DLY TIME
Range: 0000 to 0300 ms
Controls the amount of time it takes for the input signal to be presented to the plate reverb. A value of 0000 would offer no delay.

HF - DAMPING
Range: 00 to 99
Increasing the value of this parameter will gradually filter out increasing amounts of high-frequency energy. Higher values yield an abrupt decay. Controls the cut off of a low pass filter in series with the decay within the definition.

BANDWIDTH
Range: 01 to 99
Acts as a low-pass filter on the output of the plate reverbs, controlling the amount of high frequencies present. The higher the setting, the more high frequencies are allowed to pass through, offering a brighter ringing sound. Some interesting effects can be created by using a mod controller over a large range.

DETUNE - RATE
Range: 00 to 99
Controls the LFO rate of detuning incorporated within the reverb. Detuning creates a slight pitch shift into the reverberated signal, giving it a more natural sounding decay by breaking up resonant nodes.

DEPTH
Range: 00 to 99
Controls the depth of the detuning, that is, how much the pitch will change. Low values yield a metallic sound. Some voices sound best with very low values.

DEFINITION
Range: 00 to 99
Controls the rate at which echo density increases with time. Higher values can cause the echo density to build at a rate that exceeds the decay rate. Try to select the highest value that works with your sound source for the best performance.

DIFFUSION
Ranges: 00 to 99
The two diffusion parameters smear the input signal to create a smoother sound. Lower values will cause impulse sounds to appear as a series of discrete echoes, while higher values tend to increase the smear, making the echoes less apparent.

REVERB2 - DECAY TIME
PRE-DLY TIME
HF - DAMPING
BANDWIDTH
DETUNE - RATE
DEPTH
DEFINITION
DIFFUSION
These parameters are identical to the previous ones, and allow you to create a completely independent plate reverb assigned to FX2.

23 PARAMETRIC EQ + PLATE
This dual effect algorithm combines a parametric EQ with a plate reverb, allowing independent effects processing.

FX1- -EQ
Range: 00 to 99
Controls the volume mix for sounds routed to the parametric EQ (FX1 on the Output page).
**EQ-REV**
Range: 00 to 99
Controls the amount of EQ being sent into the plate reverb. A setting of 99 would yield a serial connection between the parametric EQ and the reverb for voices assigned to FX1 (on the Output page). A setting of 00 would eliminate any audible reverb for voices assigned to FX1.

**FX2-REV**
Range: 00 to 99
Controls the Dry/Wet mix for sounds routed to the plate reverb (FX2 on the Output page).

**FX2 DRY**
Range: 00 to 99
Controls the volume of a dry path around the plate reverb.

**EQ INPUT**
Range: 00 to 99
Lets you to adjust the input level before the EQs to eliminate the possibility of clipping boosted signals.

**OUTPUT**
Range: 00 to 99
Allows you to adjust the output gain to compensate for losses in perceived volume. Setting this gain too high will cause clipping of the output signal.

**MID FC**
Range: 00000 to 15000 Hz
This parameter sets the center of the mid-frequency parametric. Higher values have a brighter sound.

**BW**
Range: 00000 to 15000 Hz
This parameter is a bandwidth control that determines the width of the resonant peak at the center of the-frequency band. By raising the value, you can produce a narrower bandwidth.

**LEVEL**
Range: -99 to +48 dB
This parameter sets the amount of cut (negative values) or boost (positive values) applied to this mid-frequency parametric.

**BASS FC**
Range: 00000 to 15000 Hz
Selects the cutoff-frequency of the lower-frequency band shelving filter.

**LEVEL**
Range: -99 to +48 dB
Sets the amount of boost or cut applied to the low shelving filter.

**TREBLE FC**
Range: 00000 to 15000 Hz
Selects the cutoff-frequency of the upper-frequency band high shelving filter.

**LEVEL**
Range: -99 to +48 dB
Sets the amount of boost or cut applied to the high shelving filter.

**REVB DECAY TIME**
Range: 0.40 to 140.0 sec.
Controls the amount of time it takes for the reverberation to decay. High values of decay time sound good on drum and percussion tracks.

**PRE-DLY TIME**
Range: 0000 to 0300 ms
Controls the amount of time it takes for the input signal to be presented to the plate reverb. A value of 0000 would offer no delay.
HF - DAMPING  
Range: 00 to 99  
Increasing the value of this parameter will gradually filter out increasing amounts of high-frequency energy. Higher values yield an abrupt decay. Controls the cut off of a low pass filter in series with the decay within the definition.

BANDWIDTH  
Range: 01 to 99  
Acts as a low-pass filter on the output of the plate reverb, controlling the amount of high frequencies present. The higher the setting, the more high frequencies are allowed to pass through, offering a brighter ringing sound. Some interesting effects can be created by using a mod controller over a large range.

DETUNE - RATE  
Range: 00 to 99  
Controls the LFO rate of detuning incorporated within the reverb. Detuning creates a slight pitch shift into the reverberated signal, giving it a more natural sounding decay by breaking up resonant nodes.

DEPTH  
Range: 00 to 99  
Controls the depth of the detuning, that is, how much the pitch will change. Low values yield a metallic sound. Some voices sound best with very low values.

DEFINITION  
Range: 00 to 99  
Controls the rate at which echo density increases with time. Higher values can cause the echo density to build at a rate that exceeds the decay rate. Try to select the highest value that works with your sound source for the best performance.

DIFFUSION  
Ranges: 00 to 99  
The two diffusion parameters smear the input signal to create a smoother sound. Lower values will cause impulse sounds to appear as a series of discrete echoes, while higher values tend to increase the smear, making the echoes less apparent.

24 SMALL PLATE REVERB  
25 LARGE PLATE REVERB 1

A plate reverb takes the vibrations from a metal plate and uses them to create a metallic sounding reverb. SMALL PLATE REVERB is a tight sounding plate reverb, and LARGE PLATE REVERB 1 simulates a larger plate reverb. Small plate reverbs are most often used in the studio for drums and percussion, while large plate reverbs are often used to enhance a vocalist’s performance.

Small Plate Reverb & Large Plate Reverb 1 Signal Routing

These two plate reverb algorithms share exactly the same signal routing topology. The internal values of the components (not user programmable) differentiate the large and small plate reverbs. The signal goes directly through the diffusers which smear the signal. The signal is then routed to a larger diffuser, known as Decay Definition, and is diffused over a period of time.
The signal is then routed to the output, and then goes through a low pass filter. There is a parameter that controls the Decay Time of both the left and right signals (shown as triangles above). This signal is then routed back into the definition. There is also an external dry signal (not shown) that goes directly from the input to the Main Output (DRY). The FX-1 and FX-2 MIX parameters can be routed into the effect for different Dry/Wet mixes.

**DECAY TIME**
- Small Plate Range: 0.20 to 100.0 sec
- Large Plate 1 Range: 0.40 to 140.0 sec

Controls the amount of time it takes for the reverberation to decay. High values of decay time sound good on these algorithms.

**PRE-DLY TIME**
- Range: 0000 to 0500 msec

Controls the amount of time it takes for the input signal to be presented to the plate reverb. A value of 0000 would offer no delay.

**HF - DAMPING**
- Range: 00 to 99

Increasing the value of this parameter will gradually filter out increasing amounts of high-frequency energy. Higher values yield an abrupt decay. This parameter controls the cut off of a low pass filter in series with the decay within the definition.

**BANDWIDTH**
- Range: 01 to 99

Acts as a low-pass filter on the output of the plate reverbs, controlling the amount of high frequencies present. The higher the setting, the more high frequencies are allowed to pass through, offering a brighter ringing sound. Some interesting effects can be created by using a mod controller over a large range.

**L/R BALANCE**
- Range: -99 to +99

Controls the left/right stereo balance of the plate reverb signal. A setting of -99 would offer hard left, whereas a setting of +99 offers hard right. A setting of +00 would place the reverb in the center of the stereo spectrum.

**DEFINITION**
- Range: 00 to 99

Controls the rate at which echo density increases with time. Higher values can cause the echo density to build at a rate that exceeds the decay rate. For the best results, try to select the highest value that works with your sound source.

**DIFFUSION- 1**
- Range: 00 to 99

Smears the input signal to create a smoother sound. Lower values cause impulse sounds to appear as a series of discrete echoes, while higher values tend to increase the smear, making the echoes less apparent.

**DIFFUSION- 2**
- Range: 00 to 99

This diffuser, similar to and in series with the previous one, offers control over lower-frequency ranges. Plate reverbs tend to sound metallic, and the diffusers help to smear the signal, eliminating the metallic sound.

**EARLY REFLECTION LEVELS (1 to 4)**
- Ranges: -99 to +99

Control four early reflection levels. Setting these levels to lower values will produce a wetter sound. These four reflection levels are close to the input of the DEFINITION.
26 LARGE PLATE REVERB 2

This plate reverb shares the same signal routing topology as the previous plate reverbs, but sports poly-phase interpolation, and two additional parameters:

**SPREAD**
Range: 00000 to 31129
Determines the time intervals between the seven discrete echoes produced by the plate. The time intervals are adjusted relative to one another.

**SHAPE**
Range: -99 to +99
Determines the relative volume of the seven discrete echoes produced by the plate. At +00 seven echoes are all the same volume. At -99 the first echo is quietest, with successive echoes increasing in volume. At +99 produces the opposite effect.

27 HALL REVERB 1

This effect algorithm provides a studio-quality stereo reverb. The FX-1 and FX-2 MIX parameters can be routed into the effect for different Dry/Wet mixes. HALL REVERB is a reverb with a long decay, featuring left to right (transverse) reflections.

**DECAY TIME**
Range: 0.20 to 100.0 msec
Controls the amount of time it takes for the reverberation to decay to a low level (-60 dB) after the input signal stops.

**PRE-DLY TIME**
Range: 0000 to 0500 msec
This parameter creates a time delay before the original signal is fed into the reverb.

**HF - DAMPING**
Range: 00 to 99
Controls the rate of attenuation of high frequencies in the decay of the reverberation. As natural reverb decays, some high frequencies tend to get absorbed by the environment. Increasing the value of this parameter will filter out increasing amounts of high-frequency energy.

**BANDWIDTH**
Range: 00 to 99
Acts as a low pass filter on the signal going into the reverb, controlling the amount of high frequencies that will pass into the effect. The higher the setting, the more high frequencies are allowed to pass.

**LF DECAY**
Range: -99 to +99
This control will boost or cut the rate at which low frequencies will decay.

**DIFFUSION**
Range: 00 to 99
Determines whether the early reflections will appear as a series of discrete echoes (lower values) or will be more diffused (higher values).

**DETUNE - RATE**
Range: 00 to 99
Controls the LFO rate of detuning incorporated within the reverb. Detuning creates a slight pitch shift into the reverberated signal, giving it a more natural sounding decay by breaking up resonant nodes.

**DEPTH**
Range: 00 to 99
Controls the depth of the detuning, that is, how much the pitch will change. Low values yield a metallic sound. Some voices sound best with very low values.
28 HALL REVERB 2

This algorithm can be programmed with a high degree of precision. HALL REVERB 2 is a large acoustic space providing a high density reverb.

HALL REVERB 2 Signal Routing

The signal enters a low pass filter and goes directly through the diffusers which smear the signal. The signal is then routed to a larger decay diffuser, known as Definition, and is diffused over a period of time (creating a decay). There are taps from both the left and right Definition that are routed to the output to create a synthesized stereo output. A signal from the Definition goes through a low pass filter followed by a low-frequency decay parameter, which controls the rate of decay of the low frequencies. There is also a parameter at this stage that controls the decay time of both the left and right signals. The left and right signals are routed back into the Definition. There are two echo times between the diffuser and the definition that can be routed directly to the output, or sent back through the definition. The EFFECT MIX FX-1 and FX-2 parameters allow you to create a Dry/Wet mix.

**DECAY TIME**

Range: 0.70 to 250. sec

Controls the amount of time it takes for the reverberation to decay to a very low level after the input signal stops. We recommend higher values for the hall reverb.

**PRE-DLY TIME**

Hall Reverb 2 Range: 0000 to 0500 msec

Controls the amount of time it takes for the original signal to be presented to the reverb. Higher values denote a longer delay.

**HF - DAMPING**

Range: 00 to 99

Controls the rate of attenuation of high frequencies in the decay of the reverberation. As natural reverb decays, some high frequencies tend to get absorbed by the environment. Increasing the value of this parameter will gradually filter out (dampen) more and more high-frequency energy.

**BANDWIDTH**

Range: 01 to 99

The high-frequency bandwidth acts as a low pass filter on the signal going into the reverb, controlling the amount of high frequencies that will pass into the effect. The higher the setting,
the more high frequencies are allowed to pass. This functions like a tone control on a guitar.

**LF DECAY TIME**
Range: -99 to +99
Acts like a tone control and will boost (when set to a positive value) or cut (when set to a negative value) the rate at which low frequencies will decay.

**DEFINITION**
Range: 00 to 99
Controls the rate at which echo density is increased with time. Setting this parameter too high can cause the echo density to build at a rate which exceeds the decay rate. A general rule of thumb is this: DEFINITION should not exceed the LF DECAY TIME added to the DECAY TIME.

**DIFFUSION-1**
Range: 00 to 99
Smears the input signal transients to diffuse and smooth the sound. Lower values cause impulse sounds to appear as a series of discrete echoes, while higher values tend to increase the smear (smoother sounding with fewer discrete echoes). We recommend settings of 50 for starters.

**DIFFUSION-2**
Range: 00 to 99
This parameter, similar to and in series with DIFFUSION-1, performs the same way but controls lower-frequency ranges. Experiment with different levels between the diffuser parameters to find the settings that are right for your source.

**REFL-1 TIME**
Range: 0000 to 0120 ms
Controls the delay time for the first pre-echo. Pre-echoes are the first sounds that have been reflected back from the walls or reflective "live" surfaces. Higher values delay the diffused signal more.

**LEVEL**
Range: 00 to 99
Controls the level of the first pre-echo. This pre-level controls the echo send to the DEFINITION.

**SEND**
Range: 00 to 99
Controls the level of the first pre-echo, with the echo routed directly to the output.

**REFL-2 TIME**
Range: 0000 to 0120 ms
Controls the delay time for the second pre-echo.

**LEVEL**
Range: 0 to 99
Controls the level of the second pre-echo. As a signal continues to bounce off the different reflective surfaces (walls), it decreases in volume. Set this parameter to a lower value than REFLEX-1 LEVEL to create a natural sounding echo.

**SEND**
Range: 00 to 99
Controls the level of the second pre-echo, with the echo routed directly to the output.

**DETUNE - RATE**
Range: 00 to 99
 Controls the LFO rate of detuning introduced into the reverberation decay. Detuning creates a slight oscillating pitch shift into the decay, giving it a more natural sound by breaking up resonant nodes.

**DEPTH**
Range: 00 to 99
Controls the depth of the detuning, that is, how much the pitch will change. Low values yield a metallic sound. Some sounds may require very low values, while others sound more natural with higher values.
**PRIMARY SEND**  
Range: -99 to +99  
Controls the level of the diffused input signal into the reverb definition.

**REVB POSITION BAL- (1 to 3)**  
Ranges: -99 to +99  
The Position Balance parameters simulate the depth of the hall. Think of these parameters as three different microphones placed at various distances within the hall (the first is closest to the front, the third is farthest from the front). When the range (volume) is higher for BAL-1, the sound appears closer to the front, whereas a higher setting for BAL-3 appears farther from the front, suggesting a deeper (wetter) hall.

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**29 HALL REVERB 3**

HALL REVERB 3 shares the same signal routing topology as HALL REVERB 2, with a few additional parameters:

**DECAY DIFFUSION**  
Range: 00 to 99  
Smears the reverb decay signal.

**INPUT DIFFUS**  
Ranges: 00 to 99  
These parameters smear the input signal transients to diffuse and smooth the sound. Lower values cause impulse sounds to appear as a series of discrete echoes, while higher values tend to increase the smear (smoother sounding with fewer discrete echoes). We recommend settings of 50 for starters. Experiment with different levels between the diffuser parameters to find the settings that are right for your source.

**SPREAD**  
Range: 00000 to 31129  
Determines the time intervals between the seven discrete echoes produced by the hall. The time intervals are adjusted relative to one another.

**SHAPE**  
Range: -99 to +99  
Determines the relative volume of the seven discrete echoes produced by the hall. At +00 seven echoes are all the same volume. At -99 the first echo is quietest, with successive echoes increasing in volume. At +99 produces the opposite effect.

**FRONT-TO-BACK LEVS (1 to 3)**  
Ranges: -99 to +99  
These three fields simulate the depth of the hall. Think of these fields as three different microphones placed at various distances within the hall (the first is closest to the front, the third is farthest from the front). When the range (volume) is higher for the first value, the sound appears closer to the front, whereas a higher setting for the last value appears farther from the front, suggesting a deeper (wetter) hall.

**L/R BALANCE**  
Range: -99 to +99  
Controls the left/right stereo balance of the hall reverb signal. A setting of -99 would offer hard left, whereas a setting of +99 would offer hard right. A setting of +00 would place the reverb in the center of the stereo spectrum.

**PRIMARY SEND**  
Range: -99 to +99  
Controls the level of the diffused input signal into the reverb definition.
## 30 SMALL ROOM REVERB

SMALL ROOM REVERB features a short, room-like decay. The FX-1 and FX-2 parameters can be routed into the effect with different Dry/Wet mixes.

### DECAY TIME

Range: 0.20 to 100.0

Controls the amount of time it takes for the reverberation to decay to a low level (-60 dB) after the input signal stops.

### PRE-DLY TIME

Range: 0000 to 0500

Creates a delay in the amount of time it takes before the original signal is fed into the reverb. The range is based in milliseconds.

### HF - DAMPING

Range: 00 to 99

Controls the rate of attenuation of high frequencies in the decay of the reverberation. As natural reverb decays, some high frequencies tend to get absorbed by the environment. Increasing the value of this parameter will filter out increasing amounts of high-frequency energy.

### BANDWIDTH

Range: 00 to 99

The high-frequency bandwidth parameter acts as a low pass filter on the signal going into the reverb, controlling the amount of high frequencies that will pass into the effect. The higher the setting, the more high frequencies are allowed to pass.

### LF DECAY

Range: -99 to +99

This control will boost or cut the rate at which low frequencies decay.

### DIFFUSION

Range: 00 to 99

Determines whether the early reflections will appear as a series of discrete echoes (lower values) or will be more diffused (higher values).

### DETUNE - RATE

Range: 00 to 99

Controls the LFO rate of detuning incorporated within the reverb. Detuning creates a slight pitch shift into the reverberated signal, giving it a more natural sounding decay by breaking up resonant nodes.

### DEPTH

Range: 00 to 99

Controls the depth of the detuning, that is, how much the pitch will change. Low values yield a metallic sound. Some voices sound best with very low values.

## 31 MEDIUM ROOM REVERB

## 32 LARGE ROOM REVERB

MEDIUM ROOM REVERB provides a highly programmable medium room reverb, and LARGE ROOM REVERB offers a larger room with bright reflective surfaces.

These algorithms share the same signal routing topology as HALL REVERB 2. However, the internal values of the components (not user-programmable) differentiate these reverbs. The EFFECT MIX FX-1 and FX-2 parameters can be routed into the effect with different Dry/Wet mixes.
DECAY TIME
Medium Room Range: 0.20 to 1.33
Large Room Range: 0.20 to 1.83
Controls the amount of time it takes for the reverberation to decay to a very low level after the input signal stops. In room reverb we don’t recommend higher settings, which tend to create an infinite and unnatural sustain. Since most ambient room reverb don’t naturally have a large decay, set this low for the best sound.

PRE-DLY TIME
Range: 0000 to 0750 msec
Controls the amount of time it takes for the original signal to be presented to the reverb. Higher values denote a longer delay.

HF - DAMPING
Range: 00 to 99
Controls the rate of attenuation of high frequencies in the decay of the reverberation. As natural reverb decays, some high frequencies tend to get absorbed by the environment. Increasing the value of this parameter will gradually filter out (dampen) more and more high-frequency energy.

BANDWIDTH
Range: 00 to 99
The high-frequency bandwidth acts as a low pass filter on the signal going into the reverb, controlling the amount of high frequencies that will pass into the effect. The higher the setting, the more high frequencies are allowed to pass. This functions like a tone control on a guitar.

LF DECAY TIME
Range: -99 to +99
Functions as a tone control and boosts (when set to a positive value) or cuts (when set to a negative value) the rate at which low frequencies will decay.

DEFINITION
Range: 00 to 99
Controls the rate at which echo density is increased with time. Setting this parameter too high can cause the echo density to build at a rate which exceeds the decay rate. A general rule of thumb is this: DEFINITION should not exceed the LF DECAY TIME added to the DECAY TIME.

INPUT DIFFUSION-1
Ranges: 00 to 99
These four values, in series with each other, smear the input signal transients, to diffuse and smooth the sound. Lower values will cause impulse sounds to appear as a series of discrete echoes, while higher values tend to increase the smear (smoother sounding with fewer discrete echoes). Experiment with different levels between the diffuser parameters to find the settings that are right for your source. We recommend settings of 50 for starters.

REFL-1 TIME
Range: 0000 to 0150 msec
Controls the delay time for the first pre-echo. Pre-echoes are the first sounds that have been reflected back from the walls or reflective “live” surfaces. Higher values delay the diffused signal more.

REFL-1 LEVEL
Range: 00 to 99
Controls the level of the first pre-echo. This pre-level controls the echo send to the Definition.

REFL-1 SEND
Range: 00 to 99
Controls the level of the first pre-echo, with the echo routed directly to the output.

REFL-2 TIME
Range: 0000 to 0150 msec
Controls the delay time for the second pre-echo.

REFL-2 LEVEL
Range: 00 to 99
Controls the level of the second pre-echo. As a signal continues to bounce off the different reflective surfaces (walls), it decreases in volume. Set this parameter to a lower value than REFL-
1 LEVEL to create a natural sounding echo.

**REF-2 SEND**
Range: 00 to 99
Controls the level of the second pre-echo, with the echo routed directly to the output.

**DETUNE - RATE**
Range: 00 to 99
Controls the LFO rate of detuning introduced into the reverberation decay. Detuning creates a slight oscillating pitch shift into the decay, giving it a more natural sound by breaking up resonant nodes.

**DEPTH**
Range: 00 to 99
Controls the depth of the detuning, that is, how much the pitch will change. Low values yield a metallic sound. Some sounds may require very low values, while others sound more natural with higher values.

**L/R BALANCE**
Range: -99 to +99
Controls the left/right stereo balance of the gated reverb signal. A setting of -99 would offer hard left, whereas a setting of +99 would offer hard right. A setting of +00 would place the reverb in the center of the stereo spectrum.

**PRIMARY SEND**
Range: -99 to +99
Controls the level of the diffused input signal into the reverb definition.

### 33 TIGHT AMBIENCE

### 34 WIDE AMBIENCE

**TIGHT AMBIENCE** provides room ambience. **WIDE AMBIENCE** provides a larger ambient room reverb. These two algorithms offer studio quality ambient reverbs that can be controlled with a high degree of precision. The FX-1 and FX-2 parameters can be routed into the effect with different Dry/Wet mixes.

These algorithms share essentially the same signal routing topology as **HALL REVERB 2**. However, the internal values of the components (not user-programmable) differentiate these three reverbs.

**DECAY TIME**
Tight Ambience Range: 0.20 to 100.0 sec
Wide Ambience Range: 0.20 to 150.0 sec
Controls the amount of time it takes for the reverberation to decay to a very low level after the input signal stops. In these reverbs we don’t recommend higher settings, which tend to create an infinite and unnatural sustain. Since most ambient reverbs don’t naturally have a large decay, set this low for the best sound.

**PRE-DLY TIME**
Range: 0000 to 0500 msec
Controls the amount of time it takes for the original signal to be presented to the reverb. Higher values denote a longer delay.

**HF - DAMPING**
Range: 00 to 99
Controls the rate of attenuation of high frequencies in the decay of the reverberation. As natural reverb decays, some high frequencies tend to get absorbed by the environment. Increasing the value of this parameter will gradually filter out (dampen) more and more high-frequency energy.
BANDWIDTH
Range: 00 to 99
The high-frequency bandwidth acts as a low pass filter on the signal going into the reverb, controlling the amount of high frequencies that will pass into the effect. The higher the setting, the more high frequencies are allowed to pass. This functions like a tone control on a guitar.

LF DECAY TIME
Range: -99 to +99
Functions as a tone control and boosts (when set to a positive value) or cuts (when set to a negative value) the rate at which low frequencies will decay.

DEFINITION
Range: 00 to 99
Controls the rate at which echo density is increased with time. Setting this parameter too high can cause the echo density to build at a rate which exceeds the decay rate. A general rule of thumb is this: DEFINITION should not exceed the LF DECAY TIME added to the DECAY TIME.

DIFFUSION-1
Range: 00 to 99
Smears the input signal transients, to diffuse and smooth the sound. Lower values will cause impulse sounds to appear as a series of discrete echoes, while higher values tend to increase the smear (smoother sounding with fewer discrete echoes). We recommend settings of 50 for starters.

DIFFUSION-2
Range: 00 to 99
This parameter, similar to and in series with DIFFUSION-1, performs the same way but controls lower-frequency ranges. Experiment with different levels between the diffuser parameters to find the settings that are right for your source.

REFL-1 TIME
Range: 0000 to 0120 msec
Controls the delay time for the first pre-echo. Pre-echoes are the first sounds that have been reflected back from the walls or reflective “live” surfaces. Higher values delay the diffused signal more.

REFL-1 LEVEL
Range: 00 to 99
Controls the level of the first pre-echo. This pre-level controls the echo send to the Definition.

REFL-1 SEND
Range: 00 to 99
Controls the level of the first pre-echo, with the echo routed directly to the output.

REFL-2 TIME
Range: 0000 to 0120 msec
Controls the delay time for the second pre-echo.

REFL-2 LEVEL
Range: 00 to 99
Controls the level of the second pre-echo. As a signal continues to bounce off the different reflective surfaces (walls), it decreases in volume. Set this parameter to a lower value than REFL-1 LEVEL to create a natural sounding echo.

REF-2 SEND
Range: 00 to 99
Controls the level of the second pre-echo, with the echo routed directly to the output.

DETUNE - RATE
Range: 00 to 99
Controls the LFO rate of detuning introduced into the reverberation decay. Detuning creates a slight oscillating pitch shift into the decay, giving it a more natural sound by breaking up resonant nodes.
DEPTH  
Range: 00 to 99  
Controls the depth of the detuning, that is, how much the pitch will change. Low values yield a  
metallic sound. Some sounds may require very low values, while others sound more natural  
with higher values.

PRIMARY SEND  
Range: -99 to +99  
Controls the level of the diffused input signal into the reverb definition.

POSITION BAL - (1 to 3)  
Ranges: -99 to +99  
The Position Balance parameters simulate the depth of the room. Think of these parameters as  
three different microphones placed at various distances within the room (the first is closest to the  
front, the third is farthest from the front). When the range (volume) is higher for BAL-1, the  
sound appears closer to the front, whereas a higher setting for BAL-3 appears farther from the  
front, suggesting a deeper (wetter) room.

35 NONLINEAR REVERB 1
36 NONLINEAR REVERB 2
37 NONLINEAR REVERB 3

Non Linear Reverbs can be used to obtain blooming reverb, gated reverb, reverse reverb and  
early reflections. In general, they do not produce an exponentially decaying reverb. Unlike the  
hall, room, and plate reverbs, NONLINEAR REVERB 1, 2, and 3 pass the input signal through the  
reverb diffusers only once. For this reason the reverb diffusers are called Density, to distinguish  
them from the other reverb diffusers (called Definition). Density controls the amount of echo  
density, as opposed to the rate of increase of echo density. Other reverbs give limited control of  
early reflections. The Non Linear reverbs deliberately impose a coloration on the resulting  
sound.

- NONLINEAR REVERB 1 is optimized for shorter duration effects (approx. 0.5 sec.)
- NONLINEAR REVERB 2 offers approx. a 1.5 sec. duration
- NONLINEAR REVERB 3 is sonically similar to NONLINEAR REVERB 1, but there is less  
stereo movement, making it better suited for drum tracks

Non Linear Reverb Signal Routing

The signal goes directly through a diffuser which smears the signal. The signal is then routed to  
a decay diffuser (Density), and is diffused over a period of time. Within the density the signal  
goes through a high-frequency damper. The signal is then routed to the output. After the  
density, the signal passes through a low pass filter. There are two echo times between the  
diffuser and the density. There is also an external dry signal (not shown) that goes directly from  
the input to the Main Output (DRY). The FX-1 and FX-2 MIX parameters can be routed into the  
effect with different Dry/Wet mixes.
ENVELOPE LEVELS (1 to 9) Ranges: 00 to 99
Control the output tap levels sequenced in time across the density from input to output. Envelope Level 1 is tapped right after the diffusers and before the echoes (see the diagram). If this is undesirable, set Envelope Level 1 to 0. Envelope Levels 8 and 9 are positioned at the very end of the Density; setting these too high can cause excessive ringing. Envelope Levels 8 and 9 are also very dry. Set all nine tap levels to find the envelope for your application. We recommend the average Envelope Level not to exceed a value of 45 to prevent overdriving these reverbs.

DENSITY-1 Range: 00 to 99
Controls the number of echoes.

DENSITY-2 Range: 00 to 99
DENSITY-2 controls the number of echoes in a lower-frequency range. In general, to get the smoothest sound, DENSITY-2 is usually less than the value of DENSITY-1.

DIFFUSION-1 Range: 00 to 99
Smears the input signal transients of higher-frequency ranges. Higher values are recommended for smoother percussion. Very low values will give a highly repetitive echo-like sound. DIFFUSION-1 and 2 exist within each diffuser block (see signal routing diagram).

DIFFUSION-2 Range: 00 to 99
DIFFUSION-2 is similar to DIFFUSION-1, but offers control of lower frequencies. In general a setting of 50 can be considered an equal mix of dry/diffused sound. This setting is a good starting point.

PRIMARY SEND Range: -99 to +99
Controls the level of the diffused input signal which is nearly instantaneous with respect to the input. This signal is injected directly into the Density at the specified level.

L/R BALANCE Range: -99 to +99
Controls the left/right stereo balance of the gated reverb signal. A setting of -99 would offer hard left, whereas a setting of +99 would offer hard right. A setting of +0 would place the reverb in the center of the stereo spectrum.

HF - DAMPING Range: 00 to 99
HF DAMPING is located within the density. This parameter selects the amount of high-frequency energy to be filtered out.

BANDWIDTH Range: 00 to 99
The high-frequency bandwidth parameter acts as a low-pass filter on the output signal, controlling the amount of high frequencies that will be heard. The higher the setting the more high frequencies are heard. This works the same way that a tone control would work on a guitar.

REFL-1 TIME Non Lin 1, 3 Range: 0000 to 0600 msec
Non Lin 2 Range: 0000 to 0085 msec
Controls the amount of time it takes for the first pre-echo to be injected into the Density. Pre-echoes are the sounds that have been reflected back from the walls or other reflective surfaces.
REFL-1 SEND  
Range: -99 to +99  
Controls the level of the first pre-echo.

REFL-2 TIME  
Non Lin 1, 3 Range: 0000 to 0600 msec  
Non Lin 2 Range: 0000 to 0085 msec  
Controls the amount of time it takes for the second pre-echo to be injected into the Density.

REFL-2 SEND  
Range: -99 to +99  
Controls the level of the second pre-echo. Experiment with both positive and negative on all echoes to change the tonal character of the results.

38 GATED REVERB

GATED REVERB provides an excellent gated reverb. When a reverb is muted part way through, it creates a gated sound. To achieve this gated effect, both the Gated and Reverse reverbs must gate a number of internal parameters, not just the output amplitude envelope. It is however, the output amplitude over which the user has control. The TS-12 offers a highly controllable gated reverb, optimized for percussive instruments, but useful for any signal. The gate is first opened when the input signal passes the trigger threshold. This trigger threshold is set as low as possible by the user, so that none of the input signal is missed. The gated reverb is distinguished from the reverse reverb by retriggering whenever the input signal passes a retrigger (user programmable) threshold (see diagrams). The gate will stay open as long as the input signal remains above the retrigger threshold, and all the input signals will be accumulated under this gate until the total input signal level falls below the retrigger threshold. When this happens, the Hold time will begin (as shown in the diagram below). The reason for two thresholds is to eliminate false retriggering and to ensure precise hold-time durations. If you desire a separate gate on each note, use the Non Lin reverbs. The topology for the Gated Reverb is derived from the Plate Reverb. The FX-1 and FX-2 parameters can be routed into the effect with different Dry/Wet mixes.

Gated Reverb with a High Retrigger Threshold

Gated Reverb with a Low Retrigger Threshold

HF DAMPING  
Range: 00 to 99  
This parameter sounds best when set to low values. Its function is to filter out more and more high-frequency energy. For the most natural sounding reverse effect, we recommend a setting of 00.

DEFINITION  
Range: 00 to 99  
DEFINITION controls the rate at which echo density is increased with time. If set too high, the echo density will build at a rate that exceeds the decay rate. This can be used for a special effect.

DIFFUSION-1  
Range: 00 to 99  
DIFFUSION-1 smears the input signal making a smoother sounding reverb. Controls the high-frequency ranges. For percussion sounds, high values are recommended.
DIFFUSION-2  
Range: 00 to 99  
Similar to and in series with DIFFUSION-1, this parameter controls lower-frequency ranges.

ATTACK  
Range: 1msec to 10.0 sec  
Sets the ATTACK of the gated reverb once the incoming signal has reached the trigger level. Generally the attack should be short and not set longer than the HOLD. This parameter should not be used to achieve a reverse reverb envelope, because here the attack volume increases whereas in the Reverse Reverb the attack volume accelerates.

DECAY  
Range: 0.20 sec to 100.0 sec  
Controls the amount of time it takes for the reverberation to decay.

HOLD  
Range: 1 msec to 10.0 sec  
Sets the amount of time that the reverb will hold after the retrigger and before the release. The HOLD will begin again if retriggered.

RELEASE  
Range: 1 msec to 10.0 sec  
Sets the amount of time after the HOLD has elapsed for the gated reverb to shut down. Generally these times are very short.

SLAPBACK - TIME  
Range: 0000 to 0500 msec  
Controls the delay time of an internal dry stereo signal to create a slapback. In general, the SLAPBACK - TIME is greater or equal to the HOLD time to achieve a reverse effect.

LEVEL  
Range: 00 to 99  
Adjusts the volume of the slapback (internal dry) signal. A value of 00 would eliminate any audible slapback.

RETRIG THRESH  
Range: -96 to +00 dB  
This parameter sets the level at which the gated reverb will retrigger. For a precise HOLD time that begins at the onset of the incoming source, this parameter should be set higher than the incoming signal to prevent retriggering. After the incoming signal reaches the trigger threshold, the gated reverb is activated. Every time the signal reaches the retrigger threshold, the gated reverb will retrigger causing the HOLD time to restart.

If the level of this parameter is set lower than the incoming signal, the gated reverb will continue to retrigger. With a high DECAY level, this adds a cavernous quality to percussion instruments.

TRIG THRESH  
Range: -96 to +00 dB  
Sets the signal level that triggers the gated reverb. When the incoming signal reaches this value, it triggers (starts) the gated reverb. Higher values would require a stronger incoming signal. Set this parameter as low as possible to work with your particular source, but not too low to cause false triggering.

EARLY REFLECTION LEVELS (1 to 4)  
Ranges: -99 to +99  
These parameters control four early reflection levels. Setting these levels to lower values will produce a wetter sound.

L/R BALANCE  
Range: -99 to +99  
Controls the left/right stereo balance of the gated reverb signal. A setting of -99 would offer hard left, whereas a setting of +99 would offer hard right. A setting of +00 would place the reverb in the center of the stereo spectrum.
**39 REVERSE REVERB 1**

REVERSE REVERB 1 produces a reverberation that gradually increases, simulating a backwards sound with a maximum duration of several seconds. When a signal enters this algorithm, the plate reverb (from which this algorithm is derived) is almost instantaneously turned on, and then the output volume is ramped up. This algorithm will only trigger one time. REVERSE REVERB 1 is triggered by an input signal level (THRESHOLD) determined by the user. Once triggered, the reverse envelope will proceed to completion, and ignore subsequent trigger levels. If you are looking for a reverse effect that will retrigger, try using REVERSE REVERB 2. The topology of the Reverse Reverb is similar to the Plate Reverb. The FX-1 and FX-2 MIX parameters offer different dry/wet mixes.

**HF DAMPING**

Range: 00 to 99

This parameter sounds best when it’s set to low values. It has the same function as in the Plate Reverb, which is to filter out more and more high-frequency energy. For the most natural sounding reverse effect, we recommend a setting of 00.

**DEFINITION**

Range: 00 to 99

DEFINITION controls the rate at which echo density is increased with time. If set too high, the echo density will build at a rate that exceeds the decay rate. This can be used for a special effect.

**DIFFUSION-1**

Range: 00 to 99

DIFFUSION-1 smears the input signal making a smoother sounding reverb. Controls the high-frequency ranges. For percussion sounds, high values are recommended.

**DIFFUSION-2**

Range: 00 to 99

Similar to and in series with DIFFUSION-1, this parameter controls lower-frequency ranges.

**ATTACK**

Range: 1 msec to 10.0 sec

Sets the duration over which the reverb builds. It is recommended that you set this value less than the HOLD time.

**HOLD**

Range: 1 msec to 10.0 sec

Controls the amount of time that the reverse envelope will sound after it has been triggered. Rule of thumb: don’t set the HOLD time much longer than the ATTACK time.

**RELEASE**

Range: 1 msec to 10.0 sec

Determines the release time after the HOLD time has elapsed. Generally this time is very short. Lower values offer an abrupt cutoff.

**SLAPBACK - TIME**

Range: 0000 to 0500 msec

Controls the delay time of an internal dry signal to create a slapback. This effect helps to simulate a backwards reverb, since now the dry signal appears at the end. In general, we recommend the FX Mixes be set all wet (99) for this effect. Rule of thumb: set this parameter at about the same value as the HOLD time.
LEVEL
Range: 00 to 99
Adjusts the volume of the slapback (internal dry) signal. A value of 00 would eliminate audible slapback.

TRIG THRESH
Range: -96 to +00 dB
Set this parameter as low as possible to work with your particular sound source. To eliminate false triggering, it should not be set too low. When the input signal rises above this threshold, the reverse envelope will begin.

40 REVERSE REVERB 2

REVERSE REVERB 2 is identical to REVERSE REVERB, except this algorithm will retrigger by an assigned input signal level (threshold) determined by the user. Once triggered, the reverse envelope will proceed to completion, unless retriggered by subsequent input signals. If you are looking for a reverse effect that will not retrigger, try using the previous reverse reverb algorithm. The FX-1 and FX-2 MIX parameters are used to select different Dry/Wet mixes.

HF DAMPING
Range: 00 to 99
This parameter sounds best when set to low values. Its function is to filter out more and more high-frequency energy. For the most natural sounding reverse effect, we recommend a setting of 00.

DEFINITION
Range: 00 to 99
DEFINITION controls the rate at which echo density is increased with time. If set too high, the echo density will build at a rate that exceeds the decay rate. This can be used for a special effect.

DIFFUSION-1
Range: 00 to 99
DIFFUSION-1 smears the input signal making a smoother sounding reverb. Controls the high-frequency ranges. For percussion sounds, high values are recommended.

DIFFUSION-2
Range: 00 to 99
Similar to and in series with DIFFUSION-1, this parameter controls lower-frequency ranges.

ATTACK
Range: 1 msec to 10.0 sec
This parameter sets the duration over which the reverb builds. It is recommended that you set this value less than the HOLD time.

HOLD
Range: 1 msec to 10.0 sec
Controls the amount of time that the reverse will sound after it has been triggered. Rule of thumb: don’t set the HOLD time much longer than the ATTACK time.
**RELEASE**

Range: 1 msec to 10.0 sec

Determines the RELEASE time after the HOLD time has elapsed. Generally this time is very short. Lower values offer an abrupt cutoff.

**PRE-TRIG TIME**

Range: 0000 to 0530 msec

Used to capture transients that occur before the trigger. This parameter is critical to the sound quality. You can determine how much pretrigger sound will be injected into the reverse reverb tank.

**TRIG THRESH**

Range: -96 to +00 dB

Set this parameter as low as possible to work with your particular sound source. To eliminate false triggering, it should not be set too low. When the input signal rises above this threshold, the reverse envelope will begin.

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**41 STEREO DELAY + DELAY**

Two independent professional quality stereo digital delays. Both FX-1 and FX-2 can have different Mix, Feedback, and Delay Time settings.

**EFFECT MIX FX-1 (and 2) DDL**

Ranges: 00 to 99

Controls the mix between the original signal and each delay. Setting these parameters to 00 will allow only the unprocessed signal to be heard, while a setting of 99 will eliminate it completely, with only the delay portion remaining.

**D-1 (and 2) REGEN**

Range: 00 to 99

Determines the amount of signal that will be fed from the output of each delay back into the input, increasing the number of repeats in the delay.

**D-1 (and 2) TIME (L and R)**

D-1 (L and R) Ranges: 0000 to 2000
D-2 (L and R) Ranges: 0000 to 0150

Determines the amount of time between delays. Each value increases the delay time by 1 millisecond. The Left and Right channels are independently adjustable.

---

**42 MULTITAP DELAY**

MULTITAP DELAY produces four independent controllable delays. The EFFECT MIX FX-1 and FX-2 parameters can be routed into the effect with different dry/wet mixes. This algorithm sounds best with a mix of wet and dry.

**DELAY-1 TIME**

Range: 0000 to 2201 msec

Sets the amount of delay time for the independent delays. Experiment with different settings to find the right mix for your sound source and application. Some interesting effects can be implemented by using a real-time modulation controller for these parameters.

**LEVEL**

Range: 00 to 99

Adjusts the volume of the delayed signals against the original dry signal. A level of 00 will offer no audible delay.

**REGEN**

Range: 00 to 99

Determines the amount of signal that will be fed from the output back into the input, increasing the number of repeats in the delays. A setting of 99 would offer an infinite delay.
PAN
Range: -99 to +99
Determines the location of the delays in the stereo spectrum. A value of -99 is panned far left, and +99 is far right.

<table>
<thead>
<tr>
<th>DELAY-2 TIME</th>
<th>DELAY-3 TIME</th>
<th>DELAY-4 TIME</th>
</tr>
</thead>
<tbody>
<tr>
<td>LEVEL</td>
<td>LEVEL</td>
<td>LEVEL</td>
</tr>
<tr>
<td>REGEN</td>
<td>REGEN</td>
<td>REGEN</td>
</tr>
<tr>
<td>PAN</td>
<td>PAN</td>
<td>PAN</td>
</tr>
</tbody>
</table>

Each of the four discrete delays has identical parameters and ranges as described above.

REGEN DAMPING
Range: 00 to 99
Controls the cutoff of a low pass filter on the feedback signal, which adjusts the amount of damping to the feedback signals. The higher the number, the more the signals are dampened.

43 EQ- -STEREO DELAYLFO

EQ- -STEREO DELAYLFO features a parametric EQ and a stereo digital delay that provides LFO modulation of a wide range of delays. This algorithm sounds great with an electric piano, but try it with any source!

**EQ- -STEREO DELAYLFO Signal Routing**

The EFFECT MIX FX-1 and FX-2 DELAYLFO parameters can be routed into the effect with different Dry/Wet mixes.

**LFO RATE**
Range: 00 to 99
Controls the rate of pitch modulation which is the LFO. To achieve a chorusing effect, this rate must be very slow.

**WIDTH**
Range: 00 to 99
Controls the excursion of pitch modulation. Since the rate is usually very slow, the width is usually large.

**L/R LFO**
Range: OUT-OF-PHASE or IN-PHASE
When this parameter is IN-PHASE, the left and right choruses will modulate their detunes together. When set to OUT-OF-PHASE, the detune on the left channel will go up while the detune on the right will go down.
**DELAY INPUT R**
Range: OFF or ON
Disables the input into the right side delay line. The right delay line will still get input from the CROSS REGEN. This allows a ping-pong delay effect.

**OUTPUT LEVEL R**
Range: 00 to 99
Controls the right output signal level.

**DELAY - REGEN**
Range: -99 to +99
Controls the amount of regen (regeneration) applied to the delay time taps. The sign of the value determines the polarity of the regen.

**TIME L**
Range: 0000 to 0845 msec
Determines the amount of time between the input signal and the left delay output.

**TIME R**
Range: 0000 to 0845 msec
Determines the amount of time between the input signal and the right delay output. Set this differently from the left delay time to achieve dotted 1/8th note type effects.

**CROSS REGEN**
Range: -99 to +99
Allows you to feedback the delayed signals to their opposite sides; the left voice crosses to the right voice, and the right voice crosses to the left voice. A setting of +99 or -99 will cause infinite delay. Be careful, if the delay regen is set too high, it may cause this parameter to “blow up.”

**REGEN DAMPING**
Range: 00 to 99
Adjusts the cutoff of a low pass filter on the feedback signal, which controls the amount of damping to the feedback signals. The higher the number, the more the signals are damped.

**EQ TRIM**
Range: -24 to +00 dB
Allows you to adjust the input volume of the EQs to eliminate the possibility of clipping boosted signals.

**BASS FC**
Range: 0000 to 1000 Hz
Sets the cutoff-frequency of the lower-frequency band shelving filter.

**LEVEL**
Range: -48 to +24 dB
Sets the amount of boost or cut applied to the low shelving filter.

**TREBLE FC**
Range: 01KHz to 15KHz
Sets the cutoff-frequency of the high shelving filter.

**LEVEL**
Range: -48 to +24 dB
Sets the amount of boost or cut applied to the high shelving filter.

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**44 EIGHT VOICE CHORUS**

EIGHT VOICE CHORUS offers a symphonic chorused sound having eight different voices and using eight separately randomized LFOs. This algorithm also offers a user programmable stereo delay in a cross coupled configuration between the left and right chorused outputs (see diagram). This algorithm is good for creating an ensemble of instruments from single sources (there is no internal filtering applied to any of the chorused voices). The EFFECT MIX FX-1 and FX-2 CHORUS parameters can be routed into the effect with different Dry/Wet mixes. For this algorithm we recommend a mix of around 50 for a starting point.
EIGHT VOICE CHORUS Signal Routing

![Diagram of EIGHT VOICE CHORUS Signal Routing](image)

**CHORUS RATE**
Range: 00 to 99
Controls the eight ganged rates of modulation of the respective voices and produces an effect similar to both vibrato and tremolando occurring at the same time.

**WIDTH**
Range: 00 to 99
Controls the excursion of the vibrato of all the individual voices.

**REGEN**
Range: 00 to 99
Determines the amount of signal that will be fed from the output of the chorus back into the input of the chorus. A value of 00 will eliminate the regeneration effect.

**STEREO SPREAD**
Range: 00 to 99
This parameter offers a synthesized stereo field. The highest value is true stereo, intermediate values have the left and right signals mixed on both sides, and the lowest value yields only the left input channel from the right and left outputs. This parameter, though not a stereo pan, provides some interesting stereo effects when controlled by a modulation source.

**DELAY REGEN**
Range: 00 to 99
Determines the amount of signal that will be fed from the delay output back into the chorus input, increasing the number of repeats in the delay for high values. A value of 00 will eliminate the delay effect.

**TIME L**
Range: 0000 to 0800 ms
Controls the amount of time that the non-chorused signal will delay for the left channel.

**TIME R**
Range: 0000 to 0800 ms
Controls the amount of time that the non-chorused signal will delay for the right channel.

**45 CHORUS + REVERB 1**
This effect combines a four-voice chorus with the standard reverb. Assign a voice to FX-1 to get reverb after chorus, or use FX-2 for reverb only.

**CHORUS MIX**
Range: 00 to 99
Controls the Dry/Wet mix within the chorus itself.

**RATE**
Range: 00 to 99
Controls the four rates of modulation of the delay time of the chorus. The delay modulation produces vibrato and tremolo.
### WIDTH
- **Range:** 00 to 99
- Controls the depth of vibrato and tremolo.

### REGEN
- **Range:** -99 to +99
- Controls the amount of feedback applied to the chorus. The sign of the value determines the polarity of the feedback. Feedback accentuates the complexity of the “swept” signal.

### DECAY TIME
- **Range:** 0.20 to 100.0
- Controls the amount of time it takes for the reverberation to decay to a low level (-60 dB) after the input signal stops.

### EARLY REF LEV
- **Range:** 00 to 99
- Controls the level of pre-echoes of the input signal added directly to the reverb output.

### HF - DAMPING
- **Range:** 00 to 99
- Controls the rate of attenuation of high frequencies in the decay of the reverberation. As natural reverb decays, some high frequencies tend to get absorbed by the environment. Increasing the value of this parameter will filter out increasing amounts of high-frequency energy.

### BANDWIDTH
- **Range:** 00 to 99
- Acts as a low pass filter on the signal going into the reverb, controlling the amount of high frequencies that will pass into the effect. The higher the setting, the more high frequencies are allowed to pass.

### LF DECAY
- **Range:** -99 to +99
- Boosts or cuts the rate at which low frequencies will decay.

### DIFFUSION
- **Range:** 00 to 99
- Determines whether the early reflections will appear as a series of discrete echoes (lower values) or will be more diffused (higher values).

### DETUNE - RATE
- **Range:** 00 to 99
- Controls the LFO rate of detuning incorporated within the reverb. Detuning creates a slight pitch shift into the reverberated signal, giving it a more natural sounding decay by breaking up resonant nodes.

### DEPTH
- **Range:** 00 to 99
- Controls the depth of the detuning, that is, how much the pitch will change. Low values yield a metallic sound. Some voices sound best with very low values.

### 46 CHORUS + REVERB 2

This effect combines a four-voice chorus with a plate reverb, sporting superior randomization and poly-phase interpolation. Assign a voice to FX-1 to get reverb after chorus, or use FX-2 for reverb only.

### CHORUS MIX
- **Range:** 00 to 99
- Controls the Dry/Wet mix within the chorus itself.

### RATE
- **Range:** 00 to 99
- Controls the four rates of modulation of the delay time of the chorus. The delay modulation produces vibrato and tremolo.
WIDTH

Range: 00 to 99

Controls the depth of vibrato and tremolo.

STEREO SPREAD

Range: 00 to 99

This parameter offers a synthesized stereo field. The highest value is true stereo, intermediate values have the left and right signals mixed on both sides, and the lowest value yields only the left input channel from the right and left outputs. This parameter, though not a stereo pan, provides some interesting stereo effects when controlled by a modulation source.

REGEN

Range: -99 to +99

Controls the amount of feedback applied to the chorus. The sign of the value determines the polarity of the feedback. Feedback accentuates the complexity of the “swept” signal.

REVB DECAY TIME

Range: 0.40 to 140.0

Controls the amount of time it takes for the reverberation to decay to a low level (-60 dB) after the input signal stops.

PRE-DLY TIME

Range: 0000 to 0300

Creates a delay in the amount of time it takes before the original signal is fed into the reverb. The range is based in milliseconds.

HF - DAMPING

Range: 00 to 99

Controls the rate of attenuation of high frequencies in the decay of the reverberation. As natural reverb decays, some high frequencies tend to get absorbed by the environment. Increasing the value of this parameter will filter out increasing amounts of high-frequency energy.

BANDWIDTH

Range: 00 to 99

Acts as a low pass filter on the signal going into the reverb, controlling the amount of high frequencies that will pass into the effect. The higher the setting, the more high frequencies are allowed to pass.

DETUNE - RATE

Range: 00 to 99

Controls the LFO rate of detuning incorporated within the reverb. Detuning creates a slight pitch shift into the reverberated signal, giving it a more natural sounding decay by breaking up resonant nodes.

DEPTH

Range: 00 to 99

Controls the depth of the detuning, that is, how much the pitch will change. Low values yield a metallic sound. Some voices sound best with very low values.

DEFINITION

Range: 00 to 99

Controls the rate at which echo density is increased with time. Setting this parameter too high can cause the echo density to build at a rate which exceeds the decay rate.

DIFFUSION

Ranges: 00 to 99

These values, in series with each other, smear the input signal transients, to diffuse and smooth the sound. Lower values will cause impulse sounds to appear as a series of discrete echoes, while higher values tend to increase the smear (smoother sounding with fewer discrete echoes). Experiment with different levels between the diffuser parameters to find the settings that are right for your source. We recommend settings of 50 for starters.
## 47 DDL-CHORUS + REV RB 1

This effect algorithm is a serial version of the DDL+CHORUS+REV parallel effect, combining a digital delay with a chorus and a plate reverb. The second sub-page (not user-programmable) shows how this effect is routed:

- Voices assigned to FX1 are sent to Effect A (DDL)
- The output of Effect A is sent to Effect B (CHORUS)
- Voices assigned to FX2 are sent to a plate reverb (REV)

### SENDS A--B

<table>
<thead>
<tr>
<th>Range:</th>
<th>00 to 99</th>
</tr>
</thead>
</table>
**Description:** Controls the amount of Effect A (DDL) being sent into Effect B (the chorus). A setting of 99 would yield a serial connection between Effect A and the chorus for voices sent to FX1 and panned hard left (on the Output page). A setting of 00 would offer no chorusing.

### B--REV RB

<table>
<thead>
<tr>
<th>Range:</th>
<th>00 to 99</th>
</tr>
</thead>
</table>
**Description:** Controls the amount of Effect B (CHORUS) being sent into the reverb. This would allow you to add reverb to voices assigned to FX1 and panned hard right. A setting of 99 would yield a serial connection between the CHORUS and the reverb for voices sent to FX1 and panned hard right (on the Output page).

### A--REV RB

<table>
<thead>
<tr>
<th>Range:</th>
<th>00 to 99</th>
</tr>
</thead>
</table>
**Description:** Controls the amount of Effect A (DDL) being sent into the reverb. This would allow you to add reverb to voices assigned to FX1, without having to add any chorusing.

### FX2--REV RB

<table>
<thead>
<tr>
<th>Range:</th>
<th>00 to 99</th>
</tr>
</thead>
</table>
**Description:** Defines how much of the voices assigned to FX2 (on the Output page) will be sent into the Reverb. This allows you to fine tune the amount of reverb coloration you want to add to your voices.

### DRY

<table>
<thead>
<tr>
<th>Range:</th>
<th>00 to 99</th>
</tr>
</thead>
</table>
**Description:** This parameter allows you to define how much of the FX2 signal you want to completely bypass the Reverb. By setting this parameter to 99 and the FX2--REV RB parameter to 00, you can assign voices to be completely dry.

### DDL MIX

<table>
<thead>
<tr>
<th>Range:</th>
<th>00 to 99</th>
</tr>
</thead>
</table>
**Description:** Controls the mix between the original signal and the delay. Setting this parameter to 00 will allow only the unprocessed signal to be heard, while a setting of 99 will eliminate it completely, with only the delay portion remaining.

### LEVEL

<table>
<thead>
<tr>
<th>Range:</th>
<th>00 to 99</th>
</tr>
</thead>
</table>
**Description:** Adjusts the volume of the delayed signals against the original dry signal. A level of 00 will offer no audible delay.

### PAN

<table>
<thead>
<tr>
<th>Range:</th>
<th>-99 to +99</th>
</tr>
</thead>
</table>
**Description:** Determines the location of the delays in the stereo spectrum. A value of -99 is panned hard left, and +99 is hard right. If set to either hard left or hard right, the delayed signal for the opposite side is inaudible.
DDL REGEN L
Range: -99 to +99
Determines the amount of signal that will be fed from the output of the left delay back into the input, increasing the number of repeats in the delay. A setting of 99 would offer an infinite delay.

DAMPING
Range: 00 to 99
Controls the cutoff of a low pass filter on the feedback signal, which adjusts the amount of damping to the feedback signals. The higher the number, the more the signals are dampened.

DELAY TIME L and R
Ranges: 0000 to 1000 msec
Sets the amount of delay time for the independent delays. Each value increases the delay time by 1 millisecond. Experiment with different settings to find the right mix for your sound source and application. Some interesting effects can be implemented by using a real-time modulation controller for these parameters.

CHORUS MIX
Range: 00 to 99
Controls the Dry/Wet mix within the chorus itself. For starters, we recommend settings of 50.

LEVEL
Range: 00 to 99
Adjusts the volume of the chorused signal. A level of 00 will offer no audible signal.

WET PAN
Range: -99 to +99
Determines the location of the chorused signal in the stereo spectrum. A value of -99 is panned hard left, and +99 is hard right.

DRY PAN
Range: -99 to +99
Determines the location of the dry signal in the stereo spectrum. A value of -99 is panned hard left, and +99 is hard right.

CHORUS CENTER
Range: 000 to 127
Controls the nominal delay time of the chorus about which the delay modulation occurs. Adjusting this parameter will change the tonal character of the effect. This delay time is not related to the REGEN or the DDL delays.

RATE
Range: 000 to 127
Controls the four rates of modulation of the delay time of the chorus. The delay modulation produces vibrato and tremolo.

WIDTH
Range: 000 to 127
Controls the depth of vibrato and tremolo.

LFO SPREAD
Range: 000 to 128
Controls the depth of the detuning, that is, how much the pitch will change. Low values yield a metallic sound. Some voices sound best with very low values.

REGEN
Range: -99 to +99
Controls the amount of feedback applied to the chorus. The sign of the value determines the polarity of the feedback. Feedback accentuates the complexity of the “swept” signal.

REVERB DECAY TIME
Range: 0.40 to 140.0
Controls the amount of time it takes for the reverberation to decay to a low level (-60 dB) after the input signal stops.
PRE-DLY TIME  
Range: 0000 to 0300 msec  
This parameter creates a time delay before the original signal is fed into the reverb. The range is based in milliseconds.

HF - DAMPING  
Range: 00 to 99  
Controls the rate of attenuation of high frequencies in the decay of the reverberation. As natural reverb decays, some high frequencies tend to get absorbed by the environment. Increasing the value of this parameter will filter out increasing amounts of high-frequency energy.

BANDWIDTH  
Range: 00 to 99  
Acts as a low pass filter on the signal going into the reverb, controlling the amount of high frequencies that will pass into the effect. The higher the setting, the more high frequencies are allowed to pass.

DEFINITION  
Range: 00 to 99  
Controls the rate at which echo density increases with time. Higher values can cause the echo density to build at a rate that exceeds the decay rate. For the best performance, try to select the highest value that works with your sound source.

DIFFUSION  
Ranges: 00 to 99  
These parameters determine whether the early reflections will appear as a series of discrete echoes (lower values) or will be more diffused (higher values).

48 DDL-CHORUS + REVRB 2

This effect algorithm, similar to the previous algorithm, offers a different reverb. For a complete description of the SENDS, DDL, and CHORUS parameters, refer to the previous algorithm in this section.

REVERB DECAY TIME  
Range: 0.40 to 140.0  
Controls the amount of time it takes for the reverberation to decay to a low level (-60 dB) after the input signal stops.

PRE-DLY TIME  
Range: 0000 to 0150 msec  
This parameter creates a time delay before the original signal is fed into the reverb. The range is based in milliseconds.

HF - DAMPING  
Range: 00 to 99  
Controls the rate of attenuation of high frequencies in the decay of the reverberation. As natural reverb decays, some high frequencies tend to get absorbed by the environment. Increasing the value of this parameter will filter out increasing amounts of high-frequency energy.

BANDWIDTH  
Range: 00 to 99  
Acts as a low pass filter on the signal going into the reverb, controlling the amount of high frequencies that will pass into the effect. The higher the setting, the more high frequencies are allowed to pass.

FRONT-TO-BACK LEVS (1 to 3)  
Ranges: -99 to +99  
These three fields simulate the depth of the room/hall. Think of these fields as three different microphones placed at various distances within the room/hall (the first is closest to the front, the third is farthest from the front). When the range (volume) is higher for the first value, the sound appears closer to the front, whereas a higher setting for the last value appears farther from the front, suggesting a deeper (wetter) room/hall.
DEFINITION

Range: 00 to 99

Controls the rate at which echo density increases with time. Higher values can cause the echo density to build at a rate that exceeds the decay rate. For the best performance, try to select the highest value that works with your sound source.

DIFFUSION

Ranges: 00 to 99

These parameters determine whether the early reflections will appear as a series of discrete echoes (lower values) or will be more diffused (higher values).

49 EQ-CHORUS + REVERB

This algorithm offers a serial version of the PARAM EQ+CHORUS+REV parallel effect. The second sub-page (not user-programmable) shows how this effect is routed:

• Voices assigned to FX1 are sent to Effect A (PARAM EQ)
• The output of Effect A is sent to Effect B (CHORUS)
• Voices assigned to FX2 are sent to the reverb (REV)

For a complete description of the SENDS parameters, refer to the DDL+CHORUS+REV algorithm found earlier in this section.

INPUT

Range: 00 to 99

Allows you to adjust the input level trim to the EQs to eliminate the possibility of clipping boosted signals.

OUTPUT

Range: 00 to 99

Adjusts the output volume after the parametric EQ. With the LEVEL, BASS LEVEL, and TREBLE LEVEL set to high values, the OUTPUT parameter could be used to create a raspy distortion effect.

PAN

Range: -99 to +99

Determines the location of the EQ in the stereo spectrum. A value of -99 is panned hard left, and +99 is hard right.

MID FC

Range: 00000 to 15000

Sets the center of the mid-frequency parametric.

BW

Range: 0 to 15K

This parameter is a bandwidth control that determines the width of the resonant peak at the mid-frequency band. By lowering the value, you can produce a narrower bandwidth.

LEVEL

Range: -99 to +48 dB

Sets the amount of boost or cut applied to this mid-frequency parametric.

BASS LEVEL

Range: -99 to +48 dB

Sets the amount of boost or cut applied to a 0 to 80Hz low-shelving filter.

TREBLE LEVEL

Range: -99 to +48 dB

Sets the amount of boost or cut applied to a 10 to 15K high-shelving filter.

For a complete description of the remaining parameters, refer to the DDL+CHORUS+REV algorithm found earlier in this section.
50 EQ-CHORUS + EQ-DDL

EQ-CHORUS + EQ-DDL combines an EQ and a chorus, with an EQ and a digital delay. This is the industry standard chorus effect, designed with very long delays to provide a modulated detune effect. This algorithm sounds great with a guitar sound, but try it with any source!

EQ-CHORUS + EQ-DDL Signal Routing

The signal enters a programmable EQ, which is preceded by an input level trim (EQ TRIM). The signal is then routed to the chorus which is heard directly at the output. There is also a delayed unchorused signal (sharing the same delay lines) that is routed back into the chorus. There is also a second signal from the delay line that is routed to the right side. There are two discrete echo times tapped out before the chorus delay line. These are unchorused echoes. The signal from the echoes is routed directly to the outputs. There is also a dry signal (not shown) that goes directly from the input to the Main Output (DRY). The EFFECT MIX FX-1 and FX-2 CHORUS parameters can be routed into the effect with different Dry/Wet mixes.

CHORUS CENTER
- Range: 00 to 99
- Controls the nominal delay time of the chorus about which the delay modulation occurs. Adjusting this parameter will change the tonal character of the effect. This delay time is not related to the regen delays or the echo delays.

RATE
- Range: 00 to 99
- Controls the rate of pitch modulation which is the chorus. To achieve chorusing, this rate must be very slow.

WIDTH
- Range: 00 to 99
- Controls the excursion of pitch modulation. Since the rate is usually very slow, then the width is usually very large.

L/R LFO
- Range: OUT-OF-PHASE or IN-PHASE
- When this parameter is IN-PHASE, the left and right choruses will modulate their detunes together. When set to OUT-OF-PHASE, the detune on the left channel will go up while the detune on the right will go down.

DELAY - REGEN
- Range: -99 to +99
- Controls the amount of regeneration applied to the delay time taps. The sign of the value determines the polarity of the regen.

TIME (L and R)
- Ranges: 0000 to 1500 msec
- These parameters control the time delay for the left and right channel regen delay, and have nothing to do with the chorus effect.
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**ECHO - LEVEL**
Range: 00 to 99
Controls the volume of the discrete echo for both the left and right sides. Higher values offer louder echo, while a value of 00 will eliminate the echo. For sustained sounds, mid echo levels yield a “poor man’s reverb.”

**TIME (L and R)**
Ranges: 0000 to 1500 msec
These parameters control the chorus echo time. Higher settings yield a deeper echo. There are two discrete echoes, one to the left and one to the right.

**EQ TRIM**
Range: -24 to +00 dB
Allows you to adjust the input volume of the EQs to eliminate the possibility of clipping boosted signals.

**BASS FC**
Range: 0000 to 1000 Hz
Sets the cutoff-frequency of the lower-frequency band shelving filter.

**LEVEL**
Range: -48 to +24 dB
Sets the amount of boost or cut applied to the low shelving filter.

**TREBLE FC**
Range: 01KHz to 15KHz
Sets the cutoff-frequency of the high shelving filter.

**LEVEL**
Range: -48 to +24 dB
Sets the amount of boost or cut applied to the high shelving filter.

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**51 FLANGER + REVERB**

The FLANGER + REVERB algorithm is similar to the CHORUS + REVERB algorithm with a single LFO. Assign a voice to FX-1 to get reverb after flange, or use FX-2 for reverb only.

**FLANGER CENTER**
Range: 00 to 99
Controls the center of the flanger width.

**RATE**
Range: 00 to 99
Controls the rate of modulation of the flanger effect.

**WIDTH**
Range: 00 to 99
Controls the range of the high to low-frequency sweep in the flanger effect.

**REGEN**
Range: -99 to +99
Controls the amount of feedback applied to the flanger. The sign of the value determines the polarity of the feedback.

**DEPTH**
Range: 00 to 99
Controls the depth of the notches created by the flanging effect.

**DECAY TIME**
Range: 0.20 to 100.0
Controls the amount of time it takes for the reverberation to decay to a low level (-60 dB) after the input signal stops.

**EARLY REF LEV**
Range: 00 to 99
Controls the level of pre-echoes of the input signal added directly to the reverb output.
HF - DAMPING
Range: 00 to 99
Controls the rate of attenuation of high frequencies in the decay of the reverberation. As natural reverb decays, some high frequencies tend to get absorbed by the environment. Increasing the value of this parameter will filter out increasing amounts of high-frequency energy.

BANDWIDTH
Range: 00 to 99
Acts as a low pass filter on the signal going into the reverb, controlling the amount of high frequencies that will pass into the effect. The higher the setting, the more high frequencies are allowed to pass.

LF DECAY
Range: -99 to +99
This control will boost or cut the rate at which low frequencies will decay.

DIFFUSION
Range: 00 to 99
Determines whether the early reflections will appear as a series of discrete echoes (lower values) or will be more diffused (higher values).

DETUNE - RATE
Range: 00 to 99
Controls the LFO rate of detuning incorporated within the reverb. Detuning creates a slight pitch shift into the reverberated signal, giving it a more natural sounding decay by breaking up resonant nodes.

DEPTH
Range: 00 to 99
Controls the depth of the detuning, that is, how much the pitch will change. Low values yield a metallic sound. Some voices sound best with very low values.

52 EQ-FLANGER + DELAY

EQ-FLANGER + DELAY combines an EQ and a flanger, and a digital delay. Use flanging to get that “jet aircraft woosh” effect.

EQ-FLANGER + DELAY Signal Routing

In this algorithm the signal enters an input level trim (EQ TRIM) followed by a programmable EQ, and then is routed to the flanger. The flanger is routed directly to the output. The left channel signal passes through the delay and is routed back into the flanger. Another signal from the delay is routed to the output on the right side. The DELAY - REGEN parameter controls both delay levels. There are two discrete echoes that are sent to the left and right outputs respectively. The signal from both echoes has one level control (ECHO - LEVEL). There is also an external dry signal (not shown) that goes directly from the input to the Main Output (DRY). The EFFECT MIX FX-1 and FX-2 parameters can be routed into the effect with different Dry/Wet mixes.
FLANGE CENTER  
Range: 00 to 99  
Controls the sweep center of the flanger effect. The larger the flanger center, the wider will be the available width.

RATE  
Range: 00 to 99  
Controls the rate of modulation of the flanger effect.

WIDTH  
Range: 00 to 99  
Controls the range of the high to low-frequency sweep in the flanger effect.

REGEN  
Range: -99 to +99  
Controls the amount of feedback applied from the output to the flanger input. The sign of the value determines the polarity of the feedback.

NOTCH DEPTH  
Range: -99 to +99  
Controls the depth of the notches created by the flanging effect. A setting of +00 will disable the flanging effect. A setting of +00 will also provide a doppler effect for wide moderately slow LFO rates.

S/H RATE  
Range: 000 to 100  
Controls the sample rate of a sample and hold network. This is applied to the LFO within the flanger. When in hold, the effect will be to create momentarily fixed notches within the frequency spectrum (if the notch depth is not +00). A setting of 001 will have the largest space between samples. Higher values will increase the number of holds per second, making the flanging flow more smoothly. The sample and hold function can be turned off (when set to 000).

L/R LFO  
Range: OUT-OF-PHASE or IN-PHASE  
Determines whether the flanger on the left and right channels is modulating IN-PHASE or OUT-OF-PHASE.

DELAY - REGEN  
Range: -99 to +99  
Controls the level of the delay time taps. The sign of the value determines the polarity of the feedback.

TIME (L and R)  
Ranges: 0000 to 1500 msec  
These parameters control the time delay for the left and right channel regen delays. The left is the “ping,” and the right is the “pong.”

ECHO - LEVEL  
Range: 00 to 99  
Controls the volume of the discrete echoes for both the left and right sides. A setting of 00 would eliminate any audible echo.

TIME (L and R)  
Range: 0000 to 1500 msec  
These parameters control the flanger echo times for the left and right sides. Higher values yield a deeper echo.

EQ TRIM  
Range: -24 to +00 dB  
Allows you to adjust the input volume of the EQs to eliminate the possibility of clipping boosted signals.

BASS FC  
Range: 0000 to 1000 Hz  
Sets the cutoff-frequency of the lower-frequency band shelving filter.
LEVEL
Range: -48 to +24 dB
Sets the amount of boost or cut applied to the low shelving filter.

TREBLE FC
Range: 01KHz to 15KHz
Selects the cutoff of the upper-frequency band high shelving filter.

LEVEL
Range: -48 to +24 dB
Sets the amount of boost or cut applied to the high shelving filter.

53 PHASER + REVERB
A 12-pole phase shifter with reverb. Assign a sound to FX-1 for reverb after phase, to FX-2 for just reverb, or to DRY to bypass the effect.

PHASER CENTER
Range: 00 to 99
Controls the center of the phaser width.

RATE
Range: 00 to 99
Controls the rate of modulation of the phaser poles.

WIDTH
Range: 00 to 99
Controls the amount of modulation applied to phaser poles.

REGEN
Range: -99 to +99
Controls the amount of feedback applied to the phaser. The sign of the value determines the polarity of the feedback.

DEPTH
Range: 00 to 99
Controls the depth of the notches created by the phasing.

DECAY TIME
Range: 0.20 to 100.0
Controls the amount of time it takes for the reverberation to decay to a low level (-60 dB) after the input signal stops.

EARLY REF LEV
Range: 00 to 99
Controls the level of pre-echoes of the input signal added directly to the reverb output.

HF - DAMPING
Range: 00 to 99
Controls the rate of attenuation of high frequencies in the decay of the reverberation. As natural reverb decays, some high frequencies tend to get absorbed by the environment. Increasing the value of this parameter will filter out increasing amounts of high-frequency energy.

BANDWIDTH
Range: 00 to 99
Acts as a low pass filter on the signal going into the reverb, controlling the amount of high frequencies that will pass into the effect. The higher the setting, the more high frequencies are allowed to pass.

LF DECAY
Range: -99 to +99
Boosts or cuts the rate at which low frequencies will decay.

DIFFUSION
Range: 00 to 99
Determines whether the early reflections will appear as a series of discrete echoes (lower values) or will be more diffused (higher values).
DETUNE - RATE
Range: 00 to 99
Controls the LFO rate of detuning incorporated within the reverb. Detuning creates a slight pitch shift into the reverberated signal, giving it a more natural sounding decay by breaking up resonant nodes.

DEPTH
Range: 00 to 99
Controls the depth of the detuning, that is, how much the pitch will change. Low values yield a metallic sound. Some voices sound best with very low values.

54 PHASER + DELAY

PHASER + DELAY combines a phaser with a digital delay. The phaser creates non-harmonically spaced moving notches in the signal spectrum, whereas a flanger creates harmonic spacing. This phaser implements a stereo twelve pole phasing network to achieve time delay which is a function of frequency; this is what differentiates the phaser from the flanger. The phasing effect is achieved within the phaser topology, so it does not depend upon the external mix. A delay is included at the left output of the phaser that feeds back into the phaser (see the diagram). Setting the phaser REGEN parameter (shown at the knobs) to 00 will disable this delay function. The DELAY REGEN also controls the delay feed forward level of another tap sent to the right channel. This delay topology achieves a 1.5 second ping-pong effect, and is very effective as a “poor man’s reverb.” The FX-1 and FX-2 parameters can be routed into the effect with different Dry/Wet mixes.

PHASER CENTER
Range: -99 to +99
Controls the phaser pole center. High values raise the nominal spectral location of the “woosh” sound, while low values lower the “woosh.” The range from high to low is controlled with the phaser width.

RATE
Range: 00 to 99
The LFO is within the phaser network. This parameter controls the rate of modulation of the phaser poles. The higher the value the faster the rate. Lower values work best with sustained signals.

WIDTH
Range: 00 to 99
Controls the width of the notch excursion. For large excursions set this parameter to 99. Doing so can give a very high “woosh” and a very low “woosh.”
**REGEN**
Range: -99 to +99
Controls the amount of feedback applied to the left and right channel phaser. The sign of the value determines the polarity of the feedback.

**NOTCH DEPTH**
Range: -99 to +99
Controls the depth of the notches created by the phasing. Deep notches occur in the phased spectrum when the parameter is set to 99. When this parameter is set to +00, there exists no phasing (i.e. notches), but there is a doppler effect with higher phase rates.

**S/H RATE**
Range: 000 to 100
Controls the sample rate of a sample and hold network applied to the LFO within the phaser. When in hold, the effect will be to create momentarily fixed notches within the-frequency spectrum (if the notch depth is not +00). A setting of 001 will have the largest space between samples. Higher values will increase the number of holds per second, making the phasing flow more smoothly. The sample and hold function can be turned off (when set to 000).

**L/R LFO**
Range: OUT-OF-PHASE or IN-PHASE
Determines whether the phaser on the left and right channels is modulating IN-PHASE or OUT-OF-PHASE.

**REGEN**
Range: -99 to +99
Controls the feedback amount for the delay effect. The sign of the value determines the polarity of the feedback. A value of +00 will eliminate the delay effect. This parameter also controls the feed forward level.

**TIME L**
Range: 0000 to 1600 msec
This parameter sets the delay time for the left side. This is the “ping.”

**DLY TIME R**
Range: 0000 to 1600 msec
Controls the feed forward delay time for the right side. This is the “pong.”

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**55 EQ- -TREMOLO + DELAY**

EQ- -TREMOLO + DELAY combines an EQ and a tremolo effect, which is a pulsating change in volume, with a digital delay.

**EQ- -TREMOLO + DELAY Signal Routing**

The signal enters an input level trim (EQ TRIM) followed by a programmable EQ, and is then routed to the tremolo. The tremolo is routed directly to the output. The left channel signal passes through the digital delay and is routed back into the delay. There is another signal from the delay that is routed to the output on the right side. One regen parameter (DELAY - REGEN) between the delay sends controls the left and right delay level. This constitutes the “ping-pong” effect. There are two echoes that are sent to the left and right outputs respectively. The signal
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from the two discrete echoes has one level control. There is also an external Dry signal (not shown) that goes directly from the input to the output. The EFFECT MIX FX-1 POST-DDL and FX-2 DDL parameters can be routed into the effect with different Dry/Wet mixes.

TREMOLO RATE
Range: 000 to 130
Sets the rate of modulation. Mid values create a faster wavering sound. When used in conjunction with the S/H RATE parameter it can create some interesting staccato effects.

DEPTH
Range: 00 to 99
Sets the depth of amplitude modulation.

S/H RATE
Range: 000 to 100
Controls the sample rate of a sample and hold network applied to the LFO within the tremolo. When in “Hold,” the effect will be to fix the instantaneous amplitude (if the depth is not 00). A setting of 001 will have the largest space between holds. Lower settings create a staccato effect, whereas higher values will increase the amount of samples, making the tremolo flow more smoothly. This parameter can also be turned off (when set to 000).

L/R LFO
Range: OUT-OF-PHASE or IN-PHASE
Controls whether the left and right channels of the stereo tremolo will modulate IN-PHASE or OUT-OF-PHASE.

DELAY - REGEN
Range: -99 to +99
Controls the amount of regen applied to the delay time taps. The sign of the value determines the polarity of the regen. A value of +00 will eliminate the audible delay.

TIME (L and R)
Ranges: 0000 to 1500 msec
These parameters control the time delays for the left and right channel regen delays, and has nothing to do with the tremolo effect.

ECHO - LEVEL
Range: 00 to 99
Controls the volume of the discrete echo for both the left and right sides.

TIME (L and R)
Ranges: 0000 to 1500 msec
These parameters control the tremolo echo times for the left and right side. Higher settings yield a deeper echo.

EQ TRIM
Range: -24 to +0 dB
Allows you to adjust the input volume of the EQs to eliminate the possibility of clipping boosted signals.

BASS FC
Range: 0000 to 1000 Hz
Selects the cutoff-frequency of the lower-frequency band shelving filter.

LEVEL
Range: -48 to +24 dB
Sets the amount of boost or cut applied to the low shelving filter.

TREBLE FC
Range: 01KHz to 15KHz
Selects the cutoff-frequency of the upper-frequency band high shelving filter.

LEVEL
Range: -48 to +24 dB
Sets the amount of boost or cut applied to the high shelving filter.
56 EQ- -VIBRATO + DELAY

EQ- -VIBRATO + DELAY combines an EQ and a vibrato effect (a pitch shifter modulating over a very small range), with a digital delay. Many vintage guitar amplifiers offered a vibrato control, but don’t feel that this effect is limited to guitar sounds, try this with other sources as well. There is a sample & hold parameter that doesn’t hold the instantaneous pitch shift, but if set properly will provide a “chirping” effect when acting on the input signal.

EQ- -VIBRATO + DELAY Signal Routing

The signal enters a programmable EQ, which is preceded by an input level trim (EQ TRIM). The signal is then routed to the vibrato. The vibrato is routed directly to the output. The vibrato also passes through the delay which is then regenerated back into the delay. A different delay signal is routed to the output on the right side. This constitutes a “ping-pong” delay effect. The delay REGEN parameter between the delay sends controls the delay feedback amount. There are also two echoes that are sent to the left and right outputs respectively. The signal from the two echoes has one level control. There is also an external dry signal (not shown) that goes directly from the input to the Main Output (DRY). The EFFECT MIX FX-1 and FX-2 parameters can be routed into the effect with different Dry/Wet mixes.

VIBRATO RATE

Range: 00 to 99
Sets the amount of modulation. Higher values create a faster vibrating rate.

WIDTH

Range: 00 to 99
This parameter sets the width (adjusts the amount) of the modulation.

S/H RATE

Range: 000 to 100
Controls the sample rate of a sample and hold network. This is applied to the LFO within the vibrato. When in hold (low values), it causes rhythmic chirps in the pitch of the audio signal. Higher values will increase the number of holds per second, making the vibrato flow more smoothly. The sample and hold function is turned off when set to 000.

L/R LFO

Range: OUT-OF-PHASE or IN-PHASE
Controls the vibrato pitch direction of the left and right channels. When OUT-OF-PHASE, the quadrature pitch change on the left channel will lag 90° from the right. When IN-PHASE, both channels will change pitch together.

DELAY - REGEN

Range: -99 to +99
Controls the amount of positive or negative feedback applied to the regenerated delay. The sign of the value determines the polarity of the feedback. A value of +00 will eliminate any feedback. Controls both left and right levels.

TIME L

Range: 0000 to 1500 msec
Controls the time delay on the left regenerated delay.
TIME R
Range: 0000 to 1500 msec
Controls the time delay on the right non regenerated delay.

ECHO - LEVEL
Range: 00 to 99
Controls the volume of the discrete echo for both the left and right sides. A setting of 00 will eliminate any audible echo.

TIME (L and R)
Ranges: 0000 to 1500 msec
These parameters control the echo times for the left and right sides. Higher settings yield a deeper echo. There are two discrete echoes, one to the left and one to the right.

EQ TRIM
Range: -24 to +0 dB
Allows you to adjust the input volume before the EQs to eliminate the possibility of clipping boosted signals.

BASS FC
Range: 0000 to 1000 Hz
This parameter selects the cutoff-frequency of the low shelving filter.

LEVEL
Range: -48 to +24 dB
Sets the amount of boost or cut applied to the low shelving filter.

TREBLE FC
Range: 01KHz to 15KHz
Selects the cutoff of the upper-frequency band high shelving filter.

LEVEL
Range: -48 to +24 dB
Sets the amount of boost or cut applied to the high shelving filter.

57 PITCH SHIFTER

The Pitch Shifters allow you to change the pitch of a signal to any pitch desired within a range of one octave in either direction. The TS-12 offers three different pitch shift algorithms, each designed with a different purpose:

- PITCH SHIFTER offers a splicer type pitch shifter.
- FAST PITCH SHIFTER is a pitch shifter designed for pitch correction.
- PITCH SHIFTER + DELAY combines a pitch shifter with a DDL (described later).

These algorithms sound best with an Effect Mix of wet and dry. You can assign a modulation controller for the Effect Mix parameters to bring in or fade out the pitch shifted signal. Try the different pitch shifters until you find the one that works best with your sound source, and for your application. This first algorithm is a “splicer type” of pitch shifter, which means that it drops or adds small sections of the original signal to the effect. PITCH SHIFTER does not incorporate zero crossing detection. This pitch shifter is best used for a doubling effect. Splicer type pitch shifters are popular because for low pitch shift ratios, splicing is infrequent. These pitch shifters can create very interesting stereo fields by panning each of two pitch shifted voices selectively, and because of the inherent time delay modulation of the algorithm. The FX-1 and FX-2 parameters can be routed into the effect with different Dry/Wet mixes.

VOICE-1 SEMI
Range: -12 to +12
Allows you to adjust the pitch of Voice-1 to an octave above or below the original pitch in semitones (half steps).
FINE  Range:  -99 to +99
  Lets you to fine tune the pitch of Voice-1.

LEVEL  Range:  00 to 99
  Allows you to adjust the level of Voice-1. A setting of 00 would eliminate any audible pitch shift.

PAN  Range:  -99 to +99
  Allows you to assign the location of Voice-1 in the stereo field. A value of -99 would be far left, and +99 would be far right.

VOICE-2 SEMI
  LEVEL
  FINE
  PAN
  These parameters are identical to the VOICE-1 parameters, and allow you to define a second voice for independent pitch shifting.

PITCH SHIFTER - QUALITY  Range:  LONG/SMOOTH or SHORT/COARSE
  Allows you to choose between a long/smooth setting, or a short/coarse setting. A smooth setting would sound best with slower sustaining chords, whereas a coarse setting would enhance a rapidly played musical passage. Depending on your sound source and musical needs, set this parameter accordingly. This parameter actually controls the effect transport delay; smooth yields a long transport delay, coarse yields a short transport delay.

LFO - RATE  Range:  00 to 99
  Controls the rate of pitch modulation that creates a chorusing effect. To achieve chorusing, this rate must be very low.

WIDTH  Range:  00 to 99
  Controls the excursion of pitch modulation. Since the rate is usually very low, then the width is usually very large.

Note:  When KBD is selected as a MOD SRC, and VOICE-1 SEMI or VOICE-2 SEMI is selected as the DEST (destination), the pitch will increase one semitone at a time above middle C (C4), and decrease one semitone at a time below middle C (Middle C being zero). After each octave, the pitch shift will “wrap” and start again (the pitch can’t be modulated more than one octave in either direction).

58 FAST PITCH SHIFTER

FAST PITCH SHIFTER has a transport delay of only 10 msec and a maximum detune ratio of one semitone. Try shifting the voices slightly in both positive and negative values to create a fat sound. This algorithm should be used for pitch correction (for instance, try using the mod wheel as a pitch controller). The FX-1 and FX-2 parameters can be routed into the effect with different Dry/Wet mixes. Depending on its usage, this algorithm generally sounds best with a Mix of dry and wet. Try using the mod wheel with the Effect Mix parameter(s) to bring in or fade out the pitch shifted signal(s).

VC-1 FINE  Range:  -99 to +99
  Allows you to fine tune the pitch of Voice-1.

LEVEL  Range:  00 to 99
  Allows you to adjust the volume of Voice-1. A setting of 00 would eliminate any audible pitch shift.
PAN  
Range: -99 to +99  
This parameter allows you to assign the location of Voice-1 in the stereo field. A value of -99 would be far left, and +99 would be far right.

VC-2 FINE  
Range: -99 to +99  
This parameter allows you to fine tune the pitch of Voice-2.

LEVEL  
Range: 00 to 99  
This parameter allows you to adjust the volume of Voice-2. A setting of 00 would eliminate any audible pitch shift.

PAN  
Range: -99 to +99  
Allows you to assign the location of Voice-2 in the stereo field. A value of -99 would be far left, and +99 would be far right.

LFO RATE  
Range: 00 to 99  
Controls the rate of pitch modulation that creates a chorusing effect. To achieve chorusing, this rate must be very low.

WIDTH  
Range: 00 to 99  
Controls the excursion of pitch modulation. Since the rate is usually very low, then the width is usually very large.

59 PITCH SHIFTER + DELAY

PITCH SHIFTER + DELAY combines a pitch shifter with a digital delay. PITCH SHIFTER + DELAY uses a continual crossfading technique of pitch shifting. This technique maintains the stereo field exactly. This pitch shifter works best for large pitch shift ratios, in some circumstances. Another feature of this algorithm is a digital delay that feeds back into the pitch shift. This feature allows spiraling upward or downward pitch shifts. The EFFECT MIX FX-1 and FX-2 parameters can be routed into the effect with different Dry/Wet mixes. This algorithm sounds best with a Mix of wet and dry. Try using a modulation controller for this parameter to fade in or fade out the pitch shifted signal.

PITCH SHIFTER + DELAY Signal Routing

VOICE-1 SEMI  
Range: -12 to +12  
Allows you to adjust the pitch of Voice-1 up to an octave above or below the original pitch in semi-tones.
FINE
Range: -99 to +99
Allows you to fine tune the pitch of Voice-1.

LEVEL
Range: 00 to 99
This parameter adjusts the volume of Voice-1.

PAN
Range: -99 to +99
Allows you to assign the location of Voice-1 in the stereo field. A value of -99 would be far left, and +99 would be far right.

VOICE-2 SEMI LEVEL
These parameters are identical to the previous ones, and control Voice-2.

DELAY REGEN
Range: -99 to +99
Controls the amount of feedback from the output of the delay back into the input of the pitch shifter. This allows you to create special effects with ascending/descending delays.

TIME (L and R)
Ranges: 0000 to 1500 msec
These parameters control the amount of time for the pitch shifted signal to delay from the left and right inputs. The left and right delay times are completely independent.

MIX
Range: 00 to 99
Controls the mix between the delay signal and the pitch shifted signal. A setting of 00 would be all pitch shifter, and no delay. A setting of 99 will be all delay and no direct pitch shift.

DRY LEVEL
Range: 00 to 99
Lets you to bypass the pitch shifter with an internal dry signal, and send it through the digital delay. Higher values would send more of the dry signal to the delay. The purpose of this parameter is to mix the dry signal appropriately with the pitch shifted delay signals.

60 ROTARY SPEAKER + REV
A rotating speaker simulation with reverb and distortion. Assign a voice to FX-1 to get reverb after the rotary speaker with distortion, or use FX-2 for reverb only. There are Variations on the first sub-page for the Rotary Speaker without Distortion.

DIST INPUT/OUTPUT
Ranges: 00 to 99
The DIST INPUT parameter determines the input signal gain into the amplifier simulation, creating a tube-like overdrive.

The OUTPUT parameter controls the output of the amplifier distortion. There is a (fixed) clean path in parallel with the distortion. Therefore, to eliminate distortion, set this parameter to 00.

FILTER
Range: 00 to 99
A three-pole, low pass filter following the amplifier simulation. Controls the filter cutoff resulting in a brighter sound (for higher values) or a darker sound (low values).

SPKR GAIN
Range: 00 to 99
Controls the level of the signal (distorted or not) applied to the rotary speaker. High gain will simulate a broken speaker. Also use higher settings when using little or no distortion, because distortion raises the signal level to the speaker.
ROTOR SLOW
Range: 00 to 99
Determines the rate of the rotary speaker when in the “Slow” setting. ROTOR SLOW determines the manual level for the rotary speaker rate when SPEED= SLOW, or when the selected modulator is at zero output level. Again, the higher the value, the faster the rate.

FAST
Range: 00 to 99
Determines the rate of the rotary speaker when in the “Fast” setting. The higher the value, the faster the rate.

INERTIA
Range: 00 to 99
Determines how long it will take for the rotor effect to speed up and slow down after switching from fast to slow or vice versa. Adjust this parameter to simulate the effect of the rotary speaker gradually picking up speed.

SPEED
Range: SLOW or FAST
Determines how the rotary speaker will switch between slow and fast speeds. The behavior of the switch accurately reflects an actual rotary speaker, taking time to speed up or slow down, based on the value of the INERTIA parameter (see previous description). Any effect modulator can act as the SPEED controller. How the modulators will switch the rotor speed fall into two categories:

- WHEEL, PBEND, PEDAL, TIMBR, XCTRL, PRESS(ure), KEYBD, and VELOC — These modulation sources act like a switch to turn on or off the fast rotor speed. To reverse the polarity of the switch, set ROTOR SLOW faster than ROTOR FAST.
- KEYDN, PATCH, SUSTN, SOSTU, FX-SW — These modulation sources toggle the rotor speed between slow and fast. Every time the modulation source moves from zero in a positive direction, the rotating speaker effect changes speeds from slow to fast or fast to slow.

DECAY TIME
Range: 0.20 to 100.0
Controls the amount of time it takes for the reverberation to decay to a low level (-60 dB) after the input signal stops.

HF - DAMPING
Range: 00 to 99
Controls the rate of attenuation of high frequencies in the decay of the reverberation. As natural reverb decays, some high frequencies tend to get absorbed by the environment. Increasing the value of this parameter will filter out increasing amounts of high-frequency energy.

DIFFUSION
Range: 00 to 99
Determines whether the early reflections will appear as a series of discrete echoes (lower values) or will be more diffused (higher values).

61 SPEAKER CABINET
SPEAKER CABINET simulates the warm sound of an open-back speaker cabinet. SPEAKER CABINET is fabulous for a guitar, bass or any other stringed instrument sound. This algorithm contains the resonances and the non linearity of a real musical instrument speaker. The FX-1 and FX-2 parameters can be routed into the effect with different Dry/Wet mixes. For a brighter speaker emulation, try using TUNABLE SPEAKER.

OUTPUT GAIN
Range: -48 to +24 dB
Since speaker cabinets are “lossy,” output gain is required to compensate losses in perceived volume. Setting this gain too high will cause clipping of the output signal.
62 TUNABLE SPEAKER

Tunable Speaker offers an EQ controllable speaker sound that is brighter than SPEAKER CABINET. By tuning three parametric filters, you can simulate many different speaker cabinet sounds that are used in all styles of music. The FX-1 and FX-2 parameters can be routed into the effect with different Dry/Wet mixes.

MID-1 FC
- Range: 0000 to 9999 Hz
- This parameter sets the center of the mid-frequency parametric. Higher values have a brighter sound.

Q
- Range: 01 to 18
- This parameter is a bandwidth control that determines the width of the resonant peak at the center of the-frequency band. By raising the value, you can produce a narrower bandwidth.

LEVEL
- Range: -48 to +24 dB
- This parameter sets the amount of cut (negative values) or boost (positive values) applied to this mid-frequency parametric.

MID-2 FC
Q
LEVEL

MID-3 FC
Q
LEVEL
- These parameters are similar to the previous ones, but can be assigned to control different bandwidths within the mid-range.

INPUT LEVEL
- Range: -24 to +00 dB
- Lets you adjust the input level before the EQs to eliminate the possibility of clipping boosted signals.

OUTPUT LEVEL
- Range: -48 to +24 dB
- Since speaker cabinets are “lossy,” output gain is required to compensate for losses in perceived volume. Setting this gain too high will cause clipping of the output signal.

63 GUITAR AMP 1
64 GUITAR AMP 2

These algorithms recreate the warm sound of a guitar tube amplifier. They do this by emulating tube distortion characteristics. These algorithms are good for all stringed instrument sounds. GUITAR AMP 1, designed for Hard Rock, offers more distortion than GUITAR AMP 2, which is optimized for “bluesy” type sounds. The EFFECT MIX FX-1 and FX-2 parameters can be routed into the effect with different Dry/Wet mixes.

PREAMP GAIN
- Range: -48 to +48 dB
- This parameter adjusts the amount of boost or cut applied to the incoming signal. We recommend a setting of +0 dB, since these emulations were optimized for distortion there. Lower preamp gains will result in less distortion, while higher preamp gains will yield clipping distortion. For low preamp gain, it may be desirable to use low tube bias values.

MAIN LEVEL
- Range: 00 to 99
- Controls the output level of the main amp before the output EQ.

TUBE BIAS
- Range: 00 to 99
- For preamp gains approximately 00 dB, this parameter controls the emphasis of even to odd harmonics which determines the tone of the amp; mid values emphasize even harmonics and offer a warmer (“glowing tube”) sound, while the highest values may sound like tubes going
bad. Tube bias and preamp gain are independent parameters. For low preamp gain, it may be desirable to use low tube bias values, because this more closely imitates the operation of a real amplifier.

**PREAmp EQ TRIM**
Range: -24 to +00 dB
Controls the input level to the pre-amp EQ to eliminate the possibility of clipping boosted signals.

**HIGH FC**
Range: 4 to 1000 Hz
Filters out the low frequencies before the preamp. The higher the value, the less low frequencies pass through.

**MID FC**
Range: 0000 to 9999 Hz
Determines the center-frequency of the parametric filter before the preamp. Higher values have a brighter sound.

**Q**
Range: 01 to 18
Determines the width of the resonant peak at the parametric filter center-frequency. While the Filter center parameter determines where (at what-frequency) this peak will occur, the Q setting controls the presence of the peak.

**LEVEL**
Range: -48 to +24 dB
Adjusts the amount of boost or cut applied to the parametric filter in front of the preamp.

**GATE - OFF**
Range: -96 to +00 dB
Sets the lower threshold level at which the noise gate shuts off the audio.

**ON**
Range: -96 to +00 dB
Sets the upper threshold level at which the noise gate passes the audio. The higher second threshold prevents false “turn ons.”

**RELEASE**
Range: 1 msec to 10.0 sec
Sets the amount of time after the signal has elapsed for the noise gate to shut down. For a longer sustain, set this parameter higher.

**HIGH FC**
Range: 4 to 1000 Hz
Filters out the low frequencies of the main amp prior to the speaker. The higher the value, the less low frequencies pass through.

**LOW FC**
Range: 2.0 to 15.0 KHz
Filters out the high frequencies of the speaker. The lower the value, the less high frequencies pass through. This speaker filter is less selective than the speaker cabinet emulation algorithms.

**MAIN EQ MID-1 FC**
Range: 0000 to 9999 Hz
Determines the filter center-frequency of the parametric in the main amp stage. Higher values have a brighter sound.

**Q**
Range: 01 to 18
Determines the width of the resonant peak of the filter center. While the Filter center parameter determines where (at what-frequency) this peak will occur, the Q setting controls the presence of the peak.

**LEVEL**
Range: -48 to +24 dB
Adjusts the amount of boost or cut applied to the main amp parametric.
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MAIN EQ MID-2 FC
Range: 0000 to 9999 Hz
Determines the filter center-frequency of the second parametric in the main amp stage. Higher values have a brighter sound.

Q
Range: 01 to 18
Determines the width of the resonant peak of the second filter center.

LEVEL
Range: -48 to +24 dB
Adjusts the amount of boost or cut applied to the second main amp parametric.

65 GUITAR AMP 3

GUITAR AMP 3 combines an inverse expander with a bright distortion for amp lead sounds. The inverse expander may be thought of as a compressor that amplifies all signals below the threshold. This algorithm is good for heavy metal and hard rock guitar solos. The FX-1 and FX-2 parameters can be routed into the effect with different Dry/Wet mixes.

PREAMP GAIN
Range: -48 to +48 dB
Adjusts the amount of boost or cut applied to the EQ’d incoming signal. Lead sounds are obtained using high gain.

MAIN LEVEL
Range: 00 to 99
Controls the output level before the output EQ.

EXPANDER - RATIO
Range: 1:1 to 40:1, infinity
Sets the amount of inverse expansion. Expansion occurs below the threshold. If this is set to 3:1 for example, it will expand the change in signals below the threshold by three times in an attempt to make the signal amplitude approach the threshold level.

THRESH
Range: -96 to +00 dB
Sets the inverse expander threshold level. Signals beneath this level will be expanded, while signals that are above will be unaffected. As the input signal dies away below the threshold, the expander will increase the gain of the signal.

PREAMP EQ TRIM
Range: -24 to +00 dB
Controls the input level to the preamp EQ to eliminate the possibility of clipping boosted signals.

MID FC
Range: 0000 to 9999 Hz
Determines the filter center-frequency of the parametric in the preamp stage. Higher values have a brighter sound.

Q
Range: 01 to 18
Determines the width of the resonant peak at the filter center. While the Filter center parameter determines where (at what-frequency) this peak will occur, the Q setting controls the presence of the peak.

LEVEL
Range: -48 to +24 dB
This parameter adjusts the amount of boost or cut applied to the preamp parametric.

GATE - OFF
Range: -96 to +00 dB
Sets the lower threshold level at which the noise gate shuts off the audio.
ON
  Range: -96 to +00 dB
  Sets the upper threshold level at which the noise gate passes audio. This higher second threshold prevents false “turn ons.”

RELEASE
  Range: 1 msec to 10.0 sec
  Sets the amount of time after the signal has elapsed for the noise gate to shut down. For a longer sustain, set this parameter higher.

HIGH FC
  Range: 4 to 1000 Hz
  Filters out the low frequencies of the main amp prior to the speaker. The higher the value, the less low frequencies pass through.

LOW FC
  Range: 2.0 to 15.0 KHz
  Filters out the high frequencies of the speaker. The lower the value, the less high frequencies pass through. True speaker emulations are provided as separate algorithms.

MID-1 FC
  Range: 0000 to 9999 Hz
  Determines the filter center-frequency of the parametric in the main amp stage. Higher values have a brighter sound.

Q
  Range: 1 to 18
  Determines the width of the resonant peak at the filter center. While the Filter center parameter determines where (at what-frequency) this peak will occur, the Q setting controls the presence of the peak.

LEVEL
  Range: -48 to +24 dB
  Adjusts the amount of boost or cut applied to the main amp parametric.

MID-2 FC
  Range: 0000 to 9999 Hz
  Determines the filter center-frequency of the second parametric in the main amp stage. Higher values have a brighter sound.

Q
  Range: 01 to 18
  Determines the width of the resonant peak of the second filter center.

LEVEL
  Range: -48 to +24 dB
  Adjusts the amount of boost or cut applied to the second main amp parametric.

66 VCF- -DISTORTION- -VCF

VCF- -DISTORTION- -VCF combines a voltage control filter, a raspy distortion, and a second voltage control filter. Three effects can be obtained: Distortion, Wah-wah, and Auto-wah. The last two functions use the same VCF. These filters can be disabled or used as EQ if desired. The second VCF that exists after the distortion can be set to act like a simple speaker simulator, or it can be modulated in parallel with the pre-distortion VCF.

VCF- -DISTORTION- -VCF Signal Routing

![VCF- -DISTORTION- -VCF Diagram]
The EFFECT MIX FX-1 and FX-2 parameters can be routed into the algorithm with different Dry/Wet mixes.

**DIST LEVEL - IN**
- **Range:** 00 to 99
- Controls the gain going into the distortion effect. DIST LEVEL - IN will boost the signal level up to 48 dB. For more distortion, use a high input level gain and turn the OUT down to keep the volume under control. For less distortion, use a low gain input level and a higher output volume.

**OUT**
- **Range:** 00 to 99
- Controls the gain coming out of the distortion effect. Generally, if the DIST LEVEL - IN is set high, set this parameter lower to control the volume.

**BYPASS**
- **Range:** OFF or ON
- Allows you to bypass the distortion (as shown on the signal routing diagram).

**PRE-EQ HIGH FC**
- **Range:** 0000 to 1000 Hz
- Filters out the low frequencies before the EQ. The higher the value, the less low frequencies will pass through.

**PRE-DIST VCF FC**
- **Range:** 01 to 99
- Determines the filter cut off-frequency before the distortion. Higher values have a brighter sound. This parameter can be modulated, using a CV Pedal for a wah-wah pedal effect. To disable the distortion filter, set this parameter to 99. To use as an EQ, set the desired value and make sure ENV AMT is +00. To use as the auto-wah, set this parameter close to 01 (lower values) and turn on ENV AMT.

**Q**
- **Range:** 01 to 25
- Determines the level and width of the resonant peak at the filter cutoff point. While the PRE-DIST VCF FC parameter determines where (at what-frequency) this peak will occur, the Q setting controls the presence of the peak. This setting is important for the auto-wah effect.

**ENV AMT**
- **Range:** -99 to +99
- Determines how much the amplitude of the incoming signal will modify the distortion filter cutoff-frequency. When set to +00, no modification will occur. When set to mid positive values, the PRE-DIST VCF FC will go high, but then come down to its nominal setting. When set to negative mid values, the PRE-DIST VCF FC will go low, and then go back up to its nominal setting. How quickly it does so is determined by the ATTACK and RELEASE parameters. This sound is the auto-wah; positive values will boost the high frequencies, offering an “oww-oww” sound, and negative values will cut the high frequencies, producing a “dweep-dweep” sound.

**POST-DIST VCF FC**
- **Range:** 01 to 99
- Determines the filter cut off-frequency after the distortion. Higher values have a brighter sound. This parameter can also be modulated, using a CV Pedal for a wah-wah pedal effect. To disable the post-distortion filter, set this parameter to 99.

**Q**
- **Range:** 01 to 25
- Determines the level and width of the resonant peak at the filter cutoff point. While the POST-DIST VCF FC (filter cutoff) parameter determines where (at what-frequency) this peak will occur, the Q setting controls the presence of the peak. This setting is important for the auto-wah effect.

**ENV AMT**
- **Range:** -99 to +99
- Determines how much the amplitude of the incoming signal will modify the distortion filter cutoff-frequency. When set to +00, no modification will occur. When set to mid positive values, FC will go high, but then come down to its nominal setting. When set to negative mid values, FC
will go low, and then go back up to its nominal setting. How quickly it does so is determined by
the ATTACK and RELEASE parameters. This sound is the auto-wah; positive values will boost
the high frequencies, offering an “oww-oww” sound, and negative values will cut the high
frequencies, producing a “dweep-dweep” sound.

**ATTACK**

Range: 50 µsec to 10.0 sec
Sets the attack of the envelope follower (i.e. determines how closely the attack is followed) once
the incoming signal has been detected. Generally the attack should be short.

**RELEASE**

Range: 1 msec to 10.0 sec
Sets the amount of time after the incoming signal has ceased for the envelope follower to shut
down. Generally these times are longer than the attack times.

### 67 WAH- DISTORTION + REV

A guitar and amp simulator, featuring distortion, compression, reverb, and a resonant filter
following the amplitude of the signal. Assign a sound to FX-1 for reverb after Wah distortion, or
use FX-2 for reverb only.

**DIST INPUT and OUTPUT**

Ranges: 00 to 99
These two parameters control the levels going into and coming out of the distortion effect. For
more distortion, use a high input level and turn the output level down to keep the volume under
control. For less distortion, use a low input level and a higher output level.

**WAH - CENTER**

Range: 00 to 99
Determines where the resonant peak of the wah will occur. High values yield a higher pitched wah.

**RANGE**

Range: -99 to +99
Controls how much depth the wah will have. This is analogous to how far you move a wah-wah
pedal back and forth.

**DECAY TIME**

Range: 0.20 to 100.0
Controls the amount of time it takes for the reverberation to decay to a low level (-60 dB) after the
input signal stops.

**HF - DAMPING**

Range: 00 to 99
Controls the rate of attenuation of high frequencies in the decay of the reverberation. As natural
reverb decays, some high frequencies tend to get absorbed by the environment. Increasing the
value of this parameter will filter out increasing amounts of high-frequency energy.

**FEEDBACK**

Range: -99 to +99
Controls the amount of signal applied from the output of the reverb back into the input of the
compressor. The sign of the value determines the polarity of the feedback.

**COMPRESSOR THRESH**

Range: 00 to 99
Controls the threshold level for the compressor. As the input signal dies away below the
threshold, the compressor will increase the gain of the system, causing feedback to increase as
well. Normal compression is “72.”

**Note:**
Since the feedback level is taken from FX-1, if the Effect Mix for FX-1 is set to 00 or a low value,
feedback will have little or no consequence. Also, it is important to note that since the signal is
being taken from the reverb, which is also fed by FX-2, voices sent to FX-2 will enter the feedback
loop along with the FX-1 signals.
68 FLNG- -CMP- -DIST + REV

A screaming guitar-and-amp simulator that features not only compression, distortion, and reverb, but flanging and EQ as well. FX-1 routes the signal through each of these effect processors, while FX-2 is used for reverb only.

**FLNG- -CMP- -DIST + REV Signal Routing**

![Signal Routing Diagram]

**COMPRESSOR THRESH**
Range: 00 to 99
Controls the threshold level for the compressor. As the input signal dies away below the threshold, the compressor will increase the gain of the system, causing feedback to increase as well. Normal compression is “72.”

**FLANGE RATE**
Range: 00 to 99
Controls the rate of modulation of the notches due to the flanger effect. A setting of 00 effectively turns the flanger off.

**DIST INPUT and OUTPUT**
Ranges: 00 to 99
Control the levels going into and coming out of the distortion effect. For more distortion, use a high input level and turn the output level down to keep the volume under control. For less distortion, use a low input level and a higher output level.

**FILTER - LOW FC/HIGH FC**
Ranges: 00 to 99
The LOW FC parameter filters out high frequencies after the distortion signal path. The lower the value, the less high frequencies pass through. The HIGH FC parameter filters out low frequencies after the distortion signal path. The higher the value, the less low frequencies pass through.

**DECAY TIME**
Range: 0.20 to 100.0 msec
Controls the amount of time it takes for the reverberation to decay to a low level (-60 dB) after the input signal stops.

**HF - DAMPING**
Range: 00 to 99
Controls the rate of attenuation of high frequencies in the decay of the reverberation. As natural reverb decays, some high frequencies tend to get absorbed by the environment. Increasing the value of this parameter will filter out increasing amounts of high-frequency energy.

**FEEDBACK**
Range: -99 to +99
Controls the amount of signal applied from the output of the reverb back into the input of the compressor. The sign of the value determines the polarity of the feedback.

**Note:** Since the feedback level is taken from FX-1, if the Effect Mix for FX-1 is set to 00 or a low value, feedback will have little or no consequence. Also, it is important to note that since the signal is being taken from the reverb, which is also fed by FX-2, voices sent to FX-2 will enter the feedback loop along with the FX-1 signals.
69 DISTORT + CHORUS- -REV

A brighter guitar-and-amp simulator that features distortion, chorus, and reverb, but without the compressor. The FX-1 and FX-2 MIX parameters can be routed into the effect with different Dry/Wet mixes.

**DIST MIX**
Range: 00 to 99
Determines the Dry/Wet, or in this case, dirty/clean mix of the signal. A value of 00 yields a clean signal; 99 yields an all distortion signal.

**INPUT and OUTPUT**
Ranges: 00 to 99
These two parameters control the levels going into and coming out of the distortion effect. For more distortion, use a high input level and turn the output level down to keep the volume under control. For less distortion, use a low input level and a higher output level.

**FILTER - FC**
Range: 00 to 99
This determines the filter cutoff-frequency (brightness) of the distortion.

**Q**
Range: 01 to 25
Determines the level of the resonant peak at the filter cutoff point. While the FILTER - FC parameter determines where (at what-frequency) this peak will occur, the Q setting controls the presence of the peak.

**CHORUS MIX**
Range: 00 to 99
Controls the Dry/Wet mix within the chorus itself.

**RATE**
Range: 00 to 99
Controls the four rates of modulation of the delay time of the chorus. The delay modulation produces vibrato and tremolo.

**WIDTH**
Range: 00 to 99
Controls the depth of vibrato and tremolo.

**DECAY TIME**
Range: 0.20 to 100.0
Controls the amount of time it takes for the reverberation to decay to a low level (-60 dB) after the input signal stops.

**EARLY REF LEV**
Range: 00 to 99
Controls the level of pre-echoes of the input signal added directly to the reverb output.

**HF - DAMPING**
Range: 00 to 99
Controls the rate of attenuation of high frequencies in the decay of the reverberation. As natural reverb decays, some high frequencies tend to get absorbed by the environment. Increasing the value of this parameter will filter out increasing amounts of high-frequency energy.

**BANDWIDTH**
Range: 00 to 99
Acts as a low pass filter on the signal going into the reverb, controlling the amount of high frequencies that will pass into the effect. The higher the setting, the more high frequencies are allowed to pass.

**LF DECAY**
Range: -99 to +99
This control will boost or cut the rate at which low frequencies will decay.
DETUNE - RATE  Range:  00 to 99  
Controls the LFO rate of detuning incorporated within the reverb. Detuning creates a slight pitch shift into the reverberated signal, giving it a more natural sounding decay by breaking up resonant nodes.

DEPTH  Range:  00 to 99  
Controls the depth of the detuning, that is, how much the pitch will change. Low values yield a metallic sound. Some voices sound best with very low values.

70 PARAMETRIC EQ  
PARAMETRIC EQ offers a minimum phase four band parametric EQ.

EQ TRIM  Range:  -24 to +00 dB  
Allows you to adjust the input level trim to the EQs to eliminate the possibility of clipping boosted signals.

BASS FC  Range:  0000 to 1000 Hz  
Sets the center of the low-frequency parametric.

LEVEL  Range:  -48 to +24 dB  
Sets the amount of boost or cut applied to this low-frequency parametric.

TREBLE FC  Range:  01 to 15 KHz  
Sets the center-frequency of the high-frequency parametric.

LEVEL  Range:  -48 to +24 dB  
Sets the amount of boost or cut applied to this high-frequency parametric.

MID-1 FC  Range:  0000 to 9999 Hz  
Sets the center of the mid-frequency parametric.

Q  Range:  01 to 18  
This parameter is a bandwidth control that determines the width of the resonant peak at the center-frequency band. By raising the value you can produce a narrower bandwidth.

LEVEL  Range:  -48 to +24 dB  
Sets the amount of boost or cut applied to this mid-frequency parametric.

MID-2 FC  Q  LEVEL  
These three parameters are identical to the previous three parameters, and are used to control different bandwidths within the mid range.

71 EQ- -COMPRESSOR  
EQ- -COMPRESSOR combines an EQ with a full-feature compressor. For high compressor ratios, this algorithm functions as a limiter. This algorithm operates by compressing (attenuating) signals above the threshold and passing the signals below the threshold. For higher ratios and lower thresholds, this algorithm can be used to create sustain. EQ exists in both signal and side chain paths.
COMPRESSOR RATIO
Range: 1/1 to 40/1, infinity
Sets the amount of compression. The range is based on decibels (dB) above the threshold. If this is set to 4/1 for example, it will compress changes in signals above the threshold by one quarter. When this is set to infinity, it acts as a limiter.

THRESH
Range: -96 to +00 dB
Sets the threshold level. Signals that exceed this level will be compressed, while signals that are below will be unaffected. To turn off the compressor, set the level to +00 dB.

ATTACK
Range: 50 µsec to 100 msec
Determines the attack rate after the initial signal has been detected and before the compression takes affect.

RELEASE
Range: 01 msec to 10.0 sec
Determines how long it takes for the compression to be fully deactivated after the input signal drops below the threshold level. This is generally chosen longer than the attack time.

GATE - OFF
Range: -96 to +00 dB
Sets the lower threshold level at which the noise gate shuts off the audio.

ON
Range: -96 to +00 dB
Sets the upper threshold level at which the noise gate passes audio. This higher second threshold prevents false “turn ons.”

RELEASE
Range: 1 msec to 10.0 sec
Determines how long it takes for the gate to be fully released after the input signal drops below the threshold level. Lower settings yield a quick gate.

COMPRESSOR - OUTPUT GAIN
Range: -48 to +48 dB
Boosts the compressed signal level.

EQ TRIM
Range: -24 to +00 dB
Allows you to adjust the input volume of the EQs, to eliminate the possibility of clipping boosted signals.

BASS FC
Range: 0000 to 1000 Hz
Sets the cutoff-frequency of the lower-frequency band shelving filter.

LEVEL
Range: -48 to +24 dB
Sets the amount of boost or cut applied to the low shelving filter.

TREBLE FC
Range: 01KHz to 15KHz
Sets the cutoff-frequency of the upper-frequency band high shelving filter.

LEVEL
Range: -48 to +24 dB
Sets the amount of boost or cut applied to the high shelving filter.
72 RUMBLE FILTER

RUMBLE FILTER is a high pass filter in cascade with a low pass filter, fourth order (24dB per octave). The high pass filter is good for eliminating low end rumble. The low pass filter is good for eliminating hiss. The EFFECT MIX FX-1 and FX-2 FILTER parameters can be routed into the effect with different Dry/Wet mixes. For this algorithm, we recommend mid value Mixes.

**HIGH FC**
Ranges: 4 to 8000 Hz
Controls the boost or cut of the high pass filter-frequency applied to the input signal.

**LOW FC**
Ranges: 100 Hz to 15 KHz
Controls the boost or cut of the low pass filter-frequency applied to the input signal.

**GAIN**
Ranges: -48 to +48 dB
Because the cascade of high pass with low pass causes an insertion loss, this parameter allows you to boost the filtered output signal.

73 VAN DER POL FILTER

VAN DER POL FILTER adds synthetic high harmonics to the input signal, brightening the overall sound. This algorithm is most often used in the studio for vocalists, but feel free to experiment with this algorithm using your favorite instrument as well. This algorithm features prominent transient enhancement that makes it ideal for “plucked” sounds. The filter in this algorithm operates on the signal prior to enhancement. Set the filter to enhance the-frequency region that you desire. Then use the EFFECT MIX FX-1 parameter to mix the enhanced signal with the dry signal. For this algorithm we recommend mid values of the Mix.

**HIGH FC**
Range: 4 to 8000 Hz
Controls the boost or cut of the high pass filter-frequency applied to the input signal.

**LOW FC**
Range: 100 Hz to 15 KHz
Controls the boost or cut of the low pass filter-frequency applied to the input signal.

**GAIN**
Range: -48 to +48 dB
Because the cascade of high pass with low pass causes an insertion loss, this parameter allows you to boost the filtered output signal.
In this section, we will show you how to edit a TS-12 Program. For detailed descriptions of the many parameters, refer to the following section.

What is a Program?
A Program (or sound as we sometimes refer to it) is made up of six voices and one effect. The status of the two Patch Select buttons determines which of those six voices will play at any given time. The diagram below illustrates the make-up of a TS-12 program:

**Understanding Voices and Polyphony**
When referring to the number of voices in a program, we are not talking about polyphony (as in “you can only play so many notes”). Instead, we are referring to the number of voices that will sound on each key as you play the program. The TS-12 is unique in that it lets you choose the number of voices (from one to six) per key for each program.

The TS-12 has a total of 32 voices which are dynamically assigned to the different sounds that you play (31 voices when Sampled Sounds are loaded into Dynamic RAM). How many voices a sound uses on each key depends on the program. Many sounds use only one voice — in the case of these sounds, you can play 32 notes before “voice stealing” occurs. On programs that use two voices, you can play 16 notes before any voices are stolen. Three voices, 10 notes, and so on. Up to six voices can be active in one program.
The TS-12 is “smart” about voice allocation — there are a number of things you can do to increase the apparent polyphony of a sound and to minimize the effects of voice stealing. For example:

- As soon as a voice is finished playing (either because it reached the end of the wave or because the volume envelope went to zero), that voice is returned to the pool, and a new note can use that voice rather than stealing one that is still sustaining.
- You can assign low, medium or high priority to each voice in a program, which allows you to control how voices are reassigned.

**Using the Patch Select Buttons**

The two Patch Select buttons above and to the left of the pitch bend wheel provide instant access to four different variations within each program. When you press either or both of the Patch Select buttons, you are selecting different combinations of the voices that make up a program. For each of the four possible patches, any combination of the six voices can be made to play or to remain silent.

The Patch Select buttons are “momentary” — an alternate patch will only be in effect while the button is held down, unless you “lock in” a patch using the functions on the Patch Select sub-page (found by pressing the Performance Options button).

You can see the patches changing, and see which voices are playing for each patch, on the Select Voice page. Press Select Voice, then watch the display as you press the Patch Select buttons:

- The six voices that make up the program are represented on the display by the name of the wave that each is playing.
- Voices without brackets around the name are enabled for that patch and will play.
- Brackets around the name mean that the voice is muted for that patch and will not play.
- Asterisks (*) on both sides of the name mean that the voice is soloed for that patch, and all other voices are muted.

The Patch Select buttons are sent and received over MIDI as MIDI controller #70, and will be recorded and played back by the sequencer like any other controller.

**Compare — Using the Compare Button**

As soon as you change any parameter in a program, the LED above the Compare button will light. It will remain lit until you select another program or save (write) the newly edited program into memory. This is a constant reminder that something in the program has been changed.

To hear the original, unchanged program, press the Compare button. The Compare LED will go out, and you will hear the original sound and see the page with its original settings. Press Compare again to return to your edited program. You can toggle back and forth between the original and the edited sound as often as you like.

**Using the Edit Buffer**

You can edit a program, while keeping the original program intact, because the edited version is kept in a special area of memory called the Edit Buffer. Whenever you change any parameter of a program, the altered program is put in the edit buffer, replacing whatever was previously there. Only one program at a time can reside in the edit buffer — the edit buffer always contains the results of your last edit.

When you press the Compare button, you are alternating between the program located in the original memory location and the program located in the edit buffer. We refer to the program in the edit buffer as the Edit Program.
You can return to the edit program, even after selecting another program (as long as you don’t change any parameters there) by pressing the Compare button. This puts you back in the edit buffer, and any changes you make will affect the edit program.

A general rule of thumb: The sound you hear, is the one you’re editing.

If you like the result of the changes you have made to a program, you should rename it and save the new program permanently to another location. See “Write Page,” later in this section.

Abandoning Your Edits
If you decide, while editing a program, that you’re not happy with what you’ve done, and you want to start over with the original program, just go to the proper Sound Bank location and select the program again. Then you can start editing the program again from scratch. Remember though, you will lose the one you were working on before.

Using the Select Voice Page
The Select Voice page is one of the central programming pages of the TS-12. The mute status of each voice is shown on this page, and it is easy to see which voices are being heard and which are selected. Whenever you begin to edit a sound, you should start here so that you know just which voice(s) you are editing.

On the Select Voice page you can:
• select a voice (or group of voices) for editing,
• determine which of the six voices will play (and which will be muted) for each of the four Patch Select variations, or
• temporarily solo any one of the voices without disturbing the other settings on the page.

Press Select Voice. The display looks something like this:

Voice 1 is selected

SELV .Strings  Strings  Flugelhahn — Voices 1, 2 and 3 are active
00 (Sitar) (Pizz-sect) (Loop-kick) — Voices 4, 5 and 6 are muted

Patch Select status

The six locations on the screen represent the six voices which are available within the program. For each voice, the display shows the name of the wave that the voice is assigned to play, and the mute status of the voice in the current patch. When you press the soft button above or below one of these voices, it becomes underlined, indicating that it is the currently selected voice, the one that will be affected by any editing you do.

Voices shown without brackets are active and will play in the current patch. If you press the Down Arrow button while on a selected voice, it will mute that voice. Brackets (or parentheses) around the voice name indicate that the voice is muted in the current patch. Pressing the Up Arrow button on a muted voice will un-mute it.
Pressing the **Up Arrow** on an active (un-muted) voice will solo that voice. Solo voices are displayed enclosed by asterisks, with all other voices muted. Pressing the **Down Arrow** on a soloed voice will return it and all other voices to their normal status.

Voice 1 is soloed

SELV  **STRING**  (STRING) (FLUEHLHRN) — Voices 2 and 3 are muted
00  (SITAR) (PIZZ-SECT) (LOOP-KICK) — Voices 4, 5 and 6 are muted

**Using the soft buttons as a shortcut**

Once a voice is selected (underlined):
- If it is active, pressing its soft button again will mute it.
- If it is muted, pressing its soft button will un-mute it.
- Double-clicking will solo the voice. Click once more on a soloed voice to return all voices to normal.

Whenever you are on this page, pressing the Select Voice button again will return you to the page you were on prior to entering the Select Voice Page.

**Note:** If you edit a voice which is muted, you will see the word MUTE flashing in the lower left corner of the display to remind you that you are **not** hearing the results of your edits.

**Selecting more than one voice at a time (Group Edit Mode)**

Normally, when you are editing voice parameters, you are working on a single parameter within a single voice. In some cases you may want to edit the value(s) of the same parameter in more than one voice simultaneously. For example, you might want to edit the amplitude envelope release time for all active voices in a program at once, saving the time it would take to edit each of the voices individually. This may be accomplished using the special group edit feature of the TS-12. Group editing is a temporary state that allows more than one voice to be “selected” on the Select Voice page, and any edits performed while in this group edit state will affect all of the voices which are not muted.

Ordinarily you can only select one voice at a time. However, if you want to edit the same parameter(s) for all the active voices simultaneously, double-click the Select Voice button. The Select Voice page will appear with all the active voices in the current patch selected. Now, parameter changes you make on any of the programming pages will affect all the voices currently playing.

Programming pages you select while in group edit mode will appear with “GRP” flashing in the lower left hand corner of the display to remind you that you are editing more than one voice.

**Note** that while in group edit mode, pressing any of the soft buttons on the Select Voice page will return it to its normal state, where only one voice can be selected at a time.
Using the Group Edit feature

- Make sure that the voices you want to edit are not muted and then double-click the Select Voice button.
  The Select Voice page will be displayed with all of the active voices underlined.
- Perform the desired parameter edits. The Data Entry Slider will set the value of all of the parameters being edited to the absolute value displayed for the current voice. The Up/Down Arrow buttons will affect each parameter relative to its current value in each of the voices being edited.
- Changing the mute status of any voice, or selecting a new voice or program, will disable the group edit feature and return the TS-12 to its normal state.

Note that the parameter values displayed when editing in Group Edit mode are the values for the voice which was selected before you entered Group Edit mode, unless the previously selected voice was muted and was not included in the group. In this case, you will see the values for the first voice in the group.

This feature can be particularly convenient when you want to simultaneously edit programs with multiple-voice components. Set up a patch select for each of the various sets of voices that you wish to edit together, muting all voices except the set you wish to group. When you wish to edit a particular set, simply set the patch select and then double click Select Voice to enter group edit.

Note: The mute status of the patch select which is selected when you double-click Select Voice determines which voices are included in the group. It is possible to have muted voices appear in the group if you enter group edit mode from a patch select in which those voices are not muted.

Programming the Patch Selects

There can be four variations of the program, one for each of the four possible patch select button positions. The patch selects are used to control which voices in a program are active and which ones are muted. The current patch select variation is shown in the lower-left corner of the display on the Select Voice page. For either button, a “0” indicates that the button is not being pressed, and an asterisk (*) indicates that the button is down.

While on the Select Voice Page, press the Patch Select buttons and watch as the display changes to show the status of each patch variation. Note that for each of the four patch select variations, a different combination of voices can be active or muted. This lets you dynamically set up the patches to add or subtract components of the sound. The variations can range from subtle alterations to dramatic changes in the characteristics of the sound that the program produces.

The Patch Select parameter (found on the Performance Options page) controls how the patch selects will operate. If the parameter is set to LIVE, then pressing the Patch Select buttons while the Select Voice page is displayed will show the different variations. One of the four patch select variations may be “latched-in” as the current default by changing the value of the Performance Patch Select parameter for the currently selected program. Refer to Section 4 — Understanding Presets for more information on controlling the Patch Selects.

Tip: When programming the patch selects, it is often convenient to be able to instantly latch different Patch Select variations so that you can set up the voice mutes for each variation. You can do this by setting the Performance Options Patch Select parameter to HELD. Refer to Section 4 — Understanding Presets for more information.
Write Page — Saving a New Program Into Memory

Once you have modified an existing program or created an entirely new one, you can write or save that program to any User RAM location using the Write Page. This page is also used to rename the program with the name of your choice.

When you are ready to save a program into memory, first decide on a name of up to eleven characters for your new program. Then:

- Press Write Program. The Write Program page appears as below, with the current program name showing. You will see a cursor, or underline, beneath the first letter of that name.

```
WRITE EDIT PROGRAM  NAME=BAGLAMA-SA2
*EXIT*  LEFT  -CURSOR-  RIGHT
```

- Edit the Program Name using the Data Entry Slider and the two Cursor soft buttons, labeled LEFT and RIGHT. You can move the Data Entry Slider up and down to scroll through the available characters, or step through them one at a time with the Up/Down Arrow buttons. Find the first letter you want, then press the RIGHT button to move the cursor to the next location. Repeat this procedure until the display shows the name you have chosen (or if the KBD-NAMING parameter on the System page is ON, you can use the keyboard to enter the name, as explained in Section 2 — System Page Parameters).

Tip: Moving the Data Entry Slider all the way down gives you a blank space. Also, using dashes, periods and slashes between characters can make a sound name hold together better when displayed on Program Bank and Preset pages.

- Select a memory location for your new program. Press one of the Bank buttons (0-9). As long as you hold the button down, the display will show the sound select page for that bank, with two differences:
  1) None of the program names are underlined, and
  2) the word “SAVE” is flashing in the lower left-hand corner, below the page name.

When you release the Bank button, the display will return to the Write page. Press another Bank button and the display shows you the programs for that bank. To look at the Programs in the other User RAM BankSet, press and hold down any of the ten Bank buttons as before, and then press BankSet. You can also press the Bank buttons and the BankSet button while holding down the Sounds button to “shop around” without returning to the Write page each time you release the bank button.

- You may want to audition a few sounds before deciding which to replace. In this case, press the soft button beneath the word *EXIT* on the display. This takes you off the Write Page. Now use the Bank and BankSet buttons and the soft buttons in the usual way to select and listen to the Programs in memory. Your new Program is still safe in the TS-12’s edit buffer.

Warning: While you’re doing this, DO NOT use the data entry controls to change any parameters in the programs you audition, as this would instantly replace your hard-earned new Program in the Edit Buffer with something else entirely.

When you are through listening, return to the program you want to save by pressing the
Compare Button. The Compare LED will light. Now press Write Program to return to the Write Page. Your new program and its new name should still be in the edit buffer intact.

To Save the Program
- Press the appropriate Bank button, and while holding it down, press the soft button which corresponds to the program you wish to write over. This writes the new program, with its new name, into that memory location.

The display momentarily shows WRITING PROGRAM - PLEASE WAIT. The TS-12 will display the bank where the new program has just been saved. The new program is underlined, and is selected as the current program.

*EXIT*
The button beneath the word *EXIT* can be pressed at any time to exit the Write Page and return to the page you were on before entering it.

Copying an Existing Program to Another Location
Sometimes you’ll want to take an existing program, one that you haven’t been editing, and simply copy it to another memory location. For example, you might want to put the six most commonly used programs in the same bank, for easy access during performance.

To do this, you will use the Copy function. Normally the Write page “looks” only at the edit buffer, but you can use the Copy function to place an existing program onto the Write page:
- Select the program you want to copy.
- Press the Copy button. The Copy Context on the top line of the display shows PROGRAM PARAMETERS.
- Press the soft button beneath MAKE COPY. This puts the current program into the copy buffer. The display briefly shows COPY COMPLETED and then returns to the Copy page.
- Press the RECALL soft button. This puts you back on the Write page, with the new program showing. Now proceed exactly as described above to write the program to the new location.

Voice Programming
This section covers those functions which can be edited independently for each individual voice within the program.

TS-12 Voice Configuration
Each of the six voices within a TS-12 program consists of:
- a digital oscillator playing one of the 254 waves from the TS-12 wave memory
- two multi-mode digital filters
- one LFO (Low Frequency Oscillator)
- three complex envelope generators for controlling volume, pitch, filter frequency, etc.
- a versatile matrix modulation scheme with 15 routable modulation sources

The diagram on the following page shows the configuration of one TS-12 voice.
Modulators

About Modulation
To modulate something is simply to cause it to change. With the TS-12, you can set basic, or manual, levels for the volume, pitch, brightness, etc. of a voice, and then modulate those levels in various ways in order to create movement and dynamics.

Suppose you switch on your stereo and turn the volume half way up. This is the manual volume setting. It will stay at that level until it’s changed. Now suppose that you take the volume knob of your stereo and begin quickly turning it up and down, so the volume gets continuously louder and softer, louder and softer. What you would be doing is modulating the volume of your stereo. If you were to take the treble control, and do the same to that knob, you would be modulating the brightness of your stereo.

In much the same way we modulate various levels within the TS-12 (though generally the approach is less haphazard). There are 15 different Modulation Sources available, and they can each be independently assigned to vary the manual levels for a great many aspects of a voice, including real-time control of some aspects of an effects program.

Selecting a Modulator
On the programming pages where a modulator can be selected to vary the level of some function within an TS-12 voice, the display shows MODSRC=_____. (Modulation Source=). A modulator is chosen by selecting (underlining) that parameter with the appropriate soft button, and then using the Data Entry Slider or the Up/Down Arrow buttons to select among the 15 available modulation sources.

Tip: Moving the Data Entry Slider all the way up selects *OFF*, which is handy if you don’t want a modulator applied in a particular location.

Let’s take, for example, the Pitch Mods page, which is where you apply modulation to the pitch of a voice. Press Pitch Mods. In addition to Envelope 1 and the LFO, which are always available, you can choose an additional modulator to alter the pitch:

```
Pitch ModSource Modulation Amount
PITCH MODSRC=*OFF* MODAMT=+00 BEND=SYS
PITCHTBL=SYSTEM ENV1=+00 LFO=+04
```

MODAMT — Modulation Amount
As shown above, where a modulation source is selected, the parameter immediately to its right controls the Modulation Amount (the display shows MODAMT=±#), which controls how deeply the selected modulator will affect the level to which it is being applied.

Press the soft button above MODAMT=, and use the data entry controls to adjust the modulation amount. Modulation amount can be positive or negative. A modulation amount of +00 has the same effect as turning the modulator *OFF*.

Tip: With modulation amount, as with all parameter values that have a center value (in this case, +00), there is an easy way to reach that value. With the MODAMT selected, press the Down Arrow button and while holding it down, press the Up Arrow button, then quickly release both buttons. This automatically sets the modulation amount to +00.
Modulation Sources

The 15 Modulation Sources available on the TS-12 are as follows:

<table>
<thead>
<tr>
<th>Modulation Source</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>LFO — Low Frequency Oscillator</strong></td>
</tr>
<tr>
<td><strong>NOISE — Noise Generator</strong></td>
</tr>
<tr>
<td><strong>ENV-1 — Envelope 1</strong></td>
</tr>
<tr>
<td><strong>ENV-2 — Envelope 2</strong></td>
</tr>
<tr>
<td><strong>MIXER — Mod Mixer/Shaper</strong></td>
</tr>
<tr>
<td><strong>WL + PR — Wheel + Pressure</strong></td>
</tr>
<tr>
<td><strong>PR + VL — Pressure + Velocity</strong></td>
</tr>
<tr>
<td><strong>WHEEL — Modulation Wheel</strong></td>
</tr>
<tr>
<td><strong>PITCH — Pitch Bend Wheel</strong></td>
</tr>
<tr>
<td><strong>PEDAL — Voltage Control Foot Pedal</strong></td>
</tr>
<tr>
<td><strong>TIMBR — Timbre Control</strong></td>
</tr>
<tr>
<td><strong>XCTRL — External Controller (MIDI)</strong></td>
</tr>
<tr>
<td><strong>PRESS — Pressure (After-touch)</strong></td>
</tr>
<tr>
<td><strong>KEYBD — Keyboard Tracking</strong></td>
</tr>
<tr>
<td><strong>VELOC — Velocity</strong></td>
</tr>
<tr>
<td><strong>OFF</strong> — no modulation</td>
</tr>
</tbody>
</table>

- **LFO — Low Frequency Oscillator**
  The Low Frequency Oscillator generates only very low frequency waves, below the audio spectrum, which can produce vibrato, tremolo, and many other effects, depending on the LFO wave selected, and where it is applied as a modulator. There are seven possible waveshapes for the LFO.

- **NOISE — Noise Generator**
  The Noise generator creates a randomly changing level. It is useful for modulating, among other things, the pitch of a voice (Pitch Mods page). Applied to pitch with large modulation amounts, it tends to create strange “computer sound” effects. Small modulation amounts (around +02 to +04) can create a subtle random movement in the sound, which can impart a more natural quality.

  On the second sub-page of the LFO page (press LFO twice) there is a parameter labeled NOISE-RATE=##, which adjusts the rate at which the level of this modulator will change.

- **ENV-1, ENV-2, (ENV-3)**
  The TS-12 has three complex Envelopes. Envelopes are used to create changes, over time, in pitch, brightness, volume, etc.

  > ENV-1 is permanently routed to the pitch of the voice, though it can be assigned as a modulator elsewhere if you wish.

  > ENV-2 is permanently routed to the filter cutoff frequency. It also can be assigned as a modulator elsewhere.

  > ENV-3 is a special case. ENV 3 always controls the volume of the voice, and cannot be selected as a modulator anywhere else.

- **MIXER — Mod Mixer/Shaper**
  The Mod Mixer/Shaper is a powerful feature which allows you to assign two modulation sources to one input, and to scale and shape the response of one of those modulators. The controls on the Mod Mixer page are used to determine what will happen when MIXER is chosen as a modulator.

- **WL + PR — Wheel + Pressure**
  This is one of two “combination” modulators. When selected, both the mod wheel and pressure will affect the level which is being modulated. This can be good for modulating LFO depth when using the LFO for vibrato. That way the player can use either to get vibrato.

- **PR + VL — Pressure + Velocity**
  Another combination modulator. When this modulator is selected, both pressure and velocity will affect the level which is being modulated.
• **WHEEL — Modulation Wheel**
  The *Mod Wheel* to the left of the keyboard is assignable wherever a modulator is selected. To use the mod wheel for vibrato (one common application) WHEEL must be assigned to modulate the LFO, and the LFO Amount set to some number other than zero on the Pitch Mods Page. The mod wheel’s effect is positive-going only, from 0 (wheel towards you) to +99 (wheel away from you). Negative modulation amounts will reverse the effect.

• **PITCH — Pitch Bend Wheel**
  This assigns the Pitch Wheel, located to the left of the mod wheel, as a modulator. It allows you to have the Pitch Wheel, in addition to bending the pitch of a note (its normal function), also affect some other level. Applied to the filter cutoff frequency, for example, this would cause notes to become brighter as you bend them upwards, and more muted as you bend them down (or the opposite with negative modulation amounts).

• **PEDAL — Voltage Control Foot Pedal**
  This selects the *CVP-1 Foot Pedal*, which can be plugged into the Pedal•CV jack on the TS-12 rear panel, as a modulator. Its effect will be the same as that of the mod wheel. It can be applied wherever a Modulator is selected.

Note that the Foot Pedal will only act as a modulator when the Pedal Function Select parameter is set to PEDAL=MOD on the System Page. When that parameter is set to PEDAL=VOL the Foot Pedal will act as a volume pedal, not as a modulator (though this has no effect on incoming MIDI Foot Pedal data). See *Section 2 — System Page Parameters* for more details.

• **TIMBR — Timbre Control**
  This is a special modulator, which is intended as an “extra” real-time performance controller. TIMBR can be assigned like any other modulator wherever a modulation source is selected. It is controlled from the Timbre page in the Track Parameters section.

The Timbre parameter also controls the *relative* volume modulation amounts for each of the six program voices (assigned on the TIMBRE sub-page found on the Program Control Page). This allows you to determine how much louder or softer each voice will become as the Timbre modulation controller is increased or decreased.

Whenever you are playing a sound or preset, you can press the *Brightness/Timbre* button twice to get to the Timbre sub-page, and use the *Data Entry Slider* to change the level of the Timbre modulator. Note that because it can be assigned to modulate any mod destination within a voice or effect, the Timbre control will not always necessarily adjust the tone color (which is what we normally associate with the word *timbre*) of a given sound, depending on what the programmer has chosen to do with it. As a rule, however, programmers are encouraged to make sure that Timbre always does *something* interesting to the sound.
• **XCTRL — External Controller**

Like the TIMBR modulator, the External Controller (XCTRL) modulator can be assigned to modulate any voice or effect modulation destination. Whenever you are playing a sound or preset, you can press the **Brightness/Timbre** button three times to get to the XCTRL sub-page, and use the **Data Entry Slider** to change the level of the XCTRL modulator.

In addition to using the Track XCTRL parameter, an external controller such as a Breath Controller, Data Entry Slider, etc., that is received via MIDI from another synthesizer or MIDI controller, will modulate any voice or effect parameter that has XCTRL assigned as a modulator. On the MIDI Control Page, you select the MIDI Controller number of the external controller that will be recognized by the TS-12.

You don’t have to be playing the TS-12 from an external instrument for this to work. For example, if you have a keyboard with a Breath Controller:

1) Connect its MIDI Out to the TS-12 MIDI In
2) Make sure both instruments have controllers enabled (MIDI Control page)
3) Select Breath Controller as the external controller that will be received by the TS-12 (XCTRL=02, also on the MIDI Control Page)
4) assign XCTRL as a Modulator for LFO level, Filter Cutoff frequency, or some other manual level within a voice
5) play the sound from the TS-12 keyboard, while blowing into the Breath Controller connected to the sending instrument. The modulation will have the same effect as if you were playing from the sending instrument.

• **PRESS — Pressure (After-touch)**

Pressure, also called after-touch, is a modulator which varies a manual level within a voice depending on how hard you press down on a key or keys. After you have struck a key, and while the note is sustaining, continuing to press down harder on the key brings in pressure. The TS-12 keyboard generates pressure, and by using this modulator you can add a tremendous amount of expression to your sounds without ever taking your hands off the keyboard.

Pressure comes in two varieties — *Poly-Key™* pressure (or Polyphonic pressure), which affects each note individually, and *Channel* pressure (or Mono pressure) which affects all notes that are playing when you exert pressure on any key. Only channel pressure can be generated on the TS-12’s keyboard, but both types are received via incoming MIDI.

There is a Pressure parameter on a sub-page of the Performance Options page (press **Performance Options** twice) which determines if pressure will be used by the program. This control can also be set to NONE, in which case the program will not respond to pressure internally, nor will it send or receive it via MIDI (see Section 5 — Preset/Track Parameters for more details).

Note that not all sounds are necessarily programmed to respond to pressure. If pressure seems to have no effect when you play certain sounds, it is likely that pressure is not assigned as a modulator anywhere within the sound.

The effect of pressure as a modulator is positive-going only, though assigning a negative modulation depth will cause increased pressure to reduce manual levels.
• KEYBD — Keyboard Tracking
This uses the position of a note on the keyboard as a modulator. The scaling effect of this Modulator is based on a 76-note keyboard:

As the above illustration shows, the effect of KEYBD as a modulator goes negative as well as positive. The effect of KEYBD is to reduce the Level on notes below the break point (F4+), and increase levels above that point. Negative Modulation depths will do the opposite.

• VELOC — Velocity
Velocity means how hard you strike a key. Selecting VELOC as a Modulator allows you to modulate any manual level with velocity. Velocity as a modulation source only goes positive (though assigning a negative modulation amount will make the net result be to reduce the level with increased velocity).

• *OFF*
Modulation is disabled.
Wave Page
Each TS-12 voice will play one of the 254 waves in its memory. These waves are the “raw material” from which TS-12 programs are crafted. On the Wave page you can choose which wave the currently selected voice will play, and modify the various playback parameters of the wave.

Wave Class
The TS-12 waves are divided into 16 categories, or Wave Classes:

- **KEYBOARD**
- **STRING-SOUND**
- **BRASS+HORNS**
- **WIND+REEDS**
- **VOCAL-SOUND**
- **WIND+REEDS**
- **VOCAL-SOUND**
- **WAVEFORM**
- **INHARMONIC**
- **TRANSWAVE**
- **WAVE-LIST**
- **DRUM-MAP**

The first eleven wave classes contain samples of real acoustic and electronic sounds, which can be used as the basis for a wide variety of realistic musical sounds. Where necessary, these waves have been multi-sampled (sampled at many points through the range of the instrument) for maximum accuracy.

The next three wave classes contain a variety of sampled and algorithmically generated waves that are more “synthesizer” oriented:

- **WAVEFORM** - A waveform is a single cycle of a sound repeated over and over. The TS-12 contains both sampled and synthetic waveforms. Waveforms such as Sawtooth and Square can be used to reproduce a wide array of analog synth sounds.
- **INHARMONIC** - Inharmonic loops are similar to waveforms except that they contain many cycles of the sound and can therefore contain inharmonics — frequencies which are not exact multiples of the fundamental frequency.
- **TRANSWAVE** - is a special class of waves. Each Transwave consists of many single-cycle waveforms, each with a different harmonic spectrum. The playback parameters allow you to start the wave playing at any one of these waveforms and move through the wavetable, continually varying the timbre of the sound, using any of the 15 modulators.

The last two wave classes are unique in that they are only available when OPTION=WAVE-LIST or DRUM-MAP on the Program Control page:

- **WAVE-LIST** - up to sixteen user-definable waveforms are linked together to create a single wave-list. Any of the internal waveforms can be used, and can be played in any order, forward or backward, to create effects and “jam-loops.”
- **DRUM-MAP** - Up to 61 different waves can be assigned to each key of the keyboard to create “custom” drum-maps. Individual keys can be assigned their own volume levels, panning, pitch, and voice parameter template.
### Complete TS-12 ROM Wave Catalog

The wave class is shown in bold at the top of each ROM Wave group.

<table>
<thead>
<tr>
<th>KEYBOARD:</th>
<th>WIND+REEDS:</th>
<th>DRUM-SOUND:</th>
<th>TUNED-PERCUS:</th>
<th>INHARMONIC:</th>
</tr>
</thead>
<tbody>
<tr>
<td>GND-PIANO</td>
<td>SOPRN-SAX</td>
<td></td>
<td>VIBRAPHON</td>
<td>TUBULAR</td>
</tr>
<tr>
<td>PNO-THUD</td>
<td>SOPRN-SAX2</td>
<td></td>
<td>MARIMBA</td>
<td>BIG-BELL</td>
</tr>
<tr>
<td>EL-PIANO1</td>
<td>ALTO-SAX</td>
<td></td>
<td>XYLOPHONE</td>
<td>CRYSTAL</td>
</tr>
<tr>
<td>EL-PIANO2</td>
<td>TENOR-SAX</td>
<td></td>
<td>GLOCKEN</td>
<td>SYNTHBELL</td>
</tr>
<tr>
<td>EL-PIANO3</td>
<td>CLARINET</td>
<td></td>
<td>TYPHANI</td>
<td>NOISE</td>
</tr>
<tr>
<td>EL-PIANO4</td>
<td>OBOE</td>
<td></td>
<td>TUNED-TOM</td>
<td>AIR-LOOP</td>
</tr>
<tr>
<td>EL-PIANO5</td>
<td>OBOE-VAR</td>
<td></td>
<td>TUNED-LOG</td>
<td>SPINNER-1</td>
</tr>
<tr>
<td>WURLIE-LO</td>
<td>FLUTE</td>
<td></td>
<td>STEEL-DRM</td>
<td>SPINNER-2</td>
</tr>
<tr>
<td>WURLIE-HI</td>
<td>FOLKFLUTE</td>
<td></td>
<td>KALIMBA</td>
<td>TEXTURE-1</td>
</tr>
<tr>
<td>ROCK-ORGN</td>
<td>PANFLUTE</td>
<td></td>
<td>GAM-BELL</td>
<td>TEXTURE-2</td>
</tr>
<tr>
<td>JAZZ-ORGN</td>
<td>CHIFFLUTE</td>
<td></td>
<td>DOORBELL</td>
<td>METL-LOOP</td>
</tr>
<tr>
<td>ORGAN-1</td>
<td>HARMONICA</td>
<td></td>
<td>DANCE-HIT</td>
<td></td>
</tr>
<tr>
<td>ORGAN-1</td>
<td>ACCORDION</td>
<td></td>
<td>ORCH-HIT</td>
<td></td>
</tr>
<tr>
<td>PIPE-ORGN</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>REED-ORGN</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CELESTE</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HARPSCRD</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SYNTH-PAD</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SYNTH-ANA</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SYNTH-VOX</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STRING-SOUND:</td>
<td>BASS-SOUND:</td>
<td></td>
<td>WAVEFORM:</td>
<td></td>
</tr>
<tr>
<td>NYLON-GTR</td>
<td>EL-BASS-1</td>
<td>CLO-HAT-1</td>
<td>SINE-WAVE</td>
<td></td>
</tr>
<tr>
<td>STEEL-GTR</td>
<td>EL-BASS-2</td>
<td>CLO-HAT-2</td>
<td>SQUARE-WV</td>
<td></td>
</tr>
<tr>
<td>GTR-VAR</td>
<td>EL-BASS-3</td>
<td>CLO-HAT-3</td>
<td>SAW-WAVE1</td>
<td></td>
</tr>
<tr>
<td>FRETNISE</td>
<td>LAPP-BASS</td>
<td>CLO-HAT-4</td>
<td>SAW-WAVE2</td>
<td></td>
</tr>
<tr>
<td>NYLON-HRM</td>
<td>PICK-BASS</td>
<td>CRASH-CYM</td>
<td>SAW-WAVE3</td>
<td></td>
</tr>
<tr>
<td>ELEC-GTR1</td>
<td>MUTE-BASS</td>
<td>CHINA-CYM</td>
<td>BELL-WAVE1</td>
<td></td>
</tr>
<tr>
<td>ELEC-GTR2</td>
<td>BASS-TAP</td>
<td>RIDE-CYM</td>
<td>BELL-WAVE2</td>
<td></td>
</tr>
<tr>
<td>ELEC-GTR3</td>
<td>FRETTLESS</td>
<td>RIDE-BELL</td>
<td>BELL-WAVE3</td>
<td></td>
</tr>
<tr>
<td>DIST-GTR</td>
<td>BS-HARMS</td>
<td>SYN-HAT-CL</td>
<td>ORG-WAVE1</td>
<td></td>
</tr>
<tr>
<td>MUTE-GTR</td>
<td>AC-BASS</td>
<td>SYN-HAT-OP</td>
<td>ORG-WAVE2</td>
<td></td>
</tr>
<tr>
<td>GTR-HARM</td>
<td>BASS-THUD</td>
<td></td>
<td>ORG-WAVE3</td>
<td></td>
</tr>
<tr>
<td>HARP</td>
<td></td>
<td></td>
<td>ORG-WAVE4</td>
<td></td>
</tr>
<tr>
<td>OCT-HARP</td>
<td>SYNBASS-1</td>
<td>CONGA-MT</td>
<td>ORG-WAVE5</td>
<td></td>
</tr>
<tr>
<td>STRINGS</td>
<td>SYNBASS-2</td>
<td>CONGA-SLP</td>
<td>ORG-WAVE6</td>
<td></td>
</tr>
<tr>
<td>PIZZ-SECT</td>
<td>SYNBASS-3</td>
<td>CONGA-HI</td>
<td>ORG-WAVE7</td>
<td></td>
</tr>
<tr>
<td>SOLOVIOIN</td>
<td>ANABASS-1</td>
<td>CONGA-LO</td>
<td>ORG-WAVE8</td>
<td></td>
</tr>
<tr>
<td>SOLOCELLO</td>
<td>ANABASS-2</td>
<td>CH-ORG-WV</td>
<td>ORG-WAVE9</td>
<td></td>
</tr>
<tr>
<td>SOLO-PIZZ</td>
<td>ANABASS-3</td>
<td>TIMBALI</td>
<td>ORG-WAVE10</td>
<td></td>
</tr>
<tr>
<td>TECHSTRNG</td>
<td>ANABASS-4</td>
<td>BONGO</td>
<td>ORG-WAVE11</td>
<td></td>
</tr>
<tr>
<td>GOTO</td>
<td></td>
<td>TABLA-SLP</td>
<td>BEL-WAVE1</td>
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</tr>
<tr>
<td>BIWA</td>
<td></td>
<td>TABLA-HI</td>
<td>BEL-WAVE2</td>
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</tr>
<tr>
<td>SHAMISEN</td>
<td></td>
<td>TABLA-LO</td>
<td>BEL-WAVE3</td>
<td></td>
</tr>
<tr>
<td>SITAR</td>
<td></td>
<td></td>
<td>BEL-WAVE4</td>
<td></td>
</tr>
<tr>
<td>BANJO</td>
<td></td>
<td></td>
<td>BEL-WAVE5</td>
<td></td>
</tr>
<tr>
<td>DULCIMER</td>
<td></td>
<td></td>
<td>BEL-WAVE6</td>
<td></td>
</tr>
<tr>
<td>BRASS+HORNS:</td>
<td>DRUM-SOUND:</td>
<td></td>
<td>PERCUSSION:</td>
<td></td>
</tr>
<tr>
<td>TRUMPET</td>
<td>ROOM-KICK</td>
<td></td>
<td>ORG-WAVE3</td>
<td></td>
</tr>
<tr>
<td>FLUGEHLRN</td>
<td></td>
<td></td>
<td>ORG-WAVE4</td>
<td></td>
</tr>
<tr>
<td>MUTE-TMPR</td>
<td></td>
<td></td>
<td>ORG-WAVE5</td>
<td></td>
</tr>
<tr>
<td>PICO-TRMP</td>
<td></td>
<td></td>
<td>ORG-WAVE6</td>
<td></td>
</tr>
<tr>
<td>TROMBONE</td>
<td>LOOP-KICK</td>
<td></td>
<td>ORG-WAVE7</td>
<td></td>
</tr>
<tr>
<td>TUBA</td>
<td>REALSNARE</td>
<td></td>
<td>ORG-WAVE8</td>
<td></td>
</tr>
<tr>
<td>TRUMP-SEC</td>
<td>ROCKSNARE</td>
<td></td>
<td>ORG-WAVE9</td>
<td></td>
</tr>
<tr>
<td>FRHRN-SEC</td>
<td>DEEPSNARE</td>
<td></td>
<td>ORG-WAVE10</td>
<td></td>
</tr>
<tr>
<td>TBONE-SEC</td>
<td>GATESNARE</td>
<td></td>
<td>ORG-WAVE11</td>
<td></td>
</tr>
<tr>
<td></td>
<td>FUNKSNARE</td>
<td></td>
<td>ORG-WAVE12</td>
<td></td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>JAZZSNARE</th>
<th>WINDCHIME</th>
<th>ANA-WAVE2</th>
</tr>
</thead>
<tbody>
<tr>
<td>SNARE-ROL</td>
<td>WNDCHIME2</td>
<td>ANA-WAVE3</td>
</tr>
<tr>
<td>RIMSHOT-1</td>
<td>FNGR-SNAP</td>
<td>ANA-WAVE4</td>
</tr>
<tr>
<td>RIMSHOT-2</td>
<td>SYN-CLAPS</td>
<td>METL-WAVE</td>
</tr>
<tr>
<td>SIDESTK-1</td>
<td>SYN-KISS</td>
<td></td>
</tr>
<tr>
<td></td>
<td>RATTLE</td>
<td></td>
</tr>
</tbody>
</table>
Using the Copy Functions

The Copy page provides programming utility functions for:
• copying entire pages of parameter data at once while programming voices
• copying complete voices, effects, or programs
• changing the system pitch-table

About the Copy Functions

When programming synthesizers, it is often desirable to be able to make changes to some component of a sound and then to transfer the newly modified component to another part of the same voice or program, or even to use it in a different program. The Copy page of the TS-12 provides several useful functions which facilitate copying components from one place to another. The components which can be copied may be all of the parameters on a page or in a voice, or even an entire program. The copy function can be used to move programs from one location to another, using a procedure described later in this section.

Press the Copy button will display the Copy page menu. Pressing Copy again will return you to the last parameter page that was selected.

COPY   <COPY CONTEXT>   PARAMETERS
        <SPECIAL>   RECALL   MAKE COPY

The top line of the display indicates the currently selected copy context. The copy context is determined by the type of page that was selected just before you pressed Copy to enter the Copy page. The copy context determines which parameters will be affected by the functions on the page.

How to Set the Copy Context:
• Press Wave to display the Wave page.
• Press Copy. The copy context will show WAVE PAGE PARAMETERS.
• Press Copy again. You will be returned to the Wave page.
There is a well-defined group of copy contexts that are available for your use. The copy context is set whenever you select pages from within this group. The following table shows the copy context that is automatically set whenever particular pages are displayed.

<table>
<thead>
<tr>
<th>Prior page...</th>
<th>Copy context</th>
<th>What gets copied...</th>
</tr>
</thead>
<tbody>
<tr>
<td>LFO</td>
<td>ALL LFO</td>
<td>all LFO page parameters</td>
</tr>
<tr>
<td>ENV1, 2, 3</td>
<td>ENVELOPE-#</td>
<td>all parameters for one envelope</td>
</tr>
<tr>
<td>Pitch</td>
<td>PITCH PAGE</td>
<td>all Pitch page parameters</td>
</tr>
<tr>
<td>Pitch Mods</td>
<td>PITCH MOD</td>
<td>all Pitch Mods page parameters</td>
</tr>
<tr>
<td>Filters 1 or 2</td>
<td>FILTER-#</td>
<td>all parameters for a single filter</td>
</tr>
<tr>
<td>Output</td>
<td>ALL OUTPUT</td>
<td>all Output page parameters</td>
</tr>
<tr>
<td>Wave</td>
<td>WAVE PAGE</td>
<td>all Wave page parameters</td>
</tr>
<tr>
<td>Mod Mixer</td>
<td>MOD MIXER</td>
<td>all Mixer/Shaper page parameters</td>
</tr>
<tr>
<td>Program Control</td>
<td>PROGRAM</td>
<td>all parameters for selected program</td>
</tr>
<tr>
<td>Program Effects</td>
<td>EFFECTS</td>
<td>all Effects page parameters</td>
</tr>
<tr>
<td>Select Voice</td>
<td>ALL VOICE</td>
<td>all parameters for selected voice</td>
</tr>
<tr>
<td>Pitch-Table Editor</td>
<td>PITCHTABLE</td>
<td>one complete pitch-table (voices 5/6)</td>
</tr>
<tr>
<td>Wave-List Editor</td>
<td>WAVE-LIST</td>
<td>one complete wave-list (voices 5/6)</td>
</tr>
<tr>
<td>Drum-Map Editor</td>
<td>DRUM-MAP</td>
<td>one complete drum-map (voices 5/6)</td>
</tr>
<tr>
<td>Sounds/Program Bank</td>
<td>PROGRAM</td>
<td>all parameters for selected program</td>
</tr>
</tbody>
</table>

Note: In order to use the copy functions successfully, it is important to understand how to control the copy context, and what is being copied.

The copy buffer is an invisible portion of memory used to hold the most recently copied parameters until they are recalled.

The contents of the copy buffer are completely independent of the compare buffer used in editing programs. You can make copies into the copy buffer without affecting the data in the compare buffer. Recalling data from the copy buffer always changes only the compare buffer. The copy buffer can contain anything from a single page of parameter values up to an entire program which includes six voices and an effect. The copy buffer is context-sensitive, meaning that your options are controlled by your previous actions.

The bottom line of the display shows the available operations which can be performed on the page.

MAKE COPY
Based on the current copy context, this command will copy a set of parameters into the copy buffer. The copy buffer is a separate buffer into which the copy utility will copy data without affecting the current edit program in the compare buffer. Remember that MAKE COPY has no effect on the compare buffer or the selected program or voice.

RECALL
This command will copy parameters back from the copy buffer into the compare buffer where the edit program resides, again according to the copy context. Pressing the soft button below RECALL causes the indicated data set to be copied, and the display returns to the Copy page.

The RECALL function always copies data into the compare buffer. If the compare buffer is selected (i.e. the Compare LED is on) at the time you perform a recall, then the data is added to the edited program in the compare buffer. If the compare buffer is not selected then the compare...
buffer is loaded with the currently selected primary program before the recall is completed. The compare buffer is always selected after a recall.

If Group Edit is active when pages of voice parameters are recalled, then the recall will affect all of the voices in the group. The data being recalled will be written into all of the grouped voices in the compare buffer at the same time. For example, you could make a copy of an envelope page from one voice and then recall it into a group of voices in one step. Group Edit has no effect when recalling effects, complete voices, pitch tables, or complete programs.

**Special Recall Functions**

There are several exceptions to the normal pattern of operation in the RECALL function. The first exceptions occur with the Envelope and Filter contexts. When the copy context is set to any of the Filter or Envelope settings, pressing RECALL will display an additional page which allows you to select the source and destination pages for the parameter transfer. This allows you to copy information between different envelopes and filters.

The sample screen shown above illustrates the RECALL sub-page for the ENVELOPE context. The Source Envelope number controls which envelope in the copy buffer will be used by the recall, and the Destination Envelope number determines which envelope in the compare buffer will be replaced with the new data being recalled. The default settings are always the same number for source and destination. If you want to copy across from one envelope to another, you must set the source and destination envelope numbers accordingly. The RECALL sub-page for the FILTER context is similar in appearance and function.

Remember that the copy buffer always contains copies of each of the three envelopes and two filters, regardless of whether you last used an envelope, filter, voice, or program copy function.

Another exception occurs in the PROGRAM context. Pressing RECALL from this context will take you directly to the Write page. The compare buffer is loaded with the same information as the copy buffer whenever you recall an entire program, and you are ready to save the program in a new location.

The system will alert you if you try to recall into a context different than the last copy action that was performed. This prevents you from mistakenly recalling a fragmented voice, program or pitch-table.
Special Copy Operations

There are also some special command options that appear in the display (above the lower left soft button) for certain copy contexts.

DEFAULT

There are some copy contexts which provide the option of recalling default parameter settings automatically. When this option is available, the DEFAULT command appears in the lower left part of the display.

- For the ALL VOICE parameter context:

  ![Copy ALL Voice Parameters](image)

  The DEFAULT command will make a copy of the default voice into the copy buffer and then automatically recall it into the currently selected voice in the compare buffer, as if you had performed the steps yourself. This allows you to easily put the voice into a standard configuration, which is often useful when creating new programs.

- For the ENVELOPE-1, -2, and -3 parameter contexts:

  The DEFAULT command also appears with the ENVELOPE-# context. Pressing the soft button below the command displays a sub-page which will allow you to select from a group of standard preset envelope types which can be recalled into the current envelope. This is particularly useful when setting up typical envelopes as starting points when you are creating new voices.

  ![Recall Default into Envelope #](image)

  The available standard preset envelope types are:

<table>
<thead>
<tr>
<th>FULL VEL RANGE</th>
<th>PERCUSSION 1</th>
<th>VIBRATO LFO</th>
</tr>
</thead>
<tbody>
<tr>
<td>FULL ON</td>
<td>PERCUSSION 2</td>
<td>DETUNE LFO</td>
</tr>
<tr>
<td>RAMP DOWN</td>
<td>TIGHT PERC</td>
<td>REPEAT TRIANG</td>
</tr>
<tr>
<td>RAMP UP</td>
<td>TOM-TOM DECAY</td>
<td>REPEAT RAMP</td>
</tr>
<tr>
<td>RAMP UP+DOWN</td>
<td>HI-HAT DECAY</td>
<td>TRANSIENT</td>
</tr>
<tr>
<td>PIANO DECAY</td>
<td>LONG CYMBAL</td>
<td>SHORT BLIP</td>
</tr>
<tr>
<td>GUITAR DECAY</td>
<td>MED CYMBAL</td>
<td>AMP BLIP</td>
</tr>
<tr>
<td>BASS DECAY</td>
<td>SHORT CYMBAL</td>
<td>WIND PITCH</td>
</tr>
<tr>
<td>XPRSV STRINGS</td>
<td>BRASS FILTER</td>
<td>PITCH DOWN 1</td>
</tr>
<tr>
<td>FAST ATCK PAD</td>
<td>SFORZANDO</td>
<td>PITCH DOWN 2</td>
</tr>
<tr>
<td>SLOW ATCK PAD</td>
<td>SLOW REPEAT</td>
<td>ALL ZEROS</td>
</tr>
<tr>
<td>SLOW ATCK/REL</td>
<td>SLOW LFO</td>
<td></td>
</tr>
</tbody>
</table>

Select the default envelope type using the Data Entry Slider or the Up/Down Arrows and press *YES* if you wish to install the selected envelope type into the envelope number shown on the upper line of the display. Press *NO* to return to the Copy page without performing any action.
SYSTEM
For the PITCHTABLE parameter context only:

When entered from the Edit Pitch-table pages, the Copy page shows the SYSTEM command on the lower left part of the display. This command will copy the pitch-table directly from the currently program, or from the compare buffer if the Compare LED is on, into the system pitch-table. It is not necessary to use the MAKE COPY command in this case. Using this command will automatically set the SYSTEM PITCH-TABLE parameter on the System page to CUSTOM, thereby selecting the newly installed pitch-table for use as the System pitch-table.

Some Useful Applications of the Copy Functions

Copying an effect from one program to another
• Press Sounds and select the program whose effect you wish to copy.
• Press Program Effects in the Programming section to display the Program Effect page for this program.
• Press Copy. The copy context will show EFFECTS PARAMETERS.
• Press the soft button below the MAKE COPY option to copy the Effect page parameters into the copy buffer.
• Select the program into which you wish to copy the effect. If the sound you are working on is in the compare buffer, make sure that the Compare LED is on.
• Press Program Effects in the Programming section to redisplay the Program Effect page.
• Press Copy. You will be returned to the Copy page with the EFFECTS context.
• Press the soft button below the RECALL option to recall the effect from the copy buffer.
• Press Copy again. You will be returned to the Effect page. Note that the effect that you previously copied has now replaced the old effect. Remember to write the program if you wish to keep the change.
• You can use the same process to recall an effect into a sequence, song or preset.

Copying all parameters from one voice to another
When the Copy page is entered from the Select Voice page, the copy context is set to ALL VOICE PARAMETERS. In this context, the values of all voice parameters for the currently selected voice are transferred to or from the copy buffer. Using this method, you can easily copy voices within a program or from one program to another.

• Press Select Voice to display the Select Voice page and to set the copy context. Make sure that the voice which you wish to copy is selected.
• Press Copy. The copy context will show ALL VOICE PARAMETERS.
• Press the soft button below the MAKE COPY option to copy the voice into the copy buffer.
• Press Copy again. You will be returned to the Select Voice page.
• Select the voice you wish to replace with the voice you just copied.
• Press Copy again. You will be returned to the Copy page.
• Press the soft button below the RECALL option to recall the voice from the copy buffer.
• Press Copy again. You will be returned to the Select Voice page. Note that the voice you previously copied has now replaced the old voice.
Copying a complete program to a new location

It is easy to copy programs from one location to another using the copy and recall functions. Simply follow this procedure:

- Press **Sounds** and select the program that you wish to copy. This will automatically set the copy context to PROGRAM PARAMETERS.
- Press **Copy** to display the Copy page.
- Press the soft button below the MAKE COPY option to copy the program into the copy buffer. The program will be copied into the copy buffer, and the Copy page will be redisplayed.
- Press the soft button below the RECALL option to recall the program from the copy buffer into the compare buffer. The Write page will be displayed automatically.
- Using the normal techniques for writing programs, select the destination in which you wish to locate the copy (refer to the section describing the Write page if you are unsure how to proceed).

Making a copy of the compare buffer

If you wish to make a copy of the complete compare buffer before making some experimental edits that you are unsure of, then use the following procedure to make a backup copy of the current compare or edit buffer:

- Set the copy context to the Program context by pressing **Program Control** or **Sounds**.
- Make sure that the **Compare** LED is on, and that you are hearing the edit program of which you wish to make a copy (press **Compare** if not).
- Press **Copy** and make sure that the copy context is PROGRAM PARAMETERS.
- Press the soft button below the MAKE COPY option to copy the compare buffer into the copy buffer.

Collecting parts from several sources into the copy buffer

While you can only make a single copy of an entire voice or program at one time, it is possible to make consecutive copies of multiple pages of parameters before recalling the data you have copied. These pages can even be taken from different voices or different programs.

For example, using the normal MAKE COPY process, you can make copies of one or more envelope pages, followed by an LFO page and a wave page. A single copy of each of these pages is saved into the copy buffer. You can then start recalling the pages you want into the compare buffer using the normal RECALL procedure described above. The data you copied will remain intact until you copy a complete voice or program, which will replace the contents of the copy buffer.
About Pitch-Tables
Alternate pitch-tables enable you to chart new musical territories as well as explore ancient and ethnic tunings. In Western music, equal temperament has been the dominant tuning for the last one hundred and fifty years, and is really a musical compromise. In equal temperament, all intervals are equally out of tune. However, this compromise is what allows our music to remain relatively in tune as we modulate from one key to another.

Equal temperament evolved out of other systems of tuning — such as just intonation — where intervals in a scale are tuned perfectly. The difficulty with perfectly-tuned scales is that you can’t modulate keys as universally as with equal temperament. Nonetheless, computer technology — keep in mind your TS-12 is in fact a computer — has made it easy to create and employ alternate pitch-tables.

Imagine starting a piece in equal temperament, modulating to Pythagorean, then Werckmeister, then 19 tone, and back to equal temperament, simply by changing Programs. Sound interesting? Then the following section can help you on your way.

You select the pitch-table for each voice on the Pitch Mods page. The options are:

• SYSTEM — This is the “global” or keyboard-wide pitch-table. As it comes out of the box, the TS-12’s System pitch-table defaults to 12-tone equal-temperament tuning (standard tuning). However, you can copy a custom pitch-table into the system for use by all your programs. The parameter for changing the system pitch-table is on the System page. More on this feature a bit later.

• ALL-C4 — No pitch tracking — all notes tuned to C4 (middle C).

• CUSTOM — each program in the TS-12 can have its own “user-definable” (that is, you create it) pitch-table. When you create a custom pitch-table, wave-list, or drum-map, the TS-12 will remove voices 5 and 6 from the program to create space for the pitch-table, wave-list, or drum-map. Bear this in mind — it could adversely affect the program if voices 5 or 6 are important parts of the sound.

How to Create a Custom Pitch-Table
• Select a Program into which you want to write a custom pitch-table.
• Press Program Control. The display shows the Program Control page:

```
PROGRAM TYPE=KEYBOARD OPTION=*-NONE-*
PRESS=KEY PATCH=LIVE RESTRIKE=35
```

• Make sure OPTION=*-NONE-* is underlined.
• Press the Up Arrow button. The display reads:

```
REPLACE VOICES 5+6 WITH *EXIT*
PITCH-TABLE WAVE-LIST DRUM-MAP
```

As mentioned earlier, whenever you create a custom pitch-table, the TS-12 will delete voices 5 and 6, and use the memory normally occupied by those parameters to store the pitch-table.

- Press the soft button underneath PITCH-TABLE to REPLACE VOICES 5+6. This takes you to the Select Voice page, which now shows the words EDIT PITCH-TABLE where voices 5 and 6 once were.

We have just created a custom pitch-table with variable pitch values for each key. Keep in mind that the custom pitch-table will sound the same as the system pitch-table until you edit it. We will do this a bit later.

When you create a pitch-table and start editing it, you are in the edit buffer (the Compare light is on), and all edits will affect the data in the edit buffer, and not the program’s memory. If you use the copy function while the compare light is on, the TS-12 will copy the data in the edit buffer, and not the program’s memory.

First, we need to select which of the four voices will use the custom pitch-table:

- Double-click its soft button to solo the first voice on the Select Voice page:

  SELV CONGA-MT (SAW-WAVE2) (SAW-WAVE2)
  00 (CONGA-MT ) EDIT PITCH-TABLE

- Press Pitch Mods. This takes us to the Pitch Mods page.
- Select the pitch-table parameter in the display and set it to PITCHBL=CUSTOM.

Voice #1 is now set to play the custom pitch-table. This will enable you to hear any edits you make to the custom pitch-table.

Each voice in a program can be assigned to play either the system, no-pitch, or custom pitch-table. For example, Voice #1 can play the system pitch-table; Voice #2, a custom pitch-table; voices 3 and 4, No-pitch (C notes across the keyboard).

**Editing a Custom Pitch-Table**

As mentioned earlier, until you edit the custom pitch-table — change the default note assignments — the custom pitch-table will sound the same as the system pitch-table. To edit a custom pitch-table:

- On the Select Voice page, press either of the soft buttons beneath EDIT PITCH-TABLE. This takes us to the EDIT PITCH-TABLE page.
For every source key on the lower left, you can see and edit the pitch of that key.

The source key can be thought of as the physical location of the key on the keyboard. The playback pitch can be the same as the source key — as shown in the display — or it can be any pitch from A0 to C8. The range of the fine tuning is 00 to 99 cents. This enables you to create micro-tunings and other alternate tunings. First, let’s get a feel for the relationship between the source key and the playback pitch.

- Make sure the Source Key is underlined (by pressing the soft button beneath it).
- Play C4 (middle C) on the keyboard, or use the data entry controls to select C4 as the source key.
- Underline the playback pitch, in this case, C4.
- Use the Up Arrow button and change C4 (playback pitch) to C4+.
- Underline 00 CENTS. Use the data entry controls to change the value to 50 CENTS. The display reads:

C4 now plays back at C4+ and 50 Cents, one and one half semitones higher than normal. Try selecting other source keys, and then changing their playback pitches to any values you like. This is how we edit the custom pitch-table.

- Press *EXIT* to return to the Select Voice page.

**Removing a Custom Pitch-Table**

If a program contains a custom pitch-table and you wish to remove it (thus restoring voices 5 and 6) you can do so from the Program Control page:

To remove a custom pitch-table:
- Press Program Control.
- Underline OPTIONS=PITCHTBL.
- Press the Down Arrow button.
- The TS-12 will ask ERASE CURRENT PITCH-TABLE?
- Press *YES*. You are returned to the Select Voice page, the custom pitch-table is gone, and voices 5 and 6 are reset to the default voice.
You are now free to create a new custom pitch-table in your current program.

Now that you understand the relationship between the source key, playback pitch, and fine tuning in a custom pitch-table, let’s start over. This time we’ll work with an ancient tuning system, called Pythagorean. Then, we’ll work with the TS-12 built-in pitch-table calculator, and two new procedures: Extrapolation and Interpolation.

Creating and Extrapolating a Custom Pitch-Table

The EXTRAPOLATE command takes the pitch-table relationships from within a key range and duplicates those relationships outside that range.

- If you have a custom pitch-table from the previous exercise, remove as shown above.
- Select a program into which you want to write a custom pitch-table.
- Press Program Control. This takes us to the Program Control page.
- Make sure OPTION=*NONE-* is underlined.
- Press the Up Arrow button.
- Press PITCH-TABLE to REMOVE VOICES 5+6. This takes us to the Select Voice page.
- Select a voice into which you want to write a custom pitch-table.
- Press Pitch Mods.
- Select PITCHTBL=CUSTOM.
- Press Select Voice to return to the Select Voice page.
- Press either of the soft buttons beneath EDIT PITCH-TABLE. This takes us to the Pitch-Table Editor page.
- The display shows the source key and playback pitch as described earlier.
- To set up one octave of a Pythagorean scale, change the source keys, playback pitches, and cents, one note at a time, from C4 to C5 — to the following values:

<table>
<thead>
<tr>
<th>Source Key</th>
<th>Playback Pitch</th>
<th>Cents</th>
</tr>
</thead>
<tbody>
<tr>
<td>C4</td>
<td>C4</td>
<td>00</td>
</tr>
<tr>
<td>C4+</td>
<td>C4+</td>
<td>17</td>
</tr>
<tr>
<td>D4</td>
<td>D4</td>
<td>04</td>
</tr>
<tr>
<td>D4+</td>
<td>D4+</td>
<td>01</td>
</tr>
<tr>
<td>E4</td>
<td>E4</td>
<td>08</td>
</tr>
<tr>
<td>F4</td>
<td>E4</td>
<td>98</td>
</tr>
<tr>
<td>F4+</td>
<td>F4+</td>
<td>12</td>
</tr>
<tr>
<td>G4</td>
<td>G4</td>
<td>02</td>
</tr>
<tr>
<td>G4+</td>
<td>G4+</td>
<td>14</td>
</tr>
<tr>
<td>A4</td>
<td>A4</td>
<td>06</td>
</tr>
<tr>
<td>A4+</td>
<td>A4</td>
<td>98</td>
</tr>
<tr>
<td>B4</td>
<td>B4</td>
<td>10</td>
</tr>
<tr>
<td>C5</td>
<td>C5</td>
<td>00</td>
</tr>
</tbody>
</table>

You can manually edit your custom pitch-table across the remaining octaves of the keyboard. Or you can use the Calculator in the TS-12 to do this for you.

- Press the soft button above *CALCULATOR*. The display reads something like this:

```
PITCH-TABLE - EXTRAPOLATE  INTERPOLATE
KEY-RANGE START/END C4-C5  *EXIT*
```
The KEY-RANGE defines the area of the keyboard that the TS-12 will use as a reference by which to make its calculations.

To set the key-range:

- The START key (the first of the two key numbers shown) should be underlined. If not, press the soft button beneath it to select it. Now, play C4 (middle C) on the keyboard. The underline jumps to the END key.

- The END key should now be underlined. Play C5 on the keyboard. The parameter should read: KEY-RANGE START/END C4 – C5. You have defined the key range whose pitch intervals you want to duplicate over the entire keyboard.

Note that you can also set the start and end keys using the data entry controls, and press the soft button beneath them to toggle back and forth.

We began editing our pitch-table with note C4 and ended our editing with C5. This is the key-range for this particular pitch-table. Extrapolate will take the intervals between the notes in our one-octave custom pitch-table and apply them to the rest of the keyboard, resulting in a Pythagorean tuning covering the entire keyboard.

- Press EXTRAPOLATE. The display briefly reads PITCH-TABLE *CALCULATOR*, then returns with the Pythagorean temperament across the entire keyboard.

At this point you might want save this pitch-table by using the Copy function to write the program into a User RAM location as described earlier in this Section. Or, you can use the Copy function to copy the PITCHTABLE into another program, or even into the System, for use by all your programs.

**Creating and Interpolating a Custom Pitch-Table**

INTERPOLATE takes the interval between two notes on the keyboard and divides all the keys in between into equally-spaced fractions of that interval.

As an example, let's make the entire 5-octave keyboard of the TS-12 span just one octave in pitch from the lowest key to the highest.

- Using the procedure described earlier, create a custom pitch-table, and select PITCH-TABLE=CUSTOM on the Pitch Mods page.
- On the Select Voice page, press the soft button for EDIT PITCH-TABLE.
- Set KEY C2 = C3 AND 00 CENTS. Next, set KEY C7 = C4 AND 00 CENTS.

We’ve just established an interval of an octave between C2 and C7.

- Press “CALCULATOR*  
- Set the key range to KEY-RANGE START/END C2 -C7.  
- Press INTERPOLATE.

The TS-12 has just interpolated the octave (C3 to C4) and divided it equally across the 61 note keyboard, so we now have a 60 step octave.

**Warning:**

You must save the program containing your custom pitch-table, copy the custom pitch-table into another program, or into the system, or you will lose it as soon as you edit another sound.
Using the Copy page with Pitch-Tables

- Select a program which contains a custom pitch-table.
- Press Select Voice.
- Press either soft button beneath EDIT PITCH-TABLE.
- Press the Copy button. The display reads:

```
COPY PITCHTABLE PARAMETERS
SYSTEM RECALL MAKE COPY
```

Pressing Copy from the Pitch-Table Editor page will display the COPY PITCHTABLE PARAMETERS page with the following options:

The MAKE COPY option allows you to make a copy of the complete pitch-table from the currently selected program (or the Compare Buffer) into the Copy Buffer.

The RECALL option allows you to recall the complete pitch-table from the Copy Buffer into an edited version of the current program if 1) the current program has a pitch-table installed in it and 2) the Copy buffer contains a pitch-table. If you attempt to recall a Pitch-Table into a program without just previously having copied a pitch-table into the Copy buffer, the copy is not completed and an error message is displayed.

SYSTEM— As an added feature, the System pitch-table itself is user-definable. For instance, if you want to hear what other programs sound like using the custom pitch-table from a program, you can redefine the System pitch-table. Or, if your main tuning is “just intonation,” then it might be convenient for you to use this or some other alternate tuning as your System tuning.

To install an alternate tuning into the System pitch-table:

- Press the soft button beneath SYSTEM. The display briefly reads COPY TO SYSTEM PITCH-TABLE, and the custom pitch-table is installed into the TS-12 operating system where it is available for use by any program.
- Press the System button four times. The display shows:

```
SYSTEM PITCH-TABLE=CUSTOM
```

- Note that the System PITCH-TABLE parameter has been set to CUSTOM. Now all programs whose voices are set to use the system pitch-table (which is most programs) will use the custom pitch-table.

To return all programs to standard equi-tempered tuning, set the System PITCH-TABLE parameter back to NORMAL. Switching back to CUSTOM will restore your custom System pitch-table. You can switch back and forth as often as you wish. You can also try installing other custom pitch-tables in the System, but the System pitch-table can only contain one custom pitch-table at a time.
Dynamic Pitch-Table Selection
The TS-12 allows you to easily switch between different system pitch-tables in performance situations. With PITCH-TABLE=U1-PROGRAMS (on the System Page), you can instantly load new CUSTOM system pitch-tables without affecting the sound you are playing by selecting programs in BankSet U1. This allows you to change the tuning while playing, and without having to actually select a different sound.

In order for this feature to work correctly, you must set the system pitch-table switch to PITCH-TABLE=U1-PROGRAMS on the System page before “selecting” a new pitch-table program. If the program you indicate contains a valid pitch-table, it will be installed into the CUSTOM System pitch-table, and you will immediately hear the new tuning. If it does not, nothing will happen. In either case there will be no visible indication of your action. The program name will not be underlined when you “select” it, which is a good indication that you are using a pitch-table from a program in BankSet U1.

You may save programs (with or without pitch-tables) onto BankSet U1 in the normal way. It is suggested that you name programs that are to be used to install pitch-tables with names that describe the pitch-table they contain. For example, naming a program PT-PYTHA-F describes it as follows: PT for pitch-table program; PYTHA for Pythagorean tuning; and F for the tone center. This naming scheme is useful in making pitch-table programs easily recognizable.

In MIDI reception modes OMNI, POLY, and MONO A, incoming MIDI program changes 0 to 59 will select pitch-tables from BankSet U1, if PITCH-TABLE=U1-PROGRAMS on the System page. For more information about the MIDI MODE parameter, see Section 3 — MIDI Control Page Parameters.

About Wave-Lists
Hyper-Wave™ architecture allows up to 16 waves to be defined in a list, which can be swept through, or cross-faded for timbre-shifting and Jam-Loops. Hyper-Waves are created by selecting WAVE-LIST with the OPTION parameter found on the Program Control page (replacing voices 5 and 6 in a program). Note that when using a Wave-List, your polyphony is halved. This is to allow smooth transitions with the Wave-List XFADE-TIME (crossfade time) parameter, which requires two voices playing at the same time.

Wave-Lists have their own specific parameters, and are described in the following section.

How to Create a Wave-List
• Select a program into which you want to install a custom wave-list.
• Press Program Control. The display shows the Program Control page:

```
PROGRAM TYPE=KEYBOARD OPTION=*-NONE-*
PRESS=KEY PATCH=LIVE RESTRIKE=35
```

• Make sure OPTION=*-NONE-* is underlined.
• Press the **Up Arrow** button. The display reads:

```
REPLACE VOICES 5+6 WITH *EXIT*
PITCH-TABLE WAVE-LIST DRUM-MAP
```

Whenever you create a wave-list, the TS-12 will delete voices 5 and 6, and use the memory normally occupied by those parameters to store the wave-list.

• Press the soft button underneath WAVE-LIST to replace voices 5 & 6, and create a new default wave-list in the program. Selecting WAVE-LIST will also display the Select Voice page with the EDIT WAVE-LIST option activated. Note that the Program Control page will now show OPTION=WAVELIST to indicate that a wave-list is active in the program. The display shows:

```
SELV SAW-WAVE2 (SAW-WAVE2) (SAW-WAVE2)
00 (SAW-WAVE2) EDIT WAVE-LIST
```

• Select one of the four available voices. In the example above, the first voice is selected.

• Press the **Wave** button, select the Wave Class Category, and move the **Data Entry Slider** all the way up to select WAVE-LIST. The display shows:

```
WAVE WAVE-LIST WAVE-LIST DELAY=0000
START-STEP=01 LOOPSTART=01 END=16
```

• Press the **Select Voice** button. Your edited program now contains a Wave-List and voice #1 will now play the Wave-List.

**Note:** Voices that play the Wave-List will use two notes of polyphony for each note played. This is necessary to allow smooth crossfades between each Step in the Wave-List.

**Editing a Wave-List**

When a wave-list is active within the current program, the Select Voice page looks something like this:

```
SELV WAVE-LIST (SAW-WAVE2) (SAW-WAVE2)
00 (SAW-WAVE2) EDIT WAVE-LIST
```

The wave names of the four voices are shown with their mute status indicators, but the locations where voices 5 and 6 would normally be shown are occupied by the EDIT WAVE-LIST command.
When the displayed wave name for a voice is WAVE-LIST, the actual individual wave name for each step of the wave-list is shown only on the Wave-List Editor page (accessed by selecting EDIT WAVE-LIST). If a voice’s displayed wave name is anything other than WAVE-LIST, and it is active (no brackets around the wave name), then that voice will sound using the displayed wave whenever a key is pressed.

- Press either soft button beneath EDIT WAVE-LIST. This takes you to the Wave-List Editor page, where you can select any internal ROM waveform for each of the 16 different wave steps, set its start time, length, relative volume level, crossfade time, depth, pitch, transposition, detune amount, and its direction within the wave-list. For complete descriptions of the Wave-List Editor parameters, see Section 9 — Program Parameters.

**Note:** Remember to save the edited program after you have created and edited a wave-list.

### Removing a Wave-List

If a program contains a custom wave-list and you want to remove it (thus restoring voices 5 and 6) you can do so from the Program Control page:

To remove a custom wave-list:
- Press Program Control to display the Program Control page.
- Underline OPTION=WAVELIST.
- Press the Down Arrow button.
- The TS-12 will ask ERASE CURRENT WAVE-LIST ?
- Press *YES*. You are returned to the Select Voice page, the custom wave-list is gone, and voices 5 and 6 are reset to their default voices.

### Using the Copy page with Wave-Lists

Pressing Copy from the Wave-List Editor page will display the Copy page with the following options:

![Copy Page Options](image)

The MAKE COPY option allows you to make a copy of the complete Wave-List from the currently selected program (or the Compare Buffer) into the Copy Buffer. Pressing the lower right soft button beneath MAKE COPY will complete the command, and will show COPY COMPLETED before returning to the Copy page.

The RECALL option allows you to recall the complete Wave-List from the Copy Buffer into an edited version of the current program if 1) the current program has a Wave-List installed in it and 2) the Copy buffer contains a Wave-List. If you attempt to recall a Wave-List into a program without just previously having copied a Wave-List into the Copy buffer, the copy is not completed and the following message is displayed:

![Recall Failed Message](image)
About Drum-Maps

Drum-Maps are similar to pitch-tables in that they replace voices 5 and 6 in a program with a set of parameters which redefine the pitch of individual keys on the keyboard. Drum-Maps do not have the same tuning resolution as pitch-tables, but they add the ability to also assign different waves, volume levels, panning, and voice output assignments to individual keys across the keyboard. This feature is particularly useful for creating complex keyboard assignments for percussion applications, hence the name “Drum-Map.”

One very useful aspect of this feature is the ability to construct a TS-12 program which emulates the key mapping and sonic characteristics of an external drum machine or percussion sound module, allowing you to record and play sequencer tracks which are compatible with the maps used by any external MIDI device. You may also exercise your creativity in coming up with other uses for the remapping functions provided by this feature.

The basic function of a Drum-Map is to control how keys are assigned to voices, and to provide a certain set of parameters to control how the voice is played. When you play a key, the system looks in the drum-map for information about pitch, volume, panning, wave type, and destination voice(s) for that particular key. Based on this information, the key is sent to one or more voices to be played. The exact way that the key will sound depends both on the information in the drum-map and the parameter settings of the destination voice(s).

Drum-Maps contain information about 61 keys. This represents the range from B1 to B6 on the TS-12 (MIDI keys 35 to 95). This range was designed to comply with the General MIDI Drum-Map spec.

### General MIDI Drum Map

<table>
<thead>
<tr>
<th>MIDI Note #</th>
<th>TS-12 Note</th>
<th>GM Drum Sound</th>
<th>MIDI Note #</th>
<th>TS-12 Note</th>
<th>GM Drum Sound</th>
</tr>
</thead>
<tbody>
<tr>
<td>35</td>
<td>B1</td>
<td>Acoustic Bass Drum</td>
<td>59</td>
<td>B3</td>
<td>Ride Cymbal 2</td>
</tr>
<tr>
<td>36</td>
<td>C2</td>
<td>Bass Drum 1</td>
<td>60</td>
<td>C4</td>
<td>Hi Bongo</td>
</tr>
<tr>
<td>37</td>
<td>C2+</td>
<td>Side Stick</td>
<td>61</td>
<td>C4+</td>
<td>Low Bongo</td>
</tr>
<tr>
<td>38</td>
<td>D2</td>
<td>Acoustic Snare</td>
<td>62</td>
<td>D4</td>
<td>Mute Hi Conga</td>
</tr>
<tr>
<td>39</td>
<td>D2+</td>
<td>Hand Clap</td>
<td>63</td>
<td>D4+</td>
<td>Open Hi Conga</td>
</tr>
<tr>
<td>40</td>
<td>E2</td>
<td>Electric Snare</td>
<td>64</td>
<td>E4</td>
<td>Low Conga</td>
</tr>
<tr>
<td>41</td>
<td>F2</td>
<td>Low Floor Tom</td>
<td>65</td>
<td>F4</td>
<td>High Timbale</td>
</tr>
<tr>
<td>42</td>
<td>F2+</td>
<td>Closed Hi-Hat</td>
<td>66</td>
<td>F4+</td>
<td>Low Timbale</td>
</tr>
<tr>
<td>43</td>
<td>G2</td>
<td>High Floor Tom</td>
<td>67</td>
<td>G4</td>
<td>High Agogo</td>
</tr>
<tr>
<td>44</td>
<td>G2+</td>
<td>Pedal Hi-Hat</td>
<td>68</td>
<td>G4+</td>
<td>Low Agogo</td>
</tr>
<tr>
<td>45</td>
<td>A2</td>
<td>Low Tom</td>
<td>69</td>
<td>A4</td>
<td>Cabasa</td>
</tr>
<tr>
<td>46</td>
<td>A2+</td>
<td>Open Hi-Hat</td>
<td>70</td>
<td>A4+</td>
<td>Maracas</td>
</tr>
<tr>
<td>47</td>
<td>B2</td>
<td>Low-Mid Tom</td>
<td>71</td>
<td>B4</td>
<td>Short Whistle</td>
</tr>
<tr>
<td>48</td>
<td>C3</td>
<td>Hi Mid Tom</td>
<td>72</td>
<td>C5</td>
<td>Long Whistle</td>
</tr>
<tr>
<td>49</td>
<td>C3+</td>
<td>Crash Cymbal 1</td>
<td>73</td>
<td>C5+</td>
<td>Short Guiro</td>
</tr>
<tr>
<td>50</td>
<td>D3</td>
<td>High Tom</td>
<td>74</td>
<td>D5</td>
<td>Long Guiro</td>
</tr>
<tr>
<td>51</td>
<td>D3+</td>
<td>Ride Cymbal 1</td>
<td>75</td>
<td>D5+</td>
<td>Claves</td>
</tr>
<tr>
<td>52</td>
<td>E3</td>
<td>Chinese Cymbal</td>
<td>76</td>
<td>E5</td>
<td>High Wood Block</td>
</tr>
<tr>
<td>53</td>
<td>F3</td>
<td>Ride Bell</td>
<td>77</td>
<td>F5</td>
<td>Low Wood Block</td>
</tr>
<tr>
<td>54</td>
<td>F3+</td>
<td>Tambourine</td>
<td>78</td>
<td>F5+</td>
<td>Mute Cuica</td>
</tr>
<tr>
<td>55</td>
<td>G3</td>
<td>Splash Cymbal</td>
<td>79</td>
<td>G5</td>
<td>Open Cuica</td>
</tr>
<tr>
<td>56</td>
<td>G3+</td>
<td>Cowbell</td>
<td>80</td>
<td>G5+</td>
<td>Mute Triangle</td>
</tr>
<tr>
<td>57</td>
<td>A3</td>
<td>Crash Cymbal 2</td>
<td>81</td>
<td>A5</td>
<td>Open Triangle</td>
</tr>
</tbody>
</table>
How to Create a Drum-Map

- Select a program into which you want to install a custom drum-map.
- Press Program Control. The display shows the Program Control page:

```
PROGRAM TYPE=KEYBOARD OPTION=*-NONE-*
PRESS=KEY PATCH=LIVE RESTRIKE=35
```

- Make sure OPTION=*-NONE-* is underlined.
- Press the Up Arrow button. The display reads:

```
REPLACE VOICES 5+6 WITH *EXIT*
PITCH-TABLE WAVE-LIST DRUM-MAP
```

Whenever you create a custom drum-map, the TS-12 will delete voices 5 and 6, and use the memory normally occupied by those parameters to store the drum-map.

- Press the soft button underneath DRUM-MAP to replace voices 5 & 6, and create a new default drum-map in the program. Selecting DRUM-MAP will also display the Select Voice page with the Edit Drum-Map option activated. Note that the Program Control page will now show OPTION=DRUM-MAP to indicate that a drum-map is active in the program. The display looks something like this:

```
SELV DRUM-MAP DRUM-MAP DRUM MAP
00 DRUM-MAP EDIT DRUM MAP
```

- Select one of the four available voices. In the example above, the first voice is selected.
Press the **Wave** button. The display shows:

```
WAVE  DRUM-MAP  DRUM-MAP  DELAY=0000
        DIR=FORWARD
```

As you can see, activating a Drum-Map in a Program automatically changes the Wave for the four remaining voices to Drum-Map. Your edited program now contains a Drum-Map and all four voices will play the Drum-Map.

**Note:** When a Program contains a Drum-Map, the OCTAVE and SEMITONE values on the PITCH page will have no effect on the Drum-Map. You can still use pitch modulation to obtain more drastic pitch shifts than are possible within the PITCH parameter in the Drum Map Editor.

**Editing a Drum-Map**

When a Drum-Map is active within the current program, the Select Voice page looks something like this:

```
SELV  DRUM-MAP  DRUM-MAP  DRUM-MAP
00  DRUM-MAP  EDIT  DRUM-MAP
```

The wave names of the four voices are shown with their mute status indicators, but the locations where voices 5 and 6 would normally be shown are occupied by the Edit Drum-Map command.

When the displayed wave name for a voice is DRUM-MAP, the actual individual wave name for each key of the drum-map is shown only on the Drum-Map Editor page (accessed by selecting EDIT DRUM-MAP). If a voice’s displayed wave name is anything other than DRUM-MAP (for example, SAW-WAVE2, as in voice 3 above), then that voice will sound using the displayed wave whenever it receives a key from the drum-map.

The lower left corner of the display indicates the current Patch Select status, which has special significance for programs containing Drum-Maps. For each of the four Patch Select settings, the mute status of the four voices controls which voices will respond to drum-map keys assigned to that patch. In the Drum-Map Editor, each key is assigned to one of the four patches or to a single default drum-voice template which resides in ROM.

- Press either soft button beneath EDIT DRUM-MAP. This takes you to the Drum Map Editor page, where you can assign different waves, volume levels, panning, and voice output assignments to each key across the keyboard. For complete descriptions of the Drum Map Editor parameters, see **Section 9 — Program Parameters**.

**Note:** Remember to save the edited program after you have created and edited a drum-map.
Removing a Drum-Map

If a program contains a custom drum-map and you wish to remove it (thus restoring voices 5 and 6) you can do so from the Program Control page. To remove a custom drum-map:

- Press Program Control to display the Program Control page.
- Underline OPTION=DRUM-MAP.
- Press the Down Arrow button.
- The TS-12 will ask ERASE CURRENT DRUM-MAP?
- Press *YES*. You are returned to the Select Voice page, the custom drum-map is gone, and voices 5 and 6 are reset to their default voices.

Using the Copy page with Drum-Maps

Pressing Copy from the Drum-Map Editor page will display the Copy page with the following options:

<table>
<thead>
<tr>
<th>COPY</th>
<th>DRUM-MAP PARAMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>KEY RANGE</td>
<td>RECALL</td>
</tr>
</tbody>
</table>

The MAKE COPY option allows you to make a copy of the complete Drum-Map from the currently selected program (or the Compare Buffer) into the Copy Buffer.

The RECALL option allows you to recall the complete Drum-Map from the Copy Buffer into an edited version of the current program if 1) the current program has a Drum-Map installed in it and 2) the Copy buffer contains a Drum-Map. If you attempt to recall a Drum-Map into a program without just previously having copied a Drum-Map into the Copy buffer, the copy is not completed and the following message is displayed:

| RECALL FAILED |
| CONTEXT INCOMPATIBLE |

Selecting the KEY RANGE option will display another page which allows you to fill a range of keys with copies of the currently selected Drum-Map key (the key that was shown on the Drum-Map Editor page when you pressed Copy).

| COPY CURRENT DRUM-MAP KEY TO *COPY* |
| KEY-RANGE START/END *** - *** *EXIT* |

You can specify the range of keys in the drum-map to be filled by selecting the KEY-RANGE START/END parameter and then playing the lowest and then highest key of the range. You can also edit these parameters using the Data Entry Slider or the Up/Down Arrow buttons. Press the soft button to select between the Start and End key fields.

Selecting *COPY* will complete the command and will show COPY DONE before returning to the Copy page.

Selecting *EXIT* will simply return the Copy page without affecting the Drum-Map.
Section 9 — Program Parameters

This section covers the parameters which can be edited independently for each Voice within a Program. For a general overview of the program concepts involved, refer to the previous section.

LFO Page

The LFO Page contains the parameters related to the Low Frequency Oscillator. Each voice in a program has its own LFO, which can be assigned as a modulator wherever a modulation source is selected. LFO’s are commonly used to create vibrato, tremolo and other effects.

Press the LFO button. This takes you to the first sub-page of the LFO page:

![LFO parameters interface]

**LFO RATE**

Range: 00 to 99

Determines the speed of the LFO. The table below shows the frequency (in hertz) for each value:

<table>
<thead>
<tr>
<th>value</th>
<th>time (in Hz)</th>
<th>value</th>
<th>time (in Hz)</th>
<th>value</th>
<th>time (in Hz)</th>
<th>value</th>
<th>time (in Hz)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>.00</td>
<td>20</td>
<td>.63</td>
<td>40</td>
<td>2.17</td>
<td>60</td>
<td>4.77</td>
</tr>
<tr>
<td>1</td>
<td>.01</td>
<td>21</td>
<td>.67</td>
<td>41</td>
<td>2.30</td>
<td>61</td>
<td>4.90</td>
</tr>
<tr>
<td>2</td>
<td>.03</td>
<td>22</td>
<td>.70</td>
<td>42</td>
<td>2.43</td>
<td>62</td>
<td>5.03</td>
</tr>
<tr>
<td>3</td>
<td>.07</td>
<td>23</td>
<td>.73</td>
<td>43</td>
<td>2.56</td>
<td>63</td>
<td>5.16</td>
</tr>
<tr>
<td>4</td>
<td>.10</td>
<td>24</td>
<td>.77</td>
<td>44</td>
<td>2.69</td>
<td>64</td>
<td>5.29</td>
</tr>
<tr>
<td>5</td>
<td>.13</td>
<td>25</td>
<td>.80</td>
<td>45</td>
<td>2.82</td>
<td>65</td>
<td>5.42</td>
</tr>
<tr>
<td>6</td>
<td>.17</td>
<td>26</td>
<td>.83</td>
<td>46</td>
<td>2.95</td>
<td>66</td>
<td>5.55</td>
</tr>
<tr>
<td>7</td>
<td>.20</td>
<td>27</td>
<td>.87</td>
<td>47</td>
<td>3.08</td>
<td>67</td>
<td>5.68</td>
</tr>
<tr>
<td>8</td>
<td>.23</td>
<td>28</td>
<td>.90</td>
<td>48</td>
<td>3.21</td>
<td>68</td>
<td>5.81</td>
</tr>
<tr>
<td>9</td>
<td>.27</td>
<td>29</td>
<td>.93</td>
<td>49</td>
<td>3.34</td>
<td>69</td>
<td>5.94</td>
</tr>
<tr>
<td>10</td>
<td>.30</td>
<td>30</td>
<td>.97</td>
<td>50</td>
<td>3.47</td>
<td>70</td>
<td>6.07</td>
</tr>
<tr>
<td>11</td>
<td>.33</td>
<td>31</td>
<td>1.00</td>
<td>51</td>
<td>3.60</td>
<td>71</td>
<td>6.20</td>
</tr>
<tr>
<td>12</td>
<td>.37</td>
<td>32</td>
<td>1.13</td>
<td>52</td>
<td>3.73</td>
<td>72</td>
<td>6.33</td>
</tr>
<tr>
<td>13</td>
<td>.40</td>
<td>33</td>
<td>1.26</td>
<td>53</td>
<td>3.86</td>
<td>73</td>
<td>6.46</td>
</tr>
<tr>
<td>14</td>
<td>.43</td>
<td>34</td>
<td>1.39</td>
<td>54</td>
<td>3.99</td>
<td>74</td>
<td>6.59</td>
</tr>
<tr>
<td>15</td>
<td>.47</td>
<td>35</td>
<td>1.52</td>
<td>55</td>
<td>4.12</td>
<td>75</td>
<td>6.72</td>
</tr>
<tr>
<td>16</td>
<td>.50</td>
<td>36</td>
<td>1.65</td>
<td>56</td>
<td>4.25</td>
<td>76</td>
<td>6.85</td>
</tr>
<tr>
<td>17</td>
<td>.53</td>
<td>37</td>
<td>1.78</td>
<td>57</td>
<td>4.38</td>
<td>77</td>
<td>6.98</td>
</tr>
<tr>
<td>18</td>
<td>.57</td>
<td>38</td>
<td>1.91</td>
<td>58</td>
<td>4.51</td>
<td>78</td>
<td>7.11</td>
</tr>
<tr>
<td>19</td>
<td>.60</td>
<td>39</td>
<td>2.04</td>
<td>59</td>
<td>4.64</td>
<td>79</td>
<td>7.24</td>
</tr>
</tbody>
</table>

**Track RATE Mod Selector**

Range: enabled (*) or disabled (blank)

Press the soft button above the RATE parameter again to enable or disable the Track RATE parameter independently for each LFO. When an asterisk (*) is displayed, the Track RATE parameter will affect the Rate of the LFO. If there is no asterisk, then the Track RATE parameter will have no effect on the Rate of the LFO. This allows you to define whether or not each voice in a Program will have its LFO Rate modulated by the Track RATE parameter. Successive presses
of the soft button above RATE will toggle between the Rate value and the Track RATE Mod selector.

**Tip:** If you set the LFO Rate to 00, and the RESTART-MODE parameter to ON, you can use the LFO as a gated modulator with a variable depth. Use WAVESHAPE=SQUARE, because it starts high.

**RATE MODSRC**  
Range: various  
Selects a modulation source for LFO RATE from among the 15 available modulators.

**RATE MODAMT**  
Range: 00 to 99  
Determines the amount by which the assigned RATE modulator will affect the LFO RATE. The effect of RATE MODAMT is **added** to the effect of the LFO RATE parameter.

**DEPTH**  
Range: 00 to 99  
Sets the “manual” level of the LFO. DEPTH controls the initial amount of LFO.

**DEPTH MODSRC**  
Range: various  
Selects a modulation source for LFO DEPTH from among the 15 available modulators.

**DEPTH MODAMT**  
Range: -99 to +99  
Determines the amount by which the assigned DEPTH modulator will affect the LFO DEPTH. The effect of DEPTH MODAMT is **added** to the effect of the LFO DEPTH parameter.

Press the LFO button again to access the second sub-page of the LFO page. The display reads:

```
LFO WAVESHAPE=TRIANGLE RESTART-MODE=ON
PHASE=035 DELAY=25 NOISE-RATE=70
```

**WAVESHAPE**  
Range: various (see below)  
The Waveshape determines how the LFO signal will rise and fall. There are seven possible values:

- TRIANGLE — the triangle wave is commonly used to modulate pitch to produce vibrato.
- SINE — the sine wave is a pure fundamental frequency, more rounded in its peaks and valleys than the triangle wave.
- SINE/ TRI — a mixture of a sine and triangle wave, a sort of pointy sine wave.
- POS/SINE — the POS/SINE is a positive-only sine wave, similar in application to the POS/TRI.
- POS/TRI — the POS/TRI is a positive-only triangle wave useful for simulating vibrato on sounds like the guitar, where vibrato techniques are limited to bending the note up.
- SAWTOOTH — the sawtooth wave is commonly used for special effects.
- SQUARE — this positive-only square wave is useful for producing in-tune trill effects.
**LFO Waveshapes**

![LFO Waveshapes Diagram](image)

**RESTART-MODE**  
Range: OFF or ON  
Determines whether the LFO will restart with each keystroke. When set to OFF, the LFO will cycle continuously without resetting. When set to ON, the LFO waveform will always start at the starting phase, as determined by the PHASE parameter, each time a new key is struck.

**PHASE**  
Range: 000 to 255  
Determines the starting phase of the LFO, when RESTART-MODE=ON. With a setting of 000, the LFO will always restart at the beginning of its cycle.

**DELAY**  
Range: 00 to 99  
Determines the time it takes for the LFO to go from zero to the amount set with the DEPTH parameter. Values above 0 will cause the LFO to take longer to achieve its full depth. This is useful for creating delayed vibrato, tremolo, etc.

**NOISE-RATE**  
Range: 00 to 99  
One of the TS-12’s 15 available modulation sources is NOISE. The NOISE modulator produces a randomly changing level. Its main use is to randomize or “humanize” pitch when applied as a pitch modulator. It can also be used to randomize any other modulation destination. Typically, the NOISE signal might look like this:

![Noise Rate Diagram](image)

NOISE-RATE determines how frequently the random level will change. Low values will cause it to change very slowly; with high values the level will change quickly.
ENV1, ENV2, ENV3 — TS-12 Envelopes

An Envelope is a shape, or contour, which we apply to a signal source to make it change over time. Each TS-12 voice has three envelopes. These envelopes are automatically routed to the pitch, filter frequency and amplitude of the voice, though ENV1 and ENV2 can also be assigned elsewhere, wherever a modulator is selectable.

- ENV1 is routed to the pitch of the voice. There is a parameter always available on the Pitch Mods page which lets you adjust the amount by which ENV1 will modulate the voice’s pitch.
- ENV2 is routed to the filter cutoff frequency of the voice. For each of the voice’s two filters, the ENV2 parameter on the Filters page controls the ENV2 depth.
- ENV3 is routed to the amplitude (volume) of the voice. ENV3 always controls the final volume contour of the voice. Any other volume modulators selected on the Output page will occur before ENV3 in the signal flow.

The TS-12 envelopes are descended from the venerable ADSR (attack, decay, sustain, release) envelope, but with many refinements. While the ADSR envelope gives you control over three time segments and one level, the TS-12 envelopes give you control over four levels and five time segments.

The illustration below shows the make-up of a TS-12 envelope:

![Envelope Diagram](image)

Each envelope page consists of three sub-pages, which are reached by repeatedly pressing the Env 1, Env 2, or Env 3 button. For each envelope page:
- The first sub-page contains the five time segments: ATTACK, DECAY1, DECAY2, DECAY3 and RELEASE.
- The second sub-page contains the four levels: PEAK, BREAK1, BREAK2, SUSTAIN; this sub-page also contains the VEL-LEV velocity-to-levels modulation amount.
- The third sub-page contains the Envelope mode, keyboard scaling, and several parameters for shaping the velocity response of the envelope.

ENV1, ENV2 and ENV3 Pages

The ENV1, ENV2 and ENV3 Pages, parameters and ranges are all the same except where indicated below. We will use ENV3 as our example, since its effect on the volume of the voice is immediately apparent.
Press the Env 3 button to get to the first ENV3 sub-page containing the five TIME parameters:

Note that the numbers shown here represent *times*, not rates. That is, the envelope will take a fixed amount of time to go from one level to another no matter how close together or far apart those two levels are.

**ATTACK**

Range: 00 to 99 (see the Envelope Times chart below for a listing of the time values)

The amount of time it takes for the envelope level to travel from zero (when the key is struck) to the PEAK level. The higher the value, the longer the time.

**Track Attack Mod Selector**

Range: enabled (*) or disabled (blank)

Press the soft button above the ATTACK parameter again to enable or disable the Track ATTACK parameter independently for each Envelope. When an asterisk (*) is displayed, the Track ATTACK parameter will affect the Attack Time of the Envelope. If there is no asterisk, then the Track ATTACK parameter will have no effect on the Attack Time of the Envelope. This allows you to define whether or not each Envelope in each Voice in a Program will have its Attack Time modulated by the Track ATTACK parameter. Successive presses of the soft button above ATTACK will toggle between the Attack value and the Track ATTACK Mod selector.

**DECAY 1**

Range: 00 to 99

The time it takes the envelope to go from PEAK to BREAK 1.

**DECAY 2**

Range: 00 to 99

The time it takes the envelope to go from BREAK 1 to BREAK 2.

**DECAY 3**

Range: 00 to 99

The time it takes the envelope to go from BREAK 2 to the SUSTAIN stage. At the end of DECAY 3, the envelope will remain at the SUSTAIN level until the key is released.

**RELEASE**

Range: 00 to 99

This defines the time it will take the envelope to return to zero after the key has been released.

**Track Release Mod Selector**

Range: enabled (*) or disabled (blank)

Press the soft button below the RELEASE parameter again to enable or disable the Track RELEASE parameter independently for each Envelope. When an asterisk (*) is displayed, the Track RELEASE parameter will affect the Release Time of the Envelope. If there is no asterisk, then the Track RELEASE parameter will have no effect on the Release Time of the Envelope. This allows you to define whether or not each Envelope in each Voice in a Program will have its Release Time modulated by the Track RELEASE parameter. Successive presses of the soft button below RELEASE will toggle between the Release value and the RELEASE Mod selector.
Press Env 3 again. This takes you to the second ENV3 sub-page, which shows the five LEVELS:

<table>
<thead>
<tr>
<th>TIME</th>
<th>PEAK</th>
<th>BREAK 1</th>
<th>BREAK 2</th>
<th>SUSTAIN</th>
<th>VEL-LEV</th>
</tr>
</thead>
<tbody>
<tr>
<td>00</td>
<td>99</td>
<td>86</td>
<td>76</td>
<td>70</td>
<td></td>
</tr>
</tbody>
</table>

**PEAK**
- Range: 00 to 99
  - Determines the level the envelope will reach at the end of the time defined by ATTACK.

**BREAK 1**
- Range: 00 to 99
  - Determines the level the envelope will reach at the end of DECAY 1.

**BREAK 2**
- Range: 00 to 99
  - Determines the level the envelope will reach at the end of DECAY 2.

**SUSTAIN**
- Range: 00 to 99
  - Determines the level the envelope will reach at the end of DECAY 3 and retain as long as the key is held down.

**VEL-LEV**
- Range: 00 to 99
  - The Velocity level parameter will lower all envelope level settings with a softer keystrike. This means the settings you assign to PEAK, BREAK 1, and BREAK 2 and SUSTAIN are maximum levels — the levels that will be reached with the hardest keystrike. The amount of VEL-LEV will determine how much those levels will be reduced as you play softer. With this parameter you can have continuous dynamic control over the five levels by varying how hard you play. The Velocity Curve (VEL-CURVE on next sub-page) controls the response of the VEL-LEV parameter, reshaping the way that velocity modulates the envelope levels. This provides further control over the velocity response of the envelope.

---

Section 9 — Program Parameters TS-12 Musician’s Manual

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Press the Env 3 button again. This displays the final sub-page for ENV 3:

```
Env3  MODE=NORMAL  VEL-CURVE=CONVEX-2
KBDTRK=+00  VEL-ATTCK=12  VEL-RELS=+08
```

**MODE (ENV 1 and ENV 2)**

Range: NORMAL, FINISH, or REPEAT

- **NORMAL** — The envelope plays through normally.
- **FINISH** — The envelope runs its full cycle — finishes playing through all its stages — ignoring the key-up event. The envelope spends no time at the sustain stage. As soon as DECAY 3 is finished, instead of stopping at the sustain stage the envelope immediately goes into the release stage. This is good for percussive-type sounds where you want the envelope to be the same for every note, no matter how long the key is held down.
- **REPEAT** — In this mode, at the end of the DECAY3 stage, instead of sustaining, the envelope goes immediately back to the beginning of the envelope and repeats. When the key is released, the envelope stops repeating, and moves into the release stage. This type of envelope can be used to create complex LFO-type effects. When ENV3 is set to MODE=REPEAT, each time Envelope 3 restarts it will restart the Wave from its SAMPLE-START-OFFSET value.

**MODE (ENV 3)**

Range: NORMAL, FINISH, or REPEAT

**Voice Triggering/Stealing Notes**

Since Env 3 controls the volume of the voice, there are a number of special considerations to be aware of when using the different envelope modes:

- In NORMAL mode, if you set a delay on the voice, and you release the key before the designated delay time elapses, the voice will not sound.
- In FINISH mode, if you set a delay on the voice and you release the key before the designated delay time elapses, the note will sound anyway, and then envelope will run through its full cycle. The envelope finishes what you set it up to do.
- In REPEAT mode, the envelope will repeatedly cycle through the PEAK and BREAK 1 and 2 LEVELS, using the ATTACK and all three DECAY times, for as long as the key is held down. When envelope gets to the SUSTAIN level, it goes back to the INITIAL level. The TS-12 restarts the wave at its SAMPLE-START-OFFSET every time the envelope repeats.

In order to maximize the use of the TS-12’s 32 voices, and to manage the “voice stealing” it is sometimes useful to understand when a given voice will be assigned and when it will be released, or “put back” into the pool for use by other sounds. This depends on a combination of envelope mode and the wave type.
A looped (sustaining) wave will continue to use the voice until the envelope reaches zero. For a sustaining wave, when the Envelope Mode is Normal:

For a sustaining wave, when the Envelope Mode is set to Finish:

For unlooped, non-sustaining, waves (specifically those in the Percussion and Drum categories) the voice becomes free as soon as the sample has played through to the end, no matter where the envelope level is. The voice is released for use by another sound:

**VEL-CURVE**

Range: (described below)

This selects which of the ten available velocity response curves the envelope will use if the velocity level control (VEL-LEVEL) is set to some value other than zero. The velocity response curves are shown on the next page. Available values are: QUIKRISE, CONVEX-1, CONVEX-2, CONVEX-3, LINEAR, CONCAVE1, CONCAVE2, CONCAVE3, CONCAVE4, and LATERISE.
KBDTRK
Range: -99 to +99
KBDTRK makes the envelope times shorter or longer depending on the key played. The scaling effect of this parameter is based on a 76-note keyboard, with a center break point at F4+.

Positive values will make all envelope times (except Release) shorter for keys above F4+, and longer for keys below F4+. Negative values will have the opposite effect. Envelope times for F4+ are not affected by this parameter.

VEL-ATCK
Range: 00 to 99
This parameter makes envelope ATTACK time respond to velocity. Raising the VEL-ATCK value above zero makes the envelope ATTACK time shorter with harder keystrikes. If ATTACK=00, this parameter will have no effect.

VEL-RELS
Range: -99 to +99
This parameter makes envelope RELEASE time respond to velocity. When the value of VEL-RELS is positive, a harder keystrike will result in a longer release. Likewise, when the value of VEL-RELS is negative, a harder keystrike will result in a shorter release. Note that this parameter will have no effect if RELEASE = 00.

Pitch Page
The Pitch page parameters determine the “manual” levels for the pitch of the voice, as well as the poly/mono voice assignment mode.

Note: When a Program contains a Drum-Map, the OCTAVE and SEMITONE values on the PITCH page will have no effect on the Drum-Map. You can still use pitch modulation to obtain more drastic pitch shifts than are possible within the PITCH parameter in the Drum Map Editor.

Press the Pitch button. The display shows the PITCH page.
**OCTAVE**
Range: -4 to +4 octaves
Changes the pitch of the voice by octaves.

**SEMITONE**
Range: -11 to +11
Changes the pitch of the voice by semitones. Incrementing/decrementing this control beyond +11 or -11 automatically increases/decreases the octave by one.

**FINE**
Range: -99 to +99
Fine-tunes the pitch of the voice by steps of one cent (1/100 of a semitone).

**GLIDEMODE**
Range: (described below)
Enables Glide (portamento) and several forms of monophonic voice assignment in each voice. There are six GLIDE modes available:

For monophonic voice assignment without glide, set GLIDEMODE to LEGATO, TRIGGER, or MINIMODE, and set TIME=0.

- **NONE** — Glide is off. This is normal polyphonic operation, with no portamento.
- **PEDAL** — Enables the sustain pedal to start polyphonic glide. In this mode, the glide and polyphony are controlled by the sustain pedal. When the pedal is up, there is no glide and the voice is fully polyphonic. When the sustain pedal is depressed, the glide is enabled, and the polyphony is limited to the number of notes being sounded at the moment. For example, with the pedal up play a three-note chord. Press the sustain pedal and lift your fingers off the keys (the three notes will sustain). Now press another key: one of these sustaining notes will be stolen and will glide to the new note. The envelopes and waves are retriggered, or restarted, each time there is a new key down. Holding a key down will prevent the note from being stolen. This allows controlled voice leading.
- **MONO** — Similar to mono mode on old analog synths. The voice will play with one-note polyphony, and new notes will always glide from the previous note. The envelopes and waves are always retriggered, or restarted, each time there is a new key down.
- **LEGATO** — Enables monophonic voice assignment, allowing only one note of polyphony to be active in the voice. If a key is depressed before another is released (i.e.: if you play legato), the voice will glide from the old note to the new one. If you play a key with no other keys down (i.e.: if you play staccato), the voice will not glide. The envelopes and waves are retriggered, or restarted, from the beginning each time there is a new key down.
- **TRIGGER** — This mode plays monophonically, with the envelopes and waves retriggering, or restarting, each time there is a new key down. This mode works just like LEGATO mode, except that it has no “note memory”. It is ideal for adding monophonic piano “thuds” to piano sounds.
- **MINIMODE** — This mode plays with one-voice polyphony, and new notes will glide from the previous note if the previous note is still held. Unlike the PEDAL, MONO, LEGATO or TRIGGER modes, the envelopes and waves are only restarted from the beginning when you play a key with no other keys down (i.e.: if you play staccato).

**Note:** MONO, LEGATO and MINIMODE feature “note memory.” If you release a key while still holding down another key, the pitch will glide back to the note you are holding. Holding down the sustain pedal will dynamically disable note memory.
GLIDE MODES

<table>
<thead>
<tr>
<th>MODE</th>
<th>Staccato Glide</th>
<th>Legato Glide</th>
<th>Legato Envelope Retrigger</th>
<th>Note Memory</th>
</tr>
</thead>
<tbody>
<tr>
<td>PEDAL (WITH PEDAL DOWN)</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>MONO</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>LEGATO</td>
<td>NO</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>TRIGGER</td>
<td>NO</td>
<td>YES</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>MINIMODE</td>
<td>NO</td>
<td>YES</td>
<td>NO</td>
<td>YES</td>
</tr>
</tbody>
</table>

GLIDETIME

Range: 00 to 99
This parameter controls the time it takes for the pitch to slide smoothly (glide) from one note to another. The higher the value, the longer the glide time. The TS-12 uses Constant-Time Portamento. This means that it will take the same amount of time to glide between notes that are close together (i.e.: C4 to D4) as it will to glide between notes that are far apart (i.e.: C4 to C7).

Pitch Mods Page

The Pitch Mods page parameters control pitch modulation for the voice.

Press the Pitch Mods button. The display shows the Pitch Mods page.

MODSRC

Range: various
Selects a modulation source for the pitch of the voice from among the 15 available modulators.

MODAMT

Range: -99 to +99
Determines the amount by which the assigned pitch modulator will affect pitch.

BEND

Range: 00 to 12, 00H to 12H, or SYS
Determines whether each voice in the program will have its own independent pitch bend range, or whether it will use the system pitch bend range to determine the maximum pitch change that can be applied by the pitch bend wheel. When BEND=SYS, the voice will use the system pitch bend range setting. See the description of the PITCH-BEND parameter on the System Page in Section 2 — System Page Parameters for more information on the system pitch bend range.

PITCHTBL

Range: SYSTEM, ALL-C4, or CUSTOM
Pitch-tables allow you to map each key on the keyboard to play at any desired pitch. They provide a user-definable tuning table for each note on the keyboard. This parameter lets you select which pitch-table the voice will use.

When you create a custom pitch-table, the TS-12 stores the pitch-table inside the program. Within the program, the custom pitch-table uses the space normally used to store the parameters for voices 5 and 6. Therefore, when there is a custom pitch-table in a program, voices 5 and 6 are not available. They are replaced on the Select Voice page by the EDIT PITCH TABLE function. Of the remaining four voices, each individual voice can be assigned to use either the SYSTEM pitch-table, no pitch-table (ALL-C4), or the CUSTOM pitch-table that resides within the program.
• SYSTEM — Uses whatever is selected as the system pitch-table on the System page. Normally this is standard twelve-tone equal temperament tuning across the keyboard. However, a custom pitch-table can be copied into the system pitch-table for use by all sounds. The PITCH-TABLE parameter on the System page determines what the System pitch-table will be.
• ALL-C4 — No pitch tracking — the same pitch (C4) plays across the keyboard.
• CUSTOM — User definable pitch-table. This option is only available if a custom pitch-table has been created in the program.

ENV1
Range: -99 to +99
This hard-wired modulation routing determines the amount by which Envelope 1 will affect pitch. Unlike applying ENV-1 as a pitch modulator with the generic pitch MODSRC parameter, the hard-wired ENV1 parameter forces Envelope 1 to always sustain at the manual pitch setting on the Pitch page. The Envelope 1 SUSTAIN level no longer controls the pitch at which Envelope 1 will sustain. Instead, it becomes an "equator-shift" value, determining which Envelope 1 level values will cause the pitch to rise above the manual pitch setting and which level values will drive it below. Envelope 1 level values equal to the SUSTAIN level value will sound at the manual setting. Higher level values will shift the pitch upward from the manual pitch setting, and lower values will shift the pitch downward. This feature allows for the creation of bi-directional pitch envelope shapes, while conveniently ensuring that voices will always sustain at the manual pitch setting, without the need to offset the manual pitch setting on the Pitch page.

LFO
Range: -99 to +99
Determines the amount by which the LFO (Low Frequency Oscillator) will affect pitch.

Filters Page
Each TS-12 voice has its own pair of digital filters, FILTER 1 and FILTER 2, which are connected in series. The filter settings determine which ranges of frequencies will be allowed to pass through to the output.

Low-pass/High-pass
A low-pass filter allows only those frequencies below the filter cutoff frequency to pass — higher frequencies are filtered out. The reverse is true for a high-pass filter — it lets frequencies higher than the cutoff frequency pass and filters out those below. In the TS-12, FILTER 1 is always a low-pass filter. FILTER 2 can be either a high-pass or low-pass filter.

Poles — Rolloff Curves
"Pole" is an engineering term which describes the steepness of a filter, or the filter’s cutoff slope. Each additional pole gives a filter a steeper rolloff curve. In the TS-12, the filter modes are interdependent; that is, the combined number of poles in FILTER 1 and FILTER 2 is always four.

These four poles are divided between the two filters; either as 2 and 2, or as 3 and 1. There are two FILTER Pages; however, if you change the number of poles on either page, you will change the number of poles on the other page — high-pass will remain high-pass, but the number of poles will change.

A 1-pole filter will rolloff at 6 dB per octave; a 2-pole filter, 12 dB per octave; a 3-pole filter, 18 dB per octave; and 4-pole filter, 24 dB per octave. To reproduce a 4-pole low-pass filter (for that "classic" analog synth sound) you would set both low-pass filters to roll off at 12 dB per octave, resulting in a 24 dB per octave rolloff.

Cutoff Frequency
Every filter has a “knee” in the response curve, known as the cutoff frequency. This is the frequency at which the filter begins filtering out frequencies. The filter cutoff frequency can remain fixed over time, or it can be varied by modulating the filter with an envelope, LFO,
You can create some very interesting filter configurations by using a different modulator for each filter. For instance, try using pressure to modulate the filters. You can drive one filter up with pressure, while simultaneously driving the other down.

Filter Configurations

The diagrams below show a number of possible filter configurations. On the left are the response curves of the two filters shown separately. On the right are some of the possible shapes of the combined filters.

FILTER 1 Page

Press the Filters button. The display shows the FILTER1 page.
FILTER1 Mode

Range: LO-PASS/2 or LO-PASS/3

Determines whether Filter 1 will be a 2-pole or a 3-pole low-pass filter.

CUTOFF

Range: 000 to 127

Determines the initial filter cutoff frequency for each of the two filters. With a low-pass filter, a setting of 127 lets all the original signal pass through the filter. With a high-pass filter, a setting of 000 lets through all of the original signal. This setting represents the “filter floor,” or manual level. The effect of any selected modulators will be added to (or subtracted from) this level.

Track Brightness Mod Selector

Range: enabled (*) or disabled (blank)

Press the soft button above the CUTOFF parameter again to enable or disable the Track BRIGHTNESS parameter independently for each Filter. When an asterisk (*) is displayed, the Track BRIGHTNESS parameter will affect the Cutoff frequency of the Filter. If there is no asterisk, then the Track BRIGHTNESS parameter will have no effect on the Cutoff frequency of the Filter. This allows you to define whether or not each Filter in each Voice in a Program will have its Cutoff frequency modulated by the Track BRIGHTNESS parameter. Successive presses of the soft button above CUTOFF will toggle between the Release value and the BRIGHTNESS Mod selector.

KBD

Range: -99 to +99

Sets the amount by which the location of a note on a keyboard will modulate the filter cutoff frequency (filter keyboard tracking). The scaling effect of this parameter is based on a 76-note keyboard, with a center break point at F4+. To have the filter track the keyboard exactly, set KBD=+50.
**MODSRC**  
Range: various  
Selects a modulation source for the filter cutoff frequency from among the 15 available modulators.

**MODAMT**  
Range: -99 to +99  
Determines the amount by which the assigned filter modulator will affect the filter cutoff frequency.

**ENV2**  
Range: -99 to +99  
Determines the amount by which Envelope 2 will affect the filter cutoff frequency.

### FILTER 2 Page

Press the Filters button again. The display shows the FILTER2 page:

![FILTER 2 Page Diagram]

- **Filter 2 Mode**  
  Range: HI-PASS/2, 1 or LO-PASS/2, 1  
  FILTER 2 can be configured as a 2-pole or 1-pole high-pass filter, or a 2-pole or 1-pole low-pass filter.

The remaining parameters and ranges are the same as for FILTER 1.

### Output Page

The parameters on the Output page, along with Envelope 3, control the overall volume and panning of the voice, along with keyboard scaling, effects routing and voice “voice stealing” priority. The Output page consists of three separate sub-pages.

Press the Output button. The first OUTPUT sub-page is displayed.
OUTPUT KBD-SCALE
Range: -99 to +99, or ZON
Can be used to fade the voice in or out between the two keys specified to the right (see below). This is good for doing keyboard crossfades between voices, or for reducing the volume of a particular voice as you go higher up the keyboard. A value of +99 will fade the voice in from silence to full level from the low keys to the high keys. A value of -99 will fade the voice out from full level to silence from the low keys to the high keys. Intermediate values will scale the voice from full level to an intermediate level.

With KYB-SCALE=+99 and LO/HI KEY=A0 to C8:

<table>
<thead>
<tr>
<th>Full</th>
<th>Volume Level</th>
<th>Off</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Some attenuation is heard

With KYB-SCALE=+99 and LO/HI KEY=A0 to C8:

<table>
<thead>
<tr>
<th>Full</th>
<th>Volume Level</th>
<th>Off</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Some attenuation is heard

Setting a Keyboard Zone
Moving the Data Entry Slider all the way down to the bottom position (below -99) selects KBD-SCAL=ZON. In this position the voice will sound only over the keyboard range specified by the low and high keys. When KBD-SCAL=ZON, the volume scaling function is not in effect — the voice will play at the same volume throughout the zone.

With KYB-SCALE=ZON and LO/HI KEY=C4 to C5:

<table>
<thead>
<tr>
<th>Full</th>
<th>Volume Level</th>
<th>Off</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

With KYB-SCALE=ZON and LO/HI KEY=C4 to C5:
The next two parameters on the top line of the display provide a powerful tool for shaping the volume of the sound across the keyboard:

**LO/HI-KEY**
Ranges: -A0 to C8
Sets the key range over which the fade-in, fade-out, or keyboard zone will occur. When this parameter is selected, notes can be entered from the keyboard or using the Data Entry Slider or Up/Down Arrow buttons. Select this parameter and play the low key; that note is entered as the low key, and the cursor switches to the high key. Now play the high key; that note is entered as the high key, and the cursor disappears. If you made a mistake, or want to enter a different range of values, just press the soft button again and repeat the process.

**VOL**
Range: -50 to +14 dB
This parameter determines the volume of each voice. Since Envelope 3 is permanently routed to control the volume of the voice, this parameter also determines the amount by which ENV3 will affect volume.

Values above +00 dB are intended to let you compensate for the effects of heavy filtering or enveloping, and for the fact that some waves simply have less apparent loudness than others. For example, a percussion sample, which is by nature a quick peak, has less energy than a sustaining square wave. A higher VOL setting lets you raise the level of such waves to equal that of “louder” waves.

**Warning:**
We strongly recommended against setting high VOL levels to all the waves in your sounds just to make them louder — doing so will result in clipping (distorting) when you play more than one or two notes.

**MODSRC**
Range: various
Selects a modulation source for the output volume of the voice from among the 15 available modulators. This is in addition to ENV3, which is always routed to volume.

**MODAMT**
Range: -99 to +99
Determines the amount by which the assigned volume modulator will affect the output volume of the voice.

Press the Output button again. The display shows the second OUTPUT sub-page:

```
OUTPUT DESTINATION=BUS=DRY
PAN=+00 MODSRC=KEYBD MODAMT=+25
```
DESTINATION-BUS  
Range: FX1, FX2, DRY, or AUX  
Each voice within a sound can be routed to one of four stereo “busses:”

- FX1, FX2, and DRY feed the main stereo outputs of the TS-12.
- AUX sends the voice directly to the AUX Outputs. Note that voices sent to the AUX Outputs are always dry; that is, they bypass the effects processor.

The diagram below shows a common routing of the signals for each bus. See the sections on “Effects” for more on programming specific effects.

PAN  
Range: -64 to +63  
Pans the voice within the stereo field. A setting of -64 is panned hard left, and +63 is panned hard right. A value of +00 pans the voice center. The effect of a pan modulator (below) will be added to this.

MODSRC  
Range: various  
Selects a modulation source for the voice pan from among the 15 available modulators. This will cause the voice’s location in the stereo field to vary with the output level of the modulation source.

MODAMT  
Range: -99 to +99  
Determines the amount by which the assigned volume modulator will affect the pan of the voice.

Press the Output button a third time. The final sub-page contains three parameters:

VOICE-PRIORITY  
Range: LO, MED, or HI  
This parameter gives you some control over how voices will be reassigned, or “stolen,” to play new notes when all of the TS-12’s voices are already playing. A voice can be assigned LO, MED, or HI priority. The rule is that a given voice will only be allowed to steal from voices with the same or lower priority.

MED is the usual state and should be used for most voices. LO can be used for voices within a sound which would be missed the least if stolen (such as a voice playing the same wave as another voice but detuned a bit). HI is best used only for specific applications in which you want...
to protect a voice or voices from being stolen — such as cymbals or a sustaining “pad” sound in a sequencer track.

**VELOCITY-WINDOW LO & HI**

Ranges: 000 to 127

The LO and HI parameters allow you to define the velocity range for each voice. The full velocity range (default) is LO=000 HI=127. By adjusting these parameters, you can set specific velocity ranges for each voice. This allows velocity switching between different voices within the program. For example, if you set a solo violin voice to LO=000 HI=064, and a string section voice to LO=064 HI=127, a soft velocity will play only the solo violin, whereas a harder velocity will play only the string section. Ranges can over-lap for velocity cross-fade effects.

**Wave Page**

Press the Wave button. On the Wave page, the same three parameters (Wave Name, Wave Type, and Delay) will always appear on the top line of the display, no matter which type of wave is selected:

- **Wave Name**
  Here you select the actual wave that the voice will play. When this parameter is underlined, the Data Entry Slider will select only among the waves in the current wave class. Pressing the Up/Down Arrow button will allow you to cross over into the next Wave Class.

- **Wave Class**
  This shows which of the 16 groups the currently selected wave is in. By underlining this parameter, you can use the Data Entry Slider or the Up/Down Arrow buttons to scroll quickly through the different wave classes to the category you want. Then underline the wave name to select a specific wave from that category. Whenever the wave class is changed, the first wave in that class is selected, and lower-line parameters are reset to default values for the new wave class.

- **DELAY**
  Range: 0000 to 5000 msec, KYUP
  This parameter determines how long the voice will wait after a key is struck before playing. A delay of up to 5 seconds is possible.

  When set to DELAY=KYUP (Key Up), the voice will wait until the key is released before it plays.
Class-Specific Wave Parameters
The parameters shown on the lower line of the display on the Wave page will vary depending on the current wave class. For each wave class, the lower line of the display will contain parameters controlling the features which are specific to that class.

Changing the wave class resets these parameters. However, if you scroll only one step away from the current class and then scroll back, any lower-line settings you had will be restored. Go more than one class from the current one, and any lower-line settings will be lost.

For the first thirteen wave classes, the bottom line of the display shows:

**MULTISAMPLE-SHIFT**
Range: -60 to +60
Changes keyboard split points on multi-sampled waves. This has the effect of setting the WaveSamples to ranges you wouldn’t otherwise hear (allowing aliasing in some cases), creating completely different colorations. A setting of +00 is the default.

**DIR**
Range: FORWARD or REVERSE
Any of the waves in these wave classes can be made to play forward (which is the normal mode) or backward with this parameter. When DIR= REVERSE, the sound will play from the end of the sample to the start point, and will not loop.

Press the Wave button again to get to the next Wave sub-page:

**SAMPLE-START-OFFSET**
Range: 00 to 99
This controls where in the sample the wave will begin playing. When set to 00, the whole wave will play. As the start point is adjusted upwards, it will begin playing further into the wave. You can use this, for example, to skip the attack and play only the loop portion of looped (sustaining) sounds.

**Note:** When using the INHARMONIC and WAVEFORM Wave Classes, this parameter will change the starting phase, which is only heard when two waves are played at exactly the same pitch.

**START-MODSRC**
Range: various
Here you choose which of the modulators will control the sample-start of the voice. Any of the 15 modulators can be selected.

**MODAMT**
Range: -99 to +99
Determines how much the selected modulator (above) will affect the wave; i.e. how far away from the start point the sound will move. If MODAMT=+00, the sound will remain static. Positive amounts will modulate the sound forward (toward the end of the wave); negative modulation amounts will move the sound back toward the beginning.
TRANSWAVE -Specific Wave Parameters

Each Transwave is actually composed of many different single-cycle waveforms, which progress from one timbre to another, occupying adjacent areas of memory. Movement within the sound is created by playing different waveforms in succession; that is, by modulating the wavetable.

The illustration below shows a typical wave of this category, with the index set in the middle range, near 50.

When the wave class is TRANSWAVE, the lower line of the display shows:

INDEX  Range:  00 to 99
The Index parameter controls where within the wavetable the voice-loop will begin playing when the key is struck.

MODSRC  Range:  00 to 99
Here you choose which of the 15 modulators will control the movement of the sound. Any of the modulators can be selected.

MODAMT  Range:  -99 to +99
Determines how much the selected modulator (above) will affect the wave; i.e. how far away from the start point the sound will move. If MODAMT=+00, the sound will remain static. Positive amounts will modulate the sound forward (toward the end of the wave); negative modulation amounts will move the sound back toward the beginning.
Hyper-Wave™ -Specific Wave Parameters

Hyper-Wave architecture allows up to 16 waves to be defined in a list, which can be swept through, or cross-faded for timbre-shifting and Jam-Loops. Hyper-Waves are created by selecting WAVE-LIST with the OPTION parameter found on the Program Control page. Hyper-Waves have their own specific wave parameters.

When the Wave Class is WAVE-LIST, the display shows:

<table>
<thead>
<tr>
<th>Wave Name</th>
<th>Wave Class</th>
<th>Delay before playing</th>
</tr>
</thead>
<tbody>
<tr>
<td>WAVE</td>
<td>WAVE-LIST</td>
<td>DELAY=0000</td>
</tr>
<tr>
<td>START-STEP</td>
<td>01</td>
<td>LOOPSTART=01 END=16</td>
</tr>
</tbody>
</table>

Selects which step the Wave-List will start with when a key is pressed.
Selects which step the Wave-List will use to start the loop when a key is held down.
Defines the last Wave in the list.

Wave Name
The wave name parameter in a WAVE-LIST is meaningless and is not selectable.

Wave Class
This shows which of the 16 groups the currently selected wave is in. The WAVE-LIST category is only visible when the current sound contains a WAVE-LIST.

DELAY
Range: 0000 to 5000 msec, KYUP
Determines how long the voice will wait after a key is struck before playing. A delay of up to 5 seconds is possible.

When set to DELAY=KYUP (Key Up), the voice will wait until the key is released before it plays.

START-STEP
Range: 01 to 16
Selects which step number in the Wave-List the voice will start playing when a key is pressed.

LOOPSTART
Range: 01 to 16
Selects the step number in the Wave-List that the voice will loop back to after playing the End Step for its duration.

END
Range: 01 to 16
Defines the last step in the Wave-List that the voice will play before looping back to play the Loop Start step.

Press the Wave button again to get to the next Hyper-Wave sub-page:

<table>
<thead>
<tr>
<th>Wave</th>
<th>MOD-DESTINATION=START-STEP</th>
</tr>
</thead>
<tbody>
<tr>
<td>MODSRC=OFF* MODAMT=+00</td>
<td></td>
</tr>
</tbody>
</table>
MOD-DESTINATION  Range: *-NONE-*, START-STEP, LOOP-START, END-STEP, TRAVELER, or START+LOOP

- When set to START-STEP, the output level of the START-MODSRC at the time of the note-on will determine which step the Wave-List will begin playing at. A positive MODAMT will cause MODSRC output to increment the START-STEP above the manual level. A negative MODAMT will decrement the START-STEP below the manual level. The manual level is determined by the START-STEP parameter. After the appropriate START-STEP has played for its duration, the Wave-List will play through all of the successive steps, up to the END step, and then will loop back around to play the LOOPSTART Step. If the output of the MODSRC causes the Wave-List to begin playing at a Step that is past the END Step, the appropriate START-STEP will play for its duration, and then the Wave-List will loop back to play the LOOPSTART Step. The Wave-List will continue to loop between the LOOPSTART Step and the END Step, until the voice is turned off.

- When set to either LOOP-START or END-STEP, the LOOPSTART Step or the END Step values will be modulated in a non-real-time manner, similar to when MOD-DESTINATION=START-STEP. With either setting, if the output of the MODSRC causes the END Step to be lower than the LOOPSTART Step, the Wave-List will simply repeat the LOOPSTART Step.

- When set to TRAVELER, Step Duration will be ignored, and MODSRC output will directly control which Step will play, within the boundaries of the START-STEP and the END Step, continuously, in real-time. With MODSRC output at zero, a positive MODAMT will cause the Wave-List to play only the START-STEP. With MODSRC output at full, a positive MODAMT will cause the Wave-List to play only the END Step. A negative MODAMT will have the opposite effects.

- When set to START+LOOP, the MODSRC will modulate the START-STEP, LOOPSTART Step and END Step values all simultaneously, relative to one another, and all in a real-time manner similar to when MOD-DESTINATION=TRAVELER. The integrity of the loop will be maintained as the Step values are modulated. START+LOOP allows you to move a fixed-length window over a definable range of the Wave-List.

MODSRC  Range: 00 to 99
Here you choose which of the 15 modulators will control the movement of the wave-list. Any of the modulators can be selected.

MODAMT  Range: -15 to +15
This parameter determines the number of steps that the selected Mod Destination will be modulated. Modulation can be either positive or negative.

Drum-Map Specific Wave Parameters
A Drum-Map can use up to 64 waves per program, four waves per key, with separate pitch, volume, panning and voice template parameters for each wave. All of the DRUM-MAP wave page parameters are identical to the first thirteen wave classes, with the exclusion of the MULTISAMPLE-SHIFT parameter.

Also, the DRUM-MAP Wave Class category is only visible when the current program contains a Drum-Map. The wave name parameter in a Drum-Map is meaningless and is not selectable.

Note: When a Program contains a Drum-Map, the OCTAVE and SEMITONE values on the PITCH page will have no effect on the Drum-Map. You can still use pitch modulation to obtain more drastic pitch shifts than are possible within the PITCH parameter in the Drum-Map Editor.
Mod Mixer Page

The Mod Mixer is a unique feature which allows you to:

- combine and assign two modulators to a single modulation input
- scale and/or shape the response of one of those modulators according to one of 16 Mod Shaper Curves

Select the voice you want to edit on the Select Voice page, and then press Mod Mixer. The display shows:

```
Mod Source 1  Mod Source 2

SRC-1 = LFO  SRC-2 = TIMBR
SRC-2 SCALE = 1.0  SHAPE = CONCAVE2

Mod Source 2
Scale Amount

Mod Source 2
Shaper Curve
```

The two parameters on the top line of the display select the two modulators which will be mixed together, SRC-1 and SRC-2. On the lower line of the display are two parameters for shaping the level and response of SRC-2. Internally, the Mixer/Shaper works like this:

```
Mod Source 1

SRC-1

Mod Source 2
Scale
Shape
Mixer

This output is the modulator called MIXER, and can be selected at any modulation input.
```

There are four parameters which can be selected on the Mod/Mixer page:

**SRC-1**  
Range: various  
Select any of the 15 available modulators (including the mixer itself) as Mod Source 1. SRC-1 is sent directly to the mod mixer without any level change or response shaping.

**SRC-2**  
Range: various  
Select one of the 15 available modulators as Mod Source 2. Before being added to SRC-1, SRC-2’s level is adjusted by a scale factor, and then it is passed through the shaper, which allows its response to be customized in a number of interesting ways.

**SRC-2 SCALE**  
Range: various from 0.1 to 8.0  
This is used to adjust the level of SRC-2 relative to SRC-1, or to simply scale the level of the modulator for effect. The modulator’s level is multiplied by the number shown. A value of 1.0 leaves the modulator at its original level. Fractional values (0.1 to 0.9) will reduce the level. Values greater than 1.0 will amplify the effect of the modulator, in most cases simply causing it to reach full level much sooner.
SHAPE

Range: various

Here you select which of the 16 tracking curves will be applied to the modulator selected as SRC-2. You can use one of the convex or concave shapes to make the modulator’s effect come in earlier or later than it ordinarily would; you can use one of the quantized shapes to make the modulator’s effect sound “stepped”; or you can use the smoother (which is similar to a “lag processor” in some older analog synths) to smooth the effect of the modulator, to round off the edges. The diagram below shows the 16 Shaper tracking curves:

Some possible applications for shaping the response of SRC-2 are shown on the following page.
Input (Src-2): Scale Factor: Shape: Output:

- Smoother
  - $x_1$
- Convex
- Linear
- Concave
- Quant-08
- Smoother
- $x_1$
- Convex
- Linear
- Concave
- Quant-08

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Program Control Page

The parameters on this page control aspects of the program that affect all of the individual voices within the program. Press Program Control. The display shows:

```
PROGRAM TYPE=ACPIANOS OPTION=*
PRESS=KEY PATCH=LIVE RESTRIKE=35
```

Type: Allows you to define a sound class for your sound. This setting can be used by third-party editor librarian software for “automatic-sorting” of sounds by type. The available types are:

- ACPIANOS: Acoustic pianos, honky-tonk, toy pianos, and piano forte
- ELPIANOS: Electric and electronic piano sounds
- ORGANS: Pipe organs, electric, and electronic organs
- ALTKEYS: Other keyboard sounds such as harpsichord, accordion, and piano layered with other sounds
- SYNLEAD: Lead synth sounds
- SYNPAD: Sustaining synth pads
- SYNOTHER: Other synth sounds: hybrids, fat power-synths, synth bells
- GUITARS: Acoustic guitars, clean electric guitars and distortion guitars
- ALTPLUCK: Other plucked strings: harps, banjo, dulcimer, sitar, etc.
- SOLOSTRG: Plucked and bowed solo strings (violin, viola, cello, bass)
- STRGSECT: Plucked and bowed string sections and small ensembles
- SOLOBRAS: Solo brass: trumpet, trombone, tuba, French horns
- BRASSECT: Brass sections: trumpet, trombone, tuba, French horns
- SOLOSAX: Solo saxophones
- SOLOWIND: Solo woodwinds/reeds (including harmonica)
- WINDSECT: Woodwind/reed/saxophone sections and small ensembles
- VOCALS: Vocal sounds: choirs and synth-vox
- ACOUBASS: Acoustic basses
- ELECBASS: Electric basses
- SYNBASS: Synth basses
- DRUMS-E: Drum kits that use the ENSONIQ Drum Map
- DRUMS-GM: Drum kits that use the General MIDI Drum Map
- PERCUSSN: Percussion kits and solo untuned percussion (e.g. taiko)
- TUNEPERC: Tuned percussion: marimba, xylophone, timpani, orchestral hits
- SOUND-FX: Realistic (e.g. broken glass) and fantasy (e.g. spacecraft) sound effects
- SPLITS: Combination keyboard splits of 2 or more different sounds
- TRANS-WV: Distinctly TransWave-type sounds
- HYPER-WV: Distinctly HyperWave texture sounds
- GROOVES: Rhythm loop groove patterns and pulsed performance sounds
- UTILITY: Utility resources: default template sounds, pitch tables, etc.
- OTHER: Unclassified miscellaneous sounds (e.g. didgeridoo), and unnatural acoustic layers (e.g. violin scrape layered with a shakuhachi)
- CUSTOM: Use this to define your own special purpose sound type: ENSONIQ sounds will never be released with TYPE=CUSTOM.

Tip: With the SoundFinder feature, when a sound name is selected, pressing the Replace Track Sound button and then continued presses of the Up or Down Arrow buttons will scroll through all sounds in memory that are assigned the same TYPE.
OPTION  

Range:  **-NONE-**, PITCHTBL, WAVELIST, or DRUM-MAP

The setting of this parameter indicates whether a Custom Pitch-Table, a Wave-List, or a Drum-Map exists within the sound. These options occupy the portion of a sound program which is usually used by voices 5 and 6, so when an Option is present, you do not have access to those two voices. Whenever the setting of this parameter is changed, you will be prompted with the question “REPLACE VOICES 5+6 WITH   PITCH-TABLE, WAVE-LIST, DRUM–MAP, or *EXIT*.” If you choose *EXIT*, then the setting of the parameter is not changed.

If you have a program where OPTION=PITCHTBL, DRUM-MAP, or WAVELIST, and you want to **eliminate** the Option (to gain back Voices 5 and 6), press the **Down Arrow** button when this parameter is selected. The display will show ERASE CURRENT <PITCH-TABLE, DRUM-MAP, or WAVE-LIST>? Selecting *YES* will eliminate the Option, and restore Voices 5 and 6 to their default settings.

If you have a program where OPTION=<PITCHTBL, DRUM-MAP, or WAVELIST>, and you want to **change** the Option (to another option), press the **Up Arrow** button when this parameter is selected. The display will show the prompt REPLACE VOICES 5+6 WITH   PITCH–TABLE, WAVE-LIST, DRUM–MAP, or *EXIT*. At this point, you can select a new Option, or press *EXIT* to return to the previously selected Option assigned to the program.

PRESS  

Range:  OFF, KEY, or CHAN

Allows you to select Poly-Key, Channel, or no pressure for the program. Generally, if a program doesn’t need to respond to pressure, set this to OFF to conserve sequencer memory. This is the default setting that will be installed into a track when the program is selected.

PATCH  

Range:  LIVE or HELD

Selects the default patch select mode for the program. When set to LIVE, it uses the current state of the buttons to select a patch. When set to HELD, it uses the patch set by the first key hit while touching the patch select buttons. For more information about patch selects, refer to Sections 4 and 5. This is the default setting that will be installed into a track when the program is selected.

RESTRIKE  

Range:  00 to 99

This parameter controls the voice Restrike time. When you play a particular note and then restrike it again immediately before the old note has finished sounding, the amount of time it takes for the first strike to fadeout is determined by this parameter. By varying the setting of this parameter, you can control how long sounds overlap when a note is restruck.

For example, if you have a slow string sound, it may sound more natural to use a longer restrike value, which will cause the old note to decay more slowly, rather than end abruptly when the new note starts. Normal values are around 10. The higher the value, the longer the fadeout time.

**Tip:** If you hear clicking sounds when you restrike a note, setting the Restrike time to higher values may eliminate the click.

Along with the PRESS and PATCH parameters, the next page contains copies of track parameters that are saved in the program. When a program is selected or put on a track, values of these parameters (as saved in the program) are installed in the track as the default initial settings. They can be edited on the track pages without affecting the program default settings, but must be edited on this page in order to be saved with the program. Changes made here will be copied to the current primary track.
Press the **Program Control** button again to get to the second sub-page:

![Program Control Sub-Page]

The following parameters are the default settings for the Track parameters that are stored with the Program. For more information about how these parameters function, see Section 5 — Preset/Track Parameters.

**ATCK**  
**Range:** -64 to +63  
Editing the ATCK parameter default values will simultaneously edit the Track ATTACK Parameter values on the track that the sound is occupying. This parameter will only function if an asterisk is assigned to any ATTACK parameter (found on the ENV1, 2, and 3 pages) for any Voice in the selected program. This is the default setting that will be installed into a track when the program is selected.

**BRIGHT**  
**Range:** -64 to +63  
Editing the BRIGHT parameter default values will simultaneously edit the Track BRIGHTNESS Parameter values on the track that the Program is occupying. This parameter will only function if an asterisk is assigned to any filter cutoff parameter (found on the Filters page) for any Voice in the selected program. This is the default setting that will be installed into a track when the program is selected.

**RATE**  
**Range:** -64 to +63  
Editing the RATE parameter default values will simultaneously edit the Track RATE Parameter values on the track that the Program is occupying. This parameter will only function if an asterisk is assigned to any LFO RATE parameter (found on the LFO page) for any Voice in the selected program, or if the program contains a voice that plays a Wave-List. This is the default setting that will be installed into a track when the program is selected.

**RELS**  
**Range:** -64 to +63  
Editing the RELS parameter default values will simultaneously edit the Track RELEASE Parameter values on the track that the Program is occupying. This parameter will only function if an asterisk is assigned to any RELEASE parameter (found on the ENV1, 2, and 3 pages) for any Voice in the selected program. This is the default setting that will be installed into a track when the program is selected.

**TIMBRE**  
**Range:** 000 to 127  
Editing the TIMBRE parameter default values will simultaneously edit the Track TIMBRE Parameter values on the track that the Program is occupying. This parameter will only function if TIMBRE is assigned as a modulator within the selected program, or if the V1 through V6 relative volume modulation amounts on the third Program Control sub-page have been assigned to values other than zero. This is the default setting that will be installed into a track when the program is selected.

**XCTRL**  
**Range:** 000 to 127  
Editing the XCTRL parameter default values will simultaneously edit the Track XCTRL Parameter values on the track that the Program is occupying. This parameter will only function if XCTRL has been assigned as a modulator within the selected program. This is the default setting that will be installed into a track when the program is selected.
Press Program Control again to get to the third sub-page:

<table>
<thead>
<tr>
<th>TIMBRE</th>
<th>V1=+10</th>
<th>V2=+32</th>
<th>V3=+60</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>V4=−64</td>
<td>V5=+80</td>
<td>V6=+27</td>
</tr>
</tbody>
</table>

TIMBRE V1 to V6
Ranges: -64 to +63
The TIMBRE sub-page controls the relative volume modulation amounts for each Voice, as controlled by Timbre. Note that when OPTIONS is set to PITCH-TABLE, WAVE-LIST, DRUM-MAP, the V5 and V6 parameters are not displayed.

Pitch-Table Editor Parameters
The following parameters are only available when OPTION=PITCH-TABLE on the first Program Control Page. To access the Pitch-Table Editor parameters:

1) Press the Program Control button.
2) Select the OPTIONS parameter by pressing its soft button.
3) Press the Up Arrow button.
4) Select PITCH-TABLE on the bottom of the display by pressing its soft button.
5) Press either of the soft buttons beneath EDIT PITCH-TABLE.

The Pitch-Table Editor parameters are:

*CALCULATOR*
This parameter selects the Extrapolate/Interpolate sub-page, allowing you to create a pitch-table calculated from a user-defined key range.

KEY Source Key
Range: A0 to C8
For every Source Key on the lower left, you can see and edit the pitch of that key. The Source Key can be selected by pressing the keys, or using the Data Entry Controls.

Playback Pitch
Range: A0 to C8
The source key can be thought of as the physical location of the key on the keyboard. The playback pitch can be the same as the source key — as shown in the display — or it can be any pitch from A0 to C8.
Fine Tune Parameter

Range: 00 to 99 cents

Enables you to fine tune the pitch, or create micro-tunings and other alternate tunings.

*EXIT*

- Press *EXIT* to return to the first Program Control sub-page, eliminating any edits you may have made on the Pitch-Table Editor sub-page.

To display the Extrapolate/Interpolate sub-page, press the *CALCULATOR* soft button. The display shows:

```
KEY-RANGE START/END
Ranges: A0 to C8

Defines the area of the keyboard that the TS-12 will use as a reference by which to make its calculations. The START key is the first of the two key numbers shown, and the END key is the second number shown. By selecting a start and stop key, you can define the key range whose pitch intervals will be duplicated over the entire keyboard. Note that you can also set the start and end keys using the data entry controls, and press the soft button beneath them to toggle back and forth.

EXTRAPOLATE

The EXTRAPOLATE command takes the pitch-table relationships from within a key range and duplicates those relationships outside that range.

After a key-range has been defined, press the EXTRAPOLATE soft button. The display briefly reads PITCH-TABLE *CALCULATOR*, then returns with the newly defined range across the whole keyboard.

INTERPOLATE

INTERPOLATE takes the interval between two notes on the keyboard and divides all the keys in between into equally-spaced fractions of that interval.

After a key-range has been defined, press the INTERPOLATE soft button. The display briefly reads PITCH-TABLE *CALCULATOR*, then returns with the newly defined range across the whole keyboard.

- Press *EXIT* to return to the first Edit Pitch-Table sub-page, eliminating any edits you may have made on the Extrapolate/Interpolate sub-page.

Warning:

You must save the program containing your custom pitch-table, or copy the custom pitch-table into the system, or you will lose it as soon as you edit another sound.
Copy Pitch-Table Parameters
Pressing Copy from the Edit Pitch-Table sub-page will display the Copy page:

The MAKE COPY parameter allows you to make a copy of the complete pitch-table from the currently selected program (or the Compare Buffer) into the Copy Buffer.

The RECALL parameter allows you to recall the complete pitch-table from the Copy Buffer into an edited version of the current program if 1) the current program has a pitch-table installed in it and 2) the Copy buffer contains a pitch-table. If you attempt to recall a Pitch-Table into a program without just previously having copied a pitch-table into the Copy buffer, the copy is not completed and an error message is displayed.

The SYSTEM parameter allows you to install an alternate tuning into the System pitch-table. As an added feature, the System pitch-table itself is user-definable. For instance, if you want to hear what other programs sound like using the custom pitch-table from a program, you can redefine the System pitch-table. Or, if your main tuning is “just intonation,” then it might be convenient for you to use this or some other alternate tuning as your System tuning.

• Press the soft button beneath SYSTEM. The display briefly reads COPY TO SYSTEM PITCH-TABLE, and the custom pitch-table is installed into the TS-12 Operating System where it is available for use by any program.
• Press System four times to view the System PITCH-TABLE sub-page.

• Note that the SYSTEM PITCH-TABLE parameter has been set to CUSTOM. Now all programs whose voices are set to use the system pitch-table (which is most programs) will use the custom pitch-table.

To return all programs to standard equi-tempered tuning, set the System PITCH-TABLE parameter back to NORMAL. Switching back to CUSTOM will restore your custom System pitch-table. You can switch back and forth as often as you wish. You can also try installing other custom pitch-tables in the System, but the System pitch-table can only contain one Custom pitch-table at a time.
Wave-List Editor Parameters

The following parameters are only available when OPTION=WAVE-LIST on the Program Control Page. To access the Wave-List Editor parameters for a program that does not contain a Wave-List:

1) Press the Program Control button.
2) Select the OPTIONS parameter by pressing its soft button.
3) Press the Up Arrow button.
4) Select WAVE-LIST on the bottom of the display by pressing its soft button.
5) Press either of the soft buttons beneath EDIT WAVE-LIST.

The Wave-List Editor parameters are:

![Diagram of Wave-List Editor parameters]

- **STEP**
  - Range: 01 to 16
  - Defines which of the 16 steps within the Wave-List will be edited.

- **Wave Name and Class**
  - Range: All ROM waves
  - Defines which of the internal ROM waves will be used in the currently selected step.

- **START**
  - Range: 00 to 99
  - Determines the starting point within the internal ROM wave. This can be used to eliminate the attack portion of a wave to create a smoother transition between waves.

- **TIME**
  - Pressing this soft button will reveal the following screen:

![Diagram of TIME parameters]

- **STEP**
  - Range: 01 to 16
  - Selects the wave step to be edited, followed by the Wave Name for the current Step (read-only).

- **DUR**
  - Range: 00000 to 60000 (0 to 60 sec)
  - Selects the total length of time that the selected wave step will play. The duration is defined in 12 millisecond increments.

- **VOL**
  - Range: -50 to +14 dB
  - Sets the volume for the selected wave step.
XFADE-TIME  
Range: 00000 to 60000 (0 to 60 sec)
Sets the amount of time that the selected wave step will cross-fade into the following wave step. The XFADE-TIME adds time to the duration of both the current step and the next step:

```
+-----+     +-----+
|     |
|     |
+-----+     +-----+
 DUR  XFADE-TIME  DUR
```

DEPTH  
Range: 0 to 6 dB
Determines how many decibels (dB) below normal volume the two wave steps will meet at the center point of the cross-fade curve.

```
+-----+     +-----+
|     |
|     |
+-----+     +-----+
 Step 1 Duration XFADE-TIME Step 2 Duration
  ^
  |  DEPTH=0 dB
  |  DEPTH=6 dB
```

*EXIT*
Pressing *EXIT* will return you to the Wave-List Editor page.

*PITCH*
Pressing this soft button will reveal the following screen:

```
STEP=01 TENOR-SAX  DIR=FORWARD  PITCH-KBD-TRK=ON  XPOS=+00  DETUNE=+00
```

STEP  
Range: 01 to 16
Selects the wave step to be edited, followed by the Wave Name for the current Step (read-only).

DIR  
Range: FORWARD or REVERSE
Sets the direction of the wave step.

PITCH-KBD-TRK  
Range: OFF or ON
This determines whether the wave step will use the currently selected System pitch-table (when ON), or play the same pitch for every key (when OFF).

XPOS  
Range: -36 to +36 (in semitones)
Determines the pitch of the wave step.

DETUNE  
Range: -99 to +99 (in cents)
Allows you to fine-tune the wave step.

*EXIT*
Pressing *EXIT* will return you to the Wave-List Editor page.
Copy Wave-List Parameters
Pressing Copy from the Edit Wave-List sub-page will display the Copy page:

The MAKE COPY parameter allows you to make a copy of the complete Wave-List from the currently selected program (or the Compare Buffer) into the Copy Buffer.

The RECALL parameter allows you to recall the complete Wave-List from the Copy Buffer into an edited version of the current program if 1) the current program has a Wave-List installed in it and 2) the Copy buffer contains a Wave-List. If you attempt to recall a Wave-List into a program without just previously having copied a Wave-List into the Copy buffer, the copy is not completed and the following message is displayed:

Drum-Map Editor Parameters
The following parameters are only available when OPTION=DRUM-MAP on the Program Control Page. To access the Drum-Map Editor parameters:

1) Press the Program Control button.
2) Select the OPTIONS parameter by pressing its soft button.
3) Press the Up Arrow button.
4) Select DRUM-MAP on the bottom of the display by pressing its soft button.
5) Press either of the soft buttons beneath EDIT DRUM-MAP.

The Drum-Map Editor parameters are:

VOL
Range: +00 to +15 in incremental steps
Controls the volume level of the sound(s) played by this key relative to the other keys in the drum-map. Setting this parameter to 00 does not necessarily silence the voice(s) playing the wave, and the actual volume minimum depends on the base volume level of the original waveform.

PAN
Range: various
Determines where the drum wave voice will be panned in the stereo mix. The values for the
PAN parameter are:

- **VOICE** Uses Patch VOICE panning
- L ------ Hard Left
- - L ---- Medium Left
- - - L --- Soft Left
- - - - C - Center
- - - - R - Soft Right
- - - - - R Medium Right
- - - - - - R Hard Right

**Note:** When PAN=**VOICE**, the key uses whatever pan setting is chosen on the Output page of the voice(s) responding to the key. All of the other PAN settings override the pan setting on the Output page.

**PITCH**

Range: -16 to +15 semitones

The pitch of the selected wave can be raised or lowered in semitone steps. If a greater range or precision of tuning is required, then it is necessary to use pitch modulation on the Pitch Mods page in the destination voice(s).

**KEY**

Range: B1 to B6

This parameter selects a single key for editing and displays all of the current drum-map parameter settings for that key. When this parameter is underlined, you can select the drum-map key to be edited using the data entry controls or by playing the keys on the keyboard. If you play several keys together, the last one played will be selected. There are 61 possible keys in a drum-map, ranging from B1 to D7 (MIDI keys 35 to 95). This range is based on the General MID Spec.

**WAVE**

Range: (shown below)

This parameter allows you to select the wave to be played by the key from any of the internal ROM waves. Drum-maps will have access to all Waves in the following Wave Classes, for a total of 105 different selectable wave forms:

- DRUM-SOUND
- CYMBALS
- PERCUSSION
- TUNED-PERCUS
- SOUND-EFFECT

Setting WAVE=*-MUTED-* (Data Entry Slider all the way down) will prevent the current key of the drum-map from playing any voice(s). This could be useful in sequencing, when you want to start recording with a drum track, but don’t want the drum to play on the first beat of the first measure.

**VOICE — Voice Parameter Template**

Range: (shown below)

This parameter specifies where the current voice will be sent. For the four Patch Select settings, the destination voices are within the current program and the number of active voices is determined by the mute status of the four voices within the specified patch.

If the VOICE parameter is assigned to a patch which does not have any voices set to wave type DRUM-MAP, then the display will show WAVE=*-VOICE-* and the parameter will not be editable. This indicates that the wave played by the key is controlled by the voice(s) in the patch rather than by the Drum-Map.

For this setting the selected key is assigned to:

- 00 PATCH Voice will play, along with any other voice(s) assigned to Patch Select 00
- 0* PATCH Voice will play, along with any other voice(s) assigned to Patch Select 0*
- *0 PATCH Voice will play, along with any other voice(s) assigned to Patch Select *0
- ** PATCH Voice will play, along with any other voice(s) assigned to Patch Select **
- DRUM-FX1 This basic medium drum/perc. envelope, routed to FX-1, lets most drum
sounds through unchanged, but then closes down to create a gate-type effect. Can be used for almost all unlooped drums & percussion. To create a percussion decay out of a looped sound, you should use the LDECAY, MDECAY or SDECAY voices described below.

<table>
<thead>
<tr>
<th>Voice</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DRUM-FX2</td>
<td>Same as above, routed to FX-2</td>
</tr>
<tr>
<td>DRUM-DRY</td>
<td>Same as above, routed to DRY</td>
</tr>
<tr>
<td>TIGHT-FX1</td>
<td>Very quick decay drum/perc. env., routed to FX-1. Good for transients, muted or “choked” sounds. Turns an ambient drum wave into a tight one.</td>
</tr>
<tr>
<td>TIGHT-FX2</td>
<td>Same as above, routed to FX-2</td>
</tr>
<tr>
<td>TIGHT-DRY</td>
<td>Same as above, routed to DRY</td>
</tr>
<tr>
<td>NORMAL-FX1</td>
<td>A normal mode env. for controlling the duration of the sound (sound plays as long as the key is held, rather than always finishing its decay). Can be used for snare roll, guiro, or other sustaining waves where you would want to vary the duration.</td>
</tr>
<tr>
<td>NORMAL-FX2</td>
<td>Same as above, routed to FX-2</td>
</tr>
<tr>
<td>NORMAL-DRY</td>
<td>Same as above, routed to DRY</td>
</tr>
<tr>
<td>TOMTOM-FX1</td>
<td>Slight downward pitch envelope, volume and filter shapes optimized for toms, routed to FX-1. Can be used for toms, congas, tablas, anything that wants a subtle pitch env. and drum decay. Pressure bends the pitch down further. (For more radical pitch effects, use SYNDRM default below.)</td>
</tr>
<tr>
<td>TOMTOM-FX2</td>
<td>Same as above, routed to FX-2</td>
</tr>
<tr>
<td>TOMTOM-DRY</td>
<td>Same as above, routed to DRY</td>
</tr>
<tr>
<td>KEYGRP-FX1</td>
<td>Trigger mode voice, optimized for hi-hats. This allows group voice cutoff, and can be used for hi-hat key group.</td>
</tr>
<tr>
<td>KEYGRP-FX2</td>
<td>Same as above, routed to FX-2</td>
</tr>
<tr>
<td>KEYGRP-DRY</td>
<td>Same as above, routed to DRY</td>
</tr>
<tr>
<td>LDECAY-FX1</td>
<td>Long cymbal/percussion decay, routed to FX-1. Can be used for crash cymbals, rides, various long-decay percussion sounds.</td>
</tr>
<tr>
<td>LDECAY-FX2</td>
<td>Same as above, routed to FX-2</td>
</tr>
<tr>
<td>LDECAY-DRY</td>
<td>Same as above, routed to DRY</td>
</tr>
<tr>
<td>MDECAY-FX1</td>
<td>Medium cymbal/percussion decay, routed to FX-1. Good used for china cymbal, medium crash, and other medium-decay percussion sounds.</td>
</tr>
<tr>
<td>MDECAY-FX2</td>
<td>Same as above, routed to FX-2</td>
</tr>
<tr>
<td>MDECAY-DRY</td>
<td>Same as above, routed to DRY</td>
</tr>
<tr>
<td>SDECAY-FX1</td>
<td>Short cymbal/percussion decay, routed to FX-1. Good for splash cymbals and other, shorter-decay percussion sounds.</td>
</tr>
<tr>
<td>SDECAY-FX2</td>
<td>Same as above, routed to FX-2</td>
</tr>
<tr>
<td>SDECAY-DRY</td>
<td>Same as above, routed to DRY</td>
</tr>
<tr>
<td>SYNDRM-FX1</td>
<td>Exaggerated pitch and filter envelopes, good for processing synth drums, or creating special effects with regular drums.</td>
</tr>
<tr>
<td>SYNDRM-FX2</td>
<td>Same as above, routed to FX-2</td>
</tr>
<tr>
<td>SYNDRM-DRY</td>
<td>Same as above, routed to DRY</td>
</tr>
<tr>
<td>DRUM-AUX</td>
<td>The envelope is the same as DRUM-FX1, but the voice is routed to AUX. This special default routes the basic drum/perc. voice to the AUX outputs.</td>
</tr>
</tbody>
</table>

**Tip:** By assigning one of the PATCH settings to the drum-map VOICE parameter and setting the WAVE parameter to "*MUTED*", you can use any internal ROM voice to play for that assigned key. Just make sure that the internal ROM wave is assigned to one of the remaining voices (on the Select Voice page) and that it is active in the defined patch select setting.

Press the Program Control button to exit the Drum-Map Editor.
Copy Drum-Map Parameters

Pressing *Copy* from the Drum-Map Editor page will display the Copy page:

The MAKE COPY option allows you to make a copy of the complete Drum-Map from the currently selected program (or the Compare Buffer) into the Copy Buffer.

The RECALL option allows you to recall the complete Drum-Map from the Copy Buffer into an edited version of the current program if 1) the current program has a Drum-Map installed in it and 2) the Copy buffer contains a Drum-Map. If you attempt to recall a Drum-Map into a program without just previously having copied a Drum-Map into the Copy buffer, the copy is not completed and the following message is displayed:

Selecting the KEY RANGE option will display another page which allows you to fill a range of keys with copies of the currently selected Drum-Map key (the key that was shown on the Drum-Map Editor page when you pressed *Copy*).

KEY–RANGE START / END

Ranges:  B1 to B6

Allows you to specify the range of keys in the drum-map to be filled by playing the lowest and then highest key of the range. You can also edit these parameters using the Data Entry Slider or the Up/Down Arrow buttons. Press the soft button to select between the Start and End key fields.

Selecting *COPY* will complete the command and will show COPY DONE before returning to the Copy page.

Selecting *EXIT* will simply return the Copy page without affecting the Drum-Map.
Program Effects Page
Understanding the effect algorithms and their related parameters are described in detail in Section 6 — Understanding Effects and Section 7 — Effect Parameters.

Select Voice Page
The Select Voice page is used to view the six voices that create a program sound. Note that if there is a Drum-Map, Wave-List, or Pitch-Table within the program, the Select Voice page will only show four voices (a Drum-Map, Wave-List, or Pitch-Table replaces voices 5 and 6). Continued presses of the Select Voice button will toggle between the Select Voice page and the page you were on prior to entering the Select Voice Page.

Copy Page
The Copy page is context sensitive— depending on what was last selected, it can be used to copy:

- All LFO Parameters
- Envelope-1, 2, and 3 Parameters
- Pitch Page Parameters
- Pitch Mod Parameters
- Filter-1 and 2 Parameters
- All Output Parameters
- Wave Page Parameters
- Mod Mixer Parameters
- Program Parameters
- Pitchtable Parameters
- Drum-Map Parameters
- Effects Parameters
- All Voice Parameters

For more information on using the Copy page, refer to the previous section.

Write Program Page
Pressing the Write Program button will allow you to edit the name of the currently selected program, and write it into a User RAM location. After you’ve written your program name (using the left/right cursor buttons and the data entry controls), press and hold the Sounds button, and select a BankSet, and Bank location for your edited program. When you’ve decided on a location, while still holding down the Sounds button, press the soft button above/below where you want to load the newly edited program. The display quickly shows WRITING PROGRAM, and then shows the newly edited program in that location.

Compare Function
The Compare button is used to compare the newly edited sound with the original sound. This allows you to audition your changes before saving them. When the LED is lit, you are hearing the edited sound. When the LED is OFF, you are hearing the original sound. Continued presses of the Compare button will toggle between the edited and the original version of a sound program.

The Compare function will not work with Sampled Sounds.
Section 10 — Understanding the Sequencer

This section contains an introduction to the TS-12 sequencer and all the information you’ll need to get started sequencing. More detailed descriptions of the actual parameters are covered in the following section. Section 12 — Sequencing/MIDI Applications explains some typical uses of the TS-12 sequencer.

Introduction

The TS-12, with its 24-track sequencer, incorporates a range of features and capabilities you would expect to find in stand-alone or computer sequencers, yet with the advantage of an integrated system. The TS-12 is both powerful and easy to use — having your synthesizer, sequencer and master keyboard controller right at your fingertips in one unit is what makes the ENSONIQ approach to digital sequencing so intuitive and efficient.

If you can’t wait to start sequencing, you can turn right to “Recording a Sequence” later in this section. We recommend, however, that you come back and familiarize yourself with the many other sequencer controls and functions described in this section. This is the only way to truly take advantage of the power of the TS-12 sequencer.

Digital Sequencing

Now imagine a recorder which, instead of recording the sounds of an instrument, records the same kind of digital information that is sent and received over MIDI — key down, key up, key number and velocity, pitch bend, mod wheel, program changes and so on — and you have imagined a digital sequencer.

A sequencer records and plays back the “control information” rather than the actual notes. This means that there is no degradation of the sound in the recording process no matter how many times you overdub or re-record a part. A sequencer is sort of like an electronic player piano.

It is important to bear in mind that a sequencer only records what you play. Sequencer memory is used up on the basis of Events (keys struck, controllers, etc.), while a tape recorder’s memory (the tape) is always used up by the same amount over a fixed period of time. In other words, a digital sequencer will use virtually the same amount of memory to record 100 notes, whether you play those notes over ten seconds or ten minutes.

When you strike a key, the sequencer records a Key Down event. It then counts the clock pulses until you release the key, when it records a Key Up event. The amount of time between the key down and the key up doesn’t really affect the amount of memory required to record the note. Compare this to an audio tape recorder. With tape, time is the thing. A tape recorder will use the same amount of tape to record a minute of music, whether the signal contains one note or one hundred.

You might say that tape is linear — it is spent at a fixed rate — while digital sequencer memory is dynamic — it is used only as needed. Understanding the difference will help you to manage the TS-12 sequencer memory. For example, while key events (the notes you play) use up relatively little memory each, controllers such as pressure, mod wheel, pitch bend, etc., are recorded as a flood of numbers which can fill up the memory in a hurry. Thus if you’re trying to squeeze one more track into a sequence when there is not much memory left, you know to go easy on the controllers.

What is a Sequence?

A Sequence on the TS-12 is a collection of 12 independent tracks and an effects algorithm and its settings. Each track has its own sound and complete set of track parameters (volume, pan, timbre and all the other track parameters, including MIDI channel, status, etc.) all of which are remembered with the sequence.
A sequence has a fixed length (though you can change it at any time) which is set by the length of the first track you record. A given sequence can be as short or as long as you like (within the limitations of memory).

Each sequence has an eleven-character name which you assign to it at the time of its creation. The name can be changed at any time from the Info sub-page of the Edit Sequence page.

When you select a new sequence, each track used within a sequence will send out a MIDI program change and MIDI volume instructions on its designated MIDI channel, unless the track has been assigned ----/RECV only status — in which case you can have the new track play a new internal sound.

**What is a Song?**

In Song Mode, sequences are assigned to play consecutively in any order, with up to 99 *Steps*, and up to 99 *Repetitions* of each Step. Within each Song Step, individual tracks within the sequence can be muted or transposed.

But a Song on the TS-12 is much more than just as collection of sequences playing in order. This is because each song has an additional set of 12 tracks which are completely independent of the tracks in its component sequences.

Each *Song Track* has its own sound program and a full set of track/performance parameters, just like a sequence track. The length of the song tracks is defined by the combined length of the steps and repetitions which make up the song. Song tracks are selected from the *Seq/Song Tracks 1-6* and *7-12* pages when a song is selected.

This means that after you’ve completed a number of sequences and linked them together to form a song, you have 12 more linear tracks which run the entire length of the song. This gives you 24 tracks to work with.

**Sequencer “Transport Controls”**

The three buttons at the bottom of the Sequencer section serve to start, stop and continue the sequencer, and to put it into Record and Overdub modes. In addition to these three buttons, either of the Foot Switches can be assigned to function just like the transport control buttons, when both hands are busy.

Assuming the Autopunch function is off:

- Pressing **Play** will start the current sequence or song (whichever is selected) playing from the beginning.
- Any Foot Switch assigned to PLAY/STOP will duplicate the behavior of alternate presses of the **Play** button and the **Stop/Continue** button.
- Pressing **Stop/Continue** will stop the sequencer (if pressed while it is running); or will play the current sequence or song from wherever it was last stopped (if pressed while the sequencer is stopped).
- Any Foot Switch assigned to STOP/CONT will duplicate the behavior of the **Stop/Continue** button.
• Pressing *Play* while holding down *Record* will start the sequencer recording on the current track from the beginning of the sequence or song.
• Pressing *Stop/Continue* while holding down *Record* will start the sequencer recording on the current track from wherever it was last stopped.
• Pressing *Record* while the sequencer is playing will put the sequencer into “Punch in” Standby mode. It will wait for you to either start playing or press *Record* again before going into Record on the current track.
• Pressing any Foot Switch assigned to either PLAY/STOP or STOP/CONT will initiate recording while the sequencer is in “Punch in” Standby mode.

When the Autopunch function is on, the sequencer will only enter and exit Record mode at the points specified by the Edit Times on the Locate page.

**Sequencer Status**
On most sequencer pages the lower-left-hand corner of the display indicates the *Sequencer Status*. The sequencer is always in one of the following states:

• **STOP** — Sequencer at rest
• **PLAY** — Playing current sequence (sequence selected)
• **SNGS** — Song Stop: sequencer at rest with a song selected
• **SNGP** — Song Play: playing current song
• **REC** — Recording on current track, first pass
• **ODUB** — Overdub: re-recording current track
• **CNTF** — Countoff playing prior to going into Play, Record, or Overdub
• **REC** (flashing) — Record Standby: waiting for you to play before going into Record (first track only)
• **ODUB** (flashing) — “Punch-in” Standby: waiting for you to play before going into Overdub
• **MREC** (flashing) — MIDI sync Record Standby: same as Record Standby except that the sequencer is synced to external MIDI clocks (CLOCK-MIDI on the Seq Control page) and is waiting for MIDI clocks as well as notes before going into Record. If the *Stop/Continue* button is pressed while MREC is flashing, the sequencer waits 5 seconds before exiting MIDI sync Record Standby.
• **AUDP** — Audition Play. This State is entered automatically from Record when the end of the sequence is reached (assuming LOOP=ON). After leaving Record and entering Audition Play, the sequence will continue to play in this state, with the newly recorded track, until you press the *Stop/Continue* button. Pressing *Stop/Continue* from this state will put you on the PLAY/KEEP Page (see below).
• **AUDS** — Audition Stop is entered when you stop the sequencer from the Audition Play state. To exit Audition Stop and return to the normal stop state, you must first instruct the TS-12 to KEEP either the new or the original track (see Audition Play/Keep Page later in this section).

**Sequencer Banks**
Pressing the *Seqs/Songs* button located beneath the display puts the TS-12 into sequencer mode. The ten *Bank* buttons (labeled 0-9) will now select Sequencer Banks. Each bank contains six sequencer locations, any of which can contain a sequence or a song, or may be blank.
Song names always have a dollar sign ($) as the first character, so that you can tell at a glance which locations contain sequences and which are songs.

The names of sequences and songs which contain actual recorded track data are preceded by a dot (.) on sequencer bank pages. Locations which have not yet been defined as a song or sequence show “-BLANK-”.

Selecting an undefined (-BLANK-) field will initiate the Create New Sequence or Song function (see Creating New Sequence or Song, later in this section).

**Selecting a Sequence or Song**
- Press **Seqs/Songs**, then press the **Bank** buttons labeled 0-9 to see the ten Sequence Bank pages.
- Pressing the soft button next to any of the six locations on a page selects that as the current song or sequence.

When you select a song or sequence it becomes underlined. The currently selected song or sequence is always underlined.

**Playing Sequences and Songs**
Try selecting a sequence, and pressing the **Play** button in the Sequencer section, to the right of the display. The selected sequence will begin to play.

While one sequence is playing you can select another one. An underline will begin to flash beneath the new sequence, but the original one will continue to play. When the first sequence is finished, the underline will switch to the new sequence, and it will play. In this fashion you can string sequences together in real time, as they play. The display always tells you which is playing (underline) and which is selected to play next (flashing underline).

**Note:** In this mode, all track parameters are not automatically updated when the next sequence begins playing. Only those tracks that contain data will be loaded in. The remaining tracks will retain the performance parameters of the previous sequence. Also, if the new sequence uses a different effect than the previous one, the audio output will be muted temporarily while the new algorithm is loaded.

Press either the **Stop/Continue** button or any Foot Switch assigned to either PLAY/STOP or STOP/CONT to stop the sequence.
**Sequencer Tracks**

Each TS-12 sequence and song has twelve independent polyphonic *Tracks* on which you can record notes, controllers, and program changes using local TS-12 sounds, remote MIDI instruments, or both. These tracks are selected from the two Seq/Song Track pages, labeled **Seq/Song Tracks 1-6** and **7-12**.

Let’s take a look at the Seq/Song Tracks pages:

Press **Seq/Song Tracks 1-6**. This takes you to the first of the two pages:

The LED above the **Seq/Song Tracks 1-6** button lights, and the display shows the names of the programs on the six tracks of the current song or sequence. Press the soft button next to a track to select that track.

Press **Seq/Song Tracks 7-12**. This takes you to the second of the two Tracks pages:

The LED in the **Seq/Song Tracks 7-12** button lights, and the display shows the names of the programs on the remaining 6 sequence tracks. Tracks which show –UNDEFINED– instead of a program name have not yet been defined (to define an undefined track you just select it).

A dot to the left of the track location indicates that there is recorded data on the track.

On these two pages you can select and layer the tracks of a sequence (by clicking or double-clicking) just as you would on regular program bank pages. You can go back and forth between **Seq/Song Tracks 1-6** and **7-12** without losing what was selected or layered in the other half. The LEDs above the two Seq/Song Tracks buttons tell you where you are.
Replacing the Sound on a Sequence or Song Track

To replace the TS-12 sound on a given Sequence or Song track with a sound of your choice:

• While on either of the Seq/Song Tracks pages, select one of the six tracks.
• Press the Replace Track Sound button. The display will show program bank pages, but the Sounds LED will flash, indicating that you are in Replace Track Sound mode.
• Use the BankSet button to choose between User RAM, ROM, or Sampled Sounds, as you would when selecting sounds normally.
• Use the Bank buttons to locate the bank containing the sound you want.
• Underline the program you want to put on the track.
• Press Seq/Song Tracks 1-6 or 7-12 to return to the Seq/Song Tracks page with the new sound on the track. Note that all of the track’s Track Parameters (except for those marked with an asterisk “*” below) are left just as they were previously. The settings for the Track Parameters that are stored with each sound are installed onto the track with the sound; the other sequencer Track Parameters are never altered unless you edit them intentionally.

To copy a sound along with its effect into the sequence (replacing the current sequence effect with the one in the sound), you follow the same procedure as above, with the addition of double-clicking the Replace Track Sound.

• Press Seq/Song Tracks 1-6 or 7-12 and select the track.
• Double-click (press two times quickly) Replace Track Sound.
• Use the BankSet button, the Bank buttons, and the soft buttons to pick a sound as before; but now each time you pick a new sound its effect will become the sequence effect.
• Press Seq/Song Tracks 1-6 or 7-12 to return to the Seq/Song Tracks page with the new sound on the track, and its effect used by the sequence.

Tip: You can use the Replace Track Sound feature to audition different sounds while the sequence is playing. However, to permanently change the sound on a track, the sequencer must be stopped.

Using SoundFinder in Sequencer Mode

Here’s how to select Programs that have the same defined Program Type in Sequencer mode. For this example, we’ll replace the Program on a sequence track from a sequence used in the DEMO-SONG found on the TSD-200 floppy disk that came with the TS-12. Note that loading in any sequence file that has a flashing “P” will replace the RAM programs. If you have any customized Programs that you want to save, do so before proceeding:

• Insert the TSD-200 disk into the disk drive.
• Press the Storage button.
• Press the bottom center soft button beneath DISK.
• Press the bottom center soft button beneath *LOAD*.
• Use the Data Entry Controls to select the file TYPE=30-SEQ/SONGS. The display shows:

```
LOAD FILE=TUTORIAL   P  SIZE=256  *YES*
TYPE=30-SEQ/SONGS  BANKS 0-4  *NO*
```

• Press the soft button above *YES*.
• The display momentarily shows LOADING TUTORIAL, followed by DISK COMMAND COMPLETED, then it will return to the LOAD FILE page.
• Press the Seqs/Songs button.
Press the **Bank 0** button. The display shows:

```
SEQ . DEMO-SONG . VERSE-1 . VERSE-2
STOP . BRIDGE . RE-FUNK . LAYERS OUT
```

Press the lower right soft button beneath **LAYERS OUT**. We will be replacing a track sound assignment in this sequence.

Press the **Sequencer Control** button and set **LOOP=ON**. This way you can hear the **LAYERS OUT** sequence repeat continuously, allowing you to audition several different Programs without having to restart the sequence each time.

**Note:** The sequencer must be stopped in order to permanently change a track sound assignment. When the sequencer is playing, you can audition sounds, but when the sequencer stops, or when it loops, the original track sound is reinstalled.

Press the **Play** button if you would like to hear this sequence. When you are finished listening to the sequence, press **Stop•Continue**.

Press the **Seq/Song Tracks 1-6** button. The display shows:

```
TRAX . GENESIS . MYSTIQUE . FILMISH
STOP . ROLL-CYMBAL . BRAVO . BEST-PAD
```

Press the lower right soft button beneath **BEST-PAD**.

Press the **Play** button.

Press the **Replace Track Sound** button, followed by the **Down Arrow** button. The display shows:

```
R3-0 STUDIO-PADS TAKE-ONE GLASS-KEYS
PLAY FANTASIA TRANS-COMP BEST-PAD
```

The sequence will now be playing **GLASS-KEYS** where **BEST-PAD** used to be.

Press the **Down Arrow** button three more times. The display shows:

```
R2-8 BIG-ANNA POLY-SYNTH WOW-SWEEP
PLAY OLD-FRIEND WAVESAW 3-WAY-SYNTH
```

This is the sound that we want to use to replace **BEST-PAD**.

Press the **Stop•Continue** button, followed by the **Seq/Song Tracks 1-6** button. Notice that **Seq/Song Track #6** still shows **BEST-PAD**. That’s because you can’t change a track sound
assignment when the sequencer is playing.

- Now that we’ve auditioned Programs within the same Program Type and found the Program that we want to use to replace BEST-PAD, press the Replace Track Sound button.
- The display shows the last viewed Sound Bank page. In this case it’s R2-8. Press the soft button beneath WARMSAW.
- Press the Replace Track Sound button (its LED will turn off), and you will be returned to the Seq/Song Tracks 1-6 page. You have just successfully replaced a track sound assignment (BEST-PAD) with one of a similar Program Type (WARMSAW) within a sequence.

**Tip:** If you manually select a Program of a different type while the Replace Track Sound LED is lit, pressing the Up/Down Arrow buttons will now select Programs from the new type.

### Layering Sounds on The Tracks Pages

In a preset, a maximum of two sounds may be layered with the selected sound. Within a sequence, you can layer as many as 11 sounds with the selected sound. You can have up to 12 tracks layered (stacked) on one key, or up to 12 different tracks split across the keyboard by using the Key Zone function described in Section 4 — Understanding Presets.

Layering sounds is the same as in a normal Preset Track Parameter page:
- Select a primary sound on either of the Seq/Song Tracks pages.
- Double-click the soft button for the track you wish to layer. Layered tracks are identified by a blinking underline. If a track is layered, it can be un-layered by pressing its soft button.

### Sequencer Tracks and the Track Parameters

Every sequencer track has a full set of Track parameters which are saved with the sequence or song. The values of the following are remembered for each track:

- Mix
- Pan & Pan Mode
- Attack *
- Release *
- Brightness *
- Timbre *
- External MIDI Controller (XCTRL) *
- Key Zone
- Velocity Range
- Velocity Sensitivity
- Transpose
- Detune
- Rate (LFO and/or Wave List Duration) *
- Sustain On/Off
- Sostenuto On/Off
- Pitch Bend On/Off
- Mod Wheel On/Off
- Reset Controllers On/Off
- All-Notes-Off On/Off
- Patch Select Mode *
- Pressure Mode *
- Volume Pedal Mode
- MIDI Status
- MIDI Channel
- MIDI Program *
- MIDI Bank Select *
- Effects Bus Routing
- Effect Mod Control

Track Parameters marked with an asterisk “*” are stored with each sound.

You should refer to Section 4 — Understanding Presets and Section 5 — Preset/Track Parameters for a full discussion of the performance/track parameters and their functions.

As described in Section 1 — Controls and Basic Functions, whenever you go from Sounds or Presets mode to the Track Parameter pages, the TS-12 displays the names of the three most recently selected sounds (on the top line) and their parameter values (on the bottom line).

Sequencer Tracks are similar, except that the names of the sounds and their corresponding Track parameters are shown on different pages. When you press **Seq/Song Tracks 1-6 or 7-12**, the TS-12 displays the names of the six sounds on those six tracks.
When you then select any of the Track parameter pages, the display will show only the parameter values for the six tracks, and not the names of the sounds:

Let’s look at a Sequencer Track Performance parameter, and you’ll get a better idea how this works. Using the Brightness/Timbre page as an example:

- Press Seq/Song Tracks 1-6 or 7-12. The display shows one the Tracks pages with the names of the programs on those six tracks.
- Press the Brightness/Timbre button. This takes you to the Brightness page:

Each of the six parameter values corresponds to one of the 12 track locations (the LED above the Seq/Song Tracks 1-6 or 7-12 button will be lit to tell you which half you are in). You can verify this by pressing the Seq/Song Tracks 1-6 or 7-12 button again. Repeatedly pressing either the Seq/Song Tracks 1-6 or 7-12 button will toggle between the TRAX Page and the last-selected Track Performance parameter. This will help you keep track of what you’re editing. Notice that the upper left corner of the display still shows the Track Parameter Page name, but it may appear differently for Sequence tracks, because there is more room to display full page name. Other than that, Track parameter editing for a sequencer track is the same as for presets. All Track parameter values are remembered for each track of each sequence and song.
Important:
In Sequencer mode, selecting and editing a track from a Track Parameter page does not change what is selected or layered on the Seq/Song Tracks 1-6 and 7-12 pages — i.e. it does not affect what you hear when you play the keyboard. This means that you can edit a track parameter value for one (or more) of the tracks within a group of layered sounds without changing the layer.

You can adjust volume, pan, timbre, etc. for tracks other than the selected track while playing back a sequence. However, this also means that you could edit a performance value for a track that you are not currently hearing from the keyboard, so be careful that you know what track(s) you are listening to in relation to what is selected on the Track Parameter pages.

The track that is selected on the Seq/Song Tracks 1-6 or 7-12 pages is the one that will be recorded if you go into record.

You should get in the habit of always selecting a track from the Seq/Song Tracks 1-6 or 7-12 page before going into record.

The Tempo Track and the Track Parameters
Note that the Tempo Track feature offers no Track Parameter values, and appears on all of the track parameter pages as TEMPO. For example, the Track Parameters Mix page would look something like this:

```
MIX  127  064  101
SNGS  069  (127)  TEMPO
```

Copying a Preset into 3 Sequencer Tracks
You can copy the three tracks of a preset, with all Track Parameter settings preserved, into three tracks of the current song or sequence. The preset will be copied whole into the three tracks on the upper or lower line of either the Seq/Song Tracks 1-6 or the 7-12 page:

- Press `Seq/Song Tracks 1-6` or `7-12` and select any of the tracks on the line (upper or lower) to which you want to copy the preset.
- Press `Preset` and use the `BankSet` and `Bank` buttons to select the preset you want to copy.
- While holding down the `Preset` button, press the same `Seq/Song Tracks 1-6` or `7-12` button as you did in the first step. The preset tracks are copied into the upper or lower line of that half of the TRAX page.

When you copy a preset into a sequence, the values of all the Track Parameters are copied. However, the selected and layered status of the tracks in the preset is not copied. Whichever tracks in the sequence are selected or layered when the preset is copied will remain so after it is copied. This also does not affect the track data in the sequence. The sequencer can only record one track at a time (except in Multi-Track Record, described later in this section). If you want the preset to play a sequence track, you must copy the sequence data to the other two tracks, if needed.
Copying a Preset Along With its Effect into 3 Sequencer Tracks

To copy a preset along with its effect into the sequence (replacing the current sequence effect with the one in the preset), follow the same procedure as above, with the addition of pressing the Track Effects button before pressing Seq/Song Tracks 1-6 or 7-12 in the last step.

- While holding the Preset button down, first press the Track Effects button, then press Seq/Song Tracks 1-6 or 7-12. The Preset is copied to three tracks of the sequence and its effect becomes the sequence effect.

Creating a New Sequence

Creating a new sequence or song is easy:

- On any of the Sequencer Bank pages, pressing the soft button nearest an undefined -BLANK- location will display the following prompt:

  ![Image of sequence creation prompt]

- Press the soft button above *SEQUENCE*. The display shows:

  ![Image of sequence name entry prompt]

- Name the new sequence (or press *YES* to accept the default name). Under the first character is a cursor (underline). Use the data entry controls to edit the character, then use the soft (cursor) buttons beneath the words LEFT and RIGHT to move the underline to another character and edit that. Continue this until the display shows the name you want (or you can use the keyboard to enter the name data if the KBD-NAMING function is enabled on the System page).
- Press *YES*. The display shows:

  ![Image of sequence time signature entry prompt]

- Set the Time Signature. The time signature is set at the creation of a new sequence and cannot be changed later. Use the data entry controls to adjust the top half of the fraction, then press the soft button beneath the time signature to move the underline to bottom half, and adjust that. Continued presses of the soft button beneath the time signature will toggle between the upper and lower fraction values.
- Press *YES*. The TS-12 returns to the current Sequencer Bank page with the new sequence selected.
Creating a New Song

- On any Sequencer Bank page, select a -BLANK- sequencer location, as described above. The display will show the CREATE NEW *SONG* OR *SEQUENCE* screen.
- Press the soft button above *SONG*. The display shows:

```
CREATE SONG NAME=$SONG-02
LEFT -CURSOR- RIGHT *NO *
```

Song names are always preceded by “$” to indicate their special nature. Note that you cannot change this $ character. The other ten characters can be edited.
- Name the new song (or press *YES* to accept the default name, which is $SONG-##). Use the data entry controls and the soft buttons labeled LEFT and RIGHT to edit the song name to create the name you desire.
- Press *YES*. The TS-12 returns to the current Sequencer Bank page with the new song selected.

Erasing All Sequencer Memory

When you want to erase all sequences and songs in the TS-12 sequencer memory, first make sure you have saved any important data to disk, then:

- Press and hold the Presets button.
- While holding down the Presets button, press the middle of the three soft buttons in the top row above the fluorescent display.
- The TS-12 asks: “ERASE ALL SEQUENCER MEMORY?”
- Press *YES*. The TS-12 erases all sequences and songs from memory. After the memory is erased, there will be one blank song and one blank sequence in locations 00 and 01 (there is always one song and one sequence in memory).

Recording a Sequence

Here we will describe recording a new sequence from scratch. First we will concentrate on sequencing with the TS-12 alone, and then cover sequencing remote MIDI devices.

1) Create a New Sequence:
- Following the steps outlined earlier in this section, create a new sequence.

2) Select a Track:
- Press the Seq/Song Tracks 1-6 button. The display shows the first six tracks of the new sequence. Seq/Song Track 1 is already defined and selected (there is always one track selected in a sequence) and the current program has been placed on the track. All other tracks are as yet -UNDEFINED-.

```
TRAX DYN-Piano -UNDEFINED- -UNDEFINED-
STOP -UNDEFINED- -UNDEFINED- -UNDEFINED-
```

- If you want to begin recording the sequence with a track other than Track 1, press the soft...
button next to that track. This defines the track and puts the currently selected sound on it. Otherwise, you can just leave Track 1 selected and start from there.

3) Select a Sound for the Track:
• Press Replace Track Sound. The display shows Program Bank pages; the Sounds LED is flashing.
• Select a sound as you normally would, using the BankSet button and the ten Bank buttons to locate the sound you want, and then selecting it by pressing its soft button.
• Press Replace Track Sound again to return to the Seq/Song Tracks page. The new sound is now assigned to the track.

4) Check the CLICK and COUNTOFF settings:
• Press Click. This page controls all the functions of the TS-12’s built-in metronome. Underline the CLICK parameter and set to CLICK=REC. This will provide a click track when you are in record, but not during playback.
• Underline the COUNTOFF parameter and set to COUNTOFF=REC. This will play a one bar countoff before recording (but not when playing back) all tracks after the first. The TS-12 will display CNTF in the lower-left-hand corner of the display during countoff (when enabled on the Click page):

![Click COUNTOFF Setting](image)

5) Record the First Track:
The length of the first track defines the length of the sequence. For this reason, there is a special procedure for recording the first track of a new sequence.
• While holding down Record, press Play. The click track starts playing, giving the tempo. The first beat of each measure is emphasized.
• Adjust the tempo. Press Locate. The Tempo parameter is always selected on this page. Use the Data Entry Slider and the Up/Down Arrow buttons to set it to the tempo you want. Or, with the sequencer running, you can tap on the soft button below the TEMPO parameter at the desired tempo.
• Play the keyboard to begin recording. The bar in which you start playing becomes Bar 1 of the sequence.
• Press Stop/Continue (or the assigned AUX Foot Switch) to end recording. The display will ask “KEEP FIRST TRACK?” The length (in bars) of the first track is shown in the lower left corner of the display. This will determine the length of the sequence.
• Press *YES* to keep the track, defining the length of the sequence, or
• Press *NO* to erase the first track and start over again.

6) Record Additional Tracks:
After you have answered *YES* to the question “KEEP FIRST TRACK?,” all other recording, including re-recording the first track, will follow the same basic routine. The length of the sequence is now defined (by the length of the first track). The rest of the tracks will automatically have the same length.
• Press the Seq/Song Tracks 1-6 button, and select a second track by pressing the soft button of any -UNDEFINED- track (or leave the first track selected if you want to record over it). The name of the sound and all the track parameters from the previous track are copied onto to the new track.
• Select a sound for the track. As shown in step 3 above, use the Replace Track Sound function
to put the sound of your choice on the selected track.

- Press **Record**/**Play** to begin recording. The click track will play for one measure (assuming **COUNTOFF= REC** or **CLICK**), then the sequencer will enter record mode. It will record whatever you play on the new track until:
  1) the end of the sequence is reached, or
  2) you press **Stop/Continue** (or press the assigned AUX Foot Switch).

At the end of the sequence, the TS-12 will leave record mode and (assuming **LOOP=ON**) enter Audition mode.

**About the Audition Play/Keep Page**

- Press **Stop/Continue** or the assigned AUX Foot Switch to stop the Sequencer. This puts you onto the Audition Play/Keep page:

```
PLAY ORIGINAL TRACK    PLAY NEW TRACK
KEEP ORIGINAL TRACK    KEEP NEW TRACK
```

- Press **PLAY ORIGINAL TRACK** to hear the track as it was before you recorded the new track. The first time you record a particular track, this isn’t very useful, but it is invaluable when you begin to do second and third takes, since it allows you to compare the tracks before deciding which to keep.
- Press **PLAY NEW TRACK** to hear what you just recorded.
- Press **KEEP ORIGINAL TRACK** to leave the track as it was in memory, and delete the one you just recorded. If the track was empty before recording, pressing this button will leave it empty.
- Press **KEEP NEW TRACK** to save the new track into memory, replacing whatever was on the track before.

The Audition page appears after all track recording and after all track edit functions. The TS-12 always gives you a chance to audition changes to the track data before deciding whether to keep them.

**Playing Tracks in Audition Mode**

It is possible to alternate between playing Original and New tracks in Audition mode **without** having the track restart from the beginning, making comparisons more convenient. If the sequencer is playing, each time Play New or Play Original is selected, the context will instantly switch. Pressing **Play** will play the selected track from the beginning.

When ineligible buttons are pressed while in Audition mode, a message appears to indicate that it is necessary to decide which version of the most recently recorded track is to be kept **before** the desired action can be performed. The message appears momentarily, and then the display changes back to the Audition page.
“Punching In” on a Track

The TS-12 offers two methods for “punching in” (or re-recording) a specific part of a track. When AUTOPUNCH=OFF (on either the Locate or Sequencer Control sub-page), you can punch in manually just by playing the keyboard to start recording. When AUTOPUNCH=ON, the TS-12 will enter and exit Record mode automatically at the precise times that you specify on the Locate sub-page.

To Punch in manually on a track (meaning AUTOPUNCH=OFF on the Locate page):

- Press Seq/Song Tracks 1-6 or 7-12 and select the track you want to record on.
- Press Play to start the sequence or song playing.
- Press Record. This puts the TS-12 in Overdub Standby — ODUB flashes in the lower left corner of the display and the sequencer is waiting for you to play keys before going into record.
- Start playing at the point where you want to punch in. As soon as you play anything the TS-12 goes into overdub (or record for a new track) and records what you play, leaving intact the part of the track before the punch in. Unless you then press Stop/Continue or the assigned AUX Foot Switch, new track data will be recorded from the point where you punched in to the end of the sequence or song.
- Press Stop/Continue. You will see the Audition page as shown earlier, letting you audition the new or the old track before deciding which to keep.

To Punch in and out automatically on a track (meaning AUTOPUNCH=ON):

- Set the Edit IN and OUT times on the Locate sub-page as described earlier in this section. These define the exact bar, beat and clock at which the TS-12 will enter and exit record.
- Press Record/Play to start the sequencer. It will begin to play but will not go into record until the Edit IN time is reached. You can play along with the sequence if you wish without being recorded.
- When the Edit IN time is reached the sequencer will automatically enter record, and will record whatever you play until the Edit OUT time is reached.
- At the Edit OUT time the sequencer automatically exits record and goes into Audition Play mode.
- Audition the new track as usual from the Audition page before deciding whether to keep the new or the old track.

When AUTOPUNCH=ON, the TS-12 will record events only within the window of time specified by the Edit times, no matter how you enter record. Thus if you press Play, then Record the TS-12 will wait for you to play before entering record, but recording will only be triggered by notes within the Edit times window. Notes played before the Edit IN time or after the Edit OUT time will not initiate recording.

If the RECORD MODE=LOOPED (on the Sequencer Control page) and AUTOPUNCH=ON, the sequencer will continue to go in and out of record at the Edit points each time the sequence repeats, for as long as you let it play.
Finding the BankSet, Bank, and Display Location for Sounds on Sequencer Tracks

To find the BankSet, Bank and Display location (U0-1.5, U1-3.1, R2-7.4, etc.) for the sounds assigned to sequencer tracks:

- Select the sequence or song using the **Seqs•Songs** button, the **Bank** buttons (0-9), and the appropriate soft button in the display.
- Press the **Seq/Song Tracks 1-6** (or **7-12**) button. The Seq/Song Tracks page shows:

- Seq/Song Tracks with Programs show Program Name
- Seq/Song Tracks with Sampled Sounds show Sampled Sound name
- Empty Seq/Song Tracks show -UNDEFINED-
- Seq/Song Tracks with Sampled Sounds that are loaded and UNMUTED show the Sampled Sound name
- Seq/Song Tracks with Sampled Sounds that are MUTED, or NOT LOADED show the BankSet and Bank location of the Sampled Sound
- Empty Seq/Song Tracks will show -UNDEFINED-

- To identify the locations of the first six sequencer tracks, press and hold the **Seq/Song Tracks 1-6** (or 7-12) button, and then press **Sounds**. The display will now show:

- Seq/Song Tracks with Programs now show the BankSet, Bank, and Display location of the Program
- Seq/Song Tracks with Sampled Sounds that are loaded and UNMUTED now show the Sampled Sound BankSet and Bank location
- Seq/Song Tracks with Sampled Sounds that are MUTED or NOT LOADED now show BankSet, Bank, and Display location of the Surrogate Program assigned to the Track
- Empty Seq/Song Tracks will show ******

- Release both buttons and the Seq/Song Tracks page will be re-displayed.

See Section 14 — **Understanding Sampled Sounds** for more information about Surrogate Programs.
Edit Sequence Page — Sequence Edit Functions

Pressing the Edit Sequence button displays the sequence editing page. Pressing the button twice will display the sub-page containing the Add and Delete Bars functions.

The following functions can be selected from the Edit Song page:

- APPEND — Lets you append (attach) one sequence onto another.
- INFO — Provides information about the sequence; lets you adjust the tempo and, indirectly, the elapsed time.
- ERASE — Erase and undefine the sequence.
- COPY — Copy the sequence to another sequencer location.
- ADD & DELETE BARS — Increase or decrease the length of the sequence.

The MIDI Connection

Almost everyone is familiar with MIDI — that magical connection that lets you play one instrument (or a whole roomful of them) from another. MIDI (Musical Instrument Digital Interface) is a standard that has been agreed upon by manufacturers for translating musical events into specific numbers which are transmitted and received by MIDI instruments.

When you play middle C on the TS-12, for instance, it instantly sends to its MIDI Out jack a series of numbers representing a Key Down event, along with the location of the note on the keyboard and how hard the key was struck. When you release the key the TS-12 sends a number meaning Key Up. A MIDI instrument connected to the TS-12 can receive and translate those numbers, and will play the middle C itself. The same thing happens whenever you move a controller, such as the Pitch or Mod Wheel, or when you select a new sound — each of these events is translated into a series of numbers which are transmitted by the MIDI Out jack.

MIDI Sequencing on the TS-12 — MIDI Connections

You can use the TS-12 sequencer to drive external MIDI devices, greatly enhancing the number of available voices and timbres. A sequence or song track can be assigned MIDI status (on the Track MIDI page) so that it plays only out MIDI; so that it will play only locally; or both, in which case it will play a local sound and send on its designated MIDI channel.

When controlling multiple remote MIDI devices, first connect the various devices to the TS-12, and to each other, as shown here. Connect the MIDI Out jack of the TS-12 to the MIDI In jack of the first device. Then connect the MIDI Thru jack of the first device to the MIDI In jack of the second device. Connect the MIDI Thru jack of the second device to the MIDI In jack of the third device. And so on, for as many devices as you will be using.

With this arrangement, once you set up the proper MIDI channels, etc., each remote MIDI device will receive and play only the data that is intended for it, and will “pass along” all other data. Also, each can be played from its own keyboard (as well as from the TS-12’s) without affecting the others, because MIDI Thru jacks only pass along incoming MIDI data, and do not transmit what is played on the instrument.
This set up is ideal for controlling everything right from the TS-12. Simply by selecting the track which is set to the same MIDI channel as to a particular instrument, you can:

1) Play the remote MIDI device from the TS-12 keyboard
2) Record a track that will play back on the MIDI device when you play the sequence or song
3) Send the remote MIDI device Program Changes and adjust its volume (assuming the device receives MIDI Volume)

In other words, once you have made the appropriate connections, and set up the MIDI configuration of the tracks and all remote MIDI devices, you can use the TS-12’s keyboard and its front panel to control and record all the remote MIDI devices in your rig.

**MIDI Mode and Channel — Remote MIDI Device**

The next step is to set up each remote MIDI device to receive only the MIDI information that is intended for it. When each of the receiving units is set to receive on a different MIDI channel (or a number of them, for multi-timbral units) you can control them all right from the TS-12.

**For each** remote MIDI device:

- **Set to POLY (OMNI OFF) or MULTI Mode.** Each remote MIDI device must be in a mode where it receives only on its selected MIDI channel (or channels). This is usually referred to as POLY (or OMNI OFF) Mode for receiving on a single channel, or MULTI mode for receiving independently on multiple channels. Consult the owner’s manual if there is any question about a particular instrument.

- **Select a MIDI channel or channels.** The best idea is to assign each destination Instrument its own MIDI channel(s) and leave it that way. If you know, for instance, that a certain synth is always set to receive on MIDI channel 4, you can quickly set up a track to drive that synth by simply selecting an undefined track, then assigning that track MIDI Status and MIDI channel 4 on the Track MIDI page. Also when each destination instrument is always set to its own distinct MIDI channel, it means that different sequences and songs recorded at different times will always play the right instrument on the right track.

Once you have assigned MIDI channels to each instrument in your rig, write them down, and keep the paper handy for quick reference.

**MIDI Track Configuration**

After you have made the MIDI connections, and set up your remote MIDI devices as described above, you now configure the tracks of a sequence to send to those remote MIDI devices. Let’s suppose that you are sequencing several remote MIDI devices, as depicted in the illustration on the previous page.

For each track which you want to drive a remote MIDI device:

- **Select a track.** Go to the Seq/Song Tracks 1-6 or 7-12 page and press the soft button corresponding to a track location to select a track.

- **Assign the track MIDI Status.** Press the Track MIDI button once to display the STATUS sub-page. The selected track is underlined. Use the data entry controls to set the track to LOCAL-OFF status. You will notice that when you play the keyboard now, it doesn’t sound on the TS-12.

- **Assign the track a MIDI Channel.** Press the Track MIDI button again — the CHANNEL sub-page appears. Set the track to the MIDI channel of the remote MIDI device you want to sequence from that track. Playing the TS-12 keyboard should now play the Receiving Instrument.

- **Set the Program Number.** Press the Track MIDI button a third time — the PROGRAM sub-page appears. Now you can use the data entry controls to change the program that the
receiving unit is playing. While playing the TS-12 Keyboard, adjust the program number until the external instrument is playing the sound you want.

From now on, whenever you select that sequence, or when it plays as a step in a song, this track will send out this program change on its selected MIDI channel.

**Note:** When sequencing, you should always select the sounds for remote MIDI devices from the TS-12 as described above, and *not* from the remote MIDI device itself. This assures that the track has the proper program number for that instrument in each sequence.

**Recording MIDI Tracks**

Once everything is set up, you can proceed with recording MIDI tracks exactly as you would for tracks with local or both status. Tracks that are sent out MIDI are treated the same as internal tracks in terms of recording, overdubbing, punching in, editing, etc. Follow the same steps outlined earlier in this section for recording the first track and then for additional tracks. For each successive track you record, the procedure will follow the same lines:

1) Define the MIDI configuration of the track on the Track MIDI page
2) Record the track
3) Either keep or reject the new track from the Audition page

MIDI tracks can be selected and stacked from the Tracks pages, and can be muted or soloed from the Mix/Pan page, the same as any other tracks. Performance/Track parameters such as Mix, Key Zone and Transpose all apply to MIDI tracks just as with local tracks.

Most often you will be recording sequences and songs which contain some MIDI tracks and some local tracks. When this is the case, be sure that you assign local status (as opposed to both local and MIDI) to the tracks that you want to play only on the TS-12. This will avoid accidentally sending unintended MIDI data to an external instrument.

**Additional Sequencer Functions**

**Recording Controllers into Sequencer Tracks**

When recording sequencer tracks, the TS-12 will record all changes to controllers such as the pitch and mod wheels, pressure, foot pedal, patch selects, sustain, sostenuto, effect, foot switch, etc.

There are other, less obvious, controllers that will be recorded into the track if they are changed while the track is being recorded — The Pan, Attack, Release, Brightness, Timbre, XCTRL, and Rate Track parameters. When the sequencer is in Record or Overdub mode, if you go to any of these Track Parameter pages and change the value for the current track, the changes will be recorded. When you play back the track, you will notice that the screen is updated with the new value.

**Tip:** You can use the Controllers On/Off and the Velocity range parameters (found in the Track Parameters section on the front panel) as filters on sequence playback. For instance, you could audition the track with the Pitch Bend removed (if PBEND is set to OFF).
Changing a Sound within a Sequence or Song Track (Recording Program Changes)

The TS-12 can change track sounds in a sequence or song, allowing you to change the sound that is playing on the track as the track plays. There are two ways to do this. Both methods will have the same effect, but the first is best suited for local tracks, the second for MIDI tracks.

To change a sound within a local track:
- On the Sequencer Control page, set the Record Mode to RECORD-MODE= ADD.
- Press Seq/Song Tracks 1-6 or 7-12 and select the track that you want to change the sound.
- Press Replace Track Sound, press the BankSet and proper Bank button to locate the sound you want to change to. Don’t select the sound yet, just leave its bank showing on the display.
- Hold down Record and press Play to start the sequencer recording.
- At the point where you want to insert the new sound, press the soft button next to the new sound. The track will begin to play the new sound and the change is inserted into the track.
- You can continue selecting new sounds in this mode as long as the sequence is in record. Each time the change will be recorded.

Tip: To change the sound and install its effect as the current sequence or song effect, double-click the Replace Track Sound button in step three above. Note that when Track STATUS=VOICE-OFF, LOCAL-OFF, or MIDI-LOOP program changes +60 will not change the effect. This is good for sending numbers above 60 to external devices.

To change a sound within a MIDI track:
- On the Sequencer Control page, set the Record Mode to RECORD-MODE= ADD.
- Press Seq/Song Tracks 1-6 or 7-12 and select the track on which you want to change the sound.
- Hold down Record and press Play to start the sequencer recording.
- Press and hold down the soft button next to the track on which you want to record the program change.
- While holding down the soft button, type the number of the program change on the Bank buttons beneath the display. For example, to record program change #12, press 1, then 2; to record program change #106, press 1, then 0, then 6; and so on.
- At the instant you want the program change recorded, release the soft button. The program change is recorded (and sent to the remote MIDI device) when the soft button is released, so you can type the number in advance and let the button go at the exact instant you want the program change sent.
To send/record a MIDI program change:

1) Press and hold the track's soft button
2) "Type" the program # on the bank buttons
3) Release the soft button

- This same procedure can be used at any time to send a program change to a remote MIDI device, whether the sequencer is in record or not.

**Note:** If the track status is both, program changes recorded into the track will affect both the local and the MIDI program when the track is played back. This is true whichever of the above methods was used to insert the program change, even though the second method shown above does not change the local program at the time of recording.

**Defining Track Pressure in Sequencer Mode**

**When Track PRESSURE=OFF:**
- Local voices played from the keyboard or the sequencer will not respond to pressure.
- The sequencer will not record pressure into any tracks you record.
- The sequencer will not play back any Poly-Key or Channel pressure messages recorded on the track.
- The instrument will not transmit or receive pressure of either type via incoming MIDI.

**Note:** You should select Track PRESSURE=OFF whenever you don’t want or need pressure for a given sound, particularly when sequencing. Pressure data eats up sequencer memory rapidly, so whenever you record a track with a sound that doesn’t respond to pressure, set this parameter to OFF. This will avoid wasting valuable sequencer memory, and will avoid clogging up the MIDI data stream with a lot of unnecessary pressure information. Existing pressure information can also be removed from a track using the Filter command on the Edit Track page.

**When PRESSURE=KEY:**
- Local voices played from the TS-12 keyboard will not respond to pressure.
- The sequencer will record Poly-Key pressure received via incoming MIDI into any tracks you record.
- The sequencer will play back any Poly-Key pressure messages recorded on the track, and will ignore any Channel pressure on the track.
- The TS-12 keyboard will not transmit any pressure out via MIDI; however,
- Either Channel pressure or Poly-Key pressure will be received via incoming MIDI.

**When PRESSURE MODE=CHAN:**
- Local voices played from the TS-12 keyboard will respond to Channel pressure only.
- The sequencer will record Channel pressure into any tracks you record.
- The sequencer will play back any Channel pressure messages recorded on the track, and will ignore any Poly-Key pressure on the track.
• The TS-12 keyboard will only transmit Channel pressure out via MIDI, however.
• Either Channel pressure or Poly-Key pressure will be received via incoming MIDI.

Note: When REC-SOURCE=MULTI on the Sequencer Control page, the TS-12 sequencer will always record both Channel and Poly-Key pressure (received via incoming MIDI), no matter what the Track PRESSURE parameter is set to.

Assigning a Track to the AUX Outputs

Until you change it, each sequencer track will be sent to the output bus which is programmed into the sound. In almost all cases this means that the track will be sent to the Main stereo outputs. To assign a track to the AUX outputs for separate processing:

• Press Seq/Song Tracks 1-6 or 7-12 and select the track.
• Press the Track Effects button. The display shows the Effects Bus Override status for each track, with the current track underlined:

```
<table>
<thead>
<tr>
<th>BUS</th>
<th>VOICE</th>
<th>VOICE</th>
<th>-DRY-</th>
</tr>
</thead>
<tbody>
<tr>
<td>STOP</td>
<td>-FX1-</td>
<td>-FX2-</td>
<td>-AUX-</td>
</tr>
</tbody>
</table>
```

• Use the data entry controls to set the track to -AUX-. Anything played or recorded on that track will now be sent directly to the AUX outputs, bypassing the effects.

This page serves as a mixer for the various tracks, letting you determine how each track is routed to (or around) the effects. The available settings are:
• VOICE uses normal voice routing as programmed into the sound — this is the default setting in the track
• -FX1- forces FX2 voices to FX1; FX1 and DRY are unaffected
• -FX2- forces FX1 voices to FX2; FX2 and DRY are unaffected
• -DRY- forces all voices to the dry bus
• -AUX- forces all voices to the AUX outputs, bypassing the effects

Using the AUX Outputs as Separate Mono Outs

If you want to use the two AUX outputs as independent mono outputs, use the track Pan control in conjunction with the Effects Bus Override:

• Select a track, press the Track Effects button and assign the track to –AUX– as shown above.
• Press Mix/Pan twice to get to the PAN page. Set to -63 to assign the track to the left AUX output only; or set to +64 to assign the track to the right AUX output. You can also press the soft button for the track and define if the AUX jacks will receive a stereo or mono signal.
Edit Track Page — Track Edit Functions
Pressing the Edit Track button displays the top level track editing page. Pressing the button twice will display the track edit options sub-page. These edit functions will affect the currently selected track. If a sequence is selected, the current sequence track will be edited; if a song is selected, the current song track will be edited.

The following functions can be selected from the Edit Track page:

- **SHIFT** — Shift track forward or back in time by a number of clocks.
- **QUANTIZE** — Auto-correct notes to the nearest beat.
- **ERASE** — Erase all or part of the track.
- **COPY** — Copy all or part of the track to another track in any sequence.
- **TRANSPOSE** — Raise or lower the pitch of all or part of the track by octaves and semitones.
- **SCALE** — Scale (increase or decrease the level of) one or more controller(s) in the track.
- **EVENT-LIST** — Provides a comprehensive event editor allowing you to locate and edit any event in the track.
- **FILTER** — This powerful function lets you remove, or copy to another track, any range of notes, controllers, program changes, etc.
- **MERGE** — Merge, or combine, the data from one track with another.

Track Mix Functions — Mixing, Muting and Soloing Tracks
Once you have recorded a few tracks of a sequence, you will want to balance the levels of the tracks, and maybe listen to them one or two at a time. This is done from the Mix/Pan page.

Select a track from the Seq/Song Tracks 1-6 or 7-12 page, then press the Mix/Pan button. The display shows:

<table>
<thead>
<tr>
<th>MIX</th>
<th>STOP</th>
</tr>
</thead>
<tbody>
<tr>
<td>127</td>
<td>(127)</td>
</tr>
<tr>
<td>085</td>
<td>(127)</td>
</tr>
<tr>
<td>092</td>
<td></td>
</tr>
</tbody>
</table>

From this page, in addition to balancing the levels of the tracks in the sequence, you can solo and mute individual tracks just as you can with voices on the select voice page. Notice that the levels for any tracks without recorded data will appear in brackets:

- Press the soft button corresponding to a track to select the track for editing. The data entry controls will now adjust the level of the selected track from 00 to 127.
- Press the soft button of the selected track again to Mute the track. Muted tracks will have brackets around the volume number, as in tracks 5 and 6 above. Pressing a muted track’s button will un-mute it, removing the brackets. If the track has no recorded data, you cannot unmute it.
- Rapidly double-click on a track’s soft button to solo it. Asterisks will appear on either side of the soloed track, and all other tracks will get brackets to indicate that they are muted.
- Pressing the soft button of a soloed track will “un-solo” the track, returning all tracks to their previous status.
- When a track is soloed, you can select another track, then press its button again to “solo” it along with the other soloed track. In this way you can un-mute tracks one at a time to listen to any combination. Just press the soft button of any of the soloed tracks again to return all tracks to their previous status.
Song Mode

The TS-12’s Song Mode is the key to unlocking its true power as a Performance/Composition Synthesizer. In song mode, you can chain a number of sequences together to form a song. Songs are made up of Steps — for each song step, you can choose a sequence to play and the number of repetitions of that sequence, as well as mute and transpose status for each track of the sequence.

But wait, there’s more. Each TS-12 song also contains its own effects set-up (see below) and 12 additional tracks which are independent of the tracks in the component sequences that form the song steps. This gives you a 24 track sequencer with tremendous flexibility. You can choose which musical parts you want to put into the component sequences, and which parts you put in the song tracks. Discussion of song tracks begins on the next page.

Switching Effects in Song Mode

As you are probably aware, when you are playing TS-12 sounds and you select a sound which uses a different effect from the previous one, there is a momentary muting of the audio output. This is because, like all digital signal processors, the TS-12 requires some time to switch from one effect to another. The software program which defines the effect must be changed for each different effect.

The same holds true when selecting sequences. Each sequence has its own effects set-up, which is completely programmable and is saved with the sequence. When you select a sequence, if the new one has a different effect than the previous one there will be a brief muting of the output.

This can pose a problem when playing a song — as a new song step begins to play, if the sequence in that step has a different effect than the previous one, there might be a muting of the output. Since it is usually not desirable during sequencer play to mute the output, the TS-12 offers some alternatives.

The SONG STEP EFFECT parameter on the Sequencer Control page determines which effect(s) will be heard when a song is played:

- When SONG STEP EFFECT=SEQ, each time a new sequence begins as a step in a song, its effect will be loaded, resulting in a brief muting of the output (unless the new effect is the same as in the previous sequence).
- When SONG STEP EFFECT=SONG, the effect which is stored in the song will be used for all the song steps and there will never be any muting or “glitching” of the output when new sequences play.

The setting of this parameter is saved with each song. Whenever a new song is created, it defaults to SONG STEP EFFECT=SONG. This ensures that there will be no output muting, but it also means that a sequence might sound different in a song than when it is played on its own.

If you use the SONG STEP EFFECT=SEQ setting for a given song, you can minimize the muting by doing the following:

- Whenever possible, use the same effects algorithm in sequences which will be adjacent to each other in the song.
- Program a rest into the beginning of sequences where the effect will switch to a different algorithm from the previous one. Or create a silent one-bar sequence whose only function is to switch to a new effect. Then make sure the sequences that follow use the same effect.
Edit Song Page — Song Edit Functions
Pressing the Edit Song button displays the top level song editing page. Pressing the button twice will display the Song Step Editor. If you press the Edit Song button when a sequence is selected, the display will respond SONG NOT SELECTED and will not allow you onto this page.

The following functions can be selected from the Edit Song page:

- ADD-TEMPO-TRK — Allows you to add a tempo track to an existing song
- INFO — Provides information about the song and lets you adjust the tempo
- ERASE — Erase and undefine the song
- COPY — Copy the song to another sequencer location
- EDIT STEPS — Edit the song steps, chaining sequences together to form the basic song structure

Editing Song Steps — Using the Song Step Editor
For each Song Step you want to create, on the Edit Song Page:

- Select the Sequence Name field, which for Step 1 of a new song will read SEQ= *SONG-END*.
- Press the Up or Down Arrow button to define the song step and select among the sequences in memory until the display is showing the name of the sequence you want to play during that step.

Tip: When the cursor is beneath either STEP or SEQ, pressing and holding one of the Bank 0-9 buttons, followed by a soft button in the display will automatically select that sequence for the defined song step.

- Select the number of Repeats (REPS=##), and adjust the number of times you want the sequence to play during the step. If you only want the sequence to play once during the song step, leave it set to 01.
- Press TRACKS on the Edit Song page to reveal the Mute/Transpose sub-page shown above. If you want to mute any tracks for that step, select the character(s) representing the track(s) on the upper line of the display and set to M. To transpose tracks during the step, select the character(s) representing the track(s) on the lower line of the display and set to T. Select and adjust the Transpose amount.
- Press STEP=## once to select it, and again to return to the Song Step Editor page.
- Once the Sequence and number of Reps is correct, select STEP=## and press the Up Arrow button to select the next step (STEP=*SONG-END*) and edit that in the same way. For each successive Song Step, select the Sequence Name and use the Up/Down Arrow buttons to choose a sequence; then set the number of repeats, then proceed to the next step.
- There is always one final step which reads SEQ=*SONG-END*) after the last defined step in the Song.

To go to a different Step in the Song:
- Underline Step Number, and use the Up/Down Arrow buttons to go to any step within the song. After you have finished editing the Song Steps (or at any point during the process, for that matter) you can go back through the song to check that all the steps are right.
To change anything in an existing Song Step:
• To change any of the variables (sequence name, number of reps, track mute or transpose status) within a Song Step which has already been created, simply go to that step, as described above, select the thing you want to edit and change it.

To Insert a step anywhere in the song:
• Press STEP=## and go to the step before where you want to insert the step. That is, if you want to insert a step between Step 2 and Step 3, go to Step 3.
• Press INSERT. A BLANK step (the display reads SEQ = -BLANK-) is created.
• Select the Sequence Name field and use the Up/Down Arrow buttons to select a sequence for the new Step.
• Set the number of repeats and any mute or transpose settings for the step as shown earlier.

To Delete a step anywhere in the song:
• Press STEP=## and go to the step that you want to delete.
• Press DELETE. The step is erased and all steps after it are moved down by one.

When you are done editing the song, press Locate (or any other sequencer page button) to exit. You can then press Play to hear your new song.

Song Tracks
A Song on the TS-12 is much more than simply a group of sequences chained together. Once you have created a song and edited its steps, you can record another complete set of 12 song-length tracks. These Song Tracks are completely independent from the individual sequence tracks; each has its own sound and complete set of track parameters. The length of the song tracks is determined by the combined length of the song’s component sequences.

Let’s suppose you have constructed a song. For our example, we will take three sequences, each using up to 12 tracks, and combined those sequences into a song:
• Step 1 of the Song is Sequence 01 (a 4-bar Sequence) for 1 Repeat;
• Step 2 is Sequence 02 (an 8-bar Sequence) for 1 Repeat; and
• Step 3 is Sequence 03 (a 4-bar Sequence) for 1 Repeat.

Your Song would look like this:

<table>
<thead>
<tr>
<th>SONG STEP 1: Sequence 01 (4 bars)</th>
<th>SONG STEP 2: Sequence 02 (8 bars)</th>
<th>SONG STEP 3: Sequence 03 (4 bars)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sequence Track 1</td>
<td>Sequence Track 2</td>
<td>Sequence Track 1</td>
</tr>
<tr>
<td>Sequence Track 2</td>
<td>Sequence Track 3</td>
<td>Sequence Track 2</td>
</tr>
<tr>
<td>Sequence Track 3</td>
<td>Sequence Track 4</td>
<td>Sequence Track 3</td>
</tr>
<tr>
<td>Sequence Track 4</td>
<td>Sequence Track 5</td>
<td>Sequence Track 4</td>
</tr>
<tr>
<td>Sequence Track 5</td>
<td>Sequence Track 6</td>
<td>Sequence Track 5</td>
</tr>
<tr>
<td>Sequence Track 6</td>
<td>Sequence Track 7</td>
<td>Sequence Track 6</td>
</tr>
<tr>
<td>Sequence Track 7</td>
<td>Sequence Track 8</td>
<td>Sequence Track 7</td>
</tr>
<tr>
<td>Sequence Track 8</td>
<td>Sequence Track 9</td>
<td>Sequence Track 8</td>
</tr>
<tr>
<td>Sequence Track 9</td>
<td>Sequence Track 10</td>
<td>Sequence Track 9</td>
</tr>
<tr>
<td>Sequence Track 10</td>
<td>Sequence Track 11</td>
<td>Sequence Track 10</td>
</tr>
<tr>
<td>Sequence Track 11</td>
<td>Sequence Track 12</td>
<td>Sequence Track 11</td>
</tr>
<tr>
<td>Sequence Track 12</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Now, with the song selected, you can press the Seq/Song Tracks 1-6 and 7-12 buttons and see an entirely new set of empty tracks. These are the song tracks. Continuing with the above example, the song tracks might look like this:
Song tracks are treated like normal sequence tracks whose length is equivalent to the combined length of all the sequences which make up the song. The length of the song tracks is set according to the song length at the time the first song track is recorded. Changes made to the song structure after the first song track is recorded will not affect the length of the song tracks.

- You can change the program on a song track using the Replace Track Sound function, just as you would a sequence track.
- You can enter record (by holding down `Record` and pressing `Play`) and record on any of the twelve song tracks. Follow the same procedures (as outlined earlier in this section) for recording song tracks like you would for sequence tracks. The only difference is that a song track is associated with the song itself and not with the individual sequences that comprise the song.
- You can edit the song tracks using any of the Track Parameter functions. Selecting any Track Parameter when a song is selected will cause the current song track to be edited.
- You can use the Sequence Edit functions to edit the song tracks as a group, erasing them, adding and deleting bars, or copying the song tracks to another sequence. When a song is selected, the Sequence Edit functions will affect the song tracks, as if they were a sequence.
- You can solo, mute, and adjust the mix of song tracks from the Mix/Pan page as with sequence tracks.
- You can “mix down” the volume and pan of song tracks over the length of the song (see the description on the following page).
Viewing Sequence Tracks in Song Mode

When a song is selected, what you see on the Seq/Song Tracks pages and the track parameter pages depends on the setting of the EDIT TRACKS parameter on the Sequencer Control page.

- When EDIT TRACKS=SONG, the Seq/Song Tracks pages and the Track Parameter pages will show the song tracks. Any changes you make will affect the song tracks only.
- When EDIT TRACKS=SEQ, the Seq/Song Tracks pages and the Track Parameter pages will show the tracks for the individual sequences which make up the song steps. Any changes made to these tracks when a song is selected will not be remembered after the song step is done playing. To change anything about a sequence track you must first select the sequence and then change it there.

When a song is selected and EDIT-TRACKS=SEQ, the LED’s above the Seq/Song Tracks 1-6 and 7-12 buttons will flash to remind you that the track data is for the currently selected sequence in the song step and not the actual song tracks.

Tip: There is a shortcut for toggling between EDIT TRACKS= SEQ and SONG — While on either of the Seq/Song Tracks pages, rapidly double-click the Seq/Song Tracks 1-6 or 7-12 button. This switches between the song tracks and the sequence tracks, just as if you had changed the setting of the EDIT TRACKS parameter. The LED above the tracks button flashes when you are looking at sequence tracks; it remains solidly lit when you are looking at song tracks.

Mixing Down Sequence and Song Tracks in Song Mode

After you have created and edited a song, you can “mix down” the volume and pan of the sequence tracks that make up the song steps, and of the song tracks themselves. The mixdown process does not affect the data in the individual sequences that compose the song steps; it creates a song-length Mixdown Track (which is actually a part of the song track) on which you can record mix and pan changes which will affect the sequence and/or song tracks over the course of the entire song. You can use this function to fine-tune the dynamics of certain tracks during part of a song, or to simply fade them out at the end of the song.

To Record Mix or Pan Changes to Sequence Tracks in a Song:

- Select a song containing sequence tracks you want to mix down.
- Press Seq/Song Tracks 1-6 or 7-12 and select the song track corresponding to the sequence track you want to mix down. For example, if you want to record volume or pan changes to Track 3 of each sequence throughout the song, you must make sure that song track 3 is selected on the Seq/Song Tracks 1-6 page.
- Press Sequencer Control, and set the Record Mode parameter to RECORD MODE= MIXDOWN.
- Press Sequencer Control again, set the Edit Tracks parameter to EDIT TRACKS=SEQ (or, you can double-click the Seq/Song Tracks 1-6 button; see above).
- Press Seq/Song Tracks 1-6 or 7-12 and select the sequence track you want to mix down.
- Press Mix/Pan. The display shows the mix levels for the tracks, with the current track underlined (or press Mix/Pan again to record dynamic panning changes).
- While holding down Record, press Play. The TS-12 enters Overdub.
- Use the Data Entry Slider or the Up/Down Arrow buttons mix the volume (or pan) of the selected track. All changes you make will be recorded.
- At the end of the song, or when you press Stop/Continue, the Audition Play/Keep page appears. Here you can audition the changes before deciding whether to keep the new or the original track.
- To mix another track, press Sequencer Control twice and set the Edit Tracks parameter to EDIT TRACKS=SONG; press Seq/Song Tracks 1-6 or 7-12 and select a different track; then set the Edit Tracks parameter back to EDIT TRACKS=SEQ. Now press Mix/Pan and repeat the procedure.
To Record Mix or Pan Changes to a Song Track:

- Select a song containing song tracks you want to mix down.
- Press **Sequencer Control**, set the Record Mode parameter to RECORD MODE= MIXDOWN.
- Press **Sequencer Control** again and set the Edit Tracks parameter to EDIT TRACKS=SONG. (Note that you can toggle between Song tracks and Sequence tracks in song mode by double-clicking the **Seq/Song Tracks 1-6** or **7-12** button.)
- Press **Seq/Song Tracks 1-6** or **7-12** and select the song track you want to mix down.
- Press **Mix/Pan**. The display shows the volume levels for the tracks, with the current track underlined (or press **Mix/Pan** again to record dynamic panning changes).
- While holding down **Record**, press **Play**. The TS-12 enters Overdub.
- Use the **Data Entry Slider** or the **Up/Down Arrow** buttons mix the volume (or pan) of the selected track. All changes you make will be recorded.
- At the end of the song, or when you press **Stop/Continue**, the Audition Play/Keep page appears. Here you can audition your changes before deciding which to keep.

**Important:**

The mixdown data is always recorded into the song track which is selected on the Seq/Song Tracks page, whether you are mixing a sequence track or a song track. You must, therefore, select the appropriate-numbered song track (while EDIT TRACKS=SONG on the Sequencer Control page) before entering Record, even if you then switch to EDIT TRACKS=SEQ to mix a Sequence track. For example, if you want to mix down Sequence track 3 over the length of the song, you must have song track 3 selected.

**Tip:** In Song Mode, if you want to fade a sequence track in from a 000 value, you must first select the individual sequence and set the appropriate track to 000, otherwise when starting overdub, the sequence track will default to its original setting.

**A Few Notes About Mixdown Mode**

Mixdown volume and pan are recorded on the song track in a special form of ADD mode. When you record mixdown volume or pan, the information is added to the data in the song tracks. This means that:

- If you have recorded Mixdown volume or pan into a track and want to erase and re-record it, you must first remove the original volume or pan using the Filter command on the Edit Track page. Otherwise new mixdown information would be added to (and thus conflict with) the existing information.
- If you erase the song track, the mixdown volume and pan data will be lost. Recording notes, controllers, etc. on the song track does not affect the mixdown information, but erasing the track (using the Erase command on the Edit Track) page will remove the mixdown data.

Whenever possible, you should use this function as the last step in the production chain, after you have finished changing the song length, recording and erasing song tracks, etc.

**Note:** The dynamic mixdown discussed here, which allows recording mix and pan changes over time, applies only to sequence and song tracks while in song mode. In sequence mode, the settings on the Mix and Pan pages are saved for each track of the sequence, but the setting will not change over the course of the sequence.

**Tip:** You can use the optional CVP-1 foot pedal to record volume changes into a sequence track while the sequence is selected. Just set to PEDAL=VOL on the System page, and then record the foot pedal changes in ADD mode. This will record Volume (MIDI controller #7) messages into the track which are separate from the mixdown volume described above.
Sequencer Tempo Track

As of software version 2.0, songs are created with Song Track 12 assigned to be a Tempo Track by default. This allows you to record continuous tempo changes to the sequences that make up a song. Here’s how:

- First create a song by selecting a -BLANK- Seqs/Songs location. Name the song if you wish.
- Press the Edit Song button, and press the soft button beneath EDIT STEPS.
- Press the lower middle soft button to select the SEQ parameter, and use the Data Entry Controls to select a sequence for this song step. The song must be made of at least one sequence (with recorded data) in order for the Tempo Track feature to work.
- Press the Seq/Song Tracks 7-12 button. Notice that Song Track 12 shows *TEMPO-TRK* in the display.
- Press the soft button underneath *TEMPO-TRK* to select it. If you play the keyboard, you will hear nothing. That’s because a Tempo Track functions differently than tracks that contain sounds, and can only record and play tempo events.
- Press the Sequencer Control button. The display shows something like this:

```
CONTROL CLOCK=INT RECORD-MODE=REPLACE
SNGS TEMPO=+00 ACTUAL=025 LOOP=ON
```

When the Tempo Track is selected on the Seq/Song Track 7-12 page, the AUTOPUNCH switch (normally found in the bottom center of the Sequencer Control page) is replaced with the ACTUAL tempo value. The Song TEMPO parameter allows you to increase or decrease the tempo(s) of the sequences that make up the song: When TEMPO=+00, the ACTUAL value shows the actual tempo of the sequence corresponding to the song step that is currently playing. Raising or lowering the TEMPO value will re-compute the actual sequence tempo, and the actual value will show the sequence tempo biased by the TEMPO value. The TEMPO value range for songs is -64 to +63.

- We recommend setting the RECORD-MODE parameter to either REPLACE or ADD when recording a Tempo Track (LOOPED and MIXDOWN are not recommended)
- Press the soft button beneath the TEMPO value.
- While holding down the Record button, press Play.
- At this point, you can use the Data Entry Controls to adjust the tempo. The sequencer will record the tempo changes as you make them. At the end of the song, or when you press Stop/Continue, the Audition Play/Keep page appears. Here you can audition the tempo changes before deciding whether to keep the new or original track.

**Note:** Do not load any Seq/Songs that have been saved with Tempo Track events into a TS-10 or TS-12 using software earlier than version 2.0. The Tempo Track feature is incompatible with older software.

Removing the Song Tempo Track

When the Tempo Track feature is used, you are limited to 23 Seq/Song Tracks. If you do not need to record continuous tempo changes, you can gain back the Song Track 12 for recording a sound, but you will lose any continuous tempo changes that you may have recorded.

To Remove the Song Tempo Track:

- With a song selected, press the Seq/Song Tracks 7-12 button. Its LED should be solidly lit (showing the song tracks). If the Seq/Song Tracks LED is flashing (showing sequence tracks), double-click the button. The display should show *TEMPO-TRK* in the Song Track 12
location (bottom right in the display).

- Press the soft button beneath *TEMPO-TRK* to select it.
- Press the Edit Track button, and select the ERASE command by pressing its soft button.
- The display asks ERASE TRACK 12? Press the soft button above *YES*. The display will return to the Seq/Song Tracks 7-12 page, and the Tempo Track will now be -UNDEFINED-.
- You can now select Song Track 12 to assign it the last selected sound. You can then use the Replace Track Sound button, just as you would for any other track, to change the sound on Song Track 12.

If you change your mind, you can use the ADD-TEMPO-TRK command on the Edit Song page to regain the Song Tempo Track feature. See Section 11 — Sequencer Parameters for more about the ADD-TEMPO-TRK feature.

**Tempo Track Edit Functions**

The following Edit Track commands will function normally when a Tempo Track is selected:

- SHIFT — causes the tempo changes to move ahead or back in time by a specified number of clocks.
- ERASE — is used to erase a Tempo Track, and convert it into a normal song track.
- COPY — can be used to copy a Tempo Track from one song to another song. However, you can only copy a Tempo Track to another Tempo Track. If you try to copy a Tempo Track to a different sequence or song track, the following error message will be displayed:

```
ERROR - TRACK 12 IS A TEMPO TRACK
```

- EVENT-LIST — allows you to individually edit each Tempo Track event. For this function, Tempo Track events appear as TMP (see below).
- FILTER — can be used to selectively remove Tempo Track events.
- MERGE — functions in a similar way to the COPY command; you can only merge a Tempo Track to another Tempo Track.

**Note:** The Edit Track QUANTIZE, TRANSPOSE, and SCALE commands will *not* function when a Tempo Track is selected. The above error message will be displayed when a Tempo Track is selected and these commands are invoked.

**Thinning Out Tempo Changes Using the Event Editor**

When you record Tempo changes with the Tempo Track feature, the Data Entry Controls will “scroll” through every value between where you start and where you want to end. For instance, if your song Tempo Track value starts at +00, at the bridge in your song (song step 3), and you want to slowly increase the tempo to +05, and then at the beginning of the second verse (song step 4) instantly return to +00, the Tempo Track events will scroll through all values between +05 and +00. These extra Tempo Track events can be eliminated using the Edit Track EVENT-LIST command. Here’s how:

1) First create a song with at least four song steps, as explained later in this section.
2) Select Song Track 12 (*TEMPO-TRK*) of the song (it should be underlined).
3) Press the Locate button, followed by the lower left soft button in the display to select the TEMPO parameter. This page shows the step of the song you are currently in and the name of the sequence assigned to the step, and allows you to record tempo changes to the Tempo Track. The TEMPO parameter defaults to +00. If it is not set at this value, set it to +00 at this
time using the Data Entry Controls.

4) Press **Record** then **Play**.

5) At the bridge (song step 3), press the **Up Arrow** button five times slowly to increase the tempo.

6) At the end of song step 3, quickly press the **Down Arrow** button five times to return the tempo to +00. You can either let the song finish playing, or press the **Stop • Continue** button.

7) On the Audition page, press the soft button beneath **KEEP NEW TRACK**. You have just recorded a Tempo Track to your song. Now we’ll go into the Event Editor to eliminate unwanted Tempo Track events.

8) Press **Edit Track** twice, and then press the lower left soft button to select **EVENT-LIST**.

9) Press the upper left soft button to select the Event Type parameter, and use the data entry controls to set it to **TYPE=TMP** (tempo). The display looks something like this:

```
EVENT TYPE=TMP  TIME=01.00101.01  *EXIT*
NUM=00000  EVENT=***.000  *EDIT*
```

10) Press the soft button beneath the **NUM** parameter.

11) Press the **Up Arrow** button once. The display now shows the first Tempo event value (+01), as it slowly increases within the third song step.

12) Press the **Up Arrow** button four more times. The display should show the fifth Tempo event value (NUM=00005). This is located within the third song step (the bridge in your song), and is the fastest tempo that we want. The next four Tempo events (+04, +03, +02 and +01) are the ones that we want to delete — so that at the beginning of the fourth song step (the second verse), the song tempo will instantly change from +05 to +00 without any gradual tempo changes.

13) Press the **Up Arrow** button one more time. This shows the sixth Tempo event (NUM=00006) with a value of +04 (EVENT=TMP.+04.XXX) that we want to delete.

14) Press the soft button beneath **EDIT**.

15) Press the top center soft button above **DELETE**. This returns you to the previous display.

16) Press the **Down Arrow** button once, then the **Up Arrow** button once. This now shows that the sixth Tempo event value (EVENT=TMP.+04) was deleted, and the seventh Tempo event value (EVENT=TMP.+03.XXX) is now in its place.

17) Repeat steps 14 through 16 three times. Each time you repeat these three steps, you are eliminating another recorded Tempo event value from the Tempo Track. When you are finished, the display should show the sixth recorded Tempo event (NUM=00006) with a value of EVENT=TMP.+00.XXX.

18) Now let’s place this Tempo event at the exact beginning of the fourth song step (if it isn’t already there).

19) Press the soft button beneath **EDIT**.

20) Press the bottom center button. The display shows **START TIME=XX.XX.XX.XX.XX**.

21) Use the Data Entry Controls and set the **START TIME** to **TIME=04.XX.XXX.XX.XX**. This sets the Start Time to begin at Song Step 4.

22) Press the bottom center button again. The second value shows the repetition (REP) number. Use the Data Entry Controls to set this to **04.01.XXX.XX**.

23) Press the bottom center button again. The third value shows the bar number. Use the Data Entry Controls to set this to **04.01.001.XX**.

24) Press the bottom center button again. The fourth value shows the beat number. Use the Data Entry Controls to set this to **04.01.001.01.XX**.

25) Press the bottom center button again. The fifth value shows the clock number. Use the Data Entry Controls to set this to **04.01.001.01.01**.

26) Press the soft button above **EXIT**. This returns you to the **EVENT TYPE** page.
You have just successfully eliminated four Tempo Track events (+04, +03, +02, and +01) using the Event Editor.

**Using Multi-Track Record**

Tracks do not have to be selected in order to have data recorded on them, but they must be defined. Each channel of incoming MIDI data will be recorded on the lowest-numbered TS-12 track which has the corresponding MIDI channel number. For example, if both track 1 and track 2 are set to MIDI channel 1, only track 1 will receive and record any data because it is the lowest-numbered track set to MIDI channel 1. It is suggested that you set each track to a different MIDI channel to avoid confusion.

A newly created sequence (or song) will have MIDI channels 1 to 12 automatically assigned to the 12 tracks in ascending order, but all of the tracks except track 1 are initially UNDEFINED. Selecting undefined tracks while on the Track Select page (TRAX) will cause all the settings from the previously selected track to be copied to the new track, including the MIDI channel number. You will have to make sure that the channel assignments and other settings are correct after you have defined the appropriate number of tracks to record on.

**Suggestion for Advanced Users:**

If you wish to define a new track but leave its settings alone, you can use Replace Track Sound after underlining one of the new track’s Track Parameters (i.e. MIDI Channel). Underlining this parameter sets up the new track to have its sound replaced without actually “selecting” the track. This method allows you to define the track without changing most of the settings (except for MIDI Program number, Timbre, Release, and Pressure mode). *Beware* - *this technique can cause problems if a MIDI loop is present.*

**Note:** MIDI Program Changes will define the tracks on which they are received. If your external sequencer sends program changes on each track before any other event data, then the tracks will be automatically defined, and the MIDI channel settings will not be altered. You can see if this happens by creating a new sequence on the TS-12, playing your external sequence, and checking which tracks became defined.

**Tip:** If you will be doing a lot of Multi-Track recording, you may find it useful to create a template sequence which has no track data recorded on it to use as a starting point for each recording. Give it an easily recognizable name like “MULTI-TRACK”, and simply copy this template sequence to an unused location before starting each new recording. You can then edit the copy to suit the particular needs of the current multi-track recording.

There is no Audition when using Multi-Track Record. All new tracks that received data are kept automatically after recording ends. The “EDITING DATA...” message is displayed while the sequencer is processing the data you have recorded. The time required for processing depends on how much data and how many tracks were recorded, and it can take several minutes. After the processing is complete, the Locate page is displayed. You can either re-record or erase the tracks (or the entire sequence or song) if you do not wish to keep the results after recording. Multi-Track Record always operates in Replace mode, regardless of the setting of the REC-MODE switch on the Sequencer Control page.

Data is not recorded on tracks whose status is set to MIDI-OFF, but all defined tracks will have “dots” next to the program name after recording, even if they do not have any actual track events on them.
If external sync is being used (CLOCK=MIDI), recording begins with the first clock received after the MIDI Start command. If internal sync is selected (CLOCK=INT), then recording begins when the first note is received.

**Note:** With the SQX-70 installed, the sequencer can record over 97,00 notes. However the sequencer record buffer is of a limited size, and can only record 16,00 notes at one time. As a result, you may see an OUT OF MEMORY message if you exceed the size of the record buffer. (this is most common in multi-track record). If this occurs, try editing the incoming data into several smaller sequences; then, once recorded into the TS-12 sequencer, append them together.

**Basic Multi-track Recording from an External Sequencer**

The following procedure is the basic method for recording a multi-track sequence from an external sequencer into the TS-12.

- Set MODE=MULTI on MIDI Control page.
- Set CLOCK=MIDI and REC-SOURCE=MULTI on the Sequencer Control page(s).
- Disable count-off on both systems to avoid problems.
- Disable sequence looping on the external sequencer.
- Create a new sequence with the correct time signature.
- Make sure that the external sequencer will send its track data on MIDI channels that the TS-12 is set up to receive (track MIDI channels 1..12 by default).
- Make sure that the external sequencer will send program changes at the start of each track to automatically define the necessary tracks on the TS-12, or define them yourself on the TS-12 manually.
- Press **Record** to enter MIDI Record mode (MREC will be flashing indicating that the TS-12 is waiting for MIDI Start and Clock messages).
- Start your external sequencer playing its sequence. When the external sequence stops, or when you press **Stop** on the TS-12, the TS-12 will show “EDITING DATA...” for a time and then display the Locate page.
- Set CLOCK=INT on the Sequencer Control page and press **Play** to hear what you have recorded. You may then decide that the results are satisfactory, or if not, you can try again or erase the sequence.
Recording into the Sequencer in a MIDI Loop

Use the following basic procedure if you want to record into the TS-12’s sequencer from its own keyboard in a MIDI loop. You can record to a single track, or to multiple stacked tracks, depending on which tracks are selected, and how you set the REC-SOURCE parameter on the Sequencer Control page:

- Set MIDI-TRK-NAMES=ON on the System page.
- Set MODE=MULTI, LOOP=ON, START/STOP=OFF and PROG-CHG=OFF all on the MIDI Control pages.
- Set REC-SOURCE=MIDI (to record onto a single track with Audition) or REC-SOURCE=MULTI (to record onto multiple stacked tracks with no Audition) on the Sequencer Control page.
- Enter Seqs/Songs mode and create a new Sequence. Select and define all 12 tracks.
- Set the Track STAT (Status) to MIDI-LOOP for all 12 tracks.
- Set each of the tracks to a discrete MIDI channel (we recommend assigning tracks 1-12 to MIDI channels 1-12 to avoid confusion).
- Connect the MIDI Out jack of the TS-10 to the MIDI In jack of the TS-10 with a single MIDI cable.
- Select or stack the track(s) that you want to record on. Playing the keyboard will transmit out the MIDI Out jack, back in the MIDI In jack, and will play the sounds that are assigned to the selected and stacked tracks.
- Enter record as usual. If REC-SOURCE=MIDI, data will only be recorded on the primary (solidly selected) track, and any stacked tracks will be deselected after Audition. If REC-SOURCE=MULTI, data will be recorded on all selected and stacked tracks, but there will be no Audition.
Using the Step Entry Recorder

All notes played and all control changes made in Step Entry mode will *always* be recorded into the new track.

With GATE-TIME=HELD, if you enter a note and release the key without advancing the track location (time), then the note will be recorded with minimum (1/64th note) duration. This is also true when using AutoStep because the key down and key up appear to occur at the same time.

For controllers, it is necessary to advance the track location after entering the event so that they will be correctly recorded. Use *STEP* or advance one of the TIME fields.

It is possible to record trills played with monophonic sounds when AUTOSTEP=ON if you set the gate-time to be less than the step size, and remember to change GATE-TIME to HELD just before you finally release the held key. For example, if STEP=1/16, then GATE-TIME must be *less* than 1/16 (i.e. 1/16T, 1/32, etc.).

**Tip:** If you press and hold the **Record** button while in Step Entry Record mode, you will be able to play keys without having them recorded. Keys are not recorded while **Record** is held down. This is useful when you are looking for the right key(s) to play next and you do not want to inadvertently enter wrong notes into the track.

Access to Other Pages while in Step Entry

Your access to other pages is restricted in Step Entry mode, in a way similar to Audition mode. You may get to any of the Track Parameter pages, the Click page, and the System page. The Seq/Song Tracks 1-6 or 7-12 pages may be displayed, and you may use Replace Track Sound to enter program changes onto the current track, but you may not change tracks. The **BankSet** and **Bank** buttons may be used in Replace Track Sound mode to change BankSets and Banks. Pressing any of the other restricted buttons will return you to the Step Entry page. This is a convenient way to get back after you have selected one of the accessible pages while in Step Entry mode.

Entering Audition Mode from Step Entry

As with the normal mode of recording, when you have completed recording a track in Step Entry mode, either by pressing **Stop/Continue** or by reaching the end of the track, you will enter Audition mode, which behaves as it always has.

Entering Step Entry Record after Locating or from Play

You can use the Locate page to get to the place in the track where you wish to begin Step Entry recording, and then hold **Record** and press **Stop/Continue** to enter record at that point. You may also be in PLAY and press the **Record** button at the point where you want to start Step Entry recording. Note that autopunch does *not* affect Step Entry recording.

About the SAVE CHANGES... Page

Along with the notes, controllers, and program changes that are recorded on each track, there are many other parameters that are saved with each sequence or song. These are:

- the name and the tempo of the sequence or song
- the sound assigned to each track on the Seq/Song Tracks 1-6 and 7-12 pages, including Sampled Sounds and Surrogate Programs
- all Track Parameters for each track of the sequence or song
- which tracks are selected and layered on the Seq/Song Tracks 1-6 and 7-12 pages
- The Track Command edit times
- the setting of the LOOP switch on the Sequencer Control page
- the Sequence or Song effect algorithm and its settings
- the setting of the CLICK parameter on the Click page
- for Songs, the settings of the EDIT TRACKS and SONG STEP EFFECT parameters
Whenever you record any track of a sequence or song, all of these values are automatically saved — that is, they will be remembered by the TS-12 if you leave the sequence (by selecting another one) and return to it later. However, if the SAVE CHANGES parameter is set to ASK, and you edit any of the above values, and then select a new sequence or song before you record any new track data, the following message will appear:

```
SAVE CHANGES TO <SEQ NAME> ?
*YES*
*EXIT*
*NO *
```

- Pressing *YES* saves the sequence or song, with the current settings of all the parameters listed above, into sequencer memory.
- Pressing *NO* leaves the settings of the parameters listed above as they were when you last recorded a track, or last answered *YES* when exiting the same sequence.
- Pressing *EXIT* aborts the decision, keeping you in the same sequence or song, with all of the settings for the above parameter unchanged, but still not permanent. This is useful if you’re not sure, and want to check before deciding.

No matter which response you select, the recorded track data (notes, controllers and program changes) are always saved. Sometimes it’s hard to remember, when you get this page, exactly what you changed. As a general rule, if you are happy with the sequence or song as it is, answer *YES*. If you have just been experimenting with different tempos, Programs, MIDI configurations, etc., and want to leave the sequence as it was before your experiments, answer *NO*. If you’re not sure whether you want to save or discard your changes, and you want to re-examine the sequence or song, press *EXIT*.

**Tip:** There is a quick way to save any changes you make to a sequence or song. After you have changed any of the values listed above and want to save them, press the *Seqs/Songs* button to return to the sequence bank page, and select the same sequence or song again. The display will ask “SAVE CHANGES TO <SEQ NAME>?”. Answer *YES* and the changes you made to the sequence or song will be saved.

As mentioned earlier, you can avoid being asked to save changes by setting the SAVE CHANGES parameter on the Sequencer Control page to NO. For live performance, and other applications in which you want to experiment with tempo, track parameters, etc. without being bothered about saving the changes, this is the preferred setting. And if you are always willing to commit to your edits as you go, SAVE CHANGES=AUTO is the preferred setting.
Section 11 — Sequencer Parameters

The following parameters control the TS-12 sequencer. Parameters for creating and manipulating sequences, songs, and the tracks contained within each are covered here. For a basic overview of the concepts involved, refer to the previous section.

Sequencer Editing Functions

The three Edit buttons in the top row of the Sequencer section of the front panel provide access to the various sequencer editing functions. These are divided into Song, Sequence, and Track editing functions. Pressing any of these three buttons shows a menu of the available functions in that category.

Edit Song Page Parameters

Press the Seqs/Songs button (underneath the display) and select a Song. Then press the Edit Song button. If you press the Edit Song button when a sequence is selected, the display will respond SONG NOT SELECTED and will not allow you onto this page. The display shows:

ADD-TEMPO-TRK

The ADD-TEMPO-TRK command allows you to add a Tempo Track to an existing song that does not have a Tempo Track. This command is only visible when the currently selected song does not contain a Tempo Track:

• If Song Track 12 is -UNDEFINED-, pressing the soft button above ADD-TEMPO-TRK will immediately make Song Track 12 become a Tempo Track.
• If Song Track 12 contains a sound and/or sequencer data, the following prompt will be displayed:

  ERASE SONG TRACK 12 AND REPLACE WITH TEMPO TRACK

  *YES*  *NO*

• Pressing *YES* will erase Song Track 12, replacing it with a Tempo Track. The display will momentarily show TEMPO TRACK INSTALLED, and the ADD-TEMPO-TRK Song Command will no longer be visible.
• Pressing *NO* will abort the procedure and leave Song Track 12 intact.
INFO Sub-Page
Pressing the soft button above INFO displays a page containing information about the song, including the song name, the size in blocks, the song tempo offset, number of steps, and the elapsed time at the current tempo. From this page, you can also rename the song, and adjust the tempo offset. The parameters on this page are:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NAME</td>
<td>Used to rename the song. Pressing the soft button above the Song Name displays a sub-page which allows you to edit the name of the song. Use the data entry controls and the LEFT and RIGHT cursor buttons to rename the song. Then press <em>SAVE</em> to return to the INFO page with the new name.</td>
</tr>
<tr>
<td>SIZE</td>
<td>Range: (read only) This read only parameter displays the size of the current song in blocks. Blocks are the units of 512 bytes used by the sequencer and disk memory management software. One block generally represents 128 events, though this is only an approximation and depends on the specific data recorded.</td>
</tr>
<tr>
<td>TEMPO</td>
<td>Range: -64 to +63, or EXT This lets you speed up or slow down the entire song without changing the tempo of the component sequences. Changing the song tempo offset automatically adjusts the tempo of each of the sequences in the song, within the legal limits of 25-250 BPM.</td>
</tr>
<tr>
<td>STEPS</td>
<td>Range: (read only) This read only parameter indicates the number of steps in the song.</td>
</tr>
<tr>
<td>TIME</td>
<td>This shows you the total time of the song in minutes, seconds, and hundredths of a second. It is readout only — you cannot directly change it. However, when you change the Song Tempo Offset (TEMPO above) you will see the time readout change accordingly.</td>
</tr>
</tbody>
</table>

ERASE
The Erase command will erase the currently selected song and leave its location undefined. First, make sure the Song you want to erase is selected. Then:
- Press Edit Song.
- Press the soft button beneath ERASE. The display asks ERASE CURRENT SONG <SONG NAME> FROM LOCATION ##?
- Press *YES* to erase and undefine the song, or press *NO* to cancel.

COPY
Use this command to copy the currently selected song into another sequencer location. Note that the original song remains intact in its original location. First, make sure the Song you want to copy is selected. Then:
- Press Edit Song.
- Press the soft button beneath COPY. The display shows:
• Use the data entry controls to select a location for the copied song. Note that only undefined sequencer locations will be available for selecting.

• Press *YES* to copy the song to the new location (or press *NO* to cancel). The new song will be given the same name as the original one you copied. You can rename it from the Edit Song INFO page as described above.

EDIT STEPS Page
Pressing EDIT STEPS displays the song step editor page. Here you chain sequences together to define the basic structure of the song.

A song is composed of Steps. Each Step consists of:
• A sequence which will play during that step,
• The number of Repetitions, or Reps, of the sequence during the step, and
• The Mute and Transpose status for each sequence track during the step.

When you select EDIT STEPS, the display shows the Song Step Editor page:

INSERT
Inserts a blank song step before the current song step.

DELETE
Removes the current song step, and shifts the remaining steps down to fill the gap.

STEP
The step number can be edited using the data entry controls, allowing you to move up and down through the song and view each step. A song can contain up to 99 steps.

SEQ
Range: various
Selects the sequence to be used for the current song step. An empty song step will show SEQ= -BLANK- . To put a sequence into an empty song step (thus defining the step) simply underline this field and then press the Up Arrow button. The final step (the one after the last defined song step) will always read SEQ= "SONG-END" . To add another sequence at the end of the song, select SEQ= "SONG-END" and press the Up Arrow to define the step. This puts a sequence in that step and moves the Song End back one more step.

REPS
Range: 01 to 99, or FS
This controls the number of times the sequence in the current song step will be repeated.
FS stands for Foot Switch. In order to use this function you must first assign one of the Foot Switches (on the System page) to SONG-STEP. When REPS=FS, the song step will loop continuously until the assigned foot switch is pressed. When the foot switch is pressed, the current step will finish playing and then advance to the next step.

**TRACKS**

Selecting this option from the song step editor page displays a sub-page which allows you to *Mute* or *Transpose* specified tracks for the current song step.

**STEP**

Shows the current step number. Pressing this button again when it is already selected will return you to the Song Step Editor page.

**MUTE TRACKS**

Range: P (Play) or M (Mute)

The number 2 and 3 soft buttons each select a group of 6 positions which control the muting of sequence tracks for the current song step. Repeated presses of the soft button will scroll across the set of 6 tracks, and allow each track to be muted or unmuted individually. An M indicates that the track is muted for the entire step, and a P indicates that the track will play.

**TRANSPOSE**

Range: -12 to +12 semitones

Sets the transpose amount to be used by any tracks which are set to Transpose for that song step (see below). This will raise or lower the pitch of the entire track.

**TRANSPOSE TRACKS**

Range: N (Normal) or T (Transposed)

The number 5 and 6 soft buttons each select a group of 6 positions which control the transposition of tracks for the current song step. Repeated presses of the soft button will scroll across the set of 6 tracks, and allow each track to be transposed or left normal (no transposition) individually. A T indicates that the track will be transposed, and an N indicates that the track will play at normal pitch.
Edit Sequence Page Parameters

- Press the Edit Sequence button. The display shows:

```
EDIT SEQUENCE  APPEND  INFO
ERASE        COPY   LENGTH
```

These commands affect the currently selected sequence. If a song is selected, these commands affect the song tracks in the song.

**APPEND**

This function allows you to append one sequence onto the end of another (or to itself, doubling its length). A sequence which you specify will be appended (or “tacked on”) to the end of the currently selected sequence.

- Make sure the sequence onto which you want to append another is selected.
- Press Edit Sequence.
- Press APPEND. The display shows:

```
APPEND SEQ  SEQUENCE-12  *YES*
ONTO SEQ  SEQUENCE-12  BARS=000  *NO*
```

- Use the data entry controls to select the sequence which will be appended to the current sequence. The default source is the current sequence, which allows the current sequence to be easily appended to itself.
- The bottom of the display shows the destination sequence, and the total number of bars in the current sequence.
- Press *YES* to append the sequence specified in the top line of the display onto the end of the current sequence (or press *NO* to cancel).

**INFO**

Selecting INFO displays a page of information about the currently selected sequence, including the name, the size in blocks, the tempo, the number of bars and the elapsed time at the current tempo. The tempo is the only field which can be directly edited, but the elapsed time field will be updated to reflect the new tempo.

```
SEQ  NAME=SEQUENCE-12  SIZE=51
INFO  TEMPO=144  BARS=016  TIME=03.12.50
```

**NAME**

Pressing the soft button above the sequence NAME displays a sub-page which allows you to edit the name of the sequence. Use the data entry controls and the LEFT and RIGHT cursor buttons to rename the sequence. Then press *SAVE* to return to the INFO page.
SIZE  
Range: (read only)
Displays the size of the current sequence in events.

TEMPO  
Range: 025 to 250, or EXT
This displays the tempo of the current sequence. Changing the tempo here has the same effect as changing it on the three other pages where tempo appears; Click, Sequence Control, and Locate. On this page, however, you can see the elapsed time change as you change the tempo (see below). When CLOCK=MIDI, this parameter reads TEMPO=EXT, and cannot be edited.

BARS  
Range: (read only)
Indicates the number of bars in the sequence.

TIME  
Range: (read only)
This shows you the total time of the sequence in minutes, seconds, and hundredths of a second. It is read only — you cannot directly change it. However, when you change the tempo (above) you will see the time readout change accordingly.

ERASE
The Erase command will delete the currently selected sequence from memory and leave its location undefined (-BLANK-). This command can also be used to erase all song tracks (when a song is selected). First, make sure the sequence you want to erase is selected. Then:
• Press Edit Sequence.
• Press ERASE. The display asks ERASE CURRENT SEQ <SEQ-NAME> FROM LOCATION ##?
• Press *YES* to erase and undefine the sequence, or press *NO* to cancel.

COPY
Use this command to make a copy of the currently selected sequence in another sequencer location. If this command is used on a song, it will copy the song track data only into a new sequence. This command only copies the saved Track Parameter settings; it will not copy any temporary Track Parameter edits you may have made. Note that the original sequence or song remains intact in its original location. First, make sure the sequence you want to copy is selected. Then:
• Press Edit Sequence.
• Press COPY. The display shows:

COPY SEQ  SEQUENCE-12
TO NEW LOCATION 25
*YES*

• Use the data entry controls to select a location for the copied sequence. Note that only -BLANK- sequencer locations will be available for selecting.
• Press *YES* to copy the sequence (or press *NO* to cancel). The new sequence will be given the same name as the original sequence. You can then rename it from the Edit Sequence/INFO page if you wish.

LENGTH — Add and Delete Bars from a Sequence
Though the length of the first track determines the length of the sequence, you can use the Add Bars and Delete Bars functions to add empty bars, starting from any bar within the sequence, or to remove any number of bars from the sequence.
From the Edit Sequence page, press LENGTH. The display shows:

```
EDIT SEQ  SEQUENCE-23  BARS=012  4/4
*EXIT*  ADD BARS  DELETE BARS
```

This sub-page shows the name, number of bars, and time signature for the sequence, as well as the Add and Delete Bars commands.

**ADD BARS**

The Add Bars function lets you add any number of bars to the sequence up to a total sequence length of 999 bars. It consists of two steps: 1) you specify at which bar you want to start adding bars, and then 2) you select how many bars you want to add.

To ADD Bars to the selected sequence:

- Make sure the sequence to which you want to add bars is selected.
- Press Edit Sequence, and press LENGTH.
- Press ADD BARS — the display shows the following:

```
AT BAR 5  ADD 4 BARS *YES* *NO*
```

- Press the soft button above AT BAR ## on the display.
- Use the data entry controls to determine at which bar the new measures will be added. This can be any bar within the sequence:
  > Selecting Bar 01 will cause bars to be added at the beginning of the sequence.
  > Selecting the bar after the last bar of the sequence will cause bars to be added at the end of the sequence.
  > Selecting any other bar will cause bars to be added starting from that point in the sequence.
- Press the soft button above ADD ## BARS.

- Use the data entry controls to select how many bars you want to add. You can add any number up to a total sequence length of 999 bars. Empty bars (no track data) will be added beginning from the bar selected in the previous step.
- Press *YES* to complete the command, or press *NO* to cancel.

**DELETE BARS**

The Delete Bars function lets you delete (or remove) any number of bars from a sequence, starting from any bar within the sequence.

This is handy when, for example, you record a first track which is perfect except that it runs to 5 Bars instead of 4. With this edit function you can easily chop off the extra bar.

To DELETE Bars from the selected sequence:

- Make sure the Sequence from which you want to delete bars is selected.
- Press Edit Sequence, and press LENGTH.
• Press DELETE BARS — the display shows the following:

```
AT BAR 5    DELETE 4 BARS    *YES*
            *NO*          
```

• Use the data entry controls to determine at which bar you want to begin removing bars. This can be any Bar within the Sequence. Bars will be deleted from the beginning of the Bar you select here.
• Press the soft button above DELETE ## BARS.
• Use the data entry controls to select how many bars you want to delete.
• Press *YES* to complete the command, or press *NO* to cancel.

Sequence Bank Utilities
A new way to select sequences has been added to certain sequencer edit pages. When a sequence name parameter is selected on the Song Edit, Append Sequence, Copy Track or Merge Track pages, an LED above one of the bank buttons will flash to show where the indicated sequence is located. Pressing a Bank button will temporarily show the corresponding sequence bank page, and sequences may be selected using soft buttons. If the selection is valid, the page will then revert to the previous edit page with the new sequence name installed. In addition, you may select the destination Location for Copy Song or Copy Sequence by indicating a -BLANK- location on one of the bank pages. This will automatically install the corresponding location number and return to the copy command page.

Edit Track Page Parameters

Range Sub-Page — Setting the Time and Key Range
Within almost all track editing functions, you will find a parameter labeled RANGE. Pressing the soft button below RANGE takes you to a special sub-page where you can define the time and key range over which the track edit command will work. Data outside the defined range will be left alone. When you select RANGE from within a track edit function, the display shows:

```
Time Range

TIMES IN=001.01.01 OUT=007.04.96 *SET*
KEY RANGE FROM A0 - C8 *ALL*
```

• On the upper line of the display you can select and modify the Time range which will be affected by the edit function; on the lower line you select and modify the Key range.
• To set the time range, first press the soft button above IN to choose the beginning edit time, shown in Bars, Beats and Clocks. Adjust to the desired bar with the data entry controls. Press the same soft button again to advance the underline from Bar to Beat to Clock, etc. adjusting each as needed. Then press the soft button above OUT and repeat these steps to set the ending edit time.
• To set the key range, press the soft button beneath the low and high keys, underlining the low key. Play the lowest note you want affected by the edit function; the underline switches to the high key. Play the highest key you want to be affected. The underline disappears, allowing you to play the keyboard without resetting the ranges every time you press a key. You can reset the range (if it’s not correct) by pressing the soft button again, and playing the low and high keys. You can also set the key range using the data entry controls, and pressing the soft button again to move the cursor from the low to high key.
• Press *SET* to accept these edit ranges for the current track edit function. You will be returned to the edit function with the display reading RANGE=SET, or;
• Press *ALL* to bypass the edit ranges and have the track edit function affect the entire track. You will be returned to the edit function with the display reading RANGE=ALL.

Important:
The IN and OUT times specified in the Edit Track Range page are the same as the Edit Times found on the Locate sub-page and used by the Autopunch function. They are interactive — changing the IN or OUT times in either location will cause them to be changed in the other.

Track Edit Functions
• Press the Edit Track button. The display shows:

```
EDIT TRACK 01  SHIFT  QUANTIZE
ERASE        COPY  *MORE*
```

SHIFT
Range: -96 to +96 (96 clocks=1/4 note)
This command will cause all the events in the track to be moved ahead or back in time by a specified number of clocks (1 clock=1/96 quarter note). You can use this to create a “lazy” or “pushed” feel in a track.
• Make sure the track you want to edit is selected.
• Press Edit Track, then select SHIFT. The display shows:

```
SHIFT TRACK 01  BY  +00 CLOCKS
                 *YES*
                 *NO* *
```

• Use the data entry controls to specify the amount the track is to be shifted. Positive values will move the events in the track ahead in time, toward the end of the sequence; negative amounts will shift the events back, toward the beginning.
• Press *YES* to execute the edit command (or press *NO* to cancel). After editing, the display shows the Audition Play/Keep page where you can audition the results of the edit before deciding whether to keep it or not.

QUANTIZE
Range: 1/4 to 1/64T
The Quantize (or auto-correct) function can take a less than perfect track and put it right on the beat. The TS-12 uses post-quantization — that is, you first record a track, then apply the quantization later as a track editing option. You can select any note value from 1/4 note up to 1/64 note triplets, and move all notes in the track directly onto the nearest beat of that value.
• Make sure the track you want to quantize is selected.
• Press **Edit Track**, then select QUANTIZE. The display shows:

```
QUANTIZE TRACK 01 TO 1/4 NOTES *YES*
RANGE=ALL OPTIONS=OFF *NO *
```

• Use the data entry controls to specify the note value to which the track is to be quantized. Available values are:
  1/4 — quarter notes  1/16T — sixteenth note triplets
  1/4T — quarter note triplets  1/32 — thirty-second notes
  1/8 — eighth notes  1/32T — thirty-second note triplets
  1/8T — eighth note triplets  1/64 — sixty-fourth notes
  1/16 — sixteenth notes  1/64T — sixty-fourth note triplets
• If you wish to quantize a specific range rather than the entire track, press RANGE and set the time and/or key range on the Edit Track Range page, as shown earlier in this section. If not, leave it set to RANGE=ALL.
• Press *YES* to execute the QUANTIZE command (or press *NO* to cancel). After editing, the TS-12 returns with the Audition Play/Keep page where you can audition the results of the edit before deciding whether to keep it or not.

**Options**

The TS-12 allows you to define how you want to quantize your track. In other words, when you select the quantize options, you can select several different variables in quantizing your track. Using these variables can create a very live sounding sequence. When “OPTIONS=OFF,” all key events are quantized to the closest note value that was selected earlier. To select Options:

• Press the soft OPTIONS button. This takes you to the Options ON sub-page:

```
QUANTIZE PERCENT=100 RANDOM=0 SWING=50 *ON *
```

• On the Options page, you can set the levels of the Quantize PERCENT, RANDOM, and SWING amount using the **Data Entry Slider**. After setting these levels, to engage these parameters, press *ON*.
• If you do not want to use these features, press *OFF*. This returns you to the previous display.
• Straight quantization will always take place when quantize options are set to “OFF,” even if the user has specified values for PERCENT, RANDOM, and SWING. The options will not have any effect until “OPTIONS=ON.”

The option switch defaults to OFF when the sequencer is initialized, but after that, the quantize option switch setting is remembered until changed again by the user.
SWING

When you specify a SWING percentage value, you are defining the offset amount that every second quantize point (known as the swing note) will be delayed. In keeping with the swing implementation in most MIDI sequencers, the SWING range is from 50% (the same as straight quantization) to 74% (a tick before the next higher note value). A setting of 66 is equivalent to setting the quantization to triplets. The following examples show what happens when the user quantizes to 1/8 notes with various settings of SWING. Q denotes every straight 1/8 note quantize point, while S denotes the swing eighth quantize point.

The SWING setting is the percentage of the time difference between the two Straight quantize points, and it is used to position the Swing quantize point. As the Swing setting increases from 50%, the Swing quantize point is moved closer to the following Straight quantize point.

The SWING percentage actually defines the point between the two straight quantize points. In other words, at 96 ppq, 60% swing means that between two quarter notes, the swing eighth will occur at the 60% mark, or at clock 58 (0.60 x 96). The default value for this parameter is 50% when the sequencer is initialized. Once it is changed, the last value is always remembered.

PERCENT

While the Quantize Note Value and SWING parameters determine the position of the quantize points, the PERCENT and RANDOM parameters determine where the key events will be placed in relation to the quantize points. The PERCENT parameter specifies how much the key event will move toward the calculated quantize point. A PERCENT value of zero would mean that the key events would not move any distance toward the quantize point. A PERCENT value of 100 would mean that the key event would be placed exactly on the quantize point. A PERCENT value of 50 will move the event half way to the quantize point.

The following diagram illustrates this. Again, Q and S represent the straight quantize and swing quantize points respectively. The original source track is shown, followed by the quantized versions at 0, 25, 50, and 100% quantization.
In this example, QUANTIZE is set to 1/8th notes and SWING is set to 50%. Increasing the PERCENT setting moves the events closer to the quantize points.

Notice how increasing the quantize percentage tightens up the track timing. The default value for this parameter is 100% when the sequencer is initialized. Once it is changed, the last value is always remembered.

**RANDOM**

Range: 0 to 3

After the PERCENT parameter calculates the placement of the key event relative to the quantization points, the RANDOM parameter determines if, and how much, randomization should be applied to the key placement. The RANDOM parameter defines a “window of looseness” that the key event can fall into.

A RANDOM factor of 0 indicates that NO randomization will occur. A RANDOM factor of 3 indicates that the key event will be shifted anywhere from 0 to 3 clocks in either direction from the calculated key placement. Again, an example will illustrate this more clearly. This time we’ll use an event list. For our example, we’ll assume 1/4 note quantization with NO (i.e. 50%) swing, and a PERCENT factor of 50. The first column shows the original source track. The second column shows where the events will be placed if quantized with no randomization. The third and fourth columns show the range that the event will fall in with various degrees of randomization. Note that the placement of the key event is calculated first with NO randomization, then the random factor is applied.

<table>
<thead>
<tr>
<th>ORIGINAL</th>
<th>with RANDOM=0</th>
<th>with RANDOM=1</th>
<th>with RANDOM=2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1.08</td>
<td>1.1.04</td>
<td>1.1.03 to 1.1.05</td>
<td>1.1.02 to 1.1.06</td>
</tr>
<tr>
<td>1.2.12</td>
<td>1.2.06</td>
<td>1.2.05 to 1.1.07</td>
<td>1.2.04 to 1.2.08</td>
</tr>
<tr>
<td>1.2.95</td>
<td>1.2.96</td>
<td>1.2.95 to 1.3.01</td>
<td>1.2.94 to 1.3.02</td>
</tr>
<tr>
<td>1.4.01</td>
<td>1.4.01</td>
<td>1.3.96 to 1.4.02</td>
<td>1.3.95 to 1.4.03</td>
</tr>
</tbody>
</table>

The RANDOM parameter defaults to zero when the sequencer is initialized. After that, the last value is remembered.
Using the Quantize Options

Percentage quantization can be used to “tighten up” a track without placing everything exactly on a quantize point. This can make loose tracks sound tighter without sounding mechanical. It’s especially useful on passages where you want to play constantly ahead of or behind the beat. You can quantize the track to tighten up the looseness, yet still retain the rushed or laid back feel.

Keep in mind that percentage quantization can be done in stages. For example, quantize a track to 25% and keep it. Then later, if you decide you want it tighter still, quantize it again by 25%. Each time you perform a quantization, you will move the key events slightly closer to the quantize point.

Random quantization is useful for taking old tracks that have been quantized 100% and giving them a more human feel. This can be done by quantizing with the desired randomization factor. The higher the RANDOM factor, the looser the track will become (since the tracks have previously been quantized to the 100% quantize points, the PERCENT parameter will have no effect). Tracks that have not been quantized can be randomized as well. If your desired effect is simply to loosen a current track, select a quantize PERCENT of zero, and quantize with the desired randomization. This will shift each event in the track within a few clocks of its original place, but will not necessarily move it towards the quantize point.

In addition, the RANDOM parameter inside the TS-12 “reseeds” itself. This means that if you quantize two identical tracks with randomization, you will get different results. Also, if you set the PERCENT parameter to zero, you can randomize a track, keep the new track, and randomize it again to get things progressively looser.

Although PERCENT, RANDOM, and SWING are interrelated, you do not have to use all of them when selecting options. By setting these parameters to their default values (PERCENT=100 - RANDOM=0 - SWING=50), you can use any one or combination of these options to quantize your tracks.

Important:

An event can be randomized and end up closer to a different quantize point. This could be a problem if you later decided to go back to a straight, no-frills quantization. This is not a fault of the quantization feature, but simply what can happen with randomization. The random factor is purposely kept low to prevent this from happening, however, there are cases where this can occur. One example would be successive randomization with the PERCENT parameter set to zero. Another instance involves using combinations of a high SWING parameter with a high RANDOM factor.

For example, let’s say you have a hi-hat track that’s already been quantized to straight eighths. Now you decide to give it a large swing feel, so you set SWING to 74. Any event that was at clock number 49 (a straight eighth note) would move to clock 72. But if you also specified a RANDOM of 3, the event may move as far as clock 75. Now let’s suppose you keep this track, but then later on decide that you don’t want a swing feel. So you setup a straight 1/8 note quantize. Only this time, the event that originally was at clock 49 is now at clock 75, so it would be moved to the next quantize point at clock 1 in the next beat (since that’s the closest quantize point to that event). If you audition the track and hear that the swing event has moved up to the next quantize point, then you should keep the old track, shift the track by -3 clocks (to put the swing note closer to the original straight eighth point) then requantize with no swing to get all events back on the straight eighth points.
In this example, QUANTIZE is set to 1/8th notes, SWING is set to 74% and RANDOM set to 3, the event can be moved beyond the Swing Quantize point. In this case, a subsequent straight eighth quantize will move the event to the eighth note after the one it was initially on.

**ERASE**

This command will erase notes, controllers and all other data from the entire track, or from a given range if you so specify.

- Make sure the track you want to erase is selected.
- Press **Edit Track**, then select ERASE. The display shows:

![Erasure Display](image)

- If you wish to erase a specific range rather than the entire track, press RANGE and set the time and/or key range on the Edit Track Range page, as shown earlier in this section. If not, leave it set to RANGE=ALL.
- Press *YES* to execute the edit command (or press *NO* to cancel). After editing, if a range was specified, the TS-12 returns with the Audition Play/Keep page where you can audition the results of the edit before deciding whether to keep it or not. If the range was ALL, there is no audition.

**COPY**

This command will copy all or part of the current track (the source track) to another track. The destination track can be in the same sequence or in a different sequence.

- Make sure the track you want to copy is selected.
- Press **Edit Track**, then select COPY. The display shows:
If you want to copy the source track to a different sequence, select the destination sequence by using the data entry controls to choose the one you want. Notice that only predefined sequences can be selected. The default is the current sequence, the one the source track is in.

- Select the destination track and use the data entry controls to select a track for the source track to be copied into.

- Press the soft button beneath the destination track again to move the underline to the starting bar. The data from the source track will be copied into the destination track starting from the beginning of the bar specified here. The default is bar 1, the beginning of the track.

- If you wish to copy a specific range rather than the entire track, press RANGE and set the time and/or key range on the Edit Track Range page, as shown earlier in this section. If not, leave it set to RANGE=ALL.

- Press *YES* to execute the copy command (or press *NO* to cancel). After editing, the TS-12 returns with the Audition Play/Keep page where you can audition the results of the edit before deciding whether to keep it or not.

**Note:** The Copy Track function behaves differently depending on whether or not there is already recorded data on the destination track:

- If the destination track is empty (no track data), both the track data and all the track parameters (Mix, Pan, Timbre, etc.) from source track will be copied to the destination track.

- If the destination track already contains recorded track data, after you press *YES* to copy the track, the display will warn: DATA ON DESTINATION TRACK WILL BE LOST. Press *YES* to proceed, or press *NO* to exit and select a different destination track.

- After you press *YES*, the display asks COPY TRACK PARAMETERS TOO?
  > Press *YES* to copy both the recorded track data and all the track parameters to the destination track.
  > Press *NO* to copy only the recorded track data to the destination track, leaving the values of all the track parameters as they were before.

**MORE** — Additional Track Edit functions

Pressing *MORE* from the Edit Track page displays a sub-page which contains five additional track editing options. Pressing the Edit Track button twice will also take you directly to this page. Press *MORE*. The display shows:
The track editing functions contained on this sub-page are as follows:

**TRANSPOSE**

The Transpose function will raise or lower the notes in the track by a specified number of octaves and/or semitones. In addition to simply transposing the entire track, you can use the transpose function to re-map existing drum and percussion tracks for use with programs and instruments that have different key layouts, using the key range function to a transpose a single key.

- Make sure the track you want to transpose is selected.
- Press **Edit Track** twice (or press *MORE* from the Edit Track page), then select TRANSPOSE. The display shows:

```
TRANSPOSE TRACK 1 BY +0 +00 *YES* 
RANGE=ALL OCT/SEMI *NO * 
```

- Use the data entry controls to specify the amount the track is to be transposed:

  **Octave** Range: -4 to +4 octaves
  
  The first number (which is already selected) sets the octave amount.

  **Semitone** Range: -12 to +12 semitones
  
  Press the soft button above the transpose amount again to move the underline to the semitone amount and adjust that.

  - If you wish to transpose a specific range rather than the entire track, press RANGE and set the time and/or key range on the Edit Track Range page, as shown earlier in this section. If not, leave it set to RANGE=ALL.
  - Press *YES* to execute the edit command (or press *NO* to cancel). After editing, the TS-12 returns with the Play/Keep page where you can audition the results of the edit before deciding whether to keep it or not.

**SCALE**

The Scale command lets you increase or decrease the level of any controller information in the track by a specified amount. You could use this function, for example, to tame some over-zealous mod wheel work, or to increase the key velocity of all the notes in the track by some amount.

- Make sure the track you want to edit is selected.
- Press **Edit Track** twice (or press *MORE* from the Edit Track page), then select SCALE. The display shows:

```
SCALE KEY-VELOCITY IN TRACK 1 *YES* 
RANGE=ALL SCALE-AMT=0.00 *NO * 
```

- Use the data entry controls to choose which type of controller(s) you would like to scale. The following event types can be scaled:
KEY-VELOCITY — Note-On Velocity
CNTL-1.MODWHL — Mod Wheel
CNTL-4.PEDAL — Foot Pedal
CNTL-7.VOLUME — Volume Pedal
CNTL-10.PAN — Track or MIDI Pan
CNTL-64.SUSTN — Sustain Foot Switch
CNTL-66.SOSTU — Sostenuto Foot Switch
CNTL-12.FX-SW — Effect Mod Foot Switch
CNTL-70.PSEL — Patch Select Buttons
CNTL-71.TIMBR — Track Timbre Controller
CNTL-72.RELS — Track Release Time Controller
CNTL-73.ATTAK — Track Attack Time Controller
CNTL-74.BRITE — Track Brightness Controller
CNTL-75.RATE — Track Rate Controller (LFO Rate and/or Wave-List Duration)
CNTL-XX.XCTRL — Track External MIDI Controller
ALL.CONTROLRS — All Controllers
CHAN-PRESSURE — Channel (mono) Pressure
MIXDWN-VOLUME — Mixdown Volume
MIXDOWN-PAN — Mixdown Pan
TEMPO — Tempo Track Events (note that SCALE will have no effect on TEMPO events)
PITCH-BEND — Pitch Bend Wheel

• If you wish to scale a specific range rather than the entire track, press RANGE and set the time
and/or key range on the Edit Track Range page, as shown earlier in this section. If not, leave
it set to RANGE=ALL.
• Press *YES* to execute the Scale command (or press *NO* to cancel). After editing, the TS-12
returns with the Audition Play/Keep page where you can audition the results of the edit
before deciding whether to keep it or not.

EVENT-LIST
The Event List function provides you with an extremely powerful tool for viewing and editing
each event in the track. Every key event, controller change and program change can be
individually located and edited.

• Make sure the track you want to edit is selected.
• Press Edit Track twice (or press *MORE* from the Edit Track page), then select EVENT-LIST.
The display shows:
EVENT-TYPE
Controls which types of events will be shown as you scroll up through the events in the track. When set to ALL, every event in the track will be listed. On the other settings, some types of events will be left out of the list — when the Event Number (below) is changed, the display will jump directly to the next event of the type shown, skipping other types. The Event Types which can be selected here are:
- MOD — Mod Wheel
- PED — Foot Pedal
- VOL — Volume Pedal
- PAN — Track or MIDI Pan
- SUS — Sustain Foot Switch
- SOS — Sostenuto Foot Switch
- FXS — Effect Mod Foot Switch
- PSL — Patch Select Buttons
- TMB — Track Timbre Controller
- REL — Track Release Time Controller
- ATK — Track Attack Time Controller
- BRT — Track Brightness Controller
- RAT — Track Rate Controller (LFO Rate and/or Wave-List Duration)
- XCC — XCTRL: Track External MIDI Controller
- CNT — All Controllers
- CPS — Channel (mono) Pressure
- MXV — Mixdown Volume
- MXP — Mixdown Pan
- TMP — Tempo Track events
- BND — Pitch Bend Wheel
- KPS — Poly-Key Pressure
- PRG — Program Changes and Bank Selects
- KEY — Note Events only; no Controllers
- ALL — All Events of all types

TIME
Shows the current time in terms of Bar, Beat and Clock. These three TIME fields can be individually selected by repeated presses of the soft button. Use the Up/Down Arrows to step ahead or back in time by bars, beats or clocks, depending on which field is selected.

NUM — Event Number
When this field is selected, you can use the data entry controls to step ahead or back in time among the events in the track to find the one(s) you want to edit. When you press the Up Arrow button, it will advance to the next event of the type specified in Event Type. Moving the Data Entry Slider will scroll quickly through all the events in the track. You will hear the notes in the sequence play as you step through the track.

EVENT
This shows the type and value of the current event. The first segment of this readout is always the Event Type. For Key events Poly-Key pressure events, and Program Change events there are two additional segments; for all other event types there is one additional segment:
- On Key events, the display shows: EVENT=KEY.C4.115. The three segments represent Event Type; Key Number; and Velocity.
- On Poly-Key pressure events, the display shows EVENT=KPS.C4.115. The three segments represent Event Type; Key Number; and pressure Value.
- On Program Change events, the display shows: EVENT=PRG.000.000.B. The last three segments represent Event Type, Program Number, and Bank Select Number (followed by a “B”).
- For all other Event types, the display shows the Event Type and the Value.
• Time locations with no event are shown as EVENT=***.000.

Note: For TMP (tempo event type) the value is a percentage increase or decrease of the tempo(s) of the sequences that make up the song: when TEMPO=+00, the ACTUAL value shows the actual tempo of the sequence corresponding to the song step that is currently playing.

*EXIT*
This exits Event List mode. If you have made any changes to the track you will be put on the Play/Keep page where you can audition the changes before deciding whether to keep them.

*EDIT*
Pressing EDIT displays the event editor sub-page which shows the selected event and its event number with the time that it occurs, and in the case of events with duration, the end time of the event as well.

Once you have selected an event to edit using the Event Number parameter (NUM), press *EDIT*. The display shows:

![Event Editor Diagram]

**INSERT**
Pressing INSERT will insert an event of the current Event Type at the time showing on the display. This option is not available when the Event Type is ALL (all events) or CNT (all controllers).

**DELETE**
This will remove the current event from the track.

*EXIT*
Pressing *EXIT* returns you to the main Event List page.

**Value**
To edit the VALUE of the current Event (the key number and velocity of a key event; the value from 0 to 127 of a controller change; or a program change number, etc.), press the lower-left soft button to select the value, then use the data entry controls to change it. For Key events, Poly-Key pressure events, and Program Change events, pressing the soft button again will select the second value segment for editing.
Event Starting Time

Seq Values: Bar, Beat, and Clock
Song Values: Step, Repeats, Bar, Beat, and Clock

To change the STARTING TIME of the current event, press the soft button below the time. The display shows:

```
EVENT
START TIME=001.01.02

*EXIT*
```

Use the data entry controls to change the start point of the event, pressing the soft button beneath the time to move the cursor between Bar, Beat, and Clock. When you have the starting time that you want showing on the display, press *EXIT* to return to the Event List page with the event on the new time.

**Note:** When a Song track is selected, an additional two segments are added to this readout, and the time readouts on the other Event List pages. In song mode, the display shows Step.Rep.Bar.Beat.Clock. For example, Step 1, Rep 2, Bar 4, Beat 3, Clock 76 would appear as:

```
START TIME=01.02.004.03.76
```

Duration

For Key Events only, you can change the length of the event (the time between when the key is struck and it is released). From the Event Edit sub-page press the soft button below DURATION. The display shows:

```
EVENT
END TIME=002.01.23
DURATION= BEATS=04 CLOCKS=21

*EXIT*
```

On the upper line of the display you can edit the end time of the event, using the data entry controls to change the end point and pressing the soft button above the time to move the cursor between Bar, Beat, and Clock.

On the lower line of the display, you can edit the actual duration of the event, expressed in terms of how many beats and clocks the event lasts. You can select BEATS=##, edit that and then select CLOCKS=## and edit that.

The upper and lower lines of this sub-page are interactive — editing the End Time on the upper line will cause the duration on the lower line to change, and vice versa.

When you have the duration that you want showing on the display, press *EXIT* to return to the Event Edit sub-page.
Auditioning Event Edit Changes

If you press *EXIT* to leave the Event List function without having made any changes in the track, you will simply be returned to the Edit Track page.

If you do change anything in the track, when you press *EXIT* you will be placed on a special version of the Audition Play/Keep page, where you can audition the new track and the original before deciding to either keep the new track, keep the old track or return to the Event Editor to edit some more. The display shows:

- Press KEEP ORIGINAL to exit to the Edit Track page, leaving the track as it was before you began editing.
- Press KEEP NEW to save the changes you have made to the track in Event List mode, replacing the original track in memory. Or,
- Press EDIT EVENTS to re-enter the Event List mode with the changes you have made so far intact, but retaining the option of keeping the original track later on.

When you have a song track on which the recorded data is shorter than the length of the actual song steps, and you try to add any type of event after the end of the recorded data, you will momentarily see the following error message: EVENT TIME PAST END OF RECORDED TRACK. To remedy the problem, your song track data needs to be the same length as the song steps. Set the RECORD-MODE=ADD; Press Record and Play, and let the song track run for the entire length of the song (without recording any data). On the Audition page, select KEEP NEW TRACK, and your song track will now be the same length as the Song Steps.

FILTER

The Filter command can be used to selectively remove events (such as notes, controllers and program changes) from a track, or to copy selected events to a different track for further editing. The Filter command has two modes, Erase and Copy. Depending on which mode is selected, it will either remove the specified events from the track, or simply copy them to another track, leaving the original track intact.

- Make sure the track you want to filter is selected.
- Press Edit Track twice (or press *MORE* from the Edit Track page), then select FILTER. The display shows:

> FILTER CNTL-1 MODWHL FROM TRACK 1 *YES*
> RANGE=ALL MODE=ERASE *NO *

- Use the data entry controls to choose which type of events you would like filtered from the track. The following event types can be filtered:

CNTL-1.MODWHL — Mod Wheel
CNTL-4.PEDAL — Foot Pedal
CNTL-7.VOLUME — Volume Pedal
CNTL-10.PAN — Track or MIDI Pan
CNTL-64.SUSTN — Sustain Foot Switch
CNTL-66.SOSTU — Sostenuto Foot Switch
CNTL-12.FX-SW — Effect Mod Foot Switch
CNTL-70.PSEL — Patch Select Buttons
CNTL-71.TIMBR — Track Timbre Controller
CNTL-72.RELS — Track Release Time Controller
CNTL-73.ATTAK — Track Attack Time Controller
CNTL-74.BRITE — Track Brightness Controller
CNTL-75.RATE — Track Rate Controller (LFO Rate and/or Wave-List Duration)
CNTL-XX.XCTRL — Track External MIDI Controller
ALL.CONTROLRS — All Controllers
CHAN-PRESSURE — Channel (mono) Pressure
MIXDWN-VOLUME — Mixdown Volume
MIXDOWN-PAN — Mixdown Pan
TEMPO — Tempo Track events
PITCH-BEND — Pitch Bend Wheel
KEY-PRESSURE — Poly-Key Pressure
PROGRAM-CHNG — Program Changes and Bank Selects
KEY-EVENTS — Note Events only; no Controllers

• If you wish to filter a specific range rather than the entire track, press RANGE and set the time
  and/or key range on the Edit Track Range page, as shown earlier in this section. If not, leave
  it set to RANGE=ALL.
• Press MODE=ERASE. This displays a special sub-page where you select the Filter Mode:

  FILTER CNTL-1 MODWHL
  COPY TO TRACK 2
  *COPY*
  *ERASE*

  > If you want to copy the data to another track, select a destination track and then press COPY.
      You are returned to the Filter page, the display reading MODE=COPY.
  > If you want to permanently remove the data from the track, simply press ERASE. You are
      returned to the Filter page, the display reading MODE=ERASE. (Note that Erase mode is the
      default whenever you enter the filter command, so if you want Erase mode you can skip this
      step.)
• Press *YES* to execute the filter command (or press *NO* to cancel). After editing, the TS-12
  returns with the Audition Play/Keep page where you can audition the results of the edit
  before deciding whether to keep it or not.

Note: If you chose Copy mode, the TS-12 returns with the new track (the copy) selected. If you wanted
  to copy and then erase the data, you must first reselect the original track and then repeat the
  above procedure, using Erase mode.

Note: The Copy mode of the Filter command works just like the Copy Track command: Data on the
destination track will be erased.
MERGE
This command will take the data in the selected track and merge, or combine, it together with that of another track. The destination track can be in the same sequence or in a different sequence from the source track. Note that the source sequence is not altered or erased by this process.

- Make sure the track you want to merge (the source track) is selected.
- Press **Edit Track** twice (or press *MORE* from the Edit Track page), then select **MERGE**. The display shows:

```
Destination Track
MERGE TRACK 1 INTO TRACK 2   *YES*
IN SEQ SEQUENCE-32

Destination Sequence
*NO*
```

- Press the soft button above the destination track and use the data entry controls to select a track for the source track to be merged into.
- If you want to merge the source track with a track in a different sequence, select the destination sequence and use the data entry controls to choose the one you want. The default is the current sequence, the one the source track is in.
- Press *YES* to execute the merge command (or press *NO* to cancel). After editing, the TS-12 returns with the Audition Play/Keep page where you can audition the results of the edit before deciding whether to keep it or not.

Click Page
Pressing the Sequencer **Click** button displays a page containing parameters which control the metronome functions of the sequencer.

```
CLICK=REC TIME=1/4 COUNTOFF=REC
STOP TEMPO=120 VOLUME=99 PAN=DRY-C
```

**CLICK**
Range: OFF, ON, or REC
Controls whether or not the click will be heard.
- OFF — the click will not be heard in Play or Record modes
- ON — the click will be heard whenever the sequencer is running
- REC — the click will be heard only when the sequencer is in Record mode, not when in Play

**TIME**
Range: 1/2 to 1/32T notes
Sets the note value of the metronome click.

**COUNTOFF**
Range: OFF, ON, REC, QUIET
This determines whether playing and/or recording sequences and songs will be preceded by a 1-bar countoff.
- OFF — no countoff will occur in Play or Record modes. The song or sequence will begin as soon as **Play** (or **Record/Play**) is pressed.
- ON — a one bar countoff plays before the sequence or song begins to play.
- REC — a one bar countoff will occur in Record mode only.
• QUIET — the countoff will occur in Play or Record modes without the click.

TEMPO (Tap Tempo) 
Seq Range: 25 to 250 BPM, or EXT, Song Range: -64 to +63

Sets the tempo of the current sequence or song. On any of the three pages where tempo appears (Click, Sequencer Control, and Locate), the soft button nearest the TEMPO field can be used to “tap” in the tempo. If the field is already selected, tapping on the soft button at the correct rate for the desired tempo (based on the metronome settings on the click page) will update the tempo to the newest value. When CLOCK=MIDI on the Sequencer Control page, this field will read TEMPO=EXT to indicate that the tempo is controlled by incoming MIDI clocks.

When a song is selected, the range is expressed as a percentage of the sequence tempo — changing the song tempo offset automatically adjusts the tempo of each the sequences in the song by a percent, within the legal limits of 25-250 BPM. When TEMPO=+00 the sequences in the song will play at their designated tempo.

When a Song Tempo Track is selected, editing this value will record tempo change events.

VOL 
Range: -50 to +14 dB

Controls how loud the metronome click will sound.

PAN 
Range: described below

Controls the stereo position of the click, and allows it to be sent out of the Main or AUX Outputs.
• DRY-L, DRY-R and DRY-C will send the click (without effects) to the Main Outputs, to the left only, right only or center respectively.
• AUX-L, AUX-R and AUX-C will send the click directly to the AUX Outputs, to the left only, right only or center respectively.

Sequencer Control Page

The Sequencer Control page displays contains parameters which control the basic operation of the sequencer. This page consists of three sub-pages. The settings for the parameters on these pages are saved with the 60-SEQ/SONGS file type.

• Press Sequencer Control. The display shows:

```
CONTROL CLOCK=INT  RECORD-MODE=REPLACE
STOP TEMPO=120  AUTOPUNCH=OFF  LOOP=ON
```

CLOCK 
Range: INT or MIDI

This parameter selects the clock source for the sequencer.
• INT — Selects the TS-12’s own internal clock to run the sequencer. The TS-12 features 96 ppq (pulses per quarter-note) resolution for extremely accurate recording.
• MIDI — Selects external MIDI clocks as the sequencer clock source. Use this setting if you want to use another device (such as a computer sequencer or drum machine) as the master clock source and sync the TS-12 to it. Whenever CLOCK=MIDI, the tempo display will read TEMPO=EXT to indicate that the TS-12 is syncing to an external clock source.

When CLOCK SOURCE= MIDI, pressing the Record button puts the TS-12 into standby MIDI sync record. The MIDI indicator light will flash and the display will show WAITING… Recording will begin with the first MIDI clock received after a MIDI Start command. If the Stop•Continue button is pressed before a MIDI Start command is received, the TS-12 waits five seconds before stopping.
**RECORD-MODE**

**Range:** REPLACE, ADD, LOOPED, or MIXDOWN

Selects between the three recording modes for the sequencer.

- **REPLACE** — Anything recorded into an existing track will replace the data that was in the track previously. The sequencer will stop recording after one time through the sequence or song and will enter Audition/Play mode.

- **ADD** — New data recorded into an existing track will be added to (or merged with) data already in the track — the existing data will be left intact. Again, the sequencer will exit record after one time through the sequence or song and enter Audition/Play.

- **LOOPED** — Like ADD mode, new data recorded into an existing track will be added to (or merged with) data already in the track. However, when RECORD-MODE=LOOPED, the sequencer will remain in Record for as many times as you play the song or sequence through (rather than dropping out of Record after one time through). Think of this as “drum machine mode” — as long as the sequence/song keeps playing, you can keep adding parts each time around.

- **MIXDOWN** — This mode is only available when a song is selected, and is used to record dynamic Volume and Pan changes into sequence and song tracks. When RECORD-MODE=MIXDOWN the TS-12 will record only changes made on the Volume and Pan pages in the Track Parameters section. Notes, controllers, program changes, etc. will not be recorded in this mode.

Depending on the setting of the EDIT TRACKS parameter on the next sub-page (see below) you can mix down either the song tracks or sequence tracks over the length of the song.

**TEMPO (Tap Tempo)**

**Seq Range:** 25 to 250 BPM, or EXT, **Song Range:** -64 to +63

Sets the tempo of the current sequence or song. On any of the three pages where tempo appears (Click, Sequencer Control, and Locate), the soft button nearest the TEMPO field can be used to “tap” in the tempo. If the field is already selected, tapping on the soft button at the correct rate for the desired tempo (based on the metronome settings on the click page) will update the tempo to the newest value. When CLOCK=MIDI, this field will read TEMPO=EXT to indicate that the tempo is controlled by incoming MIDI clocks, and cannot be edited.

When a song is selected, the range is expressed as a percentage of the sequence tempo — changing the song tempo offset automatically adjusts the tempo of each the sequences in the song by a percent, within the legal limits of 25-250 BPM. When TEMPO=+00 the sequences in the song will play at their designated tempo.

When a Song Tempo Track is selected, editing this value will record tempo change events.

**AUTOPUNCH**

**Range:** OFF or ON

When overdubbing a track, this extremely powerful feature will automatically enter and exit record mode at predetermined times which you specify. You can play along with the track and have the TS-12 “punch” in and out for you like an invisible engineer. We refer to the points at which recording will begin and end as the *Edit Times* and they are set on the second sub-page of the Locate Page.

- **ON** — the TS-12 uses the Edit Times specified on the Locate sub-page for entering and exiting record state.

- **OFF** — normal recording without using Edit Times.

**LOOP**

**Range:** OFF or ON

This parameter controls whether or not the sequence or song will loop. The setting of this control is remembered for each sequence and song.

- **ON** — the sequence or song will play continuously, looping back to the beginning when it reaches the end.

- **OFF** — the song or sequence will not loop, it will play once and stop.
• Press **Sequence Control** again to display the second sub-page:

![Sequence Control](image)

**SONG STEP EFFECT**

Range: SEQ or SONG  
This controls which effect(s) will be used while a song is playing — those from each individual sequence or a single “override” effect saved with the song. A song contains a series of sequences which will play in order. Each sequence has its own effect. When switching from one sequence to another in the course of a song, there can be a momentary “glitch” of the sound as the effect for the new sequence is loaded. This can be avoided by setting this parameter to **SONG STEP EFFECT=SONG** so that the entire song will use the same effect.

- **SEQ** — the individual sequence effects will be selected as the sequences are played.
- **SONG** — the song effect will override the individual sequence effects.

**REC-SOURCE**

Range: BOTH, KEYBD, MIDI, or MULTI  
This parameter determines what will be recorded when the MIDI mode is MULTI — data from the keyboard, from incoming MIDI, or both. Setting this parameter to MIDI is useful if you want to send data from the TS-12 to a MIDI processor, then record only the incoming data coming back from the processor. This parameter only has an effect in MULTI mode; in POLY or OMNI modes the sequencer always records both.

- **BOTH** — The sequencer will record data received either from the keyboard or from MIDI on the track’s MIDI channel.
- **KYBD** — The sequencer will record data only from the keyboard.
- **MIDI** — The sequencer will record only data received from the MIDI on the track’s MIDI channel.
- **MULTI** — this setting allows you to record data onto multiple TS-12 tracks simultaneously, but only from MIDI. This is most useful for recording tracks sent from external sequencers or played from guitar controllers.

**Note:** The TS-12 must be set to receive data from MIDI in Multi mode (MODE=MULTI on the MIDI Control page) in order for this feature to work correctly.

It is possible to record multi-track sequences from the keyboard, but only if you set track status to MIDI-LOOP for each of the active (primary and layered) tracks and then set up a MIDI loop (by connecting MIDI Out to MIDI In). This procedure is a bit tricky, and should only be attempted if you have a good understanding of the system. See *Section 10 — Understanding the Sequencer* for information on recording into the TS-12 sequencer in a MIDI loop.

**Note:** With the SQX-70 installed, the sequencer can record over 97,00 notes. However the sequencer record buffer is of a limited size, and can only record 16,000 notes at one time. As a result, you may see an OUT OF MEMORY message if you exceed the size of the record buffer. (this is most common in multi-track record). If this occurs, try editing the incoming data into several smaller sequences; then, once recorded into the TS-12 sequencer, append them together.
EDIT TRACKS  
Range: SEQ or SONG
This determines which set of tracks will be displayed on the track parameter pages when a song is selected. It also determines whether song or sequence tracks will be affected by volume or pan changes when you select RECORD MODE=MIXDOWN (see above). When incoming MIDI is received, the setting of this switch determines whether the sounds on the sequence or the song tracks will play. The setting of this switch is saved with each song.

• SEQ — the sequence tracks from the current song step will be displayed. When EDIT TRACKS=SEQ and you press Seq/Song Tracks 1-6 or 7-12, the LED above the button will flash to remind you that you are looking at the tracks from the sequence currently playing and not at the song tracks. The sequence tracks will receive via incoming MIDI.
• SONG — the song tracks will be displayed when a song is selected. The song tracks will receive via incoming MIDI.

Tip: When you are working with a song, you may want to switch back and forth between the Song and Sequence tracks without having to go to the Sequencer Control page. There is a shortcut for toggling between EDIT TRACKS= SEQ and EDIT TRACKS=SONG. While on either of the Seq/Song Tracks pages, rapidly double-click the Seq/Song Tracks 1-6 or 7-12 button. The LED above the tracks button flashes when you are looking at sequence tracks; it remains solidly lit when the song tracks are displayed.

Press Sequencer Control a third time to display the third sub-page:

FREE  
Range: (read only)
This shows the number of available events in sequencer memory. This read only parameter is informational and cannot be selected or edited.

SAVE CHANGES  
Range: NO, ASK, or AUTO
This parameter turns the SAVE CHANGES prompt on or off when switching between sequences and/or songs.
• NO — when SAVE CHANGES=NO, you can edit any of the Track Parameters, replace the sound on a track, etc. and the changes will be “forgotten” as soon as you select a new sequence or song. The SAVE CHANGES prompt with not be displayed. This mode is helpful when you are not sequencing, but have edited a sequence or song, and don’t want to be slowed down by the SAVE CHANGES prompt. Recording any new track data, however, will automatically reset this parameter to ASK.
• ASK — when SAVE CHANGES=ASK, if you edit any of the Track Parameters, replace the sound on a track, etc. and then select a different sequence or song, you will be asked if you want to save those changes. This is the default setting.
• AUTO — when SAVE CHANGES=AUTO, all changes made to any of the Track Parameters, or track sound assignments are made permanent when you select another sequence or song. AUTO is similar to ASK, except the SAVE CHANGES prompt is not displayed, and assumes that you answered *YES*. Recording any new track data will not automatically reset this parameter to ASK — it will remain set to AUTO until you change it.

STEP-ENTRY  
Range: OFF or ON
Determines whether Step Entry mode will be used when the sequencer is put into record.
• OFF — With this switch set to OFF, Step Entry Recording is disabled and the system will behave normally.
• ON — Whenever you go into Record with this switch set to ON, the TS-12 will automatically display the Step Entry page after the countoff has elapsed. If there is no countoff, then it will be immediately displayed.

The Step Entry page looks something like this (depending on the settings):

```
<table>
<thead>
<tr>
<th>Gate time</th>
<th>select</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beat</td>
<td>Clock</td>
</tr>
<tr>
<td>Step</td>
<td>Rep</td>
</tr>
<tr>
<td>Bar</td>
<td></td>
</tr>
</tbody>
</table>
```

TRK

The number of the currently selected track (on which you are recording) is shown in the upper left corner of the display. It is displayed only to remind you which track is being recorded and it cannot be selected or edited.

AUTOSTEP

Range: OFF or ON
This switch determines whether key events will advance to the next defined time setting.

• ON — each individual key down event will cause a note to be recorded on the track and will automatically advance the sequencer time by the amount set in the step size parameter. The duration of the note is controlled by the gate time select parameter.
• OFF — key events do not automatically advance the sequencer time, and multiple events can be recorded at the same track location (time).

If you use AUTOSTEP=ON for entering chords, the result will be an arpeggiated chord, similar to a guitar chord being strummed. This is true because each note of the chord will advance the time by the step size, causing older notes to have longer durations.

Tip: When AUTOSTEP=OFF, assigning a Foot Switch to STEP-REC (on the System page) allows you to advance the sequencer time by the amount set in the step size parameter, whenever you press the assigned foot switch. This makes it possible to record multiple events at the same track location (time) before advancing to the next sequence step.

GATE-TIME

Range: HELD, STEP, or 1/1 to 1/64T
The gate time (duration) value of a note is assigned when a key is released. This parameter allows you to determine how long the source will sound before it is gated (cut-off).

• HELD — the amount of time that you hold down the key(s) while advancing the track will determine the gate time. The time between key down and key release will be the duration.
• STEP — the duration of new notes will be the same as the current step size.
• 1/1 to 1/64T (and dotted note values 1/1D to 1/16D) — when you select any of these settings, the displayed note value will be used for the duration. If you need finer resolution, or wish to have longer gate times than a whole note (1/1), use the closest available value to enter the note and then, after you have finished with Step Recording, use the Event Editor to precisely adjust the duration.
TIME

Range: (described below)
Allows you to set the current location on the track. The track location (or time) is normally displayed as a three-part parameter when you are recording a sequence track, with two additional parts added when a song track is being recorded. In sequence mode, the three parts are Bars, Beats, and Clocks. In song mode, Step Number and Repetition Count fields are added to the left of the Bars, Beats, and Clocks fields.

The maximum ranges for these fields are determined by the length of the track. In song mode, the song structure is also important because the number of steps, the number of repetitions of each step, and the sequence length of each step are factored into the computation of the song track length.

You can advance the track by changing any of the fields, and if you have selected RECORD-MODE=LOADED on the Sequencer Control page, advancing past the end of the track will wrap around to the beginning. Otherwise, if you advance past the end of the track you will enter Audition mode.

STEP

Range: (described below)
Allows you to set the current step size which will be added to the current track location (TIME) whenever you use the *STEP* command, or when AUTOSTEP=ON. The range of step sizes is from whole notes (1/1) to 1/64th note triplets (1/64T). Dotted note values are also available (1/1D to 1/16D).

<table>
<thead>
<tr>
<th>Note Name</th>
<th>Setting</th>
<th>Beat.Clock</th>
</tr>
</thead>
<tbody>
<tr>
<td>Whole note</td>
<td>1/1</td>
<td>4.00</td>
</tr>
<tr>
<td>Whole note triplet</td>
<td>1/1T</td>
<td>2.64</td>
</tr>
<tr>
<td>Half note</td>
<td>1/2</td>
<td>2.00</td>
</tr>
<tr>
<td>Half note triplet</td>
<td>1/2T</td>
<td>1.32</td>
</tr>
<tr>
<td>Quarter note</td>
<td>1/4</td>
<td>1.00</td>
</tr>
<tr>
<td>Quarter note triplet</td>
<td>1/4T</td>
<td>0.64</td>
</tr>
<tr>
<td>Eighth note</td>
<td>1/8</td>
<td>0.48</td>
</tr>
<tr>
<td>Eighth note triplet</td>
<td>1/8T</td>
<td>0.32</td>
</tr>
<tr>
<td>Sixteenth note</td>
<td>1/16</td>
<td>0.24</td>
</tr>
<tr>
<td>Sixteenth note triplet</td>
<td>1/16T</td>
<td>0.16</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Note Name</th>
<th>Setting</th>
<th>Beat.Clock</th>
</tr>
</thead>
<tbody>
<tr>
<td>32nd note</td>
<td>1/32</td>
<td>0.12</td>
</tr>
<tr>
<td>32nd note triplet</td>
<td>1/32T</td>
<td>0.08</td>
</tr>
<tr>
<td>64th note</td>
<td>1/64</td>
<td>0.06</td>
</tr>
<tr>
<td>64th note triplet</td>
<td>1/64T</td>
<td>0.04</td>
</tr>
<tr>
<td>Dotted whole note</td>
<td>1/1D</td>
<td>6.00</td>
</tr>
<tr>
<td>Dotted half note</td>
<td>1/2D</td>
<td>3.00</td>
</tr>
<tr>
<td>Dotted quarter note</td>
<td>1/4D</td>
<td>1.48</td>
</tr>
<tr>
<td>Dotted eighth note</td>
<td>1/8D</td>
<td>0.72</td>
</tr>
<tr>
<td>Dotted 16th note</td>
<td>1/16D</td>
<td>0.36</td>
</tr>
</tbody>
</table>

*STEP*

Pressing this soft button will advance the track location (TIME) by the amount set in the STEP parameter. Notice the TIME parameter adjusts to the new location on the track when the *STEP* button is pressed.

If you have selected RECORD-MODE=LOADED on the Sequencer Control page, stepping past the end of the track will wrap around to the beginning, allowing you to continue stepping. Otherwise, if you step past the end of the track you will enter Audition mode.

If you are using a Foot Switch with the TS-12, you can assign the foot switch to advance the location by setting FS1=*STEP* on the System page. Pressing the foot switch will act just like the *STEP* command on the Step Entry page. This is useful when you need both hands to control the keyboard.
Locate Page
Pressing the Sequencer Locate button displays a page which provides valuable sequencer information as well as control over tempo and Auto-locate functions. Pressing Locate again will reveal the second sub-page where you can set the Edit Times for use with the Autopunch feature.

First we will look at the Locate page as it appears when a sequence is selected. When a song is selected, the Locate page is a little different (see below).

Sequence Locate Page
- Select a sequence from one of the Sequencer Bank pages.
- Press Locate. When a sequence is selected, the Locate page shows:

```
<table>
<thead>
<tr>
<th>Current Sequence</th>
<th>Current Track</th>
<th>Time Signature</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOCATE SEQ=&lt;SEQ-NAME&gt; TRACK=01 4/4</td>
<td>STOP TEMPO=120 GOTO BAR/BEAT=001.01</td>
<td></td>
</tr>
<tr>
<td>Tempo</td>
<td>Auto-locate Control</td>
<td>Current location</td>
</tr>
</tbody>
</table>
```

The status of the sequencer (whether it is in Play, Stop, Record, etc.) is always shown in the lower left-hand corner of the display on this page.

The following are display only parameters, provided here for your information:

SEQ
Shows the name of the current sequence.

TRACK
Shows the current primary/selected track. You cannot change the selected track from here; you do that from the Seq/Song Tracks 1-6 or 7-12 page.

Time Signature
Shows the time signature of the current sequence.

BAR/BEAT
Shows your current location in the sequence by bar and beat. You can locate to a different place in the sequence using the GOTO function described below.

The active controls on the Sequence Locate page are:

TEMPO (Tap Tempo)
Seq Range: 25 to 250 BPM, or EXT, Song Range: -64 to +63
Sets the tempo of the current sequence or song. On any of the three pages where tempo appears (Click, Sequencer Control, and Locate), the soft button nearest the TEMPO field can be used to “tap” in the tempo. If the field is already selected, tapping on the soft button at the correct rate for the desired tempo (based on the metronome settings on the click page) will update the tempo to the newest value. When CLOCK=MIDI on the Sequencer Control page, this field will read TEMPO=EXT to indicate that the tempo is controlled by incoming MIDI clocks.

When a song is selected, the range is expressed as a percentage of the sequence tempo — changing the song tempo offset automatically adjusts the tempo of each the sequences in the song by a percent, within the legal limits of 25-250 BPM. When TEMPO=+00 the sequences in the song will play at their designated tempo.

When a Song Tempo Track is selected, editing this value will record tempo change events.
GOTO — Sequence Autolocate Control
Displays the GOTO sub-page where the auto-locator destination is set. Use the GOTO function to quickly locate to any bar and beat within the sequence, in order to play or record from there.

- Press GOTO. The display shows:

```
LOCATE SEQ=<SEQ-NAME> TRACK=01 4/4
STOP TEMPO=120 -GOTO BAR/BEAT=001.01
```

GOTO will be flashing and the destination may be set using the Data Entry Slider or the Up/Down Arrow buttons. Notice there is now a cursor (underline) beneath the bar value at the BAR/BEAT parameter. Press the soft button beneath BAR/BEAT to move the cursor between the Bar and Beat. Continued presses of the BAR/BEAT parameter will toggle between the bar and beat values.

- After selecting a new location to go to, press the GOTO soft button again to complete the locating process and return to the main Locate page. The GOTO function provides a quick and easy way to repeatedly locate to a certain place in a sequence — the destination remains set until a new sequence or song is selected.

- After using the GOTO function to locate to a spot in the sequence, press Stop/Continue to begin playing the sequence from that point.

Setting the GOTO Locate Time While the Sequence Plays
You can set the location of the GOTO time “on the fly” as the sequence plays:

- Press Play to begin playing the sequence.
- When the sequence reaches the point where you want to set the GOTO location, press GOTO. The display momentarily shows LOCATE TIME SET - STOP TO LOCATE, and installs that time as the GOTO location.
- Press Stop•Continue (or let the sequence end).
- Now if you press GOTO twice, it will go to the same location that was set as when it was playing.

Song Locate Page
- Select a song from one of the Sequencer Bank pages.
- Press Locate. When a song is selected, the Locate page shows:

```
SONG LOCATE FIRST-VERSE STEP/REP=01.00
SNGS TEMPO=+00 GOTO BAR/BEAT=001.01
```

Note that the Sequencer Status (shown in the lower left corner of the display) now shows SNGS, for Song Stop, indicating that a song is selected.
The following are display only parameters, provided here for your information:

**Sequence Name**
Shows the name of the sequence which is playing as the current song step. This is updated with the new steps as the song plays.

**STEP/REP**
Shows your current location in the song by steps and repetitions. You can locate to a different place in the song using the GOTO function described below.

**BAR/BEAT**
Shows your location within the current song step by bar and beat. As with the song steps and reps, you can locate to a different point using the GOTO function.

The user-controllable parameters on the Song Locate page are:

**TEMPO**
Range: -99 to +99 BPM, or EXT
This controls the tempo of the song. It is expressed as a percentage of the sequence tempo — changing the song tempo offset automatically adjusts the tempo of each the sequences in the song by +/-99%, within the legal limits of 25-250 BPM. When TEMPO=+00 the sequences will play at their designated tempo.

When CLOCK=MIDI on the Sequencer Control page, this field will read TEMPO=EXT to indicate that the tempo is being controlled by incoming MIDI clocks.

**GOTO — Song Autolocate control**
The GOTO sub-page looks a little different in song mode, as you can locate to any step or rep in the song, as well as to any bar and beat within the step.
• Press GOTO. The display shows:

GOTO is flashing and the destination may be set using the Data Entry Controls.
• Press the soft button above the Step/Rep field to move the cursor between the Step and Repetition selecting the desired destination. Press the soft button beneath the Bar/Beat field to move the cursor between the Bar and Beat.
• Press GOTO again to complete the locating process and return to the main Locate page with the new location currently viewed.
• After using the GOTO function to locate to a point in the song, press Stop/Continue to begin playing from that point.

Setting the GOTO Locate Time While the Song Plays
You can set the location of the GOTO time “on the fly” as the song plays:

• Press Play to begin playing the song.
• When the song reaches the point where you want to set the GOTO location, press GOTO. The display momentarily shows LOCATE TIME SET - STOP TO LOCATE, and installs that time as the GOTO location.
• Press Stop•Continue (or let the song end).
• Now if you press GOTO twice, it will go to the same location that was set as when it was playing.

Edit Times — Using the Autopunch Feature
Press Locate a second time to display the Edit Times sub-page:

AUTOPUNCH
Range:    ON or OFF
This is the same parameter found on the Sequencer Control page — it is also located on this page so that you have a handy way to enable or disable the Autopunch function on the same page where the Edit Times are located. See “Sequencer Control page” earlier in this section for a full description.
• ON — the TS-12 uses the Edit Times for entering and exiting record state.
• OFF — normal recording without using Edit Times.

When the Autopunch function is on, the TS-12 will enter and exit record only at the points specified by the Edit Times. For example, if you want to have the TS-12 automatically record over just the third bar of a four bar sequence:
• Set the Autopunch parameter to AUTOPUNCH=ON.
• Select the IN Edit Time and set to IN = 003.01.01 (bar 3, beat 1, clock 1)
• Select the OUT Edit Time and set to IN = 003.04.96 (bar 3, beat 4, clock 96)
• Press Record/Play and play along with the track. The TS-12 will automatically enter record at the first clock of the third bar and exit record on the last clock of the third bar.

EDIT TIMES IN and OUT Ranges: (various)
When a sequence is selected, the display shows the Bar, Beat and Clock at which the TS-12 will enter and exit record when AUTOPUNCH=ON. Press the soft buttons nearest IN and OUT to select the Edit Times parameters for editing.

The Edit Times are set using the Data Entry Slider or the Up/Down Arrow buttons. Repeatedly pressing the soft button next to either time toggles the cursor between the Bar, Beat and Clock value.

RESET
Pressing this soft button resets the currently selected time to its default value (the beginning and end of the sequence or song). IN is reset to 001.01.00, or the beginning of the sequence, and OUT is reset to the time value for the last clock of the sequence. If other values are installed, they will remain in effect until they are reset or a different sequence or song is selected.

SET
This sets the selected time to the current sequencer time value (as shown on the Locate page) if the sequencer is running. If the sequencer is stopped, the most recent time value is used. Using the Locate function does affect the current time value.

Edit Times in Song Mode
You can use the Autopunch mode and Edit Times to punch in and out on the song tracks as well as sequence tracks. When a song is selected, pressing Locate twice shows the following:

<table>
<thead>
<tr>
<th>Step</th>
<th>Rep</th>
<th>Bar</th>
<th>Beat</th>
<th>Clock</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EDIT TIMES AUTOPUNCH=ON</td>
<td>IN=010101010101</td>
<td>OUT=05010070496</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SNGS RESET SET</td>
<td></td>
<td></td>
<td>Step</td>
<td>Rep</td>
</tr>
</tbody>
</table>

Notice that two more parameters are added to the Edit In and Out Times: the Song Step number and the Repetition of that step are added to the Bar, Beat and Clock within the sequence that plays during the step. You can set the IN or OUT time to any point within the song.

Setting the Edit Times in Real Time
If you know the exact bar, beat and clock (or step, rep, bar, beat and clock in song mode) at which you want to punch in and out, you can simply select and set the Edit Times using the data entry controls. If not, you can set them “on the fly” using the following procedure:
• Press the soft button above IN to select the IN Edit Time.
• Press Play to begin playing the sequence or song.
• When the sequence or song reaches the point where you want to punch in, press SET. This installs that time as the IN Edit Time and moves the underline to OUT.
• At the point where you want to punch out, press SET again. This installs that time as the OUT Edit Time and moves the underline back to IN.
• Now, assuming Autopunch is on, you can go into record and play along with the track, and the TS-12 will automatically enter and exit record at those points which you chose.
Section 12 — Sequencing/MIDI Applications

This section covers a number of advanced sequencer applications, including using the TS-12 with a variety of external MIDI devices.

Using the TS-12 with a Drum Machine
When you use the TS-12 in conjunction with a drum machine or other rhythm sequencer, there are basically three ways to go:

1) Sync the drum machine’s clock to the TS-12
2) Sync the TS-12’s clock to the drum machine
3) Sequence the drum machine from the TS-12 (just as you would a synthesizer)

To Sync a Drum Machine to the TS-12:
• Connect the MIDI Out of the TS-12 to the MIDI In of the drum machine.
• Set the drum machine to sync to MIDI clocks.
• Set the drum machine to receive on an unused MIDI Channel, OMNI Off; or disable Channel information. You don’t want the drum machine playing TS-12 sequence data intended for other instruments. MIDI Clocks, Start, Stop and Continue are real-time commands, and are sent and received regardless of MIDI channel or mode.
• The drum machine should now sync to the TS-12’s clock. Pressing Play or Stop/Continue will Start, Stop and Continue the drum machine, assuming it receives those commands.

To Sync the TS-12 to a Drum Machine:
• Connect the MIDI Out of the drum machine to the MIDI In of the TS-12.
• Set the TS-12 to sync to MIDI clocks. On the Sequencer Control page, select CLOCK=MIDI.
• Set the drum machine to not send channel info, or to send on a MIDI Channel that is not being used by any of the TS-12 tracks. Again, MIDI Clocks, Start, Stop and Continue are sent and received regardless of MIDI channel or mode.
• The TS-12 should now sync to the drum machine’s clock. Starting, Stopping or Continuing the drum machine will Start, Stop and Continue the TS-12.

To Sequence a Drum Machine from a Track of the TS-12:
• Connect the MIDI Out of the TS-12 to the MIDI In of the drum machine.
• Set the drum machine to Tape Sync or External Clock, or any setting other than Internal or MIDI Clock. This way it will not play it’s own patterns, but will act only as a sound-producing device, sequenced from a track of the TS-12.
• Set the drum machine to POLY (OMNI Off) mode, and select a MIDI Channel.
• From the Track MIDI Page, assign a track on the TS-12 MIDI Status, and set it to the same MIDI Channel you assigned the drum machine.
• You should now be able to play the drum machine from the TS-12 keyboard. You can then record a track on the TS-12, from the TS-12 keyboard, which will play on the drum machine — just as if you were sequencing an external synthesizer. The advantage of this approach is that some drum machines respond better to velocity when played from MIDI than when played from their own front panels. Thus you may get more dynamic range out of your drum machine if you use this approach. The disadvantage is that you use up TS-12 sequencer memory to sequence the drum machine.
Song Position Pointers
The TS-12 transmits and receives Song Position Pointers via MIDI. Song Position Pointers are MIDI commands that tell a sequencer or drum machine where to locate within a song or sequence.

When the TS-12 receives a Song Position Pointer, it will locate to the appropriate place in the selected song or sequence.

The TS-12 sends a Song Position Pointer over MIDI whenever you use the Auto-Locate control (the GOTO function on the Locate Page). Any receiving unit which recognizes Song Position Pointers will locate to the same spot.

Not all remote MIDI devices recognize Song Position Pointers. Consult the manual of any other sequencing device you are using, to see if it does.

MIDI Song Selects
MIDI Song Selects allow a sequencer such as the TS-12 to instruct a remote MIDI sequencer or drum machine to select a new song whenever you select a Sequence or Song on the TS-12. Whether or not the TS-12 sends or receives Song Selects depends on the setting of the SONG-SEL parameter on the MIDI Control sub-page.

The TS-12 transmits and receives MIDI Song Selects in Sequence Mode as well as Song Mode (depending again on the setting on the SONG-SEL parameter). This allows you to select any TS-12 sequencer location from a remote sequencer, computer or drum machine, and vice versa. They are set up as follows:

- MIDI Song Selects # 00-59 will select TS-12 Sequencer locations # 00-59.
- Selecting Sequencer locations # 00-59 will cause the TS-12 to send MIDI Song Selects # 00-59

MIDI Controller Tricks — Creating MIDI Track Templates
There are some subtle features of the TS-12 sequencer which enhance its capabilities as a MIDI controller. You can change the sound and mix of every instrument in your rig with the push of a button, and create giant presets with as many as 12 remote MIDI devices split and/or layered.

Each sequence you create and store in the TS-12’s sequencer memory contains up to 12 sets of Sound and Mixing information, each of which will be sent out on the designated MIDI Channel when you select that sequence. Each sequence also remembers all Performance/Track Parameters settings for each track, as well as which tracks are selected or layered.

If you have the TS-12 connected to other instruments via MIDI, try this:

- Press Seqs/Songs, and select a -BLANK- location to create a new sequence. Name this sequence MIDI-OUT-1, or something similar, to indicate that it is specially set up as a MIDI controller template.
- Press the Seq/Song Tracks 1-6 button, and select the first track.
- Press Track MIDI, and set the track’s STATUS to SEND/RECV; on the second sub-page set the CHANNEL to the MIDI channel of one of your remote MIDI instruments; on the third sub-page, select a program for the instrument.
- Press Seq/Song Tracks 1-6, select another UNDEFINED track, and repeat the above steps, setting this track up to drive a different instrument. And so on, until you have one track playing each external instrument. Create a couple of MIDI-OFF tracks with different programs, too. Selecting one of them will let you play the TS-12 only. Selecting any of the MIDI tracks will let you play the receiving instrument that is set to the same MIDI channel as...
that track.

- You see that from the Seq/Song Tracks 1-6 or 7-12 pages, you can change what plays from the TS-12 keyboard simply by selecting different tracks. You can layer tracks together by double-clicking their soft buttons. You can adjust the mix, key range, transpose, etc. for any of the tracks.

- Now create another sequence. (The TS-12 will ask you SAVE CHANGES TO <SEQ NAME>? Answer *YES*.) Name this sequence MIDI-OUT-2. For the tracks of the new sequence, go through the same procedure as before, but assigning different program numbers to the external instruments. (Remember always to change programs from the TS-12’s Track MIDI sub-page.)

- Again, you can play a different external instrument, or the TS-12 alone, or the TS-12 and an external instrument, depending on which track(s) you select.

Now press **Seqs/Songs** and reselect the first sequence. (Again, the TS-12 will ask you SAVE CHANGES TO <SEQ NAME>? Answer *YES*.) Notice when you select the new sequence that all the external instruments connected to the TS-12 change to the proper program for that sequence — each track sent out a program change on its MIDI channel when the sequence was selected. Now select the second sequence again. Each external instrument again changes back to the proper program.

Notice that you haven’t recorded anything on either of these sequences. They exist merely as **Track Templates**, which serve two useful purposes when using the TS-12 as a system controller:

1) Every time you select a new sequence, each track can send a program change to an external instrument. You can change the sound that every remote MIDI device in your rig is playing with one press of a button. Also the same tracks will be selected or layered as when you last saved the sequence.

2) When you select any track of a sequence, the TS-12 keyboard plays whatever program is on that track, or sends on the track’s MIDI channel, or both. Select a different track and you have a different configuration. From the Seq/Song Tracks 1-6 and 7-12 pages you select any combination of local and/or MIDI sounds.

Of course you can record data on any of these sequences if you want. Whether you do or not, they will still work as templates. You can play external instruments from the TS-12 or from their own keyboards. You can have a track send a program change to a MIDI effects processor (like the ENSONIQ DP/4); have it send program changes to a sampler (like the ASR-10) to load sounds, or to a drum machine to change patterns, just by selecting a new sequence. No doubt you will come up with some applications of your own, based on your equipment and your needs.

**MULTI Mode — Receiving on up to 12 MIDI channels**

When you select MODE=MULTI on the MIDI Control Page, the 12 tracks of the current sequence or song become like 12 “virtual instruments,” each receiving independently on its own MIDI channel, but all sharing the same 32 voices and the same effects set-up.

- Press **MIDI Control**. Set MODE=MULTI. The 12 tracks of the current sequence will now each receive on its own MIDI channel, which you can select independently for each track.
- Create a new sequence. You might want to name this sequence *MULTI-IN, or something similar, to indicate that it is specially set up as a multi-channel MIDI receiver.
- Press **Seq/Song Tracks 1-6**. All the tracks except the first are still UNDEFINED. Select each of
the tracks, defining them and putting the current sound on them. Press 7-12 and do the same for the 6 tracks there. Then press **Seq/Song Tracks 1-6** again to return to the first 6 tracks.

- Press the **Track MIDI** button in the Track Parameters section. The first sub-page, labeled STAT, shows the status for the six tracks.
- Press **Track MIDI** again to reveal the second sub-page, labeled CHANNEL. Here you select the MIDI channels for the different tracks:

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Select any track and set it to receive on the MIDI Channel you wish. Now, as long the TS-12 is in MULTI Mode, incoming MIDI information on that channel will be received by that track. Incoming MIDI program changes will change the program on the track. Incoming MIDI volume messages will adjust the level of the track. Press **Seq/Song Tracks 7-12** and do the same for the 6 tracks there.

If (as is often the case) you don’t want all 12 MIDI channels to receive:

- Press **Track MIDI** until you return to the Status sub-page and set the track(s) you want to disable to SEND/----. Any tracks set to SEND/---- will not respond to incoming MIDI (though they will send MIDI when played from the TS-12 keyboard).
- Press the **Seqs/Songs** button to go to the Sequencer Bank page, and select the same sequence again (press the soft button above or below the sequence location that’s already underlined). The display will ask SAVE CHANGES TO <SEQ NAME>. Answer *YES*. This saves the track assignments you made. You might want to save this sequence to disk for future use.
- You don’t need to record anything on this sequence — just leave it as a template for receiving on up to 12 different MIDI Channels. Whenever you want the TS-12 to act as a multi-channel MIDI receiver, just load or select this same template.

### A Few Important Points About MULTI Mode

- When the TS-12 is in MULTI mode, only the 12 tracks of the MULTI mode will receive MIDI information. Sounds and presets selected in the normal fashion will not respond to MIDI at all.
- Each of the 12 sequencer tracks (six in **Seq/Song Tracks 1-6**, six in 7-12) is completely independent and polyphonic. The TS-12’s Dynamic Voice Allocation means each track can have up to all 32 voices if it needs them. If all 32 voices are in use and a track needs a voice, it will “steal” the voice from the oldest note (or the one with the lowest voice priority).
- The 12 tracks respond independently to MIDI program changes, allowing you to assign a new sound to a track via MIDI. The selected sound’s effect does not normally come with it — all of the 12 tracks in the sequence or song share the same effects setup, which can normally can be changed only by editing the effect from within sequence.
- You can, however, cause a sound’s effects set-up to become the sequence effect (which will then be applied to all 12 tracks) by sending a program change for the desired program number plus 60 (i.e. 60 to 119) (see “Receiving Program Changes” in Section 3 — **MIDI Control Page Parameters**).
- Only one track can receive on a given MIDI Channel. If two (or more) tracks are set to the same MIDI Channel, the lower-numbered track will receive on that channel and any higher-numbered track(s) set to the same channel will not receive at all.
• You may not want all 12 Tracks to receive. Tracks that you leave in the UNDEFINED state will not receive any MIDI data. Just define as many tracks as you need. Or set some tracks to SEND/---- on the Track MIDI page. Tracks set to SEND/---- will not respond to incoming MIDI data.

**Using the TS-12 with an External MIDI Sequencer**

For optimal results when using it with an external multi track sequencer, the TS-12 should be set up as described above to receive in Multi Mode, and the 12 tracks of the current sequence assigned to receive on the desired MIDI channels.

The illustration below shows a typical configuration for using the TS-12 with an external MIDI sequencer in MULTI Mode:

![Diagram of TS-12 with external MIDI sequencer](image)

Each of the 12 tracks of the current sequence: keys, volume, controllers, and program changes, are controlled independently.

Note that the MIDI channel assignments shown above are merely default values. You can set any of the 12 tracks to receive on any of the 16 available MIDI channels (though, as mentioned above, only one track will receive on a given channel). Also, you can turn a track’s Status to SEND/---- (so that it does not receive incoming MIDI at all) if you want less than 12 channels to be recognized by the TS-12.

When using the TS-12 as both the controller and one of several sound generators with an external sequencer:

• Set up the MIDI connections as shown in the diagram above.
• Set the external sequencer to echo incoming MIDI data at its output.
• Press **System** three times and set the MIDI-TRK-NAMES parameter to ON. When this parameter is ON, you will see the name of the sound on a track (instead of *MIDI-CHAN-##*) when the track’s status is MIDI.
• Press **Seq/Song Tracks 1-6** or **7-12** and set up your tracks for sequencing:
  > For tracks that you want to play a TS-12 sound, set the Status to SEND/RECV. The track will send MIDI to the sequencer, and then will play local TS-12 voices when it receives the information back at its MIDI input.
  > For tracks which you want to play one of the other MIDI devices, but not play a TS-12 sound, set the Status to LOCAL-OFF. The track will send MIDI to the sequencer, but will not play locally when the data is received. The MIDI Thru jack will send the information along to the remote MIDI devices.
Using The TS-12 with a MIDI Guitar Controller

The TS-12 makes an ideal voice module to use with any MIDI Guitar Controller which is capable of sending in MONO Mode. MONO Mode (MIDI Mode 4) allows a guitar controller to send the notes played on each string on a different MIDI Channel. This has the advantage of letting each string send pitch bends independently, which is the only way to truly recreate guitar technique on a synthesizer.

Some earlier guitar synths do not support MONO mode. You will have to consult the manual of your particular model to see if it does. If you have a guitar synth which only sends in POLY Mode (i.e. sends all six strings on the same MIDI Channel) you should use the TS-12 in POLY Mode (or OMNI Mode) and set the guitar controller to send on the MIDI Channel that is selected for the Base Channel on the MIDI Page.

For MIDI Guitar Controllers which do support MONO Mode, the TS-12 provides two types of MONO mode reception. The first is MONO A Mode, which is a simple and straightforward way of using MONO mode without getting involved with tracks or other complications:

- Connect the MIDI Out of the guitar controller (or its MIDI converter) to the MIDI In of the TS-12.
- Set your guitar controller to send in MONO Mode on Channels 1-6. (Some models have an easy shortcut for getting into this state.)
- On the MIDI Control page, set the Base MIDI Channel to BASE-CHAN=01.
- Also on the MIDI Control page, set the MODE parameter to MODE=MONO A. This sets up the TS-12 to respond monophonically to 12 consecutive MIDI channels starting from the Base Channel (consult Section 3 — MIDI Control Page Parameters for a more complete description of MONO Mode).

You can now select sounds or presets on the TS-12, either from the front panel or from MIDI program changes, and the guitar controller will play those sounds exactly as if they were played from the keyboard.

If you are a little more adventurous, and would like the flexibility to put a different sound program on every string of the guitar, you can use MONO B mode, in which each track of the current sequence receives monophonically on its own MIDI channel, and can receive program changes independently. Where MONO A is like POLY mode with monophonic reception, MONO B is just like MULTI mode, except that each track is monophonic.

- Press MIDI Control. Set the MIDI In mode to MODE=MONO B. The 12 tracks of the current sequence will now each receive monophonically on its own MIDI channel
- Create a new sequence. You might want to name it “MONO-B IN”, or something similar, to indicate that it is specially set up for this type of reception.
- Press Seq/Song Tracks 1-6. All the tracks except the first are still UNDEFINED. Select each of the six tracks, defining them and putting the current program on them. You can leave Seq/Song Tracks 7-12 undefined.
- Press Track MIDI twice to go to the MIDI CHANNEL sub-page. Here you select the MIDI channels for the different tracks:
The default values are as shown above. If you want to receive on a different set of MIDI channels, select each track and edit it accordingly. Unlike MONO A, in this mode the consecutive channel assignments are not automatic. You must set the tracks to six consecutive channels.

Now you’re ready to play. A few things to bear in mind:

• Notes played on each string will play only the corresponding track. Each string/track combination is totally independent.

• You can change the program for each track manually from the TS-12’s front panel (using the Replace Track Sound function) or by sending Program Changes from the controller via MIDI.

• Each track will accept Program Changes independently. In many cases you will want to have the guitar controller send the same-numbered Program Change on all six channels so that all six strings play the same sound. You can, however, send the TS-12 a different Program Change for each track. You could use this effect to have, for example, a bass sound play on the bottom two strings and a piano sound on the top four. Or if you are feeling experimental, you could play a different sound on each string.

• It’s a good idea to set up and save to disk a special template sequence, as described above, which you always use in conjunction with the guitar synth. That way you won’t accidentally change the programs in the tracks of an existing sequence.

• If your guitar synth can send certain MIDI controllers on their own MIDI Channels, have it send any controllers you want to affect all the tracks (such as the “whammy bar”) on the Base-Channel-minus-1. When the Base Channel is 1, Global controllers should be sent on Channel 16.

### Delay Times/Tempo BPM Chart

This chart shows the relationship between delay times and tempo beats per minute. Values shown are accurate to 2 decimal places—since most delay devices are not accurate to 2 decimal places, you may have to round off these values. You can use this chart to set the effect delay times to sync to your sequence or song.

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Section 12 — Sequencing/MIDI Applications
TS-12 Musician’s Manual

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Downloaded from www.Manualslib.com manuals search engine
Tip: Assign a controller to modulate the effect delay times, ands select a specified minimum and maximum range so that you can create unique poly-rhythms in real-time.
What is General MIDI?

General MIDI (GM) is an industry standard for program mapping that defines 128 sounds and their locations. This means that if a device conforms to the GM standard, MIDI Program Change #1 will always call up an acoustic piano. MIDI Program Change #62 will always call up a brass section, etc. Although the actual sounds (tone and quality) will vary from product to product, each specific MIDI Program number will always call up the same type of sound.

Sound Map

The General MIDI Sound Map (found later in this section) lists the 128 General MIDI sounds in the TS-12 ROM and their assigned General MIDI Program Change numbers.

Percussion

General MIDI also includes a Percussion Key Map, defining specific drum voices for each key. To avoid confusion, General MIDI always assigns percussion to MIDI channel 10. The General MIDI Percussion Key Map can be found after the General MIDI Sound Map.

GS/MT-32 Compatibility

GS is an extended MIDI sound specification originated by Roland® Corp. Although we provide the GS Drum Maps (listed later) and MT-32 Program Change Map for Roland Sound Canvas™ compatibility, the TS-12 is not GS compatible and does not contain the GS Alternate Sound Banks.

Other General MIDI Requirements

A General MIDI sound module must respond to all 16 MIDI channels, with dynamic voice allocation, and a minimum of 24 voices. It also must respond to velocity, pitch bend, mod wheel, volume and pan, expression, sustain, and the All Notes Off and Reset All Controllers messages. With these controllers supported, a composition that relies on note articulations and mix settings can be played back and still sound correct when played by any GM sound module. The TS-12 supports all of the above MIDI messages, and fully conforms to the General MIDI Specification.
Why use General MIDI?
While the TS-12 instruments are a superb sound source, with greater fidelity and more programmability than most GM modules, there are interesting applications for General MIDI that can enhance your music making.

1. There is an interesting genre of music software (for your computer) that creates backing patterns for you to play along with, for pleasure and study. These programs include:

   **Band in a Box**
   For more information contact:
   PG Music Inc.
   266 Elmwood Avenue
   Suite 111
   Buffalo, NY 14222
   Voice 1-800-268-6272 or 905-528-2368
   FAX 905-628-2541

   **Jammer**
   For more information contact:
   Soundtrack
   3384 Hill Dr.
   Duluth, GA 30136
   Voice 404-623-0879
   FAX 404-623-3054

   **MiBac Jazz**
   For more information contact:
   MiBac Music Software
   PO Box 468
   Northfield, MN 55057
   Voice 507-645-5851

2. Many pre-recorded pieces of music can be purchased for home listening, solo performance backing tracks (e.g., instant karaoke), and other applications. Note that this application requires a computer/hardware sequencer/sequencer player and some type of computer software (such as those listed above). Look through current issues of music/computer software magazines for listings (these products must conform to the Standard MIDI File [SMF] format* in order to use them properly).

* A Standard MIDI File (SMF) is a MIDI protocol designed for sharing sequences between different products.

3. There is an ever-increasing amount of educational software that uses General MIDI for such applications as ear training, music lessons, etc.

4. Some computer games offer General MIDI as an optional sound source. The TS-12 will provide high quality sound variations for this enjoyable leisure activity, enhancing the excitement and thrill of your computer games.
## General MIDI Sound Map

The following map shows the General MIDI sound name and program change number of each sound as they appear in the TS-12. This map also shows how General MIDI divides the instruments into 16 categories of similar sounds:

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<th>PROG #</th>
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<th>PROG #</th>
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Note that the names listed above are as they appear in the TS-12, and not as they appear in the General MIDI Spec. The only differences are in spelling.
### GM and GS Percussion Key Maps (Channel 10)

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## GM and GS Percussion Key Maps (Channel 10)

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<th>MIDI Note #</th>
<th>26 - TR-808-KIT</th>
<th>41 - BRUSH-KIT</th>
<th>49 - ORCH-PERCSN</th>
<th>128 - MT-32-KIT</th>
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<td>88</td>
<td>E6</td>
<td></td>
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<td>Applause</td>
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</table>
• There are four additional sounds assigned to keys in the MT-32-KIT:
  90 (F6+) Crash  92 (G6+) Train  93 (A6) Jet  94 (A6+) Helicopter

Using General MIDI in the Real World

![Diagram of computer (with MIDI Interface) connected to TS Keyboard]

Using TS-12 General MIDI Sounds with an External GM Sequencer

Connecting the TS-12 keyboard to a computer (or other General MIDI sequencer)
1. Power down all electronic devices before making any connections.
2. Using a MIDI Cable, connect the MIDI In jack of the TS-12 to the MIDI Out jack of the computer/hardware sequencer/sequence player.
   Note: Many computers do not have a MIDI jack built into them, and require an additional MIDI Interface connector between the computer and the TS-12.
3. Make sure the proper amplification is connected to the TS-12, and power on the computer, the TS-12 keyboard, and the amplification system (in that order).
   Tip: Headphones connected to the Phones jack of the TS-12 will work fine in General MIDI mode, and allow you to work late hours without disturbing others.

To Enable General MIDI on the TS-12
1. Press the MIDI Control button. The display shows:

   ![Display showing MIDI Base-Chan=01 GMIDI=OFF Send=Track Mode=Multi Vels/Xpos=80th XCtrl=002]

2. On the first MIDI Control sub-page, press the upper middle soft button on the display to select the GMIDI parameter (it should be underlined).
3. Press the **Up Arrow** button to enter General MIDI mode.

If the sequencer is running, the SEQUENCER MUST BE STOPPED message will be displayed. If the sequencer is stopped, the “SAVE CHANGES?” prompt will be displayed (if necessary). Otherwise, the following prompt will be displayed:

![General MIDI Mode Prompt](image)

4. Pressing the soft button beneath *NO* will leave the TS-12 system unchanged, returning you to the first **MIDI Control** sub-page.

5. Pressing the soft button above *YES* will enable General MIDI Mode. All LEDs will be off and all buttons (except the **Arrow** buttons and the soft buttons) will be disabled. The TS-12 will display the General MIDI Mode page as follows:

![General MIDI Mode Page](image)

The TS-12 behaves as though an enlarged 16-track sequence has been selected, and as though the current MIDI Mode=MULTI. Incoming MIDI will be received on all 16 MIDI channels, to 16 discrete inbound Track/Channels. The default effect algorithm (46 CHORUS + REVERB 2) will be installed, and all Track/Channels will be routed through the effect.

When you now run the external computer or hardware sequencer, you will hear the proper sounds played from the TS-12 as program changes and note/controller data is transmitted to the TS-12 via the **MIDI In** jack.

**MIDI Out in General MIDI Mode**

The TS-12 keyboard will always play the sound assigned to the currently displayed Track/Channel number. Local playing on the TS-12 keyboard and controllers will be transmitted via the **MIDI Out** jack on the displayed MIDI Channel number. This allows you to connect the TS-12 **MIDI Out** jack to the MIDI In jack of a computer sequencer/hardware sequencer/other MIDI Sound module.

This feature adds MIDI Controller capability to the TS-12 while in General MIDI Mode.
**TS-12 General MIDI Parameters**

**RECV (MIDI Reception)**  
Range: ON or OFF

This parameter is set to receive MIDI data by default (RECV=ON). By changing the RECV value for each MIDI channel, you can define how many Track/Channels you want to receive data via MIDI.

Setting RECV=OFF will disable reception of MIDI notes, controllers and program changes on the displayed MIDI channel. Sounds can still be played from the keyboard, and live playing will still transmit via MIDI on the displayed MIDI channel.

When RECV=OFF, the Track/Channel volume will be set to full on (127), so that your live playing can use the full dynamic range. Resetting RECV to ON will reset the Track/Channel volume back to the General MIDI default value of 100.

**Tip:** When set to RECV=OFF, this parameter allows for “music-minus-one” applications in General MIDI mode. By setting this parameter to OFF, you disable incoming MIDI for the selected Track/Channel, boost the volume, and can play the assigned sound live from the keyboard as the remaining sequence tracks play back via incoming MIDI.

No matter what the setting of this parameter, a CVP-1 Pedal connected to the Pedal•CV Jack will always control the volume of the selected Track/Channel.

**GM-CHAN**  
Range: 01 to 16

This parameter is used to select and view the sounds assigned to each MIDI Channel. When this parameter is selected, the Data Entry Controls will scroll through all 16 Track/Channels.

GM-CHAN=10 is permanently assigned to play Drum Maps only. When Track/Channel 10 is selected, the GM-PROG parameter will scroll through the nine available GM/GS Drum Maps.

Playing on the TS-12 keyboard will always be transmitted on the displayed MIDI channel. If the GM-CHAN value is changed while a note is held down, local voices will be silenced on the previously selected Track/Channel.

**GM-PROG**  
Range: 001 to 128

The GM-PROG (General MIDI Program number) parameter determines which sound will be assigned to each MIDI Channel. When this parameter is selected, the Data Entry Controls will change which of the 128 General MIDI ROM Sounds is assigned to the currently displayed Track/Channel. The corresponding Program Change message will be transmitted via MIDI whenever this parameter is edited.

Program Changes received on MIDI channels 1-9 and 11-16 will assign programs to the 16 Track/Channels from the 128 General MIDI sounds in ROM. MIDI Channel 10 can only access the nine GM/GS Drum Maps, and will receive the corresponding GS Drum Map Program change value (1=STANDARD-KIT, 9=ROOM-KIT, 17=POWER-KIT, 25=ELCTRNC-KIT, 26=TR-808-KIT, 33=JAZZ-KIT, 41=BRUSH-KIT, 49=ORCH-PERCSN, 128=MT-32-KIT).

The TS-12 keyboard will always play the sound assigned to the displayed Track/Channel number.
Manually Assigning GM Sounds to Each MIDI Channel

1. Press the soft button beneath the GM-PROG parameter.
2. Use the Data Entry Controls to scroll through the different GM Sounds.

   The General MIDI Sound names change when you use the Data Entry Controls. These sound names and their associated GM Program numbers are listed on the General MIDI Sound Map found earlier in this section.

   **Note:** Most sequence data contains MIDI Program Change messages intended to assign the correct sounds to each MIDI Track/Channel. These incoming MIDI program changes will probably change any manually assigned sounds. If you wish to prevent this from happening, you should disable program change transmission from the external MIDI sequencer.

General MIDI “Panic” button

Some remote MIDI Devices may leave notes and controller values “dangling,” causing Track/Channels to function improperly. The TS-12 has a solution to this problem — the MIDI “Panic” button. Pressing the upper left soft button above GENERAL MIDI MODE will invoke the GM-PANIC RESET function:

```
GM-PANIC RESET
```

“GM-PANIC RESET” will be momentarily displayed. All TS-12 and MIDI voices on all 16 Track/Channels will be silenced. The following MIDI messages will be transmitted on all 16 MIDI Channels: All Notes Off, Reset All Controllers, key-ups for all keys down, sustain and sostenuto pedal ups, and controllers will be normalized to the General MIDI default values. Program Changes will be transmitted corresponding to the sounds assigned to each of the 16 Track/Channels.

System and MIDI Control Settings in GM Mode

The following System and MIDI Control page parameter settings are installed in General MIDI mode (see Sections 2 and 3 for information about these parameters). All other parameters are reset to values appropriate for General MIDI reception:

- **System** page TUNE and PITCH-TABLE settings are retained.
- **System** page TOUCH and VEL-MAX settings are retained.
- **System** page PEDAL is set to VOL.
- **System** page FOOT-SW1-R and SW2-R are set to SUSTAIN.
- **System** page FOOT-SW1-L and SW2-L are set to SOSTENUTO if they were previously set to any value other than *UNUSED*. If they were set to *UNUSED*, they will remain *UNUSED*.
- **MIDI Control** page SYS-EX setting is set to ON.

Exiting General MIDI will restore your original settings.
Disabling General MIDI

To Disable General MIDI

- Press the soft button above *EXIT* to exit General MIDI Mode.

The TS-12 will momentarily show:

```
[ ] [ ] [ ]
GN-TRACKS RESET
[ ] [ ] [ ]
```

The TS-12 will then return to its previous state. The General MIDI Track/Channel sound assignments will be preserved in static RAM, even after power-off.

**Note:** You can also disable General MIDI by turning the TS-12 off, and then back on (this will not happen if the WAKE-UP parameter is set to GEN-MIDI).

Enabling/Disabling General MIDI with System Exclusive Messages

General MIDI can also be enabled/disabled using Universal System Exclusive (SysEx) messages:

### Turning General MIDI On using SysEx Messages

F0 7E <Device ID> 09 01 F7

- F0 7E: Universal non-real-time SysEx header
- <Device ID>: ID of target device (suggest using 7F: Broadcast)
- 09: sub-ID #1=General MIDI message
- 01: sub-ID #2=General MIDI On
- F7: EOX (end of SysEx)

### Turning General MIDI Off using SysEx Messages

F0 7E <Device ID> 09 02 F7

- F0 7E: Universal non-real-time SysEx header
- <Device ID>: ID of target device (suggest using 7F: Broadcast)
- 09: sub-ID #1=General MIDI message
- 02: sub-ID #2=General MIDI Off
- F7: EOX (end of SysEx)

More about SysEx Messages

- The MIDI Control SYS-EX parameter must be set to SYS-EX=ON in order to receive Universal SysEx messages.

- A Universal SysEx General MIDI On message acts the same as answering *YES* to the "ENTER GENERAL MIDI MODE?" prompt, and displays the General MIDI Mode page. The SysEx message will be ignored if the sequencer is running, or if the system is already in General MIDI Mode. Sequencer changes will be saved automatically, unless SAVE-CHANGES=NO (on the third Sequencer Control sub-page).

- If the TS-12 is already in General MIDI mode, a Universal SysEx General MIDI Off message acts the same as pressing *EXIT* on the General MIDI mode screen. This exits General MIDI mode and returns the TS-12 to its previous state.

- When in General MIDI Mode, the Universal SysEx General MIDI Off message is the only SysEx message that will be received; all other SysEx messages are ignored.
Sound Canvas MT-32 Mode Program Change Map

The Roland® MT-32 was an early, pre-General MIDI multi-timbral sound module. It used a different MIDI Program Change Map than General MIDI. The Roland Sound Canvas™ provides an MT-32 Emulation mode, and some Standard MIDI Files are set up to use this. An MT-32 Program Change Map has been included in the TS-12 to provide Sound Canvas MT-32 emulation capability.

Roland products use the Bank Select MSB (MIDI Controller 0) to change sound banks; in the Sound Canvas, sound bank 127 is designated as the MT-32 Emulation mode bank. After the TS-12 has received a Bank Select value of MSB 127, subsequent MIDI Program Changes on that MIDI channel will select the GM Sounds remapped to the Roland MT-32 Program Change Map, as below:

<table>
<thead>
<tr>
<th>PROG #</th>
<th>INSTRUMENT</th>
<th>PROG #</th>
<th>INSTRUMENT</th>
<th>PROG #</th>
<th>INSTRUMENT</th>
<th>PROG #</th>
<th>INSTRUMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>GRAND-PIANO</td>
<td>33</td>
<td>NEW-AGE-PAD</td>
<td>65</td>
<td>ACOUSTIC-BS</td>
<td>97</td>
<td>BRASS-SECTN</td>
</tr>
<tr>
<td>2</td>
<td>BRITE-PIANO</td>
<td>34</td>
<td>SWEEP-PAD</td>
<td>66</td>
<td>ACOUSTIC-BS</td>
<td>98</td>
<td>VIBRAPHONE</td>
</tr>
<tr>
<td>3</td>
<td>ELEC-GRAND</td>
<td>35</td>
<td>CHOIR-AAHS</td>
<td>67</td>
<td>FINGERED-BS</td>
<td>99</td>
<td>VIBRAPHONE</td>
</tr>
<tr>
<td>4</td>
<td>ELEC-PIANO2</td>
<td>36</td>
<td>BOWED</td>
<td>68</td>
<td>SYNTH-BASS2</td>
<td>100</td>
<td>DULCIMER</td>
</tr>
<tr>
<td>5</td>
<td>ELEC-GRAND</td>
<td>37</td>
<td>GLASS</td>
<td>69</td>
<td>SLAP-BASS-2</td>
<td>101</td>
<td>TINKLE-BELL</td>
</tr>
<tr>
<td>6</td>
<td>ELEC-PIANO1</td>
<td>38</td>
<td>SOUNDTRACK</td>
<td>70</td>
<td>SLAP-BASS-1</td>
<td>102</td>
<td>GLOCKNSPIEL</td>
</tr>
<tr>
<td>7</td>
<td>ELEC-PIANO1</td>
<td>39</td>
<td>ATMOSPHERE</td>
<td>71</td>
<td>FRETLESS-BS</td>
<td>103</td>
<td>TUBULR</td>
</tr>
<tr>
<td>8</td>
<td>HONKY-TONK</td>
<td>40</td>
<td>MUSIC-BOX</td>
<td>72</td>
<td>FRETLESS-BS</td>
<td>104</td>
<td>BELLS</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>DRWBAR-ORGN</td>
<td>41</td>
<td>POLYSYNTH</td>
<td>73</td>
<td>FLUTE</td>
<td>105</td>
<td>MARIMBA</td>
</tr>
<tr>
<td>10</td>
<td>ROCK-ORGAN</td>
<td>42</td>
<td>ICE-RAIN</td>
<td>74</td>
<td>FLUTE</td>
<td>106</td>
<td>KOTO</td>
</tr>
<tr>
<td>11</td>
<td>PERC-ORGAN</td>
<td>43</td>
<td>POLYSYNTH</td>
<td>75</td>
<td>PICCOLO</td>
<td>107</td>
<td>BANDONEON</td>
</tr>
<tr>
<td>12</td>
<td>DRWBAR-ORGN</td>
<td>44</td>
<td>ECHO-DROPS</td>
<td>76</td>
<td>PICCOLO</td>
<td>108</td>
<td>SHAKUHACHI</td>
</tr>
<tr>
<td>13</td>
<td>CHRC-ORGAN</td>
<td>45</td>
<td>BASS+LEAD</td>
<td>77</td>
<td>RECORDER</td>
<td>109</td>
<td>WHISTLE</td>
</tr>
<tr>
<td>14</td>
<td>CHRC-ORGAN</td>
<td>46</td>
<td>REED-ORGAN</td>
<td>78</td>
<td>PANFLUTE</td>
<td>110</td>
<td>WHISTLE</td>
</tr>
<tr>
<td>15</td>
<td>CHRC-ORGAN</td>
<td>47</td>
<td>GLOCKNSPIEL</td>
<td>79</td>
<td>ALTO-SAX</td>
<td>111</td>
<td>BOTTLE-BLOW</td>
</tr>
<tr>
<td>16</td>
<td>ACCORDION</td>
<td>48</td>
<td>SQUARE-WAVE</td>
<td>80</td>
<td>SOPRANO-SAX</td>
<td>112</td>
<td>BOTTLE-BLOW</td>
</tr>
<tr>
<td>17</td>
<td>HARPSICHORD</td>
<td>49</td>
<td>STRG-ENSMBL</td>
<td>81</td>
<td>TENOR-SAX</td>
<td>113</td>
<td>TYMPANII</td>
</tr>
<tr>
<td>18</td>
<td>HARPSICHORD</td>
<td>50</td>
<td>STRG-ENSMBL</td>
<td>82</td>
<td>BAR-SAX</td>
<td>114</td>
<td>MELODIC-TOM</td>
</tr>
<tr>
<td>19</td>
<td>SQUARE-WAVE</td>
<td>51</td>
<td>SYNTH-STR-1</td>
<td>83</td>
<td>CLARINET</td>
<td>115</td>
<td>SYNTH-DRUM</td>
</tr>
<tr>
<td>20</td>
<td>CLAVINET</td>
<td>52</td>
<td>PIZZI-STRGS</td>
<td>84</td>
<td>CLARINET</td>
<td>116</td>
<td>SYNTH-DRUM</td>
</tr>
<tr>
<td>21</td>
<td>CLAVINET</td>
<td>53</td>
<td>VIOLIN</td>
<td>85</td>
<td>OBOE</td>
<td>117</td>
<td>SYNTH-DRUM</td>
</tr>
<tr>
<td>22</td>
<td>CLAVINET</td>
<td>54</td>
<td>VIOLIN</td>
<td>86</td>
<td>ENGLISH-HRN</td>
<td>118</td>
<td>TAIKO-DRUM</td>
</tr>
<tr>
<td>23</td>
<td>CELESTA</td>
<td>55</td>
<td>CELLO</td>
<td>87</td>
<td>BASSOON</td>
<td>119</td>
<td>WOODBLOCK</td>
</tr>
<tr>
<td>24</td>
<td>CELESTA</td>
<td>56</td>
<td>CELLO</td>
<td>88</td>
<td>HARMONICA</td>
<td>120</td>
<td>REVERSE-CYM</td>
</tr>
<tr>
<td>25</td>
<td>SYN-BRASS-1</td>
<td>57</td>
<td>CONTRABASS</td>
<td>89</td>
<td>TRUMPET</td>
<td>121</td>
<td>WOODBLOCK</td>
</tr>
<tr>
<td>26</td>
<td>SYN-BRASS-1</td>
<td>58</td>
<td>HARP</td>
<td>90</td>
<td>TRUMPET</td>
<td>122</td>
<td>TINKLE-BELL</td>
</tr>
<tr>
<td>27</td>
<td>SYN-BRASS-2</td>
<td>59</td>
<td>HARP</td>
<td>91</td>
<td>TROMBONE</td>
<td>123</td>
<td>ORCH-HIT</td>
</tr>
<tr>
<td>28</td>
<td>SYN-BRASS-2</td>
<td>60</td>
<td>NYL-STR-GTR</td>
<td>92</td>
<td>TROMBONE</td>
<td>124</td>
<td>TELEPHONE</td>
</tr>
<tr>
<td>29</td>
<td>SYNTH-BASS2</td>
<td>61</td>
<td>STL-STR-GTR</td>
<td>93</td>
<td>FRENCH-</td>
<td>125</td>
<td>BIRD-TWEET</td>
</tr>
<tr>
<td>30</td>
<td>HARPSSICHORD</td>
<td>62</td>
<td>CLEAN-GUITR</td>
<td>94</td>
<td>HORN</td>
<td>126</td>
<td>BREATHNOISE</td>
</tr>
<tr>
<td>31</td>
<td>SAW-WAVE</td>
<td>63</td>
<td>CLEAN-GUITR</td>
<td>95</td>
<td>FRENCH-</td>
<td>127</td>
<td>CRYSTAL</td>
</tr>
<tr>
<td>32</td>
<td>SYNTH-BASS2</td>
<td>64</td>
<td>SITAR</td>
<td>96</td>
<td>TUBA</td>
<td>128</td>
<td>BREATHNOISE</td>
</tr>
</tbody>
</table>

After receiving a Bank Select value of MSB 127 on MIDI Channel 10, _any_ subsequent MIDI program changes on MIDI channel 10 will _always_ select the MT-32 Drum Map.

Transmitting a Bank Select value of 0-126 MSB will return the MIDI channel to normal MIDI program change reception, selecting sounds from the General MIDI Sound Map as described on
the previous page.

**MIDI Controller Implementation in General MIDI Mode**

When in General MIDI mode, many of the TS-12 controllers function differently than noted in the MIDI Implementation chart, and are described in the chart on the following page.
## General MIDI Mode Controller Implementation Chart

<table>
<thead>
<tr>
<th>Function</th>
<th>Transmitted</th>
<th>Recognized</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Velocity</td>
<td>YES</td>
<td>YES</td>
<td>1 In the TS-12, a Note Off velocity of 64 is always sent for all keys.</td>
</tr>
<tr>
<td></td>
<td>YES¹</td>
<td>NO²</td>
<td>2 The TS-12 voice architecture does not support Release Velocity.</td>
</tr>
<tr>
<td>Aftertouch</td>
<td>NO</td>
<td>NO</td>
<td></td>
</tr>
<tr>
<td>Pitch Bender</td>
<td>YES</td>
<td>YES</td>
<td>Defaults to a value of 64 (center).</td>
</tr>
<tr>
<td>Controller 0</td>
<td>YES</td>
<td>YES</td>
<td>Always transmitted as 0. An MSB value of 127 received will select the MT-32 Program Change Sound Map.</td>
</tr>
<tr>
<td>Controller 1</td>
<td>NO</td>
<td>NO</td>
<td>Defaults to a value of 0.</td>
</tr>
<tr>
<td>Controller 4</td>
<td>NO</td>
<td>NO</td>
<td></td>
</tr>
<tr>
<td>Controller 6</td>
<td>NO</td>
<td>YES</td>
<td>For recognized Registered Parameters only after controllers 100 &amp; 101 are received.</td>
</tr>
<tr>
<td>Controller 7</td>
<td>YES</td>
<td>YES</td>
<td>Defaults to a value of 100. Setting RECV=OFF will default the Track/Channel volume to 127. Devices connected to the Pedal•CV jack will control volume.</td>
</tr>
<tr>
<td>Controller 10</td>
<td>NO</td>
<td>YES</td>
<td>Defaults to a value of 64 (center).</td>
</tr>
<tr>
<td>Controller 11</td>
<td>NO</td>
<td>YES</td>
<td>Defaults to a value of 127. Expression messages received will be responded to as Mix.</td>
</tr>
<tr>
<td>Controller 12</td>
<td>NO</td>
<td>NO</td>
<td></td>
</tr>
<tr>
<td>Controller 32</td>
<td>YES</td>
<td>NO</td>
<td>Always transmitted as 0.</td>
</tr>
<tr>
<td>Controller 38</td>
<td>NO</td>
<td>YES</td>
<td>For recognized Registered Parameters only after controllers 100 &amp; 101 are received.</td>
</tr>
<tr>
<td>Controller 64</td>
<td>YES</td>
<td>YES</td>
<td>This defaults to a value of 0. The right foot switch will always function as Sustain.</td>
</tr>
<tr>
<td>Controller 66</td>
<td>YES</td>
<td>YES</td>
<td>This defaults to a value of 0. The left foot switch can function as Sostenuto, if a stereo foot switch is connected.</td>
</tr>
<tr>
<td>Controller 70</td>
<td>YES</td>
<td>NO</td>
<td>ENSONIQ Patch Selects; values of 0, 32, 64, 127</td>
</tr>
<tr>
<td>Controller 71</td>
<td>NO</td>
<td>NO</td>
<td>ENSONIQ Timbre.</td>
</tr>
<tr>
<td>Controller 72</td>
<td>NO</td>
<td>YES</td>
<td>Defaults to a value of 64 (center).</td>
</tr>
<tr>
<td>Controller 73</td>
<td>NO</td>
<td>YES</td>
<td>Defaults to a value of 64 (center).</td>
</tr>
<tr>
<td>Controller 74</td>
<td>NO</td>
<td>YES</td>
<td>Defaults to a value of 64 (center).</td>
</tr>
<tr>
<td>Controller 75</td>
<td>NO</td>
<td>YES</td>
<td>Defaults to a value of 64 (center).</td>
</tr>
<tr>
<td>Controller 91</td>
<td>NO</td>
<td>YES</td>
<td>Controls effect bus switching and the FX2 wet/dry mix in the General MIDI effect.</td>
</tr>
<tr>
<td>Controller 93</td>
<td>NO</td>
<td>YES</td>
<td>Controls effect bus switching and the FX1 wet/dry mix in the General MIDI effect.</td>
</tr>
<tr>
<td>Controller 100</td>
<td>NO</td>
<td>YES</td>
<td>Values of 0, 1, and 2.</td>
</tr>
<tr>
<td>Controller 101</td>
<td>NO</td>
<td>NO</td>
<td></td>
</tr>
<tr>
<td>Controller 120</td>
<td>NO</td>
<td>YES</td>
<td>Responded to as All Notes Off.</td>
</tr>
<tr>
<td>Controller 121</td>
<td>YES</td>
<td>YES</td>
<td>Reset Controller messages received will normalize only the controllers supported in General MIDI Mode. It is received independently on each of the 16 General MIDI Track/Channels.</td>
</tr>
<tr>
<td>Controller 123</td>
<td>YES</td>
<td>YES</td>
<td>All Notes Off messages received will be responded to regardless of the setting of the ALL-OFF parameter on the MIDI Control page. It is received independently on each of the 16 General MIDI Track/Channels.</td>
</tr>
<tr>
<td>Registered Parameters:</td>
<td></td>
<td></td>
<td>These Registered Parameters are received independently on each of the 16 General MIDI Track/Channels.</td>
</tr>
<tr>
<td>0 Pitch Bend Range</td>
<td>NO</td>
<td>YES</td>
<td></td>
</tr>
<tr>
<td>1 Fine Tuning</td>
<td>NO</td>
<td>YES</td>
<td></td>
</tr>
<tr>
<td>2 Coarse Tuning</td>
<td>NO</td>
<td>YES</td>
<td></td>
</tr>
<tr>
<td>Program Change</td>
<td>YES</td>
<td>YES</td>
<td>0-127.</td>
</tr>
</tbody>
</table>
The Storage page provides data storage functions that enable you to:
• save and load Program, Preset, Sequencer and System data to disk,
• save and load Sampled Sounds and their associated parameters, and
• transmit dumps containing Programs, Presets, and Sequencer data via MIDI system exclusive messages.

The Storage page presents a series of menus containing command options which are selected by using the soft buttons.

- Pressing **Storage** will always display the Storage page:

```
SELECT STORAGE OPTION
DISK *LOAD*

SYS-EX
```

From the Storage page you can select which kind of data storage you want to use — Disk or MIDI SYS-EX storage. A SCSI option is available for loading Sampled Sounds from EPS/EPS-16 PLUS/ASR-10 format SCSI Storage Devices when the optional SP-4 interface is installed. The TS-12 SCSI port will only **read** from SCSI; it will not write to SCSI Storage Devices. When the SP-4 is installed, the STORAGE page will display a new active field (explained later), as below:

```
SELECT STORAGE OPTION
SCSI DISK *LOAD*

SYS-EX
```

Pressing *LOAD* is the equivalent of pressing DISK followed by *LOAD* on the Disk page. Pressing the Storage button twice in a row performs the same function. Since Disk storage is the most convenient and commonly used form of storage, we’ll cover that first.

**Disk Storage — Using the Disk Drive to Save and Load Data**

The TS-12’s built-in disk drive is used to store all your program, preset and sequencer data, as well as System Exclusive messages from other MIDI devices. The TS-12 uses a Quad-density disk drive that can store 1600 Kilobytes of data on a Double-Sided High-Density (DSHD) 3.5” microfloppy disk and 800 Kilobytes of data on a Double-Sided Double-Density (DSDD) 3.5” microfloppy disk. The disks are enclosed in a protective plastic carrier with an automatic shutter to protect the diskette from physical damage. It is important not to alter this carrier in any way.
The 3.5” disks have a sliding write-protection tab so that you can protect your sounds and sequences against accidental erasure. Sliding the write-protection tab in the lower left corner of the disk so that the window is closed will allow you to store information on the disk. Sliding the tab so that the window is open will protect the disk against being accidentally reformatted or having files deleted. Double-Sided High Density disks can be easily identified because they have an additional window (with no write-protection tab) located on the lower right corner of the disk.

Floppy disks are a magnetic storage medium and should be treated with the same care you’d give important audio tapes. Just as you would use high quality audio tapes for your important recording needs, we recommend using high-quality floppy disks for your TS-12. On the following page are a few Do’s and Don’t’s concerning disks and the disk drive.

**Do’s:**
- Use either Double-Sided High-Density (DSHD) or Double-Sided Double-Density (DSDD) 3.5 inch Micro-floppy disks. Both types are available from almost any computer store and many music stores carry them as well.
- Keep your disks and the disk drive clean and free of dust, dirt, liquids, etc.
- Only transport your unit with nothing in the drive.

**Don’t’s:**
- Don’t use Single-Sided (SSDD or SSSD) disks. These disks have not passed testing on both sides. While a single-sided disk might work successfully with the TS-12, it is possible that you will eventually lose important data to a disk error if you try using Single-Sided disks.
- Don’t put anything other than a disk or the plastic sheet in the disk drive.
- Don’t transport the unit with a disk in the drive.
- Don’t expose disks to extremes of temperature. Temperatures below 50˚ F and above 140˚ F can damage the plastic outer shell.
- Don’t expose your disks to moisture.
- Don’t dry your disks in a microwave oven.
- Don’t subject disks to strong magnetic fields. Exposure to magnetic energy can permanently damage the information on the disk. Keep disks away from speaker cabinets, tape decks, power cables, airline x-ray equipment, power amplifiers, TV sets, and any other sources of magnetic energy.
- Don’t eject the disk while the drive is operating (i.e. when the disk drive light is on).
**TS-12 Disk File Types**

The TS-12 disk storage system has been designed to allow maximum flexibility in saving, loading and organizing your sound and sequence data. Consequently, for each type of data there are several different types of files that can be saved:

**Programs:**
- 1-PROGRAM — contains a single TS-12 Program.
- 6-PROGRAMS — contains a bank of 6 TS-12 programs, as displayed on the Program Bank pages 0-9. This file type lets you organize programs into groups of six that can be saved and loaded back into any RAM bank you choose.
- 60-PROGRAMS — contains one BankSet of 60 User RAM Programs.
- 120-PROGRAMS — contains all of the User RAM Program memory (both BankSets).

**Presets:**
- 1-PRESET — contains a single TS-12 Preset.
- 60-PRESETS — contains one BankSet of 60 TS-12 User RAM Presets.
- 120-PRESETS — contains all of the User RAM Preset memory (both BankSets).

**Sequence/Song:**
- 1-SEQ/SONG — contains a single TS-12 sequence or song.
- 30-SEQ/SONGS — contains 30 TS-12 sequencer locations, saved from either the lower half of the sequencer memory (Banks 0-4) or the upper half (Banks 5-9). A 30-SEQ/SONGS file can be loaded into either the upper or lower half.
- 60-SEQ/SONGS — contains the entire sequencer memory (Banks 0-9) and the global Click and Sequencer Control page settings.

Whenever you save a 30 or 60 Seq/Song file to disk, you will be asked whether you want to also save internal programs (either 60 or the entire 120) in the same file along with the sequencer data. Saving 60 Programs with a 30-SEQ/SONGS file containing Seq/Song Banks 0-4 will save the contents of Program BankSet U0. Saving 60 Programs with a 30-SEQ/SONGS file containing Seq/Song Banks 5-9 will save the contents of Program BankSet U1. Saving 60 Programs with a 60-SEQ/SONGS file will save the contents of Program BankSet U0. A 60 SEQ/SONGS file will also allow you to save the currently loaded contents of the Sample Banks with it. This lets you keep the sequences and their appropriate programs and Sample Banks information together when reloading the data.

**MIDI System Exclusive data:**
- SYS-EX-DATA — In addition to the above types of TS-12 data, you can use the disk drive to save system exclusive data from other MIDI devices. The TS-12 can thus serve as the “librarian” for your other MIDI gear. This function is covered at the end of this section.

**System File:**
- SYSTEM-SET-UP — System set-up files let you save the system, or “global” parameters, those contained on the System and MIDI Control pages, so that you can save and re-load a new system configuration in seconds. This is handy if you use the TS-12 in a number of different applications that require different settings for MIDI mode, MIDI base channel, master tuning, etc.

**Sampled Sounds:**
- SAMPLE-BANKS — remembers up to 20 Sampled Sound names (ten in BankSet 8 and ten in BankSet 9, if applicable) as well as their source disk(s), file paths, and bank locations. Loading a Sample-Banks file will allow you to Auto-Load the Sampled Sound files back into the same location(s) that they were in at the time the Sample-Banks file was saved.
- SAMPLE-EDITS — contains parameter edits of Sampled Sounds.
Disk Capacity — Bytes, Blocks, and Files
The TS-12 has a high-density (HD) drive, allowing you to use both Double-Sided High-Density and Double-Sided Double-Density disks:

- **Double-Density disks** — can store 800 kilobytes of TS-12 data, which translates into about 1600 Blocks.
- **High-Density disks** — can store 1600 kilobytes of data, which translates into about 3200 Blocks.

A Block is a handy unit that the TS-12 uses to measure internal and disk memory — 1 Block=512 bytes=256 sample words; 2 Blocks=1k bytes; 4 Blocks=1k sample words.

TS-12 disk files vary in size — how many will fit on a disk depends on the number and size of the files. Whenever you are on the DISK LOAD page the display shows the size in blocks of each file on the disk. When you are on the DISK SAVE page the display shows the number of free blocks available on the disk in the drive.

<table>
<thead>
<tr>
<th>Disk Type</th>
<th>High-Density</th>
<th>Double-Density</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kilobytes</td>
<td>1600</td>
<td>800</td>
</tr>
<tr>
<td>Sample Words</td>
<td>800k</td>
<td>400k</td>
</tr>
<tr>
<td>Blocks</td>
<td>3176</td>
<td>1585</td>
</tr>
</tbody>
</table>

There are limits to the number of files on a TS-12 disk:
- Each disk can hold a maximum of 78 files.
- A disk can hold up to 60 files of any one file type, but not more than the total of 78 files of all types for a single disk.

File Banks
A unique feature of the TS-12 called File Banks, allows you to quickly and easily locate the disk file you want to load or delete. File Banks provide a graphic way for you to organize and view disk files, and eliminate the need to scroll through long lists of files.

Whenever loading or deleting a file, after you have selected the file type you want, pressing the 10 Bank buttons beneath the display will cause all the disk files of that type to be shown in groups of six, just like sound or sequence banks. Pressing the soft button next to a file installs that file as the one to be loaded, deleted etc.

When saving data to disk you can, if you wish, specify a particular file bank location for that file to be displayed in. This gives you a high degree of control over how your disk files are organized and displayed.

TS-12 Disk Functions
The TS-12’s disk functions are all handled from the Storage page. Press the Storage button to get to this page, then press the soft button beneath DISK. When you select DISK from the Storage page, the display shows the disk storage menu:
From here you select which of the 6 disk functions you want:

- **FORMAT** — This formats a blank disk for use with the TS-12.
- **COPY** — This allows you to make a backup copy of an entire TS-12 disk.
- **RENAME** — allows you to change the disk name of a TS-12 disk.
- **SAVE** — save to disk Program, Preset, Sequencer, Sys-Ex Data, System Set-up, or Sampled Sound files.
- **LOAD** — load from disk Program, Preset, Sequencer, System Set-up, or Sampled Sound files; also load System Exclusive data for transmission to a remote MIDI device.
- **DELETE** — allows you to delete (or remove) any file from the disk.

**FORMAT — Formatting a Blank Disk**

Before a disk can be used by the TS-12 to store data, it must be formatted. Formatting puts information on the disk that the TS-12 needs to read and write files. In addition to formatting a blank disk, the Format procedure can be used to reformat a disk that has been used with some other device, such as a personal computer or another musical instrument. Note that any data (of whatever type) on a disk will be lost when the disk is formatted by the TS-12.

To Format a blank disk:

- Insert a blank, Double-Sided Double-Density or High Density 3.5” micro-floppy disk into the disk drive, with the label-side facing up, and the metal shutter facing away from you. Make sure the plastic write-protect tab is in the closed position (no light showing through the window).
- Press **Storage**.
- Press **DISK**. The Disk Storage menu appears (as shown earlier).
- Press **FORMAT**.
- The display shows:

  ![Disk Storage Menu](image)

- Use the **Up/Down Arrow** buttons or the **Data Entry Slider** (or Keyboard Naming if enabled) to change the first character of the name and the left and right soft buttons on the screen to move the cursor to the next character. The last three alpha-numeric characters can only be numbers. Once you have the name that you want:
  - SAVE saves the name shown into memory (battery backed up RAM). This name is also saved with global parameters when you SAVE SYSTEM SET-UP (on the Disk Save page). This is useful for changing the default disk name used for formatting.
  - Pressing **EXIT** will return you to the Disk Storage page with no harm done.
  - Press **FORMAT** to proceed. The display shows **FORMAT DISK ALL DISK FILES WILL BE ERASED**. Press **YES** to proceed, or **NO** to abort the command.
  - While the TS-12 is formatting the disk, the display reads **FORMATTING DISK PLEASE WAIT...** The formatting process takes about 80 seconds.
  - When the formatting is done, the display reads **DISK COMMAND COMPLETED**, and then you are returned to the Storage page. The disk is ready to accept program, preset, sequencer, system, Sys-Ex, or Sampled Sound data.
FORMAT DISK Error Messages:
There are a number of messages you might encounter while formatting a disk:
• DISK DRIVE NOT READY — No disk in the drive.
• DISK FORMAT FAILURE -- DISK IS UNSUSABLE. This indicates a defective disk. If you get
  this message we advise that you throw out the disk in question. Try again with another disk.
• DISK WRITE-PROTECTED — The plastic write-protect tab in the lower-left corner of the disk
  must be closed (so you can’t see through the hole) before anything can be written to the disk.
  Close the write-protect tab and try again.

COPY — Making a Backup Copy of a Disk
The COPY function lets you duplicate the contents of one entire disk (the source disk) on another
  disk (the destination disk). It is a good practice to regularly back up your valuable data in this
way.

Be Careful!
This procedure uses the sequencer memory to temporarily hold the information while copying it
between disks. Anything in the sequencer memory before you start will be erased. Save any
  important sequencer data before copying a disk.

To Make a Backup Copy of a Disk:
• Slide the plastic write-protect tab on the source disk — the original — so that the disk is write
  protected (you can see through the hole). This is an extra precaution to safeguard the data.
• Press Storage and then select DISK.
• Press COPY. The display shows SEQUENCER DATA WILL BE ERASED.
• Press *YES* (or press *NO* to cancel and save the data before proceeding). The display shows:

  INSERT DESTINATION DISK
  ALL DISK FILES WILL BE ERASED

• Insert the destination disk (the copy) and press *OK*. If the destination disk is not formatted,
  the TS-12 will format it before proceeding.
• After a moment, the TS-12 will ask INSERT SOURCE DISK. Insert the write-protected source
disk (the original) and press *OK*.
• The TS-12 will load the data from the source disk into the sequencer memory, and then save it
to the destination disk, asking you to insert the appropriate disks as it needs them. Each time,
insert the proper disk and press *OK*. (Note that you can press *QUIT* at any time to abort
the procedure.)
• The Copy disk procedure requires about three disk swaps with the standard TS-12 memory
configuration.
• Once the Copy procedure is successfully done, the display will read DISK COMMAND
COMPLETED, and then return to the Storage page.

DISK COPY Error messages:
• DISK WRITE-PROTECTED — A write-protected disk (window open) was inserted when
  INSERT DESTINATION DISK was displayed. The Destination Disk must have the Write-
  protect window closed.
• DISK IS NOT SOURCE DISK or DISK IS NOT DESTINATION DISK — You put the wrong
disk in the drive when prompted for a certain disk. This is not fatal; it doesn’t abort the Copy
procedure. Just insert the proper disk and proceed.
RENAME — Changing a Disk’s Name

The RENAME function lets you change the seven character Disk I.D. to a new name. The disk name is used to give each of your TS-12 disks a unique identity. The name of a newly formatted TS-12 disk defaults to TSD-000. Note that you cannot rename a Sampled Sound disk.

- Press Storage and then select DISK.
- Press RENAME. The display shows:

```
USE CURRENT DISK NAME ? *YES*
*NO *
```

- Select YES to start renaming using the name from the disk in drive as a starting point.
- Select NO to start renaming with your own custom disk name that is currently stored in memory as a starting point.

- After selecting either YES or NO, the display shows the following:

```
DISK NAME=TSD-000 *SAVE* *RENAME*
LEFT -CURSOR- RIGHT *EXIT*
```

- Use the Up/Down Arrow buttons to change the first character of the name and the left and right buttons on the screen to move the cursor to the next character. The last three alphanumeric characters can only be numbers. Once you have the name that you want:
- SAVE saves the name shown into memory (battery backed up RAM) as your custom disk name. This custom disk name is also saved with global parameters when you SAVE SYSTEM SET-UP (on the Disk Save page). Saving a custom disk name allows you to easily rename and format a series of disks by simply updating the number portion of the name.
- RENAME will write the name shown above onto the disk in the drive.
- EXIT will abort this process, without changing the disk name.
SAVE — Saving Data to Disk

When you press SAVE from the Disk Storage menu, you will see the following display:

![Display of SAVE function](image)

The display shows the **File Type**, the number of free blocks on the disk, and (for some file types) the **Source Bank** or **BankSet**, i.e. which BankSet or bank(s) you want to save. Note that you cannot save information to a Sampled Sound disk.

**To Save data to disk:**

- Insert a formatted TS-12 disk into the disk drive.
- When saving 1-PROGRAM, 1-PRESET or 1-SEQ/SONG, first make sure the program, preset or sequencer location you want to save is selected.
- Press **Storage** to go to the Storage Page.
- Press **DISK**. The Disk Storage menu appears.
- Press **SAVE**. The Save File display appears as shown above. The file type is underlined.
- Select the file type you want to save from among the available types:
  - 1-PROGRAM
  - 1-PRESET
  - 1-SEQ/SONG
  - SYS-EX-DATA
  - 6-PROGRAMS
  - 60-PRESETS
  - 30-SEQ/SONGS
  - SYSTEM-SETUP
  - 60-PROGRAMS
  - 120-PRESETS
  - 60-SEQ/SONGS
  - SAMPLE-BANKS
  - 120-PROGRAMS
  - SAMPLE-EDITS

- Select a source bank (if applicable). For the file types 6–PROGRAMS and 30–SEQ/SONGS, you will see a SELECT=BANK(s) location beneath the file type, and for the file types 60–PROGRAMS and 60–PRESETS you will see a SELECT=BANKSET location beneath the file type, as shown above. This defaults to the current BankSet (or bank). If you want to save a different BankSet (or bank) than what is showing, select this field and change it using the data entry controls.

- Press **YES**. The display shows the Name File page.

  - Name the file with a name of your choice using the data entry controls and the two cursor soft buttons, labeled LEFT and RIGHT, or you can use the keyboard to select characters and move the cursor (see below).

- Press **YES**. The display reads SAVING <FILENAME> while the data is being saved to disk. Or Press **NO** to cancel the procedure for any reason. If you are saving a 30-SEQ/SONGS or 60-SEQ/SONGS file there are additional steps (see below).

- If there is a file of that type with the same name already on the disk, the TS-12 will ask
DELETE OLD VERSION? Press *YES* to save the file, replacing the one on the disk. This is for updating files to which you have made changes. Or press *NO* to abort the procedure.

- After the file is saved, the TS-12 returns to the Save File page so that you can save any other files you may want to save at that time.

**Naming with the Keyboard**

When the KBD-NAMING parameter on the System page is ON, the keyboard can be used for name data entry. Whenever a name field is active, pressing a key on the keyboard will enter the character assigned to that key or move the cursor. The 36 white keys are the digits 0..9 and letters A..Z, while the black keys provide a repeating set consisting of cursor left, cursor right, and 3 punctuation marks (space, dash, and plus). Period, slash, and star are only available using the Data Entry Slider or the Up/Down Arrows.

Each octave of black keys repeats the same 5 characters found on the bottom octave.

**Saving Programs along with a 30-SEQ/SONGS File**

When you save a 30-SEQ/SONGS file, the TS-12 gives you the option of saving Programs in the same file, so that you can keep the sequences and the Programs that go with them together.

After you have selected the 30-SEQ/SONGS file type, chosen either SELECT=BANKS 0-4 or 5-9, and pressed *YES*, the TS-12 offers you an option. The display shows:

- NO — Only the specified sequencer data will be saved, no Programs.
- 60 — When a 30-SEQ/SONGS file to be saved is from SELECT=BANKS 0-4, the BankSet U0 programs will be saved into the file along with the sequence data. When a 30-SEQ/SONGS file to be saved is from SELECT=BANKS 5-9, the BankSet U1 programs will be saved into the file along with the sequence data. The Programs will automatically be reloaded into the same User RAM location when the 30-SEQ/SONGS file is loaded, replacing the Programs that are there.
- 120 — All User RAM Programs will be saved into the file along with the sequence data (BankSet U0 and U1). The Programs will be reloaded into the internal memory when the 30-SEQ/SONGS file is loaded, replacing the programs that are there.
- After choosing the number of Programs to be saved, press *YES* to proceed.

**Note:** If Programs have been saved in a Sequencer file along with the sequencer data, when you later go to load the file, a P will flash on the display next to the file name when the file is displayed on the DISK LOAD page. When you answer *YES* to load the data, the TS-12 will load the Programs automatically with the sequencer data. This will over-write the Programs that are in the internal memory. You should always be sure that any Programs you value are saved before loading sequencer files which contain Programs.
**Saving Sample-Banks along with a 60 SEQ/SONGS File**

When you save a 60-SEQ/SONGS file, the TS-12 also gives you the option of saving the currently loaded contents of the Sample Banks, as well as the internal User RAM Programs, in the same file, so that you can store the Programs, and Sampled Sound data that the sequences and songs use all together in a single file.

After you have selected 60-SEQ/SONGS file type and pressed *YES*, the TS-12 offers you the first option. The display shows:

```
SAVE NO PROGRAMS IN SEQ FILE  *YES*
```

Use the data entry controls to select whether or not Programs will be saved in the same file with the sequence data:

- **NO** — Only the specified sequencer data will be saved, without Programs.
- **120** — All User RAM Programs will be saved into the file along with the sequence data (BankSet U0 and U1). The Programs will be reloaded into the internal memory when the 60-SEQ/SONGS file is loaded, replacing the Programs that are there.

After choosing whether or not Programs will be saved, press *YES* to proceed. If any Sampled Sounds are currently loaded, the TS-12 offers you the second option. The display shows:

```
SAVE SAMPLE BANKS IN SEQ FILE  *YES*
```

**Note:** The SAVE SAMPLE BANKS prompt will only appear if there are Sampled Sounds currently loaded into the TS-12.

- Answering *YES* will save all of the Sampled Sound names (ten in BankSet 8 and ten in BankSet 9, if applicable) as well as their source disk(s), file paths, and bank locations with the 60-SEQ/SONGS file.
- Answering *NO* will not save the Sample-Banks file with the sequence file.

**Specifying a File Bank Location when Saving a File**

If you follow the save procedure exactly as described earlier (pressing *YES* after naming the file) the data will automatically be placed in the first empty file bank location for that file type, starting from the first location in Bank 0 and going up from there.

However, you can specify a particular file bank for the file to be placed in:

- Press **Storage**, and select DISK, then SAVE. The Save File display appears.
- Select the desired file type and then press *YES*.
- Name the file with the name of your choice.
- Now you can press the **Bank** buttons (0-9) to see the file banks, which show all the files of that type on the disk, six at a time. For example:
File Bank Locations containing Files

Empty File Bank Locations

- File bank locations containing a file show the file name. Locations that show ***** are empty and are available for saving files to.
- Press the soft button next to any empty file bank location, and the TS-12 will immediately save the file in that location. This lets you organize your files into banks of your choosing for easy access when loading them later.
- If there is a file with the same name already on the disk in a different file bank location, the TS-12 will ask DELETE OLD VERSION? If you press *YES* the TS-12, will delete the original file and save the new one in the new location. Use this to change the bank in which a file is saved.
- Note that when you simply want to update an existing file, but not change its file bank location, it is not necessary to specify the location. Just press *YES* after naming the file and answer *YES* to DELETE OLD VERSION?

LOAD — Loading Data from Disk

When you press LOAD from the Disk Storage menu, you will see the following display:

The display shows the File Name which identifies the file that will be loaded if you press *YES*; the Size of the file in Blocks; the File Type and (for some file types) the Destination Bank, i.e. which bank(s) to load the data into. Only files of the type selected will be shown in the File Name field, or in file banks.

To Load a file from disk:
- Insert the disk containing the file data into the disk drive.
- Press Storage to go to the Storage Page.
- Press DISK. The Disk Storage menu appears.
- Press LOAD. The Load File display appears as shown above. The file type is underlined.
- Select the file type you want from among the available types:

| 1-PROGRAM | 1-PRESET | 1-SEQ/SONG | SYS-EX-DATA |
| 6-PROGRAMS | 60-PRESETS | 30-SEQ/SONGS | SYSTEM-SETUP |
| 60-PROGRAMS | 120-PRESETS | 60-SEQ/SONGS | SAMPLE-BANKS |
| 120-PROGRAMS | | | SAMPLE-EDITS |
Tip:  Press the **Storage** button twice to get to the Load File display quickly.

- Press the soft button above the file name and use the data entry controls to find the file you want, or you can use the File Banks to quickly locate the file without scrolling (see below).
- Select a destination bank (if applicable). For the file types 6–PROGRAMS and 30–SEQ/SONGS, you will see a Bank destination, as shown above. For the file types 60–PROGRAMS and 60–PRESETS, you will see a BankSet destination. This defaults to the same BankSet (or bank) the file was originally saved from. If you want a different destination bank, select this field and change it using the data entry controls.
- Press *YES*. The display reads LOADING FILE... while the data is being loaded. Or Press *NO* to cancel the procedure for any reason.
- After the file is loaded, the TS-12 returns to the Load File page so that you can load any other files you may want.

Where the data ends up depends on the file type and (where applicable) the destination bank selected:

- 1-PROGRAM file — once loaded, the program is placed on the Write page, where you can save it to any internal User RAM location as detailed in Section 8 — Understanding Programs.
- 6-PROGRAMS file — the bank of 6 programs is loaded into the destination Bank (U0-0 to U1-9) specified before pressing *YES*.
- 60-PROGRAMS file — the 60 programs will be loaded into either BankSet U0 or U1 as specified before pressing *YES*.
- 120-PROGRAM file — replaces all User RAM program memory locations (both BankSets).
- 1-PRESET file — the preset is loaded as the Edit Preset, and can be saved to memory as detailed in Saving a Preset in Section 4 — Understanding Presets.
- 60-PRESETS file — will be loaded into either BankSet of preset memory as specified before pressing *YES*.
- 120-PRESET file — replaces the internal preset memory (both BankSet locations).
- 1-SEQ/SONG file — After selecting the single sequence/song file to be loaded and selecting *YES* on the Load File page, you are shown a prompt page which allows you to select the bank location into which the sequence/song file will be loaded. The default value is the first available location, and you may accept this choice, or you may select a different location by using one of two methods. Pressing a Bank button will temporarily show the corresponding sequence bank page, and while the bank button is held, you may select the destination Location using the soft buttons. If your selection is a -BLANK- location, the display will revert to the prompt page with the new location selected. You may also directly select the location number using the data entry controls.
- 30-SEQ/SONGS file — the 30 sequence/songs will be loaded into either the lower half of the sequencer memory (Banks 0-4) or the upper half (Banks 5-9), specified before pressing *YES*.

If 60 or 120 programs were saved in a 30-SEQ/SONGS file along with the sequencer data, a P will flash on the upper line of the display when the file is displayed on the DISK LOAD page. When you answer *YES* to load the data, the TS-12 will load the programs automatically with the sequencer data, replacing the programs currently in memory.

- 60-SEQ/SONGS file — replaces the entire sequencer memory (Banks 0-9), and installs global Sequencer Control page settings.

### Loading 60 SEQ/SONGS Files that Contain Programs and/or Sample Banks

- If only Programs have been saved in a 60-SEQ/SONGS file along with the sequencer data, when you go to load the file, a P will flash on the display next to the file name when the file name is displayed on the LOAD FILE page.
- If only Sample Banks have been saved in a 60-SEQ/SONGS file along with the sequencer data, when you later go to load the file, an S will flash on the display next to the file name when the file name is displayed on the LOAD FILE page.
- If both Programs and Sample Banks have been saved in a 60-SEQ/SONGS file along with the
sequencer data, when you later go to load the file, a PS will flash on the display next to the file
name when the file name is displayed on the LOAD FILE page.

To load a 60 SEQ/SONGS file:
• Press Storage.
• Press the soft button beneath DISK.
• Press the soft button beneath *LOAD*.
• Use the Data Entry Controls to locate TYPE=60-SEQ/SONGS.
• Press the upper left soft button to select the file to load.
• Press the upper right soft button above *YES*.

If the 60-SEQ/SONGS file had Sample Banks saved with it, after answering *YES* to load the 60-
SEQ/SONGS file, the Auto-Load prompt will be displayed. If you answer *YES* to Auto-Load
the Sampled Sound data, the TS-12 will ask for the disk(s) to automatically load the Sampled
Sound data. If you answer *NO*, the Sampled Sound bank information is loaded and all
currently loaded Sampled Sounds are deleted, but the Sampled Sound files are not loaded.

Note: Do not load any 60-SEQ/SONGS files that have been saved with Sample-Banks into a TS-12 that
is running software earlier than version 2.0. The new feature is incompatible with older software.
To check which software version of the TS-12 you are running, while holding down the Presets
button, press the System button.

Using File Banks to Locate Files for Loading
As we mentioned earlier, File Banks provide a quick way to locate and select a file for loading.
After you have selected LOAD from the DISK Storage menu, the ten Bank buttons will select file
banks. From the file banks you can directly select a file to be loaded instead of scrolling through
the entire list of files.

Here’s how file banks work:
• Press Storage and select DISK, then LOAD to get to the Load File display.
• Select the file type you want to load.
• Press Bank button 0 and hold it down. The display shows the first File Bank for that file type:

![File Bank Locations diagram]

• File bank locations containing a file show the file name. Locations that show ***** are empty
and cannot be selected. If you release the Bank button, the display remains on the file bank
for about 1 second and then returns to the Load File page. This lets you “shop” among the
different banks until you find the file you want.
• While the file bank is displayed, press the soft button next to the name of the file you want load.
This selects that file as the one to be loaded and instantly returns you to the Load File page.
• Press *YES* to load the selected file.

Note: On the Load File page, you may notice another type called DIAGNOSTICS. This is for use by
ENSONIQ manufacturing for quality testing/troubleshooting, and is not for use by the end-user.
DELETE — Deleting (Erasing) Files from Disk
When you press DELETE from the Disk Storage menu, you will see the following display:

The display shows the File Name which identifies the file that will be deleted if you press *YES*; the Size of the file in Blocks; and the File Type. Only files of the type selected will be shown in the Name field, or in the file banks. Note that you cannot delete any data from a Sampled Sound disk.

To Delete a file from disk:
- Insert the disk containing the file to be deleted into the disk drive.
- Press Storage to go to the Storage page.
- Press DISK. The Disk Storage menu appears.
- Press DELETE. The Delete File page appears as shown above. The file type is underlined.
- Select the file type you want from among the available types.
- Press the soft button above the file name and use the data entry controls to find the file you want to delete. (Or you can press the Bank buttons (0-9) and use the File Banks to select the file without scrolling, just as when loading.)
- Press *YES*. The display asks DELETE <FILE NAME>, and warns <FILE TYPE> FILE WILL BE ERASED.
- Press *YES*. The display reads DELETING <FILE NAME>… while the file is being removed.
- After the file is deleted, the TS-12 returns to the Delete File page so that you may delete any other files you may want. If you have no more files to delete, press *NO* to exit.

SCSI Option (read-only)
A SCSI option is available for loading Sampled Sounds from EPS/EPS-16 PLUS/ASR-10 format SCSI Storage Devices when the optional SP-4 interface is installed. The TS-12 SCSI port will only read from SCSI; it will not write to SCSI Storage Devices. When the SP-4 is installed, the STORAGE page will display a new active field, as below:

Pressing the lower left soft button beneath SCSI will reveal the following sub-page:
This is the SCSI STATUS page, where you select the SCSI DEVICE ID from which you want to load Sampled Sounds. It is important that each SCSI Storage Device in a SCSI network be assigned a unique SCSI Device ID number — this will ensure predictable communication between devices. Since the range of valid SCSI IDs is 0 to 7, it is possible to connect up to eight distinct devices on a single network. The TS-12 is permanently assigned to Device ID #3, so no other devices in the SCSI network can be assigned to Device ID #3.

The STATUS field will show one of five different values:
- INVALID - there is no device mounted on the current SCSI Device ID number
- FOREIGN - the volume on the current SCSI Device ID number is not an ENSONIQ format
- AUDIOCD - an Audio CD volume is on the current SCSI Device ID number.
- STANDBY - a removable media device is mounted on the current SCSI Device ID number, but it contains no volume
- UNNAMED - an unnamed ENSONIQ format volume is on the current SCSI Device ID number
- xxxx### - 7 character ENSONIQ volume name

Pressing *LOAD* will display the lowest numbered Sample Sound file or Directory name in the Root directory of the selected SCSI Storage Device. If no Sampled Sound files exist in the current directory, the file TYPE parameter will be automatically set to TYPE=DIRECTORY, and the lowest numbered directory name will automatically be displayed. If no sub-directories exist in the current directory, the file TYPE parameter will be automatically set to TYPE=SAMPLEDSND and the lowest numbered Sampled Sound file will be displayed.

Tip: Pressing Storage then *LOAD*, or pressing Storage twice, will display the contents of the last viewed directory.

After the directory from a SCSI device has been loaded, pressing Storage, then the soft button beneath SCSI, and the soft button beneath *LOAD* will always display the contents of the Root directory.
Directories

What is a Directory?

Files on Sampled Sound disks are organized in directories. A directory is a group of up to 38 files. These files can be one of two possible file types: a Sampled Sound or another directory (called a sub-directory). Each sub-directory may contain up to 38 more files. If there are no sub-directories, the disk will only contain the 38 files of the Root (or Main) directory. The Root directory is the default top level directory selected when you change SCSI DEVICE ID numbers on the SCSI STATUS page or after power-up. If you are familiar with the Macintosh computer, or Microsoft Windows™ for IBM/PC Compatibles, sub-directories are similar to folders.

The directories and sub-directories on a Sampled Sound disk form a tree-like structure, with the Root directory as the trunk, and the various levels of sub-directories conceptually similar to the branches of the tree. For example:

Example Directory Structure

![Diagram of a Directory Structure]

Navigating in Directories

File Paths

It is helpful to have an understanding of how the TS-12 keeps track of all the files that can be on a large Sampled Sound disk like a CD-ROM. If we were to describe the location of the sound SOLO VIOLIN in the Example Directory Structure diagram above, we might say:

“The SOLO VIOLIN Sampled Sound file is the fourth file in the SOLO STRING sub-directory, within the STRINGED directory, which is in the ROOT directory, on the SCSI Storage Device assigned to DEVICE-ID #4.”

If we read the description from right to left, starting with the SCSI Storage Device, it becomes:

SCSI DEVICE-ID 4..ROOT..STRINGED..SOLO STRNG..SOLO VIOLIN

This description of the location of the file is called a file path. This is the path that the TS-12 will follow to find the file. If you use an IBM PC/Compatible running under MS-DOS, you may already be familiar with file paths (e.g. C:\STRINGED\SOLOSTRNG\SOLOVIOL). On a Macintosh computer, or an IBM PC/Compatible running Microsoft Windows, the file path would correspond to the cascade of the folders you would open in order to locate a file.
To Enter or Move Down into a Directory
• Press the Storage button.
• On the SELECT STORAGE OPTION page, press the soft button beneath the word SCSI to reveal the following sub-page:

```
SCSI DEVICE-ID=1
*LOAD*
STATUS=CDROM001
*EXIT*
```

• If the STATUS is a valid volume, press the soft button beneath the word *LOAD*. This takes you to the LOAD FILE page.
• When FILE TYPE=DIRECTORY on the LOAD FILE page, you can view the contents of the Root directory, and select a sub-directory by using the Data Entry Controls, and pressing *YES*. The display momentarily shows LOADING <Directory>, and then shows the LOAD FILE page with either Sampled Sound files or another sub-directory selected.
• You can continue to select other Sampled Sound files or sub-directories using the Data Entry Controls and pressing the *YES* button to load them.

To Exit from or move back up from a Directory:
• On the LOAD FILE page, press the lower left soft button beneath the TYPE value.
• Press the Down Arrow button to set TYPE=DIRECTORY. The display shows *EXIT* on the top of the display.
• Press the top middle soft button above *EXIT* to exit the current sub-directory level, and return you to its parent directory.

Tip: To quickly return to the Root Directory, press the Storage button, the soft button beneath SCSI, and then the soft button beneath *LOAD*.

Direct-Macros™

What Is a Direct-Macro?
It may have occurred to you that with the large number of files that a SCSI Storage Device can contain, it would be nice to be able to get directly to a directory or specific file quickly rather than having to scroll through all of the files and manually enter each directory and sub-directory. Direct-Macros allow you to do this. In the TS-12, a Direct-Macro is a shortcut that allows you to get to a file or directory on a Sampled Sound CD ROM with just a few button presses.

Direct-Dialing Macros on Sampled Sound CD ROMs
ENSONIQ formatted Sampled Sound CD ROMs have a unique Direct-Macro number assigned to each individual file location (see the CD-ROM manual for Direct-Dial listings). Pressing and holding the top left soft button above the LOAD FILE name field, and then pressing the Bank buttons, allows direct-dialing of Direct-Macro numbers. The following screen will be displayed after a Bank button has been pressed, for as long as the top left soft button is held down:
Letting go of the top left soft button will invoke the Direct Macro for the value that is displayed. Direct-Macro numbers conform to the ENSONIQ CD-ROM conventions:

- 1 digit is meaningless and does nothing.
- 2 digits selects files by number in the current directory.
- 3 digits changes to a new sub-directory within the current directory (the 1st digit), and then selects a file by number in the new sub-directory.
- 4 digits changes to a new main directory (the 1st digit), and then selects a sub-directory and file by number in the new main directory.
- 5 digits changes SCSI Device ID numbers (the 1st digit), and then selects a main directory, sub-directory and file by number on the new SCSI Storage Device.

If we were to locate the sound SOLO VIOLIN in the Example Directory Structure using the Direct-Dial feature, you would enter 41204:

<table>
<thead>
<tr>
<th>This number:</th>
<th>4</th>
<th>1</th>
<th>2</th>
<th>04</th>
</tr>
</thead>
<tbody>
<tr>
<td>selects:</td>
<td>SCSI DEVICE ID</td>
<td>STRINGED</td>
<td>SOLO STRING</td>
<td>SOLO VIOLIN</td>
</tr>
<tr>
<td>which is:</td>
<td>SCSI DEVICE-ID</td>
<td>Main Directory</td>
<td>Sub-Directory</td>
<td>File Number</td>
</tr>
</tbody>
</table>

**Note:** All Direct-Macro operations are performed with the top left soft button above the file name held down, and take effect when the button is released.

It is not necessary to enter the SCSI Device ID digit unless you are changing SCSI Storage Devices. When working with a CD-ROM, four digits are all you need to enter, because CD ROM drives containing ENSONIQ CD-ROMs should always be set to SCSI ID #4. If you make a mistake, type up to six digits; the sixth digit entered will start over at the first digit of your next attempt.

**MIDI SYS-EX**

**To Send MIDI Sys-Ex Messages to another TS-12**

The TS-12 is able to send System Exclusive dumps of Programs and Presets, either singly or in banks, as well as Sequencer dumps containing either the entire sequencer memory or the current sequence/song. These dumps can be understood by another TS-12.

Banks of programs or presets are always transmitted from the internal RAM. If you want to send internal ROM data, you must first replace all of the internal RAM data with copies of the internal ROM data. Make sure that you have first saved your internal RAM data before replacing it with the ROM data.

From the STORAGE page:
Press the soft button for SYS-EX. The display reads:

```
SELECT MIDI SYS-EX OPTION
  RECORDER    SEND-DUMP
```

This page is used to select either the Sys-Ex Recorder, or the option to transmit bulk Sys-Ex dumps of data in RAM. Pressing the soft button below SEND-DUMPS will reveal the following sub-page:
PROGRAMS
To Send Programs out via MIDI Sys-Ex
From the MIDI SYS-EX page:
• Press the soft button for PROGRAMS. The display reads:

- CURRENT PROGRAM — this command will send out all data for the currently selected primary Program as a system exclusive message. The Program may be in any bank, including the ROM BankSets, or may be in the Compare buffer.
- BANKSET-U0 — this command transmits the contents of User RAM Program BankSet U0 as a system exclusive message. The dump contains data for 60 Programs.
- BANKSET-U1 — this command transmits the contents of User RAM Program BankSet U1 as a system exclusive message. The dump contains data for 60 Programs.
- ALL — this command transmits the contents of both User RAM Program BankSets U0 and U1 as a system exclusive message. The dump contains data for the complete set of 120 RAM Programs.

PRESETS
To send Presets out via MIDI Sys-Ex
From the MIDI SYS-EX page:
• Press the soft button for PRESETS. The display reads:

- CURRENT PRESET — will send out all data for the current Preset as a system exclusive message. The Preset may be in any bank, including the ROM BankSets, or may be in the Preset Edit buffer.
- BANKSET-U0 — this command transmits the contents of User RAM Preset BankSet U0 as a system exclusive message. The dump contains data for 60 Presets.
- BANKSET-U1 — this command transmits the contents of User RAM Preset BankSet U1 as a system exclusive message. The dump contains data for 60 Presets.
- ALL — this command transmits the contents of both User RAM Preset BankSets U0 and U1 as a system exclusive message. The dump contains data for the complete set of 120 RAM Presets.
SEQUENCER DATA
To Send Sequences/Songs out via MIDI Sys-Ex
From the MIDI SYS-EX page:
- Press the soft button for SEQUENCER. The display reads:

```
  SEND SYS-EX SEQUENCER DATA
  CURRENT SEQ/SONG TRACKS ALL SEQ DATA
```

- CURRENT SEQ/SONG — will send out all data for the currently selected sequence or song as a system exclusive message.
- TRACKS — transmits all information about the 12 tracks and the effect in the current sequence or song (not including recorded track data) as a system exclusive message. If received by a TS-12, it will change the effect and reconfigure the tracks of the current sequence or song.
- ALL SEQ DATA — transmits the contents of the ten Sequencer Banks as a system exclusive message. The dump contains data for the complete set of 60 sequencer locations.

ALL
Sending Programs, Presets and All Sequencer data out via MIDI Sys-Ex
From the MIDI SYS-EX page:
- Press the soft button for ALL. The TS-12 will transmit three consecutive dump messages containing both User Program BankSets (U0 and U1), both User Preset BankSets (U0 and U1), and the entire Sequencer memory. Using this command is equivalent to sending the three messages individually, and is convenient when you wish to transmit everything with one command.

Receiving MIDI Sys-Ex Messages
The receiving of data dumps is initiated automatically by System Exclusive messages sent from the transmitting unit. No front-panel commands are necessary to receive dumps if the receiving of System Exclusive messages is enabled on the MIDI Control sub-page (SYS-EX=ON).
MIDI System Exclusive Recorder

What are System Exclusives?
Some MIDI information—such as key events, controllers, program changes, etc.—is understood by virtually all MIDI devices, regardless of the manufacturer. The common ability to send and receive these messages is what allows you to play any MIDI synth from any other, to change programs and volume remotely, to start and stop sequencers and drum machines together, and the many other performance miracles we have come to expect from MIDI.

There are other messages which each manufacturer has reserved for communicating specific information with a specific machine (or family of machines). These machine-specific messages are called System Exclusive (or Sys-Ex) messages, since they are meant to be recognized only by a particular device and ignored by all others (i.e. they are exclusive to a particular system).

The TS-12, for example, can transfer programs, presets or sequences or via to another TS-12. It is a lot like sending a file from one computer to another via modem. The 1’s and 0’s that make up the data in memory are sent out the MIDI port. This data can be received and understood by another TS-12, or by a computer running the proper librarian software.

“Generic” System Exclusive Storage
It is not strictly necessary, however, for the receiving system to understand the data it receives, if the purpose is to store it for later reloading into the original system (just as it’s not necessary for a file cabinet to understand the pieces of paper you file there). The TS-12 can receive any MIDI System Exclusive message up to 288k bytes and save it to disk without having the slightest notion of what it means or what type of device it came from. When you want to send the data back to the original device, you just load the data from disk back into the TS-12, which will then re-transmit the message exactly as it was received.

Here are a few examples of the kinds of information which you can use the TS-12 to store in this way:
• The Program (patch) memory of virtually any MIDI synthesizer
• The pattern memory of a drum machine
• The sequence memory of a MIDI sequencer
• The preset memory of any MIDI effects device which can send and receive it (such as the ENSONIQ DP/4)

In short, any MIDI data (within memory limits) which can be transmitted from one device to another can be received and stored by the TS-12. With the TS-12 at the heart of your system, you now have disk storage for the data in all your MIDI instruments.

Saving Sys-Ex data uses the Sequencer Memory
The TS-12 uses the RAM (Random Access Memory) that is normally devoted to the sequencer to “buffer” incoming System Exclusive messages before saving them to disk. A buffer is an area of memory where data is held temporarily. When the TS-12 receives a System Exclusive data dump, it stores it in the sequencer memory until you save the data to disk.

Important:
You must save all sequencer memory before using the System Exclusive Recorder function to receive data.

Loading Sys-Ex data from disk to an external device will not necessarily clear the sequencer memory. If there is enough unused sequencer memory to load and transmit the Sys-Ex message, the memory will not be affected. If there is not enough memory, the TS-12 will warn you, and give you a chance to proceed (erasing the sequencer memory) or quit and save the data.
SAVING System Exclusive Data from an External Device

Using the TS-12’s disk drive for storing data from external devices is a three-step process:

1) First you get the TS-12 ready to receive the data via MIDI;
2) next, you send the data from the external MIDI device to the TS-12; and finally
3) you save the data to a formatted disk with the TS-12’s disk drive.

To Save System Exclusive Data from an External MIDI Device:

- Connect the MIDI Out of the sending device to the MIDI In of the TS-12.
- Insert a formatted double-sided 3.5” disk into the TS-12 disk drive.
- Press the Storage button to select the Storage page.
- Press DISK. The Disk Storage menu appears.
- Press SYS-EX REC.
- The display shows SEQUENCER DATA WILL BE ERASED to warn you that any sequences
  and songs currently in memory will be lost. It’s not too late, however, to quit and preserve the
  sequencer memory intact. Pressing *NO* at this point will return you to the Storage page
  without erasing the sequencer memory, allowing you to save it to disk before proceeding.
- Press *YES* to proceed. The following screen appears:

![SYS-EX REC STATUS=WAITING... SIZE=0]

SAVE SEND *EXIT*

The TS-12 will now record into its memory any System Exclusive message which it receives. At
the upper right of the display (SIZE=##) you see the size (expressed in disk blocks) of the Sys-Ex
data received so far.

> Pressing SAVE lets you name and save to disk what has been received so far (don’t do that
  yet).
> Pressing SEND will retransmit whatever has been received so far (don’t do that yet either).
> Pressing *EXIT* returns you to the Storage Page.

- From the external MIDI device, transmit the System Exclusive data. The display will read
  STATUS=RECEIVING... while the data is being sent.
- When the full message has been received, the display will read STATUS=COMPLETE to
  indicate that a complete message was recorded. The display shows how many blocks of data
  have been received so far. At this point, assuming there’s enough memory, you can send the
  TS-12 another System Exclusive message (from a different instrument, for example) which will
  be stored right after the first one. You can save as many different messages as memory
  permits in a single Sys-Ex block. Each time, the TS-12 will read STATUS=RECEIVING... and
  then return with STATUS=COMPLETE when the complete message has been received. When
  the data is later retransmitted, all the messages will be sent out in the order they were
  received, with a 100 millisecond pause between each. In this way you could load new data
  into all your devices with a single Load command from the TS-12.
• Once you have successfully received the Sys-Ex message (or messages), press SAVE. The standard SAVE FILE display appears:

![Save File Display]

• Name the file with an 11-character name of your choice using the data entry controls and the two cursor soft buttons, labeled LEFT and RIGHT. (Or you can use the keyboard to select characters and move the cursor, if Keyboard Naming is enabled on the System page).
• Press *YES*. The Display reads SAVING <FILENAME> while the data is being saved. Or Press *NO* to cancel the procedure for any reason.
• If there is a Sys-Ex file with the same name already on the disk, the TS-12 will ask DELETE OLD VERSION? Press *YES* to save the file, replacing the one on the disk. This is for updating files to which you have made changes. Or press *NO* to abort the procedure.
• After the file is saved, the TS-12 returns to the SAVE FILE page, so that you can save a backup copy of the data to a different disk if you wish. Press *NO* (or any other front panel button) to exit.

Note: If during the reception of Sys-Ex data, the TS-12 display reads STATUS=INCOMPLETE, this means it did not receive an “End Of Exclusive” after the System Exclusive message. This would indicate that the external MIDI device did not transmit a complete message for some reason. Press *EXIT* and try again.

If the TS-12 display reads STATUS=MEMORY FULL, this means it ran out of memory with which to “buffer” the incoming data (the maximum amount which can be received is 256, 767 with expanded memory, blocks for a standard TS-12). After receiving the Memory Full message you can still save the file, but it is almost certain that the last Sys-Ex message received is incomplete and will not be able to be received successfully when retransmitted.

LOADING System Exclusive Data from Disk to an External Device
After you have saved a System Exclusive message from an external MIDI instrument, getting the data back to the original instrument involves three steps:
1) First you prepare the receiving instrument(s) to receive System Exclusive messages via MIDI;
2) next, you Load the data from the TS-12’s disk drive into memory; and then
3) you send (transmit) the data to the remote MIDI device(s) from the TS-12.

To Load and Transmit a System Exclusive File from disk:
• Connect the MIDI Out of the TS-12 to the MIDI In of the receiving device(s).
• Enable the receiving instrument(s) to receive System Exclusive messages. Many devices have a switch or a parameter which enables or disables the receiving of System Exclusive messages. Consult the manual of each particular device for details.
• Insert the disk containing the Sys-Ex data into the disk drive.
• Press Storage to select the Storage page.
• Press DISK. The Disk Storage menu appears.
• Press LOAD. The Load File display appears as shown earlier. The file type is underlined.
• Use the data entry controls to select the file type SYS-EX DATA.
• Press the soft button above the file name and use the data entry controls to find the file you want to transmit (or use the File Banks to quickly locate the file without scrolling as detailed earlier in this section).
• Press *YES*.
• If there is not enough free sequencer memory to hold the Sys-Ex data, the display shows SEQUENCER DATA WILL BE ERASED. If you have sequencer data in memory which hasn’t been saved, press *NO* to return to the Storage page and save it to disk before proceeding. Otherwise, press *YES*.
• The display reads LOADING <FILENAME> while the data is being loaded. Once the data is in memory, the Sys-Ex Recorder screen appears:

![Sys-Ex Recorder Screen]

• Press SEND to transmit the data. The display reads STATUS=SENDING, and then returns to STATUS=READY..., ready to send the data again if necessary.
• Check the receiving instrument(s) to see that the data was received correctly. If it wasn’t, make sure that:
  > the MIDI connections are correct (TS-12’s MIDI Out to the receiving device’s MIDI In),
  > the receiving device(s) is enabled to receive System Exclusive messages,
  > the receiving device(s) is set to the same MIDI base channel(s) as when the data was initially sent to the TS-12.
• Then press SEND again, and the data will be transmitted again. You can keep repeating this until the data has been successfully received by the remote device(s).
• Once the data has been successfully transmitted, press EXIT.

**Additional Sys-Ex Recorder Notes**

As you have no doubt noticed, the TS-12 displays exactly the same page for sending and receiving Sys-Ex data. In fact, MIDI System Exclusive data can be transmitted or received any time this page is on the display, regardless of which way you entered it.

Whenever this page is displayed:
• Pressing SEND will transmit whatever is in the MIDI Sys-Ex buffer.
• Incoming MIDI Sys-Ex messages will be recorded and added to the data already in the buffer memory.
• Pressing SAVE will always take you to the SAVE FILE page where you can name and save to disk the data in the buffer memory.

This allows a number of useful applications. You can, for example, load a Sys-Ex file from disk, then transmit to the TS-12 any additional message or messages, adding that data to the original data, and then resave the file to disk. Or you can press SEND to retransmit a Sys-Ex message immediately after it has been received, to check and see that it was received properly.
TS-12 Disk Messages

Disk messages are displayed for one second and indicate either successful completion or non-fatal error conditions encountered during a disk operation:

- **DISK COMMAND COMPLETED** — indicates that the disk operation was completed successfully and without errors.
- **DISK WRITE-PROTECTED** — appears during SAVE or DELETE operations if the diskette is write-protected.
- **DISK HAS BEEN CHANGED** — appears when you respond *YES* to LOAD, SAVE or DELETE when the disk in the drive has been changed since the last time the TS-12 loaded a disk directory.
- **DISK DRIVE NOT READY** — usually indicates that there is no diskette in the drive, although it can indicate a hardware problem if it persists.
- **NOT ENOUGH DISK SPACE** — indicates that there are not enough available sectors on diskette to save the file.
- **FILE DOES NOT EXIST** — appears when you respond *YES* to LOAD or DELETE when the display shows FILE=*NO FILES*.
- **DISK COMMAND NOT COMPLETED** — appears when you respond *NO* to DELETE OLD VERSION? when saving files.
- **NO FREE DISK FILES** — indicated that there are no free directory entries in which to save the file.
- **NO SYS-EX DATA TO SAVE** — indicates that there is no data in the Sys-Ex Recorder to save.
- **SEQUENCER MEMORY RESET** — appears after using the Sys-Ex Recorder (which erases sequencer memory) and you try to enter a sequence.
- **FILE TOO LARGE TO LOAD** — indicates that the sequence data in the file will not fit into the free memory. Delete sequences or songs to make some memory available. If that does not work, the file may have been saved from a system with expanded memory.
- **INCOMPATIBLE DISK CAPACITY** — appears when copying an HD disk’s contents to a DD disk, or vice versa.
- **NOT ENOUGH SOUND RAM INSTALLED** — appears when you try to Auto-Load a SAMPLE-BANKS file that was created on an 8 Meg TS-12 into a 2 Meg unit.

Note: Any Sample-Banks files created on an 8 Meg TS-12 using BankSet S9, and then loaded into a 2 Meg unit will automatically erase all Sampled Sounds in BankSet S9.

Fatal Error Messages

Fatal error messages are always accompanied by the PRESS ANY BUTTON TO CONTINUE... prompt, and remain on the screen until any button is pressed. These messages indicate serious error conditions which interrupted the disk operation. These errors may have prevented the correct saving or loading of the data in the file(s).

- **DISK DRIVE NOT READY** — indicates either that there is no diskette in the drive or that there are hardware problems.
- **DISK NOT FORMATTED** — the disk format was not recognized, and the disk is either blank or formatted for some other system.
- **NOT TS-12 DISK** — the disk format was recognized, but the disk does not contain TS-12 data.
- **DISK ERROR - WRITE VERIFY** — during a SAVE operation, the data written could not be verified. Probably indicates a bad disk sector. The file may be unusable.
- **DISK ERROR - LOST DATA** — during a disk read operation, the system missed data coming from the disk. Probably indicates a hardware problem. The file may be unusable.
• FILE OPERATION ERROR — one of a number of possible fatal errors occurred during a disk operation. Probably caused by a low-level hardware or software error, although the disk may be bad.

• DISK ERROR - BAD DATA — during a file operation, the CRC (error checking code) of the data block was incorrect. Probably indicates a bad disk sector. The file may be unusable.

• DISK ERROR - BAD DISK OS — during a file operation, the CRC of the Disk OS Program Control Block was incorrect. Probably indicates a bad disk sector. The disk may be unusable.

• DISK ERROR - BAD DIRECTORY — during a file operation, the CRC of the Directory blocks was incorrect. Probably indicates a bad disk sector. The disk may be unusable.

• DISK ERROR - BAD FAT — during a file operation, the CRC of the FAT (File Allocation Table) block was incorrect. Probably indicates a bad disk sector. The disk may be unusable.

• DISK ERROR - BAD DEVICE ID — during a file operation, the CRC of the Device ID block was incorrect. Probably indicates a bad disk sector. The disk may be unusable.

• FORMAT FAILED - BAD DISK — during formatting, a bad disk sector was detected. The disk may be defective, and should not be used.

• DISK COPY NOT COMPLETED — appears if *QUIT* is pressed during the Disk Copy procedure.

• INVALID SCSI DEVICE — indicates that there are problems either with the connected SCSI Device, with the SCSI cable, or that the SCSI Storage Device is set to the wrong SCSI Device-ID number.
Section 14 — Understanding Sampled Sounds

This section provides an overview of the concepts behind understanding and editing a Sampled Sound. For detailed descriptions of the actual parameters, refer to the following section.

What is a Sampled Sound?
A Sampled Sound is a sound created for ENSONIQ's EPS, EPS-16 PLUS, and/or ASR-10 samplers, giving you access to the largest library of sampled sounds anywhere! In addition to having access to this versatile library of sounds (from ENSONIQ and many third-party companies from around the world), this means that you can incorporate vocals, drum loops, and any sound imaginable into your music. Just use an ENSONIQ sampler, or your friend’s ENSONIQ sampler, to make new Sampled Sounds to use in your music.

Sampled Sounds differ from the TS-12’s on-board sounds in several significant ways.

First, Sampled Sounds are volatile. This means that once loaded, the sounds will remain in the TS-12 for as long as the TS-12 is turned on. Once the TS-12 is turned off, though, any Sampled Sounds will disappear, just as they would from an ASR-10, or any other sampler. Sampled Sounds can require a tremendous amount of memory. Your TS-12 is shipped with 2 Megabytes of memory, expandable to 8 Megabytes with industry-standard SIMMs — more memory than you’ll find in many personal computers. Backing up this amount of memory when the TS-12 is turned off requires more power than the internal battery (which supplies power to backup the TS-12's sound programs) can supply.

Second, the parameters available for programming in the EPS/EPS-16 PLUS/ASR-10 are somewhat different than those in the TS-12. When a Sampled Sound is selected, pressing any of the buttons in the Programming section will display edit pages specific to Sampled Sounds.

Finally, loading and selecting Sampled Sounds differs somewhat from loading and selecting TS-12 sound programs.

What is a SIMM?
SIMM is an acronym which stands for Single In-line Memory Module. SIMMs have become the industry standard used by most computers (both IBM and Mac compatible) to expand the computer’s memory. Because of this, SIMMs are readily available in most computer software stores, and from mail order organizations. By having expansion SIMMs installed in the TS-12, you can load up to 20 EPS/EPS-16 PLUS/ASR-10 Sampled Sound files, with all settings intact.

Warning!
Because adding expansion SIMMs requires opening the TS-12 casing (which voids the ENSONIQ Warranty), SIMMs are not user-installable, and must be installed by an Authorized ENSONIQ Repair Station. To prevent damaging your TS-12, and/or causing bodily injury, do not attempt to install the SIMMs yourself.

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Purchasing SIMMs
Since you will need to purchase your SIMMs before you bring them to an Authorized ENSONIQ Repair Station for installation, here is some important information you should know about purchasing the proper SIMMs:

• The TS-12 was designed to use either a pair of 1M x 8 (Macintosh) non-parity SIMMs or a pair of 4M x 8 (Macintosh) non-parity SIMMs (not 1M x 9 or 4M x 9 parity SIMMs). We highly recommend using this type of SIMMs.
• Use 30 pin (not 72 pin) SIMMs.
• We do not recommend using parity SIMMs (designed for IBM PC compatibles). These SIMMs may not operate properly, and may cause damage to the TS-12.

How Many SIMMs?
The TS-12 offers two options for SIMMs:

• The TS-12 is shipped from the factory with two 1x8 non-parity SIMMs — 1 BankSet (S8) is available (1 BankSet consists of 10 Sampled Sound Banks). The Sampled Sound BankSet will hold 1MWord of Sampled Sound information, equivalent to 4018 blocks of memory.
• With two 4x8 non-parity SIMMs installed — 2 BankSets (S8 and S9) of 10 Sampled Sound Banks each are available. Each Sampled Sound BankSet will hold 2MWords of Sampled Sound information, for a total of 4 MWords, offering 8114 blocks of memory for BankSet S8, and 8191 blocks for BankSet S9.

An Important Note About Electrostatic Discharge
SIMMs are susceptible to Electrostatic Discharge (ESD) commonly known as “static.” Electrostatic Discharge can destroy or damage SIMMs. Here are some procedures you should follow when handling SIMMs in order to minimize the possibility of causing ESD damage:

1) Minimize the handling of SIMMs. Keep them in their static free packages until needed. Only transport or store SIMMs in their protective packages.
2) When handling SIMMs, avoid touching the connector pins. Try to handle the SIMMs by the edges only.

If you have any questions concerning the use of SIMMs, the TS-12, or for additional technical support, please contact ENSONIQ Customer Service at (215) 647-3930 Monday through Friday 9:30 a.m. to 12:15 p.m. and 1:15 p.m. to 6:30 p.m. Eastern Time.

Sampled Sound Configuration
Each Sampled Sound consists of up to eight Layers, and up to 127 WaveSamples. Each WaveSample within a TS-12 Sampled Sound consists of the following:

• a digital oscillator playing a wave from memory
• two multi-mode digital filters
• one LFO (Low Frequency Oscillator)
• one random NOISE generator
• three complex envelope generators for controlling pitch, filter, and volume
• a versatile matrix modulation scheme with 15 routable modulation sources
About WaveSamples

The WaveSample is the most basic unit of a Sampled Sound. A WaveSample can be anything — a drum, a mandolin trill, a sound effect, or your voice, for example. Each WaveSample has its own set of WaveSample parameter settings. Several WaveSamples can be grouped together to form Layers, and up to eight layers can reside within a Sampled Sound.

Loading a Sampled Sound

Because Sampled Sounds are stored in dynamic RAM, they are not saved internally, and must be loaded each time the TS-12 is powered on. To load a Sampled Sound:

1) Insert a disk containing a Sampled Sound into the TS-12 disk drive.
2) Press the Storage button.
3) Press the soft button above the word *LOAD* in the display. Note that the display will be slightly different than when loading normal sound programs:

   LOAD FILE=SOUND-NAME  SIZE=XXX  *YES*
   TYPE=SAMPLEDSND  DIR=ROOT  *NO*

4) Make sure the TYPE parameter is set to SAMPLEDSND (rather than DIRECTORY).
5) Select (underline) the LOAD FILE= parameter and use the Up/Down Arrow buttons or the Data Entry Slider to scroll through the listing of sounds available.
6) Once you’ve located a sound you’d like to load and hear, press the soft button above the word *YES*. The display shows:

   USE BANK BUTTONS TO SELECT LOCATION
   FREE=XXXX  BANKSET=8  *EXIT*

7) Here you can select which BankSet you want to load your Sampled Sound into (BankSet 9 is only available with expansion SIMMs installed) by using the data entry controls. The bottom left corner of the display shows the amount of free (unused) blocks available in DRAM for the
currently displayed BankSet. As it comes from the factory, the TS-12 has 4018 blocks of free DRAM memory. With expansion SIMMs installed, the TS-12 will offer 8114 blocks of DRAM memory in BankSet S8, and 8191 in BankSet S9.

8) Press any Bank button (0-9) to load the Sampled Sound into the TS-12.

About Directories

What is a Directory?
Files on Sampled Sound disks are organized in directories. A directory is a group of up to 38 files. These files can be one of two possible file types: a Sampled Sound or another directory (called a sub-directory). Each sub-directory may contain up to 38 more files. If there are no sub-directories, the disk will only contain the 38 files of the Root (or Main) directory. The Root directory is the default top level directory selected when you change SCSI DEVICE ID numbers on the SCSI STATUS page or after power-up. If you are familiar with the Macintosh computer, or MicroSoft Windows™ for IBM/PC Compatibles, sub-directories are similar to folders.

As explained above, the TS-12 will only allow you to scroll through a list of up to 38 files at any one time without changing directories. However, any one (or more) of these files may be a sub-directory, which may contain up to 38 more files. Eventually this becomes a tree-like structure with the root directory as the trunk, and the various levels of sub-directories conceptually similar to the branches of the tree.

For more information about SCSI and directories, refer to Section 13 — Storage.

Loading (Changing) a Directory
Sampled Sounds are most often saved in the ROOT (top level) directory on a floppy disk. However, there may be an instance where a Sampled Sound file is stored within a different directory. To load and/or change a Directory:

1) Insert a Sampled Sound disk containing a directory into the TS-12 disk drive.
2) Press the Storage button.
3) Press the soft button above the word *LOAD* in the display.
4) Select (underline) the TYPE parameter and use the Data Entry Controls to change the type to DIRECTORY.
5) Press the soft button above the LOAD FILE parameter to scroll through the listing of directories available.
6) Once you’ve located a directory you’d like to load, press the soft button above the word *YES*. The display shows:

```
LOAD FILE=SAMPLED_NAME SIZE=XXXX *YES*
TYPE=SAMPLEDSND DIR=XXXXXXXXX *NO *
```

7) The bottom line of the display shows the newly loaded directory name. If there are any sub-directories within the currently loaded directory, you can set the TYPE parameter to DIRECTORY, select them using the LOAD FILE soft button, and load them as explained above. Any Sampled Sound within a directory can be loaded in the same manner as explained earlier.
Here you can select which BankSet you want to load your Sampled Sound into (BankSet 9 is only available with expansion SIMMs installed) by using the data entry controls. The bottom left corner of the display shows the amount of free (unused) blocks available in DRAM for the currently displayed BankSet. As it comes from the factory, the TS-12 has 4018 blocks of free DRAM memory. With expansion SIMMs installed, the TS-12 will offer 8114 blocks of DRAM memory in BankSet S8, and 8191 in BankSet S9.

8) Press any Bank button (0-9) to load the Sampled Sound into the TS-12.

Multi-Disk Sampled Sound Display Messages
Multi-disk Sampled Sounds are loaded the same way as single-disk Sampled Sounds, with the addition of a few extra display messages. Multi-disk EPS/EPS-16 PLUS/ASR-10 Sampled Sound files are indicated by a flashing number next to the file name on the LOAD FILE page. After loading part of a multi-disk Sampled Sound file, the display will read:

• If you answer YES to loading the next higher part number, with a disk containing the wrong part number in the drive, the display will show DISK CONTAINS WRONG PART. This message will last for a few seconds, and then return to the previous display.
• If you answer NO to loading the next higher part number, the display will momentarily show: MULTI-DISK LOAD NOT COMPLETED.
• If you try to load part 2 without loading part 1 first, the display will momentarily show: INVALID FILE LOAD PART 1 FIRST.

Selecting and Playing a Sampled Sound
Once the sound has finished loading, you will probably want to select it so you can play it:

• Press the Sounds button, press the BankSet button, and while holding it down, press the Bank 8 button to select the Sampled Sound BankSet 8. You’ll find the display looks a bit different than when you are selecting Programs:

The top line of display shows the status of the Sampled Sound, and the name of the disk from which the Sampled Sound was loaded into the TS-12. The bottom of the display also shows the size of the Sampled Sound in blocks, the Sampled Sound name (or *EMPTY-BANK* for an empty Sampled Sound bank location), and OPTIONS that provides access to an Options sub-page.
When the Sampled Sound Status is showing:

- **SAMPLED-SOUND** — You will hear the Sampled Sound, because it has been loaded into memory, and is not muted.
- **SAMPLE-EDITS** — You will hear the Sampled Sound, because it has been loaded into memory, and is not muted. However, edits have been made to the Sampled Sound within the TS-12, and those edits were saved on a TS-12 formatted disk as a Sample Edits file. When the Sampled Sound Status shows SAMPLE-EDITS, the Source Disk Name will show the name of the TS-12 floppy disk on which the Sample Edits are stored.
- **UNSAVED-EDITS** — Appears after you have edited a Sampled Sound or Sampled-Edits file, but have not saved or resaved it as a SAMPLE-EDITS file to a TS-12 disk. Think of this as a reminder to save your edits.
- **----(MUTED)---** — You will not hear the Sampled Sound, because it has been loaded into memory, and then muted. You will hear the “Surrogate Program” in its place (described in Section 14 — Understanding Sampled Sounds).
- **---NOT LOADED---** — You will not hear the Sampled Sound because it has not been loaded into memory. You will hear the “Surrogate Program,” because the Sampled Sound is not loaded into the TS-12.

When the Sampled Sound Status shows ---(MUTED)--- or ---NOT LOADED---, the name of the Sampled Sound on the bottom line will appear in parentheses. Any Preset or Seq/Song Tracks that the Sampled Sound Bank is assigned to will show *BANK S#* in place of the Sampled Sound name. This indicates the BankSet and Bank location of the Sampled Sound that was assigned to the Track.

Use the bottom center soft button to select (single press) or layer (rapidly double-click) the Sampled Sound. Sampled Sounds can be stacked and used in Presets and Sequences just as Programs can.

![Sampled Sound Interface Snippet](image)

Unlike Programs, which are stored in battery backed-up memory, if you turn the TS-12 off and back on, any Sampled Sounds will disappear from memory and need to be re-loaded into the same locations in order for Sequences and Presets that use them to work correctly. The Sampled Sound Bank pages will retain the information about which Sampled Sounds or Sample Edits were loaded into each location. They can be manually reloaded one at a time, or reloaded automatically, using the Auto-Load feature. See the description of the Auto-Load feature later in this section for more information.
Sampled Sound OPTIONS page

The bottom right field on the Sampled Sound Bank pages provides access to certain options. Pressing the soft button beneath OPTIONS will reveal the following sub-page:

```
S8-0 SAMPLED-SOUND OPTIONS
   *DELETE*   *MUTE*   *EXIT*
```

On this sub-page you can delete, or mute/unmute the Sampled Sound. The bottom center of the display will either show *MUTE* or *UNMUTE*. The *MUTE* field will appear whenever a Sampled Sound is loaded and not muted. The *UNMUTE* field will appear whenever a Sampled Sound is muted. Pressing the bottom center soft button will switch between a muted and unmuted status and return you to the previous screen.

- Pressing the soft button beneath *MUTE* will mute the Sampled Sound, and you will hear the “Surrogate Program” in place of the Sampled Sound on any Preset or Seq/Song Track(s) that the Sampled Sound is assigned to.
- Pressing the soft button beneath *UNMUTE* will unmute the Sampled Sound, allowing you to hear the Sampled Sound, and it will play normally on any Preset or Seq/Song Track(s) that it is assigned to.
- Pressing *EXIT* will exit the Options sub-page, returning you to the Sampled Sound Bank page. The Sampled Sound Status will be unchanged.
- Pressing the soft button beneath *DELETE* will prompt you with the following message:

```
DELETE <Sampled Sound name> FROM SAMPLED-SOUND BANK S8-0
   *YES*   *NO *
```

The top line of the display will show the name of the Sampled Sound that will be deleted, and the bottom line will show the BankSet and Bank location. Pressing *YES* will delete the Sampled Sound from memory, making the location into an *EMPTY-BANK*. This is useful if you want to load in a large Sampled Sound to another bank and don’t have enough memory, or if you want to save only certain Sampled Sound information with a SAMPLE-BANKS file (see later in this section). Pressing *NO* will abort the procedure and will display the Sampled Sound Bank page.

**Tip:** It is a good idea to delete unused Sampled Sounds so they will not be loaded or prompted for during the Auto-Load procedure.
Lack of Memory Message
If you try loading a Sampled Sound, and do not have enough free memory available, the following display will appear:

At this point, you can select a Sampled Sound Bank location to delete (by pressing the appropriate Bank button), or press the soft button beneath *EXIT* to abort the LOAD FILE procedure. The shortage field in the display will show how many additional blocks of memory are needed to load in the Sampled Sound file. If the Sampled Sound Bank that you select to delete is smaller than the shortage amount, that Bank will be deleted, and the shortage amount will be adjusted, showing how many blocks are still needed to load the Sampled Sound file.

About the Auto-Load Feature
If you have loaded any Sampled Sounds or Sample Edits into the TS-12 and then powered down, the TS-12 remembers the name, source disk(s), file path, and Sampled Sound bank location for each of the Sampled Sounds. The Auto-Load feature allows you to automatically load Sampled Sounds back into the same Bank location(s). The Auto-Load feature loads Sampled Sounds into the TS-12 from left to right, and then loads any Sample-Edits last. When you turn the TS-12 on, the display shows the following prompt:

The Auto-Load prompt will also appear after you manually load a SAMPLE-BANKS file, or load a 60-SEQ/SONGS file that was saved with Sample Banks (flashing S or PS on the LOAD FILE page).

Note: If you do not want to see this prompt, use the Erase All Sampled Sounds Data command described later in this section.

Note: Any edits made to a Sampled Sound that have not been saved as a Sample Edits file, will not be restored with the Auto-Load feature.

If you answer *NO* to the Auto-Load prompt, the TS-12 will display the last Sounds or Preset Bank page, and no Sampled Sounds will be automatically loaded.

If you answer *YES*, the display will momentarily show:

WORKING... is displayed when the TS-12 is preparing to load Sampled Sound files, and is
identifying the data on the current floppy disk in the disk drive and any connected SCSI storage devices. WORKING... will also be displayed while a removable SCSI storage device is spinning up to speed (see later in this section for information on the SCSI option).

Once the TS-12 is finished WORKING..., it will automatically load any needed files from the current disk in the disk drive, and from any connected SCSI Storage Devices.

If the TS-12 cannot find a file it needs to load on either the current disk in the disk drive, or from any connected SCSI Storage Device, the display will show one of four different prompts:

1) If a Sampled Sound originated from a floppy disk that has a disk name, the display shows:

   ![Insert Disk with Name](image)

   The display asks you to insert the disk with the defined disk name into the disk drive. Insert the requested disk into the disk drive, and press the soft button above *OK*. The TS-12 will automatically load any needed Sampled Sound files from the disk. If you do not want to load the Sampled Sound from the requested floppy disk, or if you do not have the disk, press the soft button beneath *SKIP*, and the TS-12 will request the next disk that it needs to load from.

   **Note:** If you intend to skip all of the Sampled Sound files, you may need to press *SKIP* up to 20 times.

2) If the Sampled Sound originated from a floppy disk that does not have a disk name, the display shows:

   ![Put Disk with File](image)

   Because the disk has no disk name, the display asks you to insert the disk with the defined Sampled Sound file name into the disk drive. Insert the requested disk into the disk drive, and press the soft button above *OK*. The TS-12 will automatically load the requested Sampled Sound file from the disk. If you do not want to load the requested Sampled Sound file, press the soft button beneath *SKIP*, and the TS-12 will request the next disk that it needs to load from.

   **Note:** If you own or have access to an ENSONIQ ASR-10 or an EPS-16 PLUS, we recommend that you add unique disk names to unlabeled disks using the Command/System•MIDI, WRITE DISK LABEL Command to improve the functionality of the Auto-Load feature. This should be done before the Sampled Sounds are loaded into the TS-12.
3) If the Sampled Sound originated from a SCSI volume that has a disk name, the display shows:

The display asks you to insert the disk (CD ROM, removable cartridge, or other removable media) with the defined name into the selected SCSI Storage Device, or verify that the requested drive is connected.

**Warning!**

If the requested drive is not connected, be sure to power down both the TS-12 and the SCSI Storage Device before making any connections between the units.

Note that the SCSI Device ID number for the requested SCSI volume must be set to the same value as shown in the display. Insert the requested disk into the SCSI Storage Device, and press the soft button above "OK". The TS-12 will automatically load any needed Sampled Sound files from the disk. If you do not want to load the Sampled Sound from the requested disk, press the soft button beneath "SKIP", and the TS-12 will request the next disk that it needs to load from.

4) If the Sampled Sound originated from a SCSI volume that does not have a disk name, the display shows:

Because the SCSI volume has no disk name, the display asks you to insert the disk (CD ROM, removable cartridge, or other removable media) with the defined Sampled Sound file name into the selected SCSI Storage Device or to verify that the requested drive is connected. Note that the SCSI Device ID number for the requested SCSI volume must be set to the same value as shown in the display. Insert the requested disk into the SCSI Storage Device, and press the soft button above "OK". The TS-12 will automatically load the requested Sampled Sound file from the disk. If you do not want to load the requested Sampled Sound file, press the soft button beneath "SKIP", and the TS-12 will request the next disk that it needs to load from.

Insert the requested disk into the disk drive (or SCSI Storage Device) and press the soft button above "OK" to automatically load the Sampled Sound files. If the Sampled Sound files needed are from several disks, the display will show each disk label name, allowing you the opportunity to load the file, or "SKIP" that particular file.

**Warning!**

Because the TS-12 can automatically load Sampled Sounds that were previously loaded from a connected SCSI Storage Device, we recommend powering on the SCSI Storage Device(s) first before powering on the TS-12.

**Note:** The TS-12 remembers Sampled Sound files not only by the disk name and file path, but also by the SCSI Device ID number. If you originally loaded a Sampled Sound file from a CD ROM Drive assigned to SCSI Device ID #4, and then changed its ID number, the TS-12 will not be able
to find the Sampled Sound to load it. Make sure you leave each SCSI Storage Device set to the same Device ID number as when the Sampled Sounds were first loaded from it.

**Note:** When you power down, the TS-12 remembers the information about which Sampled Sounds or Sample Edits were loaded into each Sample Sound bank location (whether muted or unmuted). If you do not want to reload certain Sampled Sound files when you power up, use the DELETE option found on the Sampled Sound OPTIONS sub-page to delete any unwanted Sampled Sounds before you power down.

### Loading Sample-Edits with the Auto-Load Feature

If any Sample Edits files have been loaded into the TS-12, or have been saved to a TS-12 disk and are still loaded, they will also be reloaded by the Auto-Load Feature. After you choose to Auto-Load all Sampled Sound files:

- The TS-12 will ask for the disk that contains the Sampled Sound data used by the Sample Edits file. Insert the requested disk into the disk drive (or connected SCSI Storage Device) and press the soft button above * OK * to automatically load the Sampled Sound file. The display will momentarily show:

```
LOADING <Sampled Sound name>
```

The display will then ask for the TS-12 formatted disk that has the Sample-Edits file:

- Insert the requested disk into the disk drive and press the soft button above * OK * to automatically load the Sample Edits file, and apply the edits to the Sampled Sound Wave data.

### When Does Auto-Load Delete All Sampled Sounds?

When you load a SAMPLE-BANKS file or a 60-SEQ/SONGS file that was saved with Sample Banks into the TS-12, and then answer *YES* to the AUTO LOAD ALL Sampled Sounds prompt, it deletes all currently loaded Sampled Sounds and Sample Edits in the TS-12, with the following exceptions:

- If the same Sampled Sound is being loaded into the same BankSet and Bank location, the old data is kept and the load is skipped.
- If the same Sampled Sound is being loaded into the same BankSet, but into a different Bank location, it will be moved to the correct location.
- If the same Sampled Sound is being loaded into the same BankSet, but into a different Bank location, and has had any parameter and/or effect edits made to it, but was not saved as a Sample-Edits file, the Sampled Sound will be moved, and the parameter edits will be moved, but the edited effects settings will be discarded. The original Sampled Sound effects settings will be reinstalled into the new location.
- If the same Sample-Edits file is being loaded into the same BankSet, but into a different Bank location, it will also be moved. If there were parameter and/or effect edits that were not resaved to the Sample-Edits file, the edited parameter and effect settings will be moved to the new location.
Selecting a WaveSample or Layer for Editing — the Edit Context page (Select Voice button)

In the next two sections of the manual, all the tools available for editing a raw WaveSample will be covered. Almost all of the Sampled Sound parameters will require you to select either a WaveSample or Layer for editing. The procedure for doing this is quite simple:

- Select the Sampled Sound that you want to edit (it should be underlined).
- Press the Select Voice button, which is the Edit button for Sampled Sounds. The TS-12 displays the Edit Context page:

```
EDIT SAMPLEDSOUND LAYER=A WAVESMPL=ALL
00 LAYERS-IN-PATCH=12------
```

You see the currently selected Sampled Sound, layer (stereo or mono), and WaveSample.

- Press the top right soft button to move the cursor (underline) beneath the WaveSample Number (WAVESMPL=ALL).
- Play the keyboard to select the WaveSample you want to work on. When you play the keyboard, the WaveSample Number showing on the display will change as you play different WaveSamples. Whichever WaveSample Number is showing is considered the current “edit WaveSample” — the one that will be affected by any WaveSample Edit functions.
- To perform editing on all WaveSamples in an entire layer, press the top middle soft button. The cursor should be beneath the Layer Number (LYR=__). You can select the various layers within the Sampled Sound by using the Data Entry Controls. Only layers active in the current patch can be edited (active layers are displayed on the bottom of the display). If the layer number has an “L” or an “R” directly after it, then it is defined as a Left or Right stereo layer. Any edits to WaveSamples in a stereo layer will also affect the WaveSamples in its “companion” layer, even if the companion layer is not active in the current patch.
- To perform editing on all active layers and WaveSamples in a Sampled Sound, make sure the cursor is beneath the Name (by pressing its soft button). The Layer Number reads LYR=A, and the WaveSample Number reads WAVESMPL=ALL. Now any WaveSample parameter edits will affect all layers and WaveSamples in the current patch.
- When LYR=A or WS=ALL, the Data Entry Controls function as described below:

**Note:** When STEREO=ON on the Layer page (found by pressing the Program Control button), editing layer or WaveSample parameters in one layer will edit the same parameter in its companion layer. Editing with the Data Entry Slider will set the current parameter in both layers to the same absolute value. Editing with the Up/Down Arrow buttons will edit parameter values in both layers relative to one another.

**Tip:** When the cursor is beneath the Layer Number on the Edit Context page, selecting any WaveSample Edit page, and pressing different keys, will display the parameter values for the WaveSamples assigned to that key range in the selected layer.

**Note:** Always make sure the WaveSample you want to edit is selected on the Edit Context page.

**Note:** Wherever you see the notation ##, that symbol will represent the numeric value of a parameter whose setting or level is considered arbitrary to the subsequent discussion. For example, if LOOP-POSITION=##, the ## represents the entire range of this parameter. You can use the Data Entry Slider or Up/Down Arrow buttons to explore the range of values.
Tip: When editing Sampled Sounds, alternate presses of the Edit (Select Voice) button will toggle between the last selected editing page or sub-page, and the Edit Context page.

LAYERS-IN-PATCH (Layer Enable/Disable)

Using the Patch Select Buttons

The two patch select buttons above and to the left of the wheels can be programmed to provide instant access to up to four completely different sounds within each Sampled Sound. These variations might be a different set of samples, or the same samples with different envelopes, or a chorused version of the sound, or perhaps a different range of a wave sample.

What you are doing when you press either or both of the patch select buttons is selecting different layers to play. A layer is a group of WaveSamples spread across the keyboard — each Sampled Sound can have up to eight layers. For each of the four possible patches, any of these eight layers can be made to play or to remain silent.

- The patch select buttons are “momentary” — an alternate patch will play only on notes played while the button is held down unless you “lock in” a Patch.
- To “lock in” a particular patch so that it will play without having to hold any buttons: press the Performance Options button, and use the data entry controls to select the particular patch.
- To return to the default patch (neither patch button down) after you have “locked in” one of the other patches, press the Performance Options button again and set it to LIVE.

Here’s how a typical Sampled Sound might react when you press the patch select buttons:

<table>
<thead>
<tr>
<th>Patch Select Status</th>
<th>The Bottom Line of the Display shows:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neither button pressed</td>
<td>LAYERS-IN-PATCH=12-------</td>
</tr>
<tr>
<td>Press</td>
<td></td>
</tr>
<tr>
<td>Press</td>
<td>LAYERS-IN-PATCH=---34----</td>
</tr>
<tr>
<td>Press</td>
<td>LAYERS-IN-PATCH=-----56--</td>
</tr>
<tr>
<td>Press</td>
<td>LAYERS-IN-PATCH=-------7B</td>
</tr>
</tbody>
</table>

- A number means that a given layer is enabled, and will play in that patch;
- A dash means that the layer is disabled for that patch and will not play.
**TS-12 Sampled Sound Messages**

Sampled Sound messages are displayed for one second and indicate either successful completion or non-fatal error conditions encountered during a Sampled Sound operation:

- **SELECTED LAYER IS NOT IN PATCH** - indicates that you are attempting to edit a WaveSample in a layer that is not enabled in the current patch. See the above description of the LAYERS-IN-PATCH parameter for more information.
- **LAYER EDIT NOT ALLOWED** — certain parameters, like the Wave page parameters, can only be edited when the Edit Context page is set up to edit a single WaveSample (WAVESAMPLE=###). This message will be displayed if you try to edit those parameters with the Edit Context set up to edit an entire layer or an entire Sampled Sound. See the above description of the Edit Context page for more information.
- **NO STEREO COMPANION LAYER** — appears if you try to turn on the Layer page STEREO parameter when no companion layer exists. See the description of the STEREO parameter in the next section for more information.

**Programming Patches**

The LAYERS-IN-PATCH parameter allows you to program a layer—or combination of layers—to either play or not play depending on which patch select buttons are pressed.

To program patches:
- Select the Sampled Sound that you would like to program patches.
- Press the **Select Voice** button.
- With no patch select buttons pressed, use any of the bottom soft buttons to select the individual layers and the **Up/Down Arrow** buttons to enable and disable them. This will program the default patch (the one that will play with no patch select buttons pressed).
- Once the default patch is programmed, press the left patch select button. Notice that the left hand character in the display is now an asterisk, rather than a zero. This indicates the status of the particular patch select button.
- With the left patch select button held down, use the soft buttons to select the individual layers and the **Up/Down Arrows** to enable and disable them, as you did with the default patch.
- Repeat the procedure with the right hand patch select button held down, then with both patch select buttons held down.
- Remember to use the SAMPLE-EDITS save file type after you’ve made any changes.

The Patch Select buttons are transmitted and received over MIDI as MIDI controller #70.

**What is a Surrogate Program**

Because Sampled Sounds are stored in dynamic RAM (DRAM), which can only operate while power is on, they are not saved when the TS-12 power switch is turned off. If you should unexpectedly lose power, or have to power down for some unknown reason, you can define a substitute Program that will play on each Track that originally contained a Sampled Sound, until you can load the Sampled Sound back into the TS-12. This substitute Program is called a **Surrogate Program**. A Surrogate Program will also play whenever you mute a Sampled Sound (by pressing the soft button beneath *MUTE* on the Sampled Sound Bank OPTIONS sub-page).

All defined Preset or Sequence Tracks **always** have a Program assigned to them. When a Sampled Sound is put on a Track, it “covers up” the Program. When the power is turned off, the Sampled Sound (being in dynamic RAM) is gone. The next time you power on, you will hear the “uncovered” Surrogate Program until you reload the Sampled Sound.

**Tip:** To determine which Sampled Sound bank has been assigned to a track before power-off, press and hold either **Seq/Song Tracks** button, and while holding it down, press the **Sounds** button.
Assigning a Surrogate Program to a Track

A Surrogate Program can be assigned to each Sequencer and Presets Track that contains a Sampled Sound. To assign a Surrogate Program to a Sequence track:

- Load the Sampled Sound into the TS-12, and select it (underlined on the Sampled Sound Bank page).
- Press the Seqs/Songs button, select a -BLANK- location, and create a new sequence. Because the Sampled Sound was selected, it becomes the default sound assigned to Track 1.
- Record sequence Track data using the Sampled Sound. By having recorded data on the track, you will be able to hear the difference as you select an appropriate Surrogate Program.
- Make sure the Track on which the Sampled Sound resides is selected by pressing its soft button on the TRAX page (found by pressing the Seq/Song Tracks 1-6 or 7-12 buttons).
- Press Replace Track Sound once (its LED is solidly lit), and the Sounds LED will be flashing.
- At this point, you can shop around using the BankSet, Bank and soft buttons to find an appropriate Program to use as the Surrogate Program for your Sampled Sound.
- When you’ve found the Program that you want to assign as the Surrogate Program, press Replace Track Sound again. This sends you back to the TRAX page showing that the Sampled Sound Track has been “replaced” by the Surrogate Program. You have just defined the Surrogate Program.

To reassign the Sampled Sound back to the Track:
- Press Replace Track Sound once. Its LED should be solidly lit, and the Sounds LED will be flashing.
- Use the BankSet, Bank and soft buttons to find and select the original Sampled Sound.
- After you’ve selected the original Sampled Sound, press Replace Track Sound again. The TRAX page will be displayed, and you can see that the Sampled Sound now resides on the Track. You have just assigned a Sampled Sound to a Track and defined its Surrogate Program.

Tip: There is a quick way to audition the Surrogate Program in a sequence or song:
- Press the Sounds button and go to the Sampled Sound Bank page.
- Press OPTIONS, then the *MUTE* button on the bottom of the options sub-page. Notice that the Sampled Sound name is now in brackets (parentheses).
- Press the Play button. The Track Sound you will hear is the Surrogate Program.

Erasing All Sampled Sound Data From Memory

If you want to clear the Sampled Sound memory, and start out with a “blank canvas”, you can easily delete all of the loaded Sampled Sound and Sample-Edits from the TS-12 all at one time. This function will also delete the information about which Sampled Sounds had previously been loaded into Sampled Sound Banks.

Note: This can also be used to prevent the Auto-Load prompt from being displayed on power-on.

Here’s how:
- While holding down the Presets button, press the bottom center soft button in the display. The display will show:

```
ALL SAMPLED-SOUND DATA *YES* WILL BE ERASED *NO*
```

- Pressing the soft button above *YES* will erase all Sampled Sound data. Pressing the soft button beneath *NO* will abort the procedure, and any loaded Sampled Sound and Sample-Edits will remain in the TS-12.
Saving Sampled Sound Information

Although you cannot save Sampled Sound wave data from the TS-12, there are two options for saving Sampled Sound information on the Storage page. To access these:

- Press Storage to go to the Storage page.
- Press DISK. The Disk Storage menu appears.
- Press SAVE. The Save File display appears as shown above. The file type is underlined.

The two file types available for saving Sampled Sound information are:

- SAMPLE-BANKS — This file type will remember the name, source disk and file path, and the location of each Sampled Sound currently loaded in the TS-12. This can be useful in remembering which Bank locations certain Sampled Sounds are loaded into. This file type will also offer you the option to Auto-Load all Sampled Sounds (and Sample-Edits) that make up the SAMPLE-BANKS file.
- SAMPLE-EDITS — This file type will save all of the edited parameter information, as well as the effect for the Sampled Sound. This file type does not store the wave data for the Sampled Sound. The wave data must be loaded from the original EPS/EPS-16 PLUS/ASR-10 disk (or SCSI Storage Device, or CD-ROM with the optional SP-4 installed) after the SAMPLE-EDITS file has been loaded (explained later in this section).

- When you press *YES* for either file type, the display shows:

```
SAVE FILE NAME=SAMPLE-BANKS *YES*
LEFT -CURSOR- RIGHT *NO*  
```

- Name the file with a name of your choice using the data entry controls and the two cursor soft buttons, labeled LEFT and RIGHT.
- Press *YES*. The display reads SAVING <FILENAME> while the data is being saved to disk. Or Press *NO* to cancel the procedure for any reason.
- If there is a file of that type with the same name already on the disk, the TS-12 will ask DELETE OLD VERSION? Press *YES* to save the file, replacing the one on the disk. This is for updating files to which you have made changes. Or press *NO* to abort the procedure.
- After the file is saved, the TS-12 returns to the Save File page so that you can save any other files you may want to save at that time.

What is a Sample-Banks File

A Sample-Banks file remembers up to 20 Sampled Sound names (ten in BankSet 8 and ten in BankSet 9, if applicable) as well as their source disk(s), file paths, and Bank locations. Loading a Sample-Banks file will allow you to Auto-Load the Sampled Sound files back into the same location(s) that they were in at the time the Sample-Banks file was saved.

Saving a Sample-Banks File

Because a Sample-Banks file remembers up to 20 Sampled Sound names, their source disk(s), file paths, and Bank locations, any Sampled Sounds Banks that you do not want to save as part of a Sample-Banks file must be deleted prior to saving the Sample-Banks file. This will prevent the AUTO-LOAD feature from requesting unwanted Sampled Sounds files.

When you are ready to save a Sample-Banks file, first verify that there are no additional Sampled-Sounds loaded into the TS-12 that you do not want to save with the Sample-Banks file, and that there are no - NOT LOADED- Sample Sound Bank locations that you do not want reloaded.
Here’s how:

- Press **Sounds**.
- While holding down the **BankSet** button, press the **Bank 8** button. This displays Sampled Sound BankSet 8.
- Press each of the **Bank** buttons (0-9) and verify that for each Sampled Sound Bank, the bottom center of the display shows the name of a Sampled Sound that you want to save with the Sample-Banks file, or (*EMPTY-BANK*).

**Note:** If you have expansion SIMMs installed, after viewing BankSet 8, repeat the previous step for BankSet 9. To select BankSet 9, press the **BankSet** button once.

- If you should find a Sampled Sound either loaded (muted or unmuted) or - -NOT LOADED- - that you do not want to save with the Sample-Banks file, press the bottom right soft button beneath OPTIONS.
- Press the bottom left soft button to *DELETE* the Sampled Sound. The display shows:

  ![Sampled Sound Delete Screen]

  - Press the soft button above *YES*.
  - Repeat these steps for all Sampled Sound Banks that contain Sampled Sounds that you do not want to save with the Sample-Banks file.
  - When you are sure that all Sampled Sounds that you do not want to save with the Sample-Banks file are deleted, insert a formatted TS-12 floppy disk into the disk drive.

- Press **Storage**.
- Press the bottom center soft button beneath DISK.
- Press the bottom left soft button beneath SAVE. The display shows the Save File page:

  ![Sampled Sound Save Screen]

  - Use the Data Entry Controls to select TYPE=SAMPLE-BANKS.
  - Press the soft button above *YES*.
  - At this point you can use the Data Entry Controls and the LEFT and RIGHT CURSOR controls to name the SAMPLE-BANKS file. When you’ve written a name for the file,
  - Press the soft button above *YES*. The display momentarily shows SAVING <file name>, then DISK COMMAND COMPLETED, then reverts back to the SAVE FILE page.
  - You have just successfully saved a Sample-Banks file.
Updating Sample-Banks Files Saved with Software Earlier than Version 2.0

If you have any Sample-Banks files that were created on the TS-10 or TS-12 using software earlier than version 2.0, they may not Auto-Load properly. Follow this procedure to update them for use with the version 2.0 Auto-Load feature:

- Insert the floppy disk with the Sample-Banks file into the disk drive.
- Press Storage, then the soft button in the display beneath DISK, followed by the soft button beneath *LOAD*. The LOAD FILE page will be displayed.
- Use the Data Entry Controls to select TYPE=SAMPLE-BANKS. The display shows:

<table>
<thead>
<tr>
<th>The name of the SAMPLE-BANKS file</th>
<th>The size of the SAMPLE-BANKS file</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOAD FILE=MY SET-UP</td>
<td>SIZE=3</td>
</tr>
<tr>
<td>TYPE=SAMPLE-BANKS</td>
<td></td>
</tr>
</tbody>
</table>

- Press the upper left soft button, and use the Data Entry Controls to locate your Sample-Banks file.
- Press the soft button above *YES* to load your Sample-Banks file. The display shows:

  | ALL SAMPLED-SOUND DATA           | will be erased                    |
  |                                   |                                   |
  |                                    |                                   |
  |                                    |                                   |
  |                                    |                                   |

- Press the soft button above *YES* The display momentarily shows LOADING <Sample-Banks file name>, and then shows:

  | AUTO-LOAD ALL SAMPLED-SOUNDS      |                                    |
  |                                   |                                    |
  |                                   |                                    |
  |                                   |                                    |
  |                                   |                                    |

- Press the soft button beneath *NO*. The Sampled Sound Banks will now contain the names and types of the files to be reloaded, but not the Sampled Sound data.
- All Sampled Sound Bank locations that you do not want to save within the SAMPLE-BANKS file should be deleted from both BankSets S8 and S9, if applicable, using the "DELETE" Option found on the Sampled Sound Bank OPTIONS sub-page.
- All SAMPLE-EDIT files and their associated Sampled Sound files should be manually reloaded into their correct Bank locations.
- All SAMPLE-EDIT files should be manually resaved to a TS-12 disk.
- All Sampled Sounds should be manually reloaded into their correct Bank locations.
- The SAMPLE-BANKS file should then be resaved to a TS-12 disk in its updated form.

After performing this procedure, loading a Sample-Banks file and answering *YES* to the AUTO-LOAD prompt will properly load the Sampled Sounds and Sample Edits back into their original locations.
Loading a Sampled Sound into an Occupied Sampled Sound Bank

When loading a Sampled Sound, you can replace a currently loaded Sampled Sound with the one you want to load. For this example, we'll replace GUITR STRUMS with RS PERCS (both of these Sampled Sound files are found on the SSD-100 disk that came with your TS-12). Here's how:

- Insert the SSD-100 disk into the disk drive.
- Press Storage, press DISK, then press *LOAD*. The display shows:

```
LOAD FILE=VOCAL SNIPS   SIZE=420   *YES*
TYPE=SAMPLED|SND  DIR=ROOT   *NO *
```

- Press the upper left soft button in the display to select the file name (VOCAL SNIPS will be underlined).
- Press the Up Arrow button twice to select GUITR STRUMS.
- Press the *YES* button in the display to load the GUITR STRUMS file. The display shows:

```
USE BANK BUTTONS TO SELECT LOCATION
FREE=XXXX   BANKSET=0   *EXIT*
```
To load RS PERCS into BankSet 8, Bank 0 (replacing GUITR STRUMS), while holding down the Bank 0 button, press the lower right soft button in the display beneath the word *DELETE*. The display momentarily shows LOADING RS PERCS, then reverts back to the LOAD FILE page. You have just successfully loaded a Sampled Sound file into an occupied Sampled Sound Bank.

If you press a Bank button that does not have a Sampled Sound loaded (no LED lit), the TS-12 will immediately load the new Sampled Sound file.

**Loading Sample-Edits**

When loading a SAMPLE-EDITS file type, which contains edit parameter settings as well as the Sampled Sound effect, there are a few additional display requests. When a SAMPLE-EDITS file is loaded the following display appears:
Lack of Memory Message

If you try loading a Sampled Sound and do not have enough free memory available, the following display will appear:

```
NOT ENOUGH ROOM - SELECT BANK TO DELETE
SHORTAGE=XXXX *EXIT*
```

At this point, you can select a loaded Sampled Sound Bank location to delete by pressing and holding the appropriate Bank button. The display will show the name of the Sampled Sound in that Bank location with the word *DELETE* flashing in the lower right corner of the display for as long as the Bank button is held down:

```
S8-0 SAMPLED-SOUND    DISK NAME=SSD-100
SIZE=1251    GUITAR STRUMS *DELETE*
```

While holding down a Bank button, if you press the soft button beneath *DELETE*, that Sampled Sound Bank will be deleted. If the Sampled Sound Bank that you select to delete is smaller than the SHORTAGE amount, the SHORTAGE amount will be adjusted, showing how many blocks are still needed to load the Sampled Sound file. You may continue to erase Sampled Sound Banks until there is enough free memory to load the Sampled Sound, at which point the file will automatically load. Press the soft button beneath *EXIT* to abort the LOAD FILE procedure.

Note that with expansion SIMMs installed (2x4 megabyte SIMMs), the two BankSets S8 and S9 are completely separate, and Sampled Sound memory blocks cannot overlap from one BankSet into the other. The SHORTAGE value indicates the memory shortage in the BankSet that was selected as the target for loading the Sampled Sound.
Modulators

About Modulation
Various parameters within the voice architecture of Sampled Sounds can be modulated in the exact same way as Program Sounds. For a complete description of the TS-12 Modulation Sources, see Section 8 — Understanding Programs.

Selecting a Modulator
On programming pages where a modulator can be selected to modulate a given modulation destination, the display shows MODSRC=__ (short for Modulation Source). A modulator is chosen by selecting (underlining) the MODSRC= parameter with the soft buttons, and then using the Data Entry Slider or the Up/Down Arrow buttons to select among the 15 available modulation sources.

Tip: Moving the Data Entry Slider all the way up selects OFF, which is handy if you don’t want a modulator applied to a particular destination.

Let’s take, for example, the Pitch Mods page, which is where you apply modulation to the pitch of a WaveSample (i.e. Pitch is the modulation destination). Press Pitch Mods, then the soft button above MODSRC. The following display appears:

Modulation Amount
As shown above, where a modulation source is selected, the parameter immediately to its right controls the Modulation Amount which controls how deeply the selected modulator will affect the level to which it is being applied.

Press the Right Arrow button to underline the Modulation Amount, and use the data entry controls to adjust it. Modulation amount can be positive or negative. A modulation amount of +00 has the same effect as turning the modulator OFF.
This section offers detailed descriptions of the specific parameters used in editing Sampled Sounds. A Sampled Sound must be selected in Sounds mode in order for these parameter pages to be displayed. Most parameters are available on a per WaveSample basis, except for the parameters on the Layer page that apply to all WaveSamples in entire layers. For an overview of the concepts involved, refer to the previous section.

**Edit KEY-DOWN/KEY-UP LAYERS Page (Copy button)**

The parameters on this page control which layer(s) will be triggered when the keyboard is played. To access these parameters press **Copy**, which is the Sampled Sound Edit KEY-DOWN/KEY-UP button.

**KEY-DOWN-LAYERS**

This parameter determines which layer(s) will be triggered when a key is pressed down.

- Select KEY-DOWN-LAYERS=#####. Successive presses of the soft button above KEY-DOWN-LAYERS will move the cursor through the numbers representing each layer. When the desired layer number is underlined, use the **Data Entry Slider** or **Up/Down Arrow** buttons to select either a number (layer enabled on keydown) or a dash (layer disabled on keydown) for each layer.

**KEY-UP-LAYERS**

This parameter determines which layer(s) will be triggered when a key is released. A good example of this would be the “thunk” sound made by a harpsichord when you release a key. This release sound can be a separate sample placed in a layer designated as a keyup layer. If you want a layer to be triggered only when keys are released, first enable the layer on the KEY-UP-LAYERS parameter, and then disable the same layer on the KEY-DOWN-LAYERS parameter.

- Select KEY-UP-LAYERS=#####. Successive presses of the soft button beneath KEY-UP-LAYERS will move the cursor through the numbers representing each layer. When the desired layer number is underlined, use the **Data Entry Slider** or **Up/Down Arrow** buttons to select either a number (layer enabled on keyup) or a dash (layer disabled on keyup) for each layer.

**PATCH**

Selects the default patch select mode for the Sampled Sound. When set to **LIVE**, it uses the current state of the buttons to select a patch. When set to **HELD**, it uses the patch set by the first key hit while touching the patch select buttons. When set to any of the 4 patches (00, -0*, -*0-, -*0-*), the Sampled Sound will ignore the patch selects and will always play the layers in the selected patch. For more information about patch selects, refer to Sections 4 and 5. This is the default setting that will be installed into a track when the Sampled Sound is selected.
TRK Defaults Page (Write Program button)
The parameters on this page are the default settings for the Track parameters that are stored with the Sampled Sound when it is saved as a SAMPLE-EDITS file. For more information about how these parameters function, see Section 5 — Preset/Track Parameters. To access these parameters press Write Program, which is the Sampled Sound TRK button.

The Sampled Sound TRK page contains copies of track parameters that are saved in the Sampled Sound. When a Sampled Sound is selected or put on a track, values of these parameters are installed in the track as the default initial settings. They can be edited on the track pages without affecting the Sampled Sound default settings, but must be edited on this page in order to be saved with the SAMPLE-EDITS feature. Changes made here will be copied to the current primary track.

XPOS
Range: -64 to +63
This parameter is the default transposition for the Sampled Sound. It is a transposition offset independent of the Track TRANSPOSE setting, and determines the pitch of the Sampled Sound when Track TRANSPOSE is set to +0 +00 (i.e.: nominal pitch). Editing this parameter will not edit the Track TRANSPOSE value.

BRIGHT
Range: -64 to +63
Editing the BRIGHT parameter default values will simultaneously edit the Track BRIGHTNESS parameter values on the track that the Sampled Sound is occupying. This is the default setting that will be installed into a track when the Sampled Sound is selected.

RATE
Range: -64 to +63
Editing the RATE parameter default values will simultaneously edit the Track RATE parameter values on the track that the Sampled Sound is occupying. This is the default setting that will be installed into a track when the Sampled Sound is selected.

RELS
Range: -64 to +63
Editing the RELS parameter default values will simultaneously edit the Track RELEASE parameter values on the track that the Sampled Sound is occupying. This parameter will affect the Time 5 value for Envelopes 1, 2 and 3. This is the default setting that will be installed into a track when the Sampled Sound is selected.

PRESS
Range: OFF, KEY, or CHAN
Allows you to select Poly-Key, Channel, or no pressure for the Sampled Sound. Generally, if a Sampled Sound doesn’t need to respond to pressure, set this to OFF to conserve sequencer memory. This is the default setting that will be installed into a track when the Sampled Sound is selected.

XCTRL
Range: 000 to 127
Editing the XCTRL parameter default values will simultaneously edit the Track XCTRL Parameter values on the track that the Sampled Sound is occupying. This parameter will only function if XCTRL has been assigned as a modulator within the selected Sampled Sound. This is the default setting that will be installed into a track when the Sampled Sound is selected.
LFO Page
The LFO Page contains the parameters related to the Low Frequency Oscillator. Each WaveSample has its own LFO, which can be assigned as a modulator wherever a modulation source is selected. LFO's are commonly used to create vibrato, tremolo, and other effects.

Press the LFO button. This takes you to the first sub-page of the LFO page:

```
LFO RATE=40 MODSRC=PRESS MODAMT=+0
DEPTH=0 MODSRC=HEEL MODAMT=+99
```

RATE
Range: 0 to 99
Determines the speed of the LFO. The table below shows the frequency (in hertz) for each value:

<table>
<thead>
<tr>
<th>value</th>
<th>time (in Hz)</th>
<th>value</th>
<th>time (in Hz)</th>
<th>value</th>
<th>time (in Hz)</th>
<th>value</th>
<th>time (in Hz)</th>
<th>value</th>
<th>time (in Hz)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>.05</td>
<td>20</td>
<td>1.25</td>
<td>40</td>
<td>6.25</td>
<td>60</td>
<td>11.25</td>
<td>80</td>
<td>16.25</td>
</tr>
<tr>
<td>1</td>
<td>.05</td>
<td>21</td>
<td>1.50</td>
<td>41</td>
<td>6.50</td>
<td>61</td>
<td>11.50</td>
<td>81</td>
<td>16.50</td>
</tr>
<tr>
<td>2</td>
<td>.06</td>
<td>22</td>
<td>1.75</td>
<td>42</td>
<td>6.75</td>
<td>62</td>
<td>11.75</td>
<td>82</td>
<td>16.75</td>
</tr>
<tr>
<td>3</td>
<td>.08</td>
<td>23</td>
<td>2.00</td>
<td>43</td>
<td>7.00</td>
<td>63</td>
<td>12.00</td>
<td>83</td>
<td>17.00</td>
</tr>
<tr>
<td>4</td>
<td>.09</td>
<td>24</td>
<td>2.25</td>
<td>44</td>
<td>7.25</td>
<td>64</td>
<td>12.25</td>
<td>84</td>
<td>17.25</td>
</tr>
<tr>
<td>5</td>
<td>.07</td>
<td>25</td>
<td>2.50</td>
<td>45</td>
<td>7.50</td>
<td>65</td>
<td>12.50</td>
<td>85</td>
<td>17.50</td>
</tr>
<tr>
<td>6</td>
<td>.07</td>
<td>26</td>
<td>2.75</td>
<td>46</td>
<td>7.75</td>
<td>66</td>
<td>12.75</td>
<td>86</td>
<td>17.75</td>
</tr>
<tr>
<td>7</td>
<td>.08</td>
<td>27</td>
<td>3.00</td>
<td>47</td>
<td>8.00</td>
<td>67</td>
<td>13.00</td>
<td>87</td>
<td>18.00</td>
</tr>
<tr>
<td>8</td>
<td>.08</td>
<td>28</td>
<td>3.25</td>
<td>48</td>
<td>8.25</td>
<td>68</td>
<td>13.25</td>
<td>88</td>
<td>18.25</td>
</tr>
<tr>
<td>9</td>
<td>.09</td>
<td>29</td>
<td>3.50</td>
<td>49</td>
<td>8.50</td>
<td>69</td>
<td>13.50</td>
<td>89</td>
<td>18.50</td>
</tr>
<tr>
<td>10</td>
<td>.10</td>
<td>30</td>
<td>3.75</td>
<td>50</td>
<td>8.75</td>
<td>70</td>
<td>13.75</td>
<td>90</td>
<td>18.75</td>
</tr>
<tr>
<td>11</td>
<td>.11</td>
<td>31</td>
<td>4.00</td>
<td>51</td>
<td>9.00</td>
<td>71</td>
<td>14.00</td>
<td>91</td>
<td>19.00</td>
</tr>
<tr>
<td>13</td>
<td>.14</td>
<td>33</td>
<td>4.50</td>
<td>53</td>
<td>9.50</td>
<td>73</td>
<td>14.50</td>
<td>93</td>
<td>19.50</td>
</tr>
<tr>
<td>14</td>
<td>.17</td>
<td>34</td>
<td>4.75</td>
<td>54</td>
<td>9.75</td>
<td>74</td>
<td>14.75</td>
<td>94</td>
<td>19.75</td>
</tr>
<tr>
<td>15</td>
<td>.20</td>
<td>35</td>
<td>5.00</td>
<td>55</td>
<td>10.00</td>
<td>75</td>
<td>15.00</td>
<td>95</td>
<td>20.00</td>
</tr>
<tr>
<td>16</td>
<td>.25</td>
<td>36</td>
<td>5.25</td>
<td>56</td>
<td>10.25</td>
<td>76</td>
<td>15.25</td>
<td>96</td>
<td>20.25</td>
</tr>
<tr>
<td>17</td>
<td>.33</td>
<td>37</td>
<td>5.50</td>
<td>57</td>
<td>10.50</td>
<td>77</td>
<td>15.50</td>
<td>97</td>
<td>20.50</td>
</tr>
<tr>
<td>18</td>
<td>.50</td>
<td>38</td>
<td>5.75</td>
<td>58</td>
<td>10.75</td>
<td>78</td>
<td>15.75</td>
<td>98</td>
<td>20.75</td>
</tr>
<tr>
<td>19</td>
<td>1.00</td>
<td>39</td>
<td>6.00</td>
<td>59</td>
<td>11.00</td>
<td>79</td>
<td>16.00</td>
<td>99</td>
<td>21.00</td>
</tr>
</tbody>
</table>

RATE MODSRC
Range: various
Selects a modulation source for LFO RATE from among the 15 available modulators.

RATE MODAMT
Range: 0 to 99
Determines the amount by which the assigned RATE modulator will affect the LFO RATE. The effect of RATE MODAMT is added to the effect of the LFO RATE parameter.

DEPTH
Range: 0 to 99
Sets the “manual” level of the LFO. DEPTH controls the initial amount of LFO.

DEPTH MODSRC
Range: various
Selects a modulation source for LFO DEPTH from among the 15 available modulators.

DEPTH MODAMT
Range: 0 to 99
Determines the amount by which the assigned DEPTH modulator will affect the LFO DEPTH. The effect of DEPTH MODAMT is added to the effect of the LFO DEPTH parameter.

Press the LFO button again to access the second sub-page of the LFO page. The display reads:
**WAVESHAPE**

Range: various (see below)

Determines how the LFO signal will rise and fall. There are seven possible values:

- **TRIANGLE** — the triangle wave is commonly used to modulate pitch to produce vibrato.
- **SINE/TRI** — a mixture of a sine and triangle wave, a sort of pointy sine wave.
- **SINE** — the sine wave is a pure fundamental frequency, more rounded in its peaks and valleys than the triangle wave.
- **POS/TRI** — the POS/TRI is a positive-only triangle wave useful for simulating vibrato on sounds like the guitar, where vibrato techniques are limited to bending the note up.
- **POS/SINE** — the POS/SINE is a positive-only sine wave, similar in application to the POS/TRI.
- **SAWTOOTH** — the sawtooth wave is commonly used for special effects.
- **SQUARE** — this positive-only square wave is useful for producing in-tune trill effects.

**LFO Waveshapes**

![LFO Waveshapes Diagram](image-url)
**RESTART-MODE**
Range: OFF or ON
Determines whether the LFO will restart with each keystrike. When set to OFF, the LFO will cycle continuously without restarting. When set to ON, the LFO waveform will always start at the beginning of its cycle each time a new key is struck.

**DELAY**
Range: 0 to 99
Determines the time it takes for the LFO to go from zero to the amount set with the DEPTH parameter. Values above 0 will cause the LFO to take longer to achieve its full depth. This is useful for creating delayed vibrato, tremolo, etc.

**NOISE-RATE**
Range: 0 to 99
One of the TS-12’s 15 available modulation sources is NOISE. The NOISE modulator produces a randomly changing level. Its main use is to randomize or “humanize” pitch when applied as a pitch modulator. It can also be used to randomize any other modulation destination. Typically, the NOISE signal might look like this:

```
+100
0
-100
```

Noise Rate

NOISE-RATE determines how frequently the random level will change. Low values will cause it to change very slowly; with high values the level will change quickly.
WaveSample Envelopes

Each WaveSample has three envelopes associated with it. These envelopes are hard-wired to the pitch, filter cutoff frequency, and amplitude of the WaveSample. Env 1 and Env 2 can also be assigned elsewhere, wherever a modulator is selectable. Each of the three envelope buttons are directly above the page buttons for the function that they are hard-wired to:

- Env 1 is hard-wired to WaveSample pitch modulation.
- Env 2 is hard-wired to WaveSample filter cutoff frequency.
- Env 3 is hard-wired to WaveSample output volume.

About ENV 3

The ENV3 LEVEL parameters and the WaveSample VOL parameter on the Output page both use the same (non linear) response curve. As shown below, setting any of these volume controls to 50 will attenuate a sound by 16 dB.

<table>
<thead>
<tr>
<th>HARD OR SOFT LEVEL RESPONSE (dB)</th>
<th>LEVEL AMPLITUDE</th>
</tr>
</thead>
<tbody>
<tr>
<td>99</td>
<td>0 dB</td>
</tr>
<tr>
<td>75</td>
<td>-8 dB</td>
</tr>
<tr>
<td>50</td>
<td>-16 dB</td>
</tr>
<tr>
<td>25</td>
<td>-32 dB</td>
</tr>
<tr>
<td>6</td>
<td>-56 dB</td>
</tr>
<tr>
<td>0</td>
<td>-∞ (infinity)</td>
</tr>
</tbody>
</table>

Typical WaveSample Envelope

The figure below shows a typical WaveSample envelope shape:

The WaveSample envelopes have six times and six levels. The envelope parameters allow you to describe two entirely different shapes; one for maximum velocity (VEL-HARD) and one for minimum velocity (SOFT). When a key is struck, the envelope generator interpolates between the two, creating a curve that is a combination of the two based on the incoming velocity.
ENV1, ENV2, ENV3 Pages
The ENV1, ENV2, and ENV3 Pages, parameters and ranges are all the same except where indicated below. We will use ENV3 as our example, since its effect on the volume of the WaveSample is immediately apparent.

Press the Env 3 button. The display shows the first ENV3 sub-page.

### LEVELS - VEL-HARD
Ranges: 0 to 99
VEL-HARD shows the five levels for the envelope that will be used with maximum velocity. Level-1 is the initial level. In a traditional ADSR shape, Level-1 is always set to zero. Level-5 is the sustain level.

### LEVELS - SOFT
Ranges: 0 to 99
SOFT shows the five levels for the envelope that will be used with minimum velocity.

### TIMES
Ranges: 0 to 99
TIMES shows five time parameters. The first four are the times between the five levels. The fifth time is the (first) release time.

Note that the numbers shown here represent times, not rates. That is, the envelope will take a fixed amount of time to go from one level to another no matter how close together or far apart those two levels are.
Press the Env 3 button again. The display shows the second ENV3 sub-page.

2ND-RELEASE-TIME

REL-LEVEL

2ND-RELEASE-TIME and REL-LEVEL provide one more breakpoint in the envelope that occurs after the release time (TIME-5). The LEVEL value controls where the breakpoint will be placed relative to the current output level of the envelope at the time the key was released.
The following diagram illustrates how the 2ND-RELEASE-TIME and REL-LEVEL interact with the VEL-HARD and SOFT levels of a typical envelope shape.

![Diagram of envelope shape with key times and levels]

**KBD-TIME-SCALING**  
Range: -99 to +99  
KBD-TIME-SCALING makes the envelope times shorter or longer above and below the WaveSample root key depending on the key played. Positive values will make all envelope times shorter for keys above the root key, and longer for keys below the root key. Negative values will have the opposite effect. Envelope times for the WaveSample root key are not affected by this parameter. 2ND-RELEASE-TIME is also not affected by this parameter.

**VEL-ATCK-TIME**  
Range: 0 to 99  
This parameter makes envelope attack time (TIME-1) respond to velocity. Raising the VEL-ATCK-TIME value above zero makes TIME-1 shorter with harder keystrikes. If TIME-1 is set to zero this parameter will have no effect.

Press the Env 3 button again. The display shows the third ENV3 sub-page.

**Envelope MODE**  
Range: NORMAL, FINISH, REPEAT  
The MODE parameter has three states:

- **NORMAL**: The envelope will behave as pictured in the previous envelope diagrams.
- **FINISH**: The envelope will run through its full cycle, ignoring the key-up event. The envelope finishes what you set it up to do.
- **REPEAT**: The envelope will repeatedly cycle through LEVELS 2 through 5, using TIMES 1 through 4, for as long as the key is held down. When the envelope gets to LEVEL 5, it goes back to LEVEL 2.
SOFT-VEL-CURVE

Range: OFF, VEL, VEL1, VEL2

Determines how incoming velocity will affect the envelope’s interpolation between the SOFT and VEL-HARD level settings. There are four settings:

- OFF — The envelope uses only the VEL-HARD levels, regardless of velocity.
- VEL, VEL1, or VEL2 — Incoming velocity will modulate the envelope levels between the SOFT and VEL-HARD level settings, according to one of the following velocity curves:

![Velocity Curves](image)

Pitch Page

The Pitch page parameters determine the playback pitch for each WaveSample.

Press the Pitch button. The display shows the PITCH page.

![Pitch Page Display](image)

WS-ROOT-KEY

Range: K00 to K20, A0 to C8

This parameter allows you to change the WaveSample root key. The root key is the key at which the WaveSample plays back at the same pitch as it was recorded.

Note: Keys below A0 are displayed as K00 through K20. These values are only accessible when the Sampled Sound is transposed up.

FINE-TUNE

Range: -99 to +99 cents

This parameter adjusts the WaveSample fine-tuning.
Pitch Mods Page
The Pitch Mods page parameters control WaveSample pitch modulation.

Press the Pitch Mods button. The display shows the Pitch Mods page.

![Pitch Mods Page parameters](image)

Note: When STEREO=ON, all pitch modulation in the right layer will be slaved to the settings in the WaveSamples assigned to the same or overlapping key zones in the left layer. This includes BEND Range, NOISE RATE, and all pitch modulation. Pitch modulation settings for WaveSamples in the right layer will be ignored.

**MODSRC**
- **Range:** various
- Selects a modulation source for the pitch of the WaveSample from among the 15 available modulators.

**MODAMT**
- **Range:** -99 to +99
- Determines the amount by which the assigned pitch modulator will affect pitch.

**BEND**
- **Range:** 0 to 12 semitones or SYS
- Determines whether each WaveSample will have its own independent pitch bend range, or whether it will use the system pitch bend range to determine the maximum pitch change that can be applied by the pitch bend wheel. When BEND=SYS, the WaveSample will use the system pitch bend range setting. See the description of the PITCH-BEND parameter on the System Page in Section 2 — System Page Parameters for more information on the system pitch bend range.

**NOISE**
- **Range:** -99 to +99
- This parameter controls the amount by which the NOISE modulator will affect pitch.

**ENV1**
- **Range:** -15.7 to +15.7 semitones
- This parameter controls the amount by which ENV1 will affect pitch.

**LFO**
- **Range:** -15.7 to +15.7 semitones
- Determines the amount by which the LFO (Low Frequency Oscillator) will affect pitch.
TS-12 Filters

Each TS-12 WaveSample has its own pair of digital filters, F1 and F2, that are connected in series. The filter settings determine which frequencies will be allowed to pass through to the output.

Low-Pass and High-Pass

A low-pass filter allows only those frequencies below the filter cutoff frequency to pass—higher frequencies are filtered out. The reverse is true for the high-pass filters. In the TS-12, the first filter (F1) is always a low-pass filter. The second filter (F2) can be either a high-pass or low-pass filter.

Poles — Rolloff Curves

“Pole” is an engineering term that describes the steepness of a filter. Each additional pole gives a filter a steeper rolloff curve. In the TS-12, four poles are available, but they are divided between two filters; either as 2 and 2, or as 3 and 1. A single-pole filter will rolloff at 6 dB per octave; a 2-pole, 12 dB per octave; a 3-pole, 18 dB per octave; and 4-pole, 24 dB per octave. To reproduce a 4-pole low-pass filter (for that “classic” analog synth sound) you would set both filters to 2-pole low-pass. Each filter would then roll-off at 12 dB per octave, resulting in a total 24 dB per octave rolloff.

Cutoff Frequency

Every filter has a “knee” in the response curve, known as the cutoff frequency. This is the frequency at which the filter begins filtering out frequencies. The filter cutoff frequency can remain fixed over time, or it can be varied by modulating the filter with an envelope, LFO, velocity, etc. You can create some very interesting filter configurations by using a different modulator for each filter. For instance, try using pressure to modulate the filter. You can drive one filter up with pressure, while simultaneously driving the other down.

Edit/Filters Page

Use the parameters on this page to adjust the filters.

MODE (Filter Mode)

Use this parameter to choose one of the four filter modes.

The following diagrams show some possible filter configurations. On the left are the response curves of the two filters shown separately. On the right are some possible shapes of the combined filters.
Filter 1 = 3 pole / Low-pass
Filter 2 = 1 pole / Low-pass

Filter 1 = 2 pole / Low-pass
Filter 2 = 2 pole / Low-pass

Filter 1 = 2 pole / Low-pass
Filter 2 = 2 pole / High-pass

Filter 1 = 3 pole / Low-pass
Filter 2 = 1 pole / High-pass

Bandpass

(when F1 and F2 are tuned to the same frequency)
FILTER 1 Page
Press the Filters button. The display shows the FILTER1 page.

FILTER1 Mode
Range: LO-PASS/2 or LO-PASS/3
Determines whether Filter 1 will be a 2-pole or a 3-pole low-pass filter.

CUTOFF
Range: 0 to 150
Determines the initial filter cutoff frequency for each of the two filters. With a low-pass filter, a setting of 150 lets all the original signal pass through the filter. With a high-pass filter, a setting of 0 lets through all of the original signal. This setting represents the “filter floor,” or manual level. The effect of any selected modulators will be added to (or subtracted from) this level.

KBD
Range: -99 to +99
Sets the amount by which the location of a note on the keyboard will modulate the filter cutoff frequency (filter keyboard tracking). To have the filter track the keyboard exactly set KBD=+50.

MODSRC
Range: various
Selects a modulation source for the filter cutoff frequency from among the 15 available modulators.

MODAMT
Range: -99 to +99
Determines the amount by which the assigned filter modulator will affect the filter cutoff frequency.

ENV2
Range: -99 to +99
Determines the amount by which Envelope 2 will affect the filter cutoff frequency.

FILTER 2 Page
Press the Filters button again. The display shows the FILTER2 page:

FILTER2 Mode
Range: HI-PASS/2, 1 or LO-PASS/2, 1
FILTER 2 can be configured as a 2-pole or 1-pole high-pass filter, or a 2-pole or 1-pole low-pass filter.

The remaining parameters and ranges are the same as for FILTER1.
Output Page
The parameters on this page control the amplitude (or volume) of the WaveSample.

<table>
<thead>
<tr>
<th>OUTPUT</th>
<th>BOOST=OFF</th>
<th>LO/HI-KEY C3+-C8</th>
<th>VOL=99</th>
<th>MODSRC=PRESS</th>
<th>MODAMT=0</th>
</tr>
</thead>
</table>

**BOOST**
Range: OFF or ON
Setting this parameter to ON gives the selected WaveSample a +12dB boost in volume. Be careful that adding boost to a sample doesn’t cause it to become so loud that it starts to clip.

**LO/HI-KEY**
Range: K00 to K20, A0 to C8
This parameter determines the key range the selected WaveSample will cover. Select the WS RNG LO parameter, play the key that you want to be the low key, the cursor will then automatically switch to the HI parameter, which can then be set in the same fashion.

**Note:** Keys below A0 are displayed as K00 through K20. These values are only accessible when the Sampled Sound is transposed up.

**Note:** If you accidentally set the High Key below the Low Key, the selected WaveSample will not be heard.

**VOL**
Range: 0 to 99
Determines the volume of each WaveSample. Since Envelope 3 is permanently routed to control the volume of the WaveSample, this parameter also determines the amount by which ENV3 will affect volume.

**MODSRC**
Range: various
Selects a modulation source for the output volume of the WaveSample from among the 15 available modulators. This is in addition to ENV3, which is always routed to volume.

**MODAMT**
Range: 00 to 99
Determines the amount by which the assigned volume modulator will affect the output volume of the WaveSample. Raising this value will lower the unmodulated volume of the WaveSample(s), creating the headroom necessary for the volume modulation. Note that the AMOUNT value is positive-going only. To obtain negative volume modulation, you must use the VOL MODSRC SHAPER (see later in this Section).
Press the **Output** button again. The display shows the second OUTPUT sub-page:

![Output Button Diagram]

**DESTINATION-BUS**

Range: FX1, FX2, DRY, or AUX

Each WaveSample within a Sampled Sound can be routed to one of four stereo “busses:”

- FX1, FX2, and DRY feed the main stereo outputs of the TS-12.
- AUX sends the voice directly to the AUX Outputs. Note that voices sent to the AUX Outputs are always dry; that is, they bypass the effects processor.

The diagram below shows a common routing of the signals for each bus. See the sections on “Effects” for more on programming specific effects.

![Routing Diagram]

**PAN**

Range: -99 to +99

Pans the WaveSample within the stereo field. A setting of -99 is panned hard left, and +99 is panned hard right. A value of +00 pans the voice center. The effect of a pan modulator (below) will be added to this.

**MODSRC**

Range: various

Selects a modulation source for the WaveSample pan from among the 15 available modulators. This will cause the WaveSample’s location in the stereo field to vary with the output level of the modulation source.

**MODAMT**

Range: -99 to +99

Determines the amount by which the assigned volume modulator will affect the pan of the WaveSample.
Wave Page

The parameters on this page control all the WaveSample pointers such as sample start, sample end, loop points, etc. Also on this page, you can choose the playback mode and set up modulation of the sample start and/or various loop modulation options.

Note: The Wave page parameters can only be edited when the Edit Context page is set up to edit a single WaveSample (WAVESAMPLE=###). The LAYER EDIT NOT ALLOWED message will be displayed if you try to edit those parameters with the Edit Context set up to edit an entire layer or an entire Sampled Sound.

Press the Wave button. The first WAVE sub-page is displayed.

---

### PLAYBACK-MODE

Range: various

This parameter allows you to select one of five possible WaveSample playback modes.

- **FORWARD-NO LOOP** — The TS-12 plays through the WaveSample once, from sample start to sample end.
- **BACKWARD-NO LOOP** — The TS-12 plays through the WaveSample once, only in reverse, from sample end to sample start.
- **LOOP FORWARD** — The TS-12 will play forward from sample start to loop end and return to loop start and will continue playing the loop while the key is depressed. Once the key is released the loop continues playing as the WaveSample envelopes away.
- **LOOP BIDIRECTION** — The TS-12 will play forward from sample start. At loop end, the TS-12 will play the WaveSample in reverse to the loop start, playing the loop section back and forth until the key is released.
- **LOOP AND RELEASE** — The TS-12 will play forward from sample start and will continue playing the loop while the key is depressed. As soon as the key is released the TS-12 will go into release mode from wherever it is and will keep playing until the end of the WaveSample, playing data after the loop. LOOP AND RELEASE works in conjunction with Envelope 3, which needs to have its MODE parameter set to FINISH, and its TIME and LEVEL values adjusted appropriately.

### SAMPLE-START

This parameter allows you to set the sample start point.

When the SAMPLE START or SAMPLE END parameters are displayed there are two ways to adjust them — you can move in large steps by adjusting the percent setting, or move one sample at a time by choosing the fine adjust.

---

The Coarse Adjust reading is the one in parentheses. Changing this value will move the Sample...
Start in steps of one percent of the entire WaveSample. Use the Data Entry Slider or the Up/Down Arrow buttons to move the Sample Start ahead until the dead space is gone when you play.

Once you have gotten close using the percent setting, press the Left Arrow button to underline the Fine Adjust setting. Now the Data Entry Slider or the Up/Down Arrow buttons will move the SAMPLE-START in small steps (less than 1%), letting you fine-tune its exact position while playing the WaveSample.

**Sample END**

Allows you to set the sample end point. Again you see the sample number (Fine Adjust) and the percent (Coarse Adjust). Use the data entry controls to edit this parameter in the same fashion as the SAMPLE-START parameter.

Press the Wave button again. The second WAVE sub-page is displayed.

![Sample END](image)

**LOOP-POSITION**

This parameter displays the LOOP-START but moves both LOOP-START and END, keeping the size of the loop the same. It lets you search for the perfect loop location after you’ve set up an optimal loop length.

**LOOPSTART**

This parameter allows you to set the loop start point. After making a sample it is often necessary to “loop” (play over and over) a portion of the sound, so that it can sustain indefinitely when the key is held down.

**Loop END**

This parameter allows you to set or change the loop end point.

**Note:** The maximum loop length is 1.5 MegaWords.

Press the Wave button a third time. The final WAVE sub-page is displayed.

![Loop End](image)

**WAVE-MODULATION-TYPE**

Range: various (see below)

This parameter allows you to modulate certain WAVE page parameters with any of the 15 modulation sources. The WAVE-MODULATION-TYPE parameter specifies which of the WAVE page parameters the modulation will affect. There are seven possible modulation types:

- OFF — Wave modulation is disabled.
- LOOP POS — Selecting this setting will modulate the LOOP-POSITION of the WaveSample, moving it forward (towards the end of the WaveSample) with positive MODAMT values, and
backward (toward the beginning of the WaveSample) with negative MODAMT values.

- **START** — The SAMPLE-START will be modulated.
- **START+LP** — Both the SAMPLE-START and the LOOP-POSITION will be modulated. When START+LP is selected, sample playback will always begin at the LOOPSTART value, rather than at the SAMPLE-START value.
- **LOOPSTRT** — Modulates the LOOPSTART parameter. This will have the effect of either making the loop shorter (with positive MODAMT values moving the LOOPSTART point closer to the Loop END) or longer (with negative MODAMT values moving the LOOPSTART away from the Loop END).
- **LOOP END** — Works the same as LOOPSTRT, but from the back end of the WaveSample.
- **LPSTRT–X** — This setting works the same as LOOPSTRT, but a pitch correction scheme is now employed to keep the pitch constant as the loop gets longer and shorter.
- **TRANSWAV** — Similar to LOOP POS, but the loop will move in increments of exactly one loop length. For example, with LOOPSTART at 0 and Loop END at 100, a positive MODAMT will cause the loop to jump to LOOPSTART 100, Loop END 200, and then to LOOPSTART 200, Loop END 300, etc. When TRANSWAV is selected, the MODRANGE parameter (see below) has no effect, but the MODAMT (also below) sets the number of “jumps” that will happen over the full range of the modulator’s output.

### MODSRC

**Range:** various

Selects a modulation source for the wave modulation from among the 15 available modulators.

### MODAMT

**Range:** -99 to +99

### MODRANGE

**Range:** 1 Sample to 2 MegaSamples

The MODAMT and MODRANGE parameters determine the amount by which the assigned wave modulator will affect the WAVE page parameters:

- **MOD AMT** — This parameter determines the amount of modulation that will be applied to the wave parameter specified in the WAVE-MODULATION-TYPE parameter. This parameter has a value range of -99 to +99, allowing both positive and negative modulation amounts.
- **RANGE** — This parameter determines the range that will be covered by the MODAMT. The RANGE is displayed in sample size. The reason for this parameter is due to the nature of Sampled Sounds. Whereas ROM-based synthesizers contain waveforms that have a defined length that will always be the same, the size of each individual WaveSample will vary from Sampled Sound to Sampled Sound. The MOD AMT parameter has no way of knowing this sample size, so the TS-12 uses the RANGE parameter to define it.

To determine what value to set the RANGE parameter to, go to the Sample END parameter and examine at the value. This value tells you how large the selected WaveSample is. You can then select the RANGE value that comes closest to the actual size of the WaveSample.

If you were working with a very small WaveSample, you would adjust the wave modulation amount to something like this MOD AMT=+99 RANGE=128. If you were working with a much larger WaveSample, you would adjust the wave modulation to MOD AMT=+99 RANGE=1 MG (MegaSample). Think of RANGE as a multiplier, and MOD AMT=-99 TO +99 as fine tuning.
Volume Mod Source Shaper Page

Press the Mod Mixer button. The VOL MODSRC SHAPER page is displayed.

A - B FADE-IN - TO
Range: 0 to 127

C - D FADE-OUT - TO
Range: 0 to 127

The volume modulator cross fade breakpoints (A and B, C and D) allow you to scale the effect of the volume modulator (selected on the Output page MODSRC parameter) to create keyboard, velocity, or other types of cross fades. Using the cross fade breakpoints, you can customize how the volume modulator will affect the volume of the WaveSample across the range (or throw) of its output. This lets you use velocity, keyboard position, pressure or any other modulator to cross fade between WaveSamples.

Think of the A-B FADE-IN/C-D FADE-OUT parameters as a trapezoid, whose shape will affect the output of the modulator assigned to the Output page MODSRC parameter. The A-B FADE IN value sets the point along the throw of the volume modulator that the modulator’s output value will begin to rise above zero (i.e. fade in). The A-B FADE TO value sets the point along the throw of the volume modulator that the modulator’s output value will have risen to its maximum output. The C-D FADE OUT value sets the point along the throw of the volume modulator that the modulator’s output value will begin to fall from maximum (i.e. fade out). The C-D FADE TO value sets the point along the throw of the volume modulator that the modulator’s output value will have fallen to zero.

The default values are “A-B FADE IN=0 TO 127” and “C-D FADE OUT=127 TO 127,” imposing the following shape on the output of the volume modulator. In this example the Mod Wheel is the volume modulator:

To reverse the polarity of the volume modulator, set the values as follows: “A-B FADE IN=0 TO 0” and “C-D FADE OUT=0 TO 127.” The shape imposed on the output of the volume modulation is as follows; again, the Mod Wheel is the volume modulator:

Note: Whenever you cross fade between WaveSamples, the WaveSamples must be in different layers,
since only one WaveSample can occupy a given key within a single layer.

**CURVE**

Range: CROSSFADE or LINEAR

Determines what type of curve will be used when fading samples in and out between breakpoints A-B and C-D. There are two possible fade curves:

- CROSSFADE — This convex curve features a steep initial rise/drop off. It is best used when a quick change between breakpoints is desired, as in a keyboard or velocity cross fade.
- LINEAR — This linear curve ramps up and down evenly, making it preferable when smoother transitions between breakpoints are appropriate, such as when using pressure to cross fade.

**Layer Page**

The parameters on this page control the layers within a Sampled Sound.

Press the **Layer (Program Control)** button. The first LAYER sub-page is displayed.

---

**PITCHTBL**

Range: SYSTEM, NO PITCH, Pitch Tables 1-8.

This parameter determines whether the layer will use the SYSTEM pitch-table, or play each WaveSample in the layer at the pitch it would play on C4 (NO PITCH), or use any pitch-table that was stored with the Sampled Sound.

**STEREO**

Range: OFF or ON

Stereo samples are stored in pairs of adjacent layers (1&2, 3&4, 5&6, or 7&8), with the LEFT channel always stored in an odd numbered layer (1, 3, 5 or 7), and the RIGHT channel stored across the same key range in the next higher even numbered layer. These paired adjacent layers are called *companion* layers.

When the STEREO parameter is turned ON in the selected LAYER, it is simultaneously turned ON in the companion layer. When STEREO= ON, simultaneous editing of both channels of a Stereo Sample is enabled (see below).

When STEREO= ON, editing layer or WaveSample parameters in one layer will edit the same parameter in the companion layer. Editing with the **Data Entry Slider** will set the current parameter in both layers to the same absolute value. Editing with the **Up/Down Arrow** buttons will edit parameter values in both layers relative to one another.

When STEREO= ON, all pitch modulation in the right layer will be slaved to the settings in the WaveSamples assigned to the same or overlapping key zones in the left layer. This includes Pitch BEND Range, NOISE-RATE, and all pitch modulation. Pitch modulation settings for WaveSamples in the right layer will be ignored.

STEREO can be turned OFF to allow independent editing of layers that contain one channel of a stereo sample.

If the companion layer does not exist, STEREO cannot be turned ON in the selected layer. The screen will display NO STEREO COMPANION LAYER.
GLIDEMODE

Range: various (see below)

Enables Glide (portamento) and several forms of monophonic voice assignment in each layer. There are five GLIDE modes available:

For monophonic voice assignment without glide, set GLIDEMODE to LEGATO, TRIGGER, or MINIMODE, and set TIME=0.

- NONE — Glide is off. This is normal polyphonic operation, with no portamento.

- LEGATO — Enables monophonic voice assignment, allowing only one note of polyphony to be active in the layer. If a key is depressed before another is released (i.e.: if you play legato), the voice will glide from the old note to the new one. If you play a key with no other keys down (i.e.: if you play staccato), the voice will not glide. The envelopes and WaveSamples are retriggered, or restarted, from the beginning each time there is a new key down. This is also the mode to use to enable the legato layer function.

- PEDAL — Enables the sustain pedal to start polyphonic glide. In this mode, the glide and polyphony are controlled by the sustain pedal. When the pedal is up, there is no glide and the layer is fully polyphonic. When the sustain pedal is depressed, the glide is enabled, and the polyphony is limited to the number of notes being sounded at the moment. For example, with the pedal up play a three-note chord. Press the sustain pedal and lift your fingers off the keys (the three notes will sustain). Now press another key: one of these sustaining notes will be stolen and will glide to the new note. The envelopes and WaveSamples are retriggered, or restarted, each time there is a new key down. Holding a key down will prevent the note from being stolen. This allows controlled voice leading.

- TRIGGER — This mode plays monophonically, with the envelopes and WaveSamples retriggering, or restarting, each time there is a new key down. This mode works just like LEGATO mode, except that it has no “note memory”. It is ideal for adding monophonic piano “thuds” to piano sounds.

- MINIMODE — This mode plays with one-voice polyphony, and new notes will glide from the previous note if the previous note is still held. Unlike the LEGATO, PEDAL, or TRIGGER modes, the envelopes and WaveSamples are only restarted from the beginning when you play a key with no other keys down (i.e.: if you play staccato).

Note: LEGATO and MINIMODE feature “note memory.” If you release a key while still holding down another key, the pitch will glide back to the note you are holding. Holding down the sustain pedal will dynamically disable note memory.

### GLIDE MODES

<table>
<thead>
<tr>
<th>Mode</th>
<th>Staccato Glide</th>
<th>Legato Glide</th>
<th>Legato Envelope Retrigger</th>
<th>Note Memory</th>
</tr>
</thead>
<tbody>
<tr>
<td>LEGATO</td>
<td>NO</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>PEDAL</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td></td>
<td>(with pedal down)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TRIGGER</td>
<td>NO</td>
<td>YES</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>MINIMODE</td>
<td>NO</td>
<td>YES</td>
<td>NO</td>
<td>YES</td>
</tr>
</tbody>
</table>

TIME

Range: 0 to 99

This parameter controls the time it takes for the pitch to slide smoothly (glide) from one note to another. The higher the value, the longer the glide time. The TS-12 uses Constant-Time Portamento. This means that it will take the same amount of time to glide between notes that are close together (i.e. C4 to D4) as it will to glide between notes that are far apart (i.e. C4 to C7).
LEGATO-LYR

Range: layers 1 to 8

The legato layer is an ENSONIQ innovation that enables the TS-12 to capture the elusive nuances of acoustic Sampled Sounds. The sound of a wind Sampled Sound, the flute for example, is different when it is “tongued” than when notes are played in a connected manner (called legato). When two notes are “slurred” or “trilled” the characteristic attack of the second note is not present. The TS-12 allows a simulation of this effect when used with one of the glide modes.

The rules for glide, described above, determine when one note will glide to another. The glide time determines how fast it will glide to the new note. The LEGATO-LYR parameter selects which layer, and therefore which WaveSample(s), will play on the new note.

For example, suppose that layer 1 is a flute sample with a tongued attack, and layer 2 is a flute sustain without any attack. To use this function:

On the Edit page (press the Select Voice button):
• Enable both layer 1 and layer 2 in the current patch.
  The display reads: 00 LAYERS-IN-PATCH=1 2 - - - - - -.

On the Edit KEY-DOWN/KEY-UP LAYERS page (press the Copy button):
• Enable layer 1, the attack, as a keydown layer. Disable layer two as a keydown layer. The display reads: KEY-DOWN-LAYERS=1 - - - - - - -.

On the Layer page for layer 1 (press the Program Control button):
• Set GLIDEMODE=LEGATO.
• Set LEGATO-LYR=2.
• Adjust Glide TIME as you see fit.

If a key is depressed before another is released, the new note will play the WaveSample in the LEGATO-LYR (layer 2).

Press the Layer (Program Control) button. The second LAYER sub-page is displayed.

VELOcity-WINDOW LO & HI

Ranges: 000 to 127

The LO and HI parameters allow you to define the velocity range for each layer. The full velocity range (default) is LO=000 HI=127. By adjusting these parameters, you can set specific velocity ranges for each layer. This allows velocity switching between different layers within the Sampled Sound. For example, if you set a solo violin voice to LO=000 HI=064, and a string section voice to LO=064 HI=127, a soft velocity will play only the solo violin, whereas a harder velocity will play only the string section. Ranges can over-lap for velocity cross-fade effects.

DELAY

Range: 0 to 5000 msec

This parameter determines how long WaveSamples within the selected layer will wait after a key is struck before playing. A delay of up to 5 seconds is possible.
VEL-MODAMT

Range: -99 to +99

This parameter determines the amount by which velocity will affect the layer DELAY time. Positive VEL-MODAMT values will cause harder velocities to increase the DELAY time. Negative VEL-MODAMT values will cause harder velocities to decrease the DELAY time. Setting the DELAY to zero will disable velocity modulation of layer DELAY time.

RESTRIKE

Range: 0 to 99

This parameter controls the layer Restrike time. When you play a particular note and then restrike it again immediately before the old note has finished sounding, the amount of time it takes for the first note to fadeout is determined by this parameter. By varying the setting of this parameter, you can control how long sounds overlap when a note is restruck.

For example, if you have a slow string sound, it may sound more natural to use a longer RESTRIKE value, which will cause the old note to decay more slowly, rather than end abruptly when the new note starts. Normal values are around 10. The higher the value, the longer the fadeout time.

Sampled Sound Effects Page (Program Effects button)

Understanding the effect algorithms and their related parameters are described in detail in Section 6 — Understanding Effects and Section 7 — Effect Parameters.
Appendix

**TS-12 MIDI Implementation**

The TS-12 features an extensive MIDI (Musical Instrument Digital Interface) implementation. For normal applications, you will find all the information you need regarding the TS-12’s MIDI functions in this manual. You can also refer to the MIDI Implementation Chart on the next page for a summary of the TS-12 MIDI implementation.

If you are writing a computer program to communicate with the TS-12 via MIDI, or otherwise require a copy of the full TS-12 System Exclusive Specification, it is available free of charge by writing to:

ENSONIQ Corp.
MIDI Specification Desk
155 Great Valley Parkway
P.O. Box 3035
Malvern PA 19355-0735
USA

Include in your written request your name and address, and indicate that you would like a copy of the “TS-12 System Exclusive Specification.” Please allow 2 to 3 weeks for delivery.

**Registered Parameters**

Registered parameters are transmitted (as four sequential continuous controller messages) by the TS-12 whenever certain parameters are edited from the front panel. The two registered parameter controllers select the parameter and the following two data entry controllers specify the value.

**Controllers**

<table>
<thead>
<tr>
<th>Number</th>
<th>Name</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>Registered Parameter Select LSB</td>
<td>00 or 01</td>
</tr>
<tr>
<td>101</td>
<td>Registered Parameter Select MSB</td>
<td>always 0</td>
</tr>
<tr>
<td>6</td>
<td>Data Entry MSB (Most Significant Byte)</td>
<td>(see below)</td>
</tr>
<tr>
<td>38</td>
<td>Data Entry LSB (Least Significant Byte)</td>
<td>(see below)</td>
</tr>
</tbody>
</table>

**Registered Parameters**

<table>
<thead>
<tr>
<th>Number</th>
<th>Name</th>
<th>TS-12 parameter range</th>
</tr>
</thead>
<tbody>
<tr>
<td>00</td>
<td>Pitch Bend Range</td>
<td>0..12..0H..12H</td>
</tr>
<tr>
<td>01</td>
<td>Fine Tuning</td>
<td>0.255 (displayed -99 to +99)</td>
</tr>
<tr>
<td>02</td>
<td>Coarse Tuning (GM Mode only)</td>
<td>0.127 (displayed -64 to +63)</td>
</tr>
</tbody>
</table>

The parameter values are sent as two Data Entry controller messages:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Data Entry MSB (6)</th>
<th>Data Entry LSB (38)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pitch Bend Range</td>
<td>0.25</td>
<td>0</td>
</tr>
<tr>
<td>Fine Tuning</td>
<td>0.127 (internal bits 1..7)</td>
<td>64 or 0 (internal bit 0)</td>
</tr>
</tbody>
</table>

For Fine Tuning, which is an 8-bit value internally, the most significant 7 bits are offset by 64 and shifted once before being sent as Data Entry MSB (Controller 6). The least significant bit of the internal value is transmitted as bit 6 of Data Entry LSB (Controller 38).

In most system modes, registered parameters 0 and 1 affect the System page TUNE and BEND parameters respectively (when received on the Base Channel only). In General MIDI mode, registered parameters 0, 1, and 2 are received multi-timbrally, and affect each Track/Channel independently.
<table>
<thead>
<tr>
<th>Function...</th>
<th>Transmitted</th>
<th>Recognized</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Basic</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Channel</td>
<td>Default Channels</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>1-16</td>
<td>1-16</td>
<td></td>
</tr>
<tr>
<td><strong>Mode</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Default Messages Altered</td>
<td>1</td>
<td>1, 3, 4, MULTI</td>
<td>Global Controllers in MONO Mode</td>
</tr>
<tr>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td><strong>Note Number</strong></td>
<td>True Voice</td>
<td>21-108</td>
<td>21-108</td>
</tr>
<tr>
<td><strong>Velocity</strong></td>
<td>Note ON</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td></td>
<td>Note OFF</td>
<td>O</td>
<td>X</td>
</tr>
<tr>
<td><strong>After Key</strong></td>
<td>Channel</td>
<td>X</td>
<td>O</td>
</tr>
<tr>
<td><strong>Pitch Bender</strong></td>
<td></td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td><strong>Control Change</strong></td>
<td>1–127 External Controller</td>
<td>1–127 External Controller</td>
<td>assignble (XCTRL)</td>
</tr>
<tr>
<td></td>
<td>0 Bank Select MSB</td>
<td>0 Bank Select MSB</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 Mod Wheel</td>
<td>1 Mod Wheel</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4 Foot Pedal</td>
<td>4 Foot Pedal</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6 Data Entry MSB²</td>
<td>6 Data Entry MSB²</td>
<td></td>
</tr>
<tr>
<td></td>
<td>7 Volume</td>
<td>7 Volume</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10 Pan</td>
<td>10 Pan</td>
<td></td>
</tr>
<tr>
<td></td>
<td>12 Effect Mod Foot Switch</td>
<td>12 Effect Mod Foot Switch</td>
<td></td>
</tr>
<tr>
<td></td>
<td>32 Bank Select LSB</td>
<td>32 Bank Select LSB</td>
<td></td>
</tr>
<tr>
<td></td>
<td>38 Data Entry LSB²</td>
<td>38 Data Entry LSB²</td>
<td></td>
</tr>
<tr>
<td></td>
<td>64 Sustain</td>
<td>64 Sustain</td>
<td></td>
</tr>
<tr>
<td></td>
<td>66 Sostenuto</td>
<td>66 Sostenuto</td>
<td></td>
</tr>
<tr>
<td></td>
<td>70 Sound Variation³</td>
<td>70 Sound Variation³</td>
<td></td>
</tr>
<tr>
<td></td>
<td>71 Harmonic Content⁴</td>
<td>71 Harmonic Content⁴</td>
<td></td>
</tr>
<tr>
<td></td>
<td>72 Release Time</td>
<td>72 Release Time</td>
<td></td>
</tr>
<tr>
<td></td>
<td>73 Attack Time</td>
<td>73 Attack Time</td>
<td></td>
</tr>
<tr>
<td></td>
<td>74 Brightness</td>
<td>74 Brightness</td>
<td></td>
</tr>
<tr>
<td></td>
<td>75 Rate (LFO &amp;/or Duration)</td>
<td>75 Rate (LFO &amp;/or Duration)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>100 Reg. Param. Select LSB⁵</td>
<td>100 Reg. Param. Select LSB⁵</td>
<td></td>
</tr>
<tr>
<td><strong>Program Change</strong></td>
<td>True Number</td>
<td>0-127</td>
<td>0-119</td>
</tr>
<tr>
<td></td>
<td>0-127</td>
<td>0-119</td>
<td></td>
</tr>
<tr>
<td><strong>System Exclusive</strong></td>
<td></td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td><strong>System Common</strong></td>
<td>Song Pos</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td></td>
<td>Song Sel</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td></td>
<td>: Tune</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td><strong>System Real Time</strong></td>
<td>Clocks</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td></td>
<td>: Commands</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td></td>
<td>⁷</td>
<td>⁷</td>
<td></td>
</tr>
<tr>
<td><strong>Aux. Messages</strong></td>
<td>Local On/Off</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>All Notes Off</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td></td>
<td>Active Sense</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>: Reset</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td><strong>Notes</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mode 1= OMNI ON, POLY</td>
<td>Mode 2= OMNI ON, MONO</td>
<td>O = YES</td>
<td></td>
</tr>
<tr>
<td>Mode 3= OMNI OFF, POLY</td>
<td>Mode 4= OMNI OFF, MONO</td>
<td>X = NO</td>
<td></td>
</tr>
</tbody>
</table>
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