

**INSTRUCTIONS MANUAL AND
TROUBLESHOOTING**

ANTAR

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INSTRUCTIONS FOR THE ADJUSTMENT OF TEST, BOOKKEEPING & STANDARD

By means of a push button located in the internal corner of the door and the games push button, all functions of TEST, BOOKKEEPING and adjustments for the score, tunes and machine play are controlled.

When connecting the machine to the a.c. line by means of the switch, the machine automatically tests whether the adjustments and scoring kept in the memory are valid. Such memory is powered, during the time the machine is not connected to the a.c. line, by means of a rechargeable battery, located on the MPU board, with sufficient capacity to keep the power of the memory during several months. The information kept in the memory will be altered if same is disconnected from the circuit.

When the information regarding the adjustments and scoring kept in the memory is not valid, all the displays will not lit except the one for the 1st. PLAYER, which will indicate "St", and the one corresponding to CREDIT, which will indicate "00". In this case the machine will have automatically reset the bookkeeping, the credit and the rest of the adjustments corresponding to the standard value indicated later on. To surpass this stage it is required to disconnect and connect the machine again, by means of the switch or the plug.

T E S T

When the machine is connected to the a.c. line, with the door push button closed (depressed), the machine will automatically start the test process, (see the list at the end of these instructions).

The counters advance from 000 000 up to 999 999 and the cycle is repeated. On the counter of CREDIT can be read, from major to minor, the number of any closed contact, should there be any (initially 11). When there is no one the sign "00" appears.

The relays of "hold" and "coin latch" are permanently activated.

When pressing the cabinet push button for games, it will be consecutively activated: the drop-targets, return ball, quickers, "taca" as well as the up targets unit. At the same time a musical scale will sound. To surpass this stage it is necessary to disconnect and connect the machine. The accumulated credits will be erased.

BOOKKEEPING

If the push button of the door is closed while the machine is on GAME OVER, the games left on the counter are kept internally (they appear again when disconnecting and connecting the machine) besides the following information appears on the counters:

- 1st. PLAYER display.- Number of coins accepted by the first coin rejector.
- 2nd. PLAYER display.- Number of coins accepted by the 2nd. coin rejector.
- 3rd. PLAYER display.- Number of coins accepted by the 3rd. coin rejector.
- 4th. PLAYER display.- Number of games played (free & paid)
- CREDIT display.- A "C" appears (it means "Coins")

If the push button placed at the IOS board is depressed, the four totals are cleared. (This only happens when the counters are in this situation).

To surpass this stage it is necessary to disconnect and connect the machine.

If the push button of the door is once more depressed, the following information appears on the displays:

- 1st. PLAYER display.- Total prizes by SPECIAL.
- 2nd. PLAYER display.- Total of EXTRA BALLS given.
- 3rd. PLAYER display.- Total of prizes by scoring.
- 4th. PLAYER display.- Total of FREE GAMES given.
- CREDIT display.- A "T" appears (it means "Totals")

If the push button placed at the IOS board is depressed, the four totals are cleared. (This only happens when the counters are in this situation).

To surpass this stage it is necessary to disconnect and connect the machine.

STANDARD ADJUSTMENT

If, once more, the push button of the door is depressed, all the counters become blank if we exclude the one for the CREDIT in which it will appear "St".

When in this situation the push button for GAMES is depressed, all the adjustments of the machine are automatically modified to the STANDARD value (see the list of adjustments) and the display of the 1st. PLAYER will show "St" in or-

der to confirm that a new adjustment has been made. To surpass this stage it is necessary to disconnect and connect the machine.

INDEPENDENT ADJUSTMENTS

Starting from the former situation "St", each time the door push button is depressed, a new area of adjustment is reached. The CREDIT counter shows in what area is the adjustment and the 1st. PLAYER counter will show the value being adjusted presently. To modify such value, the GAMES push button has to be depressed in order to increase the amount. When the button is held depressed, the amount will increase more rapidly. When reaching the total value wished, release the pressure upon the push button and increase the amount one by one until the total wished. This value will be fixed when passing to a new area or disconnecting and connecting the machine.

In the following list the different adjustments, as well as the areas, display readings for the 1st. PLAYER and the value of the STANDARD adjustment are listed:

OBJECT OF THE ADJUSTMENT	AREA	R E A D I N G	STANDARD
Maximum number of credits	01	00 up to 99	15
HIGH SCORE scoring	02	000. up to 990.	700.
Free game first score	03	000. up to 990.	500.
Free game second score	04	000. up to 990.	650.
Free game third core	05	000. up to 990.	000.
Games per coin first coin rejector .	06	0,3-0,5-1-1,5 up to 39	0,5
Games per coin second coin rejector .	07	0,3-0,5-1-1,5 up to 39	3
Games per coin third coin rejector .	08	0,3-0,5-1-1,5 up to 39	5
Maximum amount of EXTRA BALLS	09	0-1-2-3 extra balls	3
Free games when HIGH SCORE is reached	10	0-1-2-3 free games	1
Music only in prizes, start and end .	11	0=NO 1=YES	0
Music every 10 minutes	12	0=YES 1=NO	0
Type of sound	13	0=effects 1=bells	0
Prizes by SPECIAL	14	0=game 1=ball	0
Prizes by scoring	15	0=game 1=ball	0
Return to HIGH SCORE initial value. .	16	0=YES 1=NO	0
Match feature	17	0=YES 1=NO	0
Number of ball per game	18	0=3 balls 1=5 balls	0
Games for each player	19	0=several 1=1 only	0
Guns eliminate LIT x 10 when multiply	20	0=YES 1=NO	0
BUMPER scoring	21	0=1000/100 1=10000/	0
Outlane rollover scoring	22	0=5000 1=30000	0
Drop targets score.	23	0=5000 1=500	0
Not used	24		0
Not used	25		0
Not used	26		0

If the door push button is held once more, when being in area 26, the reading returns to area 1. To surpass this stage it is necessary to disconnect and connect the machine.

REMARKS:

Maximum number of credits. AREA 01.

It is the maximum number accepted by the CREDIT counter. Below it it is possible to increase it, by means of coins or by games during the play. When one coin adds games, so that the maximum amount to which it has been adjusted is surpassed, the games will be added the first time. When the number in the CREDIT counter is the same or superior to the maximum, the coin rejectors will automatically be blockaded.

When the maximum number of credits is adjusted to 00, then the machine will play without coins, the limit will remain at 99 and the coin rejectors will be blockaded. (This adjustment is used for home play or at exhibitions).

HIGH SCORE scoring. AREA 02.

When it is adjusted to 000.000 the HIGH SCORE prize will be totally disconnected.

Free game. AREAS 03, 04 & 05.

When it is adjusted to 000.000 the corresponding prize will be disconnected. (Two prizes in the same scoring will be like one).

Games per coin. AREAS 06, 07 & 08.

The reading 0,3 indicates that 3 coins are needed for a game.

The reading 0,5 indicates that 2 coins are needed for a game.

The reading 1,5 indicates that 2 coins will give three games.

Maximum amount of EXTRA BALLS. AREA 09.

It indicates the maximum amount of extra balls that the counter will accumulate. When it is adjusted to 0, no extra ball will be given.

Free games by HIGH SCORE. AREA 10.

Number of games the machine will give when reaching the HIGH SCORE. When it is adjusted to 0, instead of games, will give an extra ball.

Music only in prizes, start and end. AREA 11.

When it is adjusted to 1, only the music of bells sounds when getting prizes, when introducing coins, at the start of game and at the end when GAME OVER

appears. Adjusting it to 0, the selected music in the AREA 13, sounds in any contact when scoring, besides all other moments already mentioned.

Music every 10 minutes. AREA 12.

When it is adjusted to 0, approximately every ten minutes, while the machine is in GAME OVER, a tune will sound.

Type of sound. AREA 13.

Two sound may be selected: At 0 the sounds are special effects and at 1 the sounds will be melodic, similar to bells. At the IOS board there is a potentiometer that regulates the volume of the two sounds.

Prizes by SPECIAL. AREA 14.

The prizes given by SPECIAL, except the ones for HIGH SCORE and scoring (which are regulated by other areas), may be either one game or a ball, whenever the regulation is 0 or 1.

Prizes by scoring. AREA 15.

When reaching the scoring set in the AREAS 03, 04 or 05 the machine will add a game or extra ball, whenever the regulation is 0 or 1.

Return to HIGH SCORE initial value. AREA 16.

When the HIGH SCORE scoring is above 899.900, when disconnecting and connecting again the machine, the HIGH SCORE returns automatically to 700.000. (This is also automatically achieved when the machine is switched off during the night and switched on in the morning).

Match feature. AREA 17.

Match feature is disconnected when it is regulated at 1.

Number of balls per game. AREA 18.

The machine will play with three or five balls per game, besides the ones the player can get by EXTRA BALL, according to the regulation set.

Games for each player. AREA 19.

When it is adjusted to 0, the machine may accumulate free games up to the number of credits of the AREA 01 adjustment.

When it is adjusted to 1, the machine will only add the first game obtained

by each player and the other ones during the play will be EXTRA BALL.

Guns eliminate LIT x 10 when multiply. AREA 20.

When it is adjusted to 0, when the ball enters one of the lateral guns and the light x 10 is lit, once the corresponding points have been added, the light x 10 switches off and stops multiplying until the corresponding target is reached once more.

When it is adjusted to 1, the light x 10 remains lit during all the time the ball remains in the playfield, multiplying the score of the guns every time the ball enters them.

BUMPER scoring. AREA 21.

When it is adjusted to 0, the bumper scores 100 points when it is off and 1.000 when it is on.

When it is adjusted to 1, the bumper also scores 100 points when it is off but 10.000 points when it is lit. (Remember to change the bumper cap in accordance to the score).

Outlane rollover scoring. AREA 22.

The two bottom outlane rollovers score 5.000 points when the adjustment is set at 0, and 30.000 when it is adjusted at 1.

Drop targets score. AREA 23.

The score of the drop targets will be 5.000 points when the adjustment is set at 0, and 500 points when it is adjusted at 1.

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GENERAL GUIDE FOR REPAIRING "ANTAR" PINBALL

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The modular system designed for that machine allows the replacement or repair of any faulty unit in a very short time because the modules can be replaced on the spot, where the machine is located, by a new one, whenever the failure is of electronic origin. To this end, all modules are of a reduced shape in order to facilitate the repair or its transportation when necessary. For this purpose there are cases with a complete set of modules as well as the necessary tools to substitute them.

In order to know which are the modules to be substituted it is important to follow these general guides:

IMPORTANT ! TURN OFF POWER BEFORE REMOVING OR REPLACING ANY OF THE BOARDS.

- 1) The light box display, the lights controlled and the flippers do not work.
... Substitute, following the same order, until the failure is found: PSU (checking the fuses), MPU, IOS.
- 2) No one display lits but some controlled light lits permanently.
... Substitute, following the same order, until the failure is found: PSU, (checking the fuses), MPU, IOS.
- 3) No one display lits but some controlled lights lit alternatively.
... Substitute, following the same order, until the failure is found: DPY first player, IOS.
- 4) The display of one or several players lits, changing from 000000 to 999999, but not all.
... Substitute, following the same order, until the failure is found: DPY first player, DPY second player, DPY third player, DPY fourth player DPY STATUS.
- 5) The sound fails.
... Substitute, following the same order, until the failure is found: IOS, loudspeaker.
- 6) Some of the controlled lights never lits.
... Substitute, following the same order, until the failure is found: LIGHTS FUSES, LITTLE LAMP, the corresponding BLC (see the number of the little

lamps or change the three BLC). Note that the bumper lights have a rectifier in the playfield.

- 7) Some controlled little lamp, other than GAME OVER or HIGH SCORE, is always lit.
 - ... Substitute, following the same order, until the failure is found: Corresponding BLC (see little lamps numbers) or change the three BLC successively.

- 8) Some memorized drop-target solenoid does not work.
 - ... Substitute, following the same order, until the failure is found: ETC, IOS.

- 9) Bumpers, flippers, kickers, ball return, guns, "taca".
 - ... Substitute, following the same order, until the failure is found: First check whether the corresponding relay closes properly, if not change: BSC, IOS.

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DESCRIPTION OF THE MPU BOARD

In this board there is the MICROPROCESSOR set which is composed of:

- 1 CPU (6) COSMAC CDPI802.
- 2 RAM MEMORY (7A) & (7B) 5101.
- 4 ROM MEMORY (8), (9), (10) & (11).
- 2 MEMORY ADDRESS DECODER (3) & (5) 1859.
- 1 INPUT/OUTPUT DECODER (1) 1853.
- 1 DUAL D-type Flip-Flop (2) 4013.
- 1 TIMER COUNTER (4) 4020.

The CPU board controls the operation of the whole machine, following the programme of the ROM memories. It receives and sends the signals coming or with destination to the several elements of the machine through the IOS board, to which it is connected by the connections MRD, 101, 102, 103, 104, 105, 106, 107, TPB, BUS \emptyset -BUS7 & CKD.

The DECODERS (3) & (5), generate the addresses A8, A9 & A1 \emptyset which are not directly obtained from the CPU as the A \emptyset -A7, and by means of the outputs CE \emptyset , CE1, CE2 & CE3, only connect one of the RAM devices (7) or ROM (8-11) to the data bus BUS \emptyset -BUS7.

The decoder (3) when receiving the TPA pulse, holds the value of MA2 and of MA5. Thus making:

- 1: When MA5 is high makes -CS of the RAM (7) selecting low. When MA5 is low makes -CS of the RAM (7) high disconnecting them.
- 2: When -MRD is high makes its output CE \emptyset high therefore the decoder (5) will disconnect the ROM.
- 3: When MA2 is high makes A1 \emptyset high. When MA2 is low makes A1 \emptyset low.

The decoder (5) when receiving TPA holds the value of MA \emptyset , MA1 and MA2, MA3 if memories of 1Kx8 are used. It also holds the value of MA3, MA4 if the memories of 2Kx8 are used. Thus making:

- 1: If MA \emptyset , MA1 are high makes A8, A9 high respectively and on the contrary.
- 2: If the input -EN coming from the circuit (3) is high, all the CE \emptyset , CE1, CE2, CE3 are high and the ROM (8-11) are disconnected.
- 3: If the input -EN is low, according to the value hold of MA2, MA3 or MA3, MA4, selects one of the ROM making one of the CE \emptyset to CE3 low and the rest high.

The RAM MEMORIES (7A & 7B) are continuously powered, even when the machine is disconnected from the line, by means of a buffer battery which recharges itself when the machine is connected to the line. This is in order to keep the information stored, which, in another way would be lost. This information corresponds to the book-keeping functions, tones, etc. as well as the accumulators for coins, games, prizes, etc. These memories are internally disconnected when its input CS (pin 17) is low. It occurs when the a.c. line is disconnected. In that way the information kept is preserved.

The CPU board (6) controls these memories TAM by means of the addresses $MA\emptyset$ - $MA6$ which indicate to which word it is addressed and for the signals -MRD, -MWR, -CS.

When the CPU board needs to read or write in the RAM, makes its -CS low through de decoder (3). When it has to read -MRD will be low and -MWR will be high. When it has to write -MRD will be high and -MWR will be low.

As every memory is organized in 256 words of 4 bits, two of them have been placed with all connections in paralel, except the one for the data bus. In the memory (7A) $BUS\emptyset$ - $BUS3$ have been connected and $BUS 4$ - $BUS7$ in the memory (7B).

The DECODER I/O (1) generates the signals IO1 to IO7 from $N\emptyset$, N1, N2, TPA, TPB, which are used to control the IOS board.

The value of $N\emptyset$, N1, N2 is held from the moment it receives the pulse from TPA until it receives the one from TPB. With these three signals $N\emptyset$, N1, N2 decoded, eight possible cases are obtained, which correspond to make low all signals IO1 to IO7 or else to make high one of them, precisely the one corresponding to the input or output device located in the IOS board to which the CPU board wants to connect in order to receive or supply information.

The FLIP-FLOP (2), located on the left hand side of the scheme of the board, generates the clock signal used to transmit synchronously the information that controls the display boards through a shift register located in the IOS board.

The FLIP-FLOP (2), located on the right hand side of the scheme of the board, memorizes the interrupt request generated in the PSU power supply board, at the beginning of each half cycle of the a.c. line. The request is entered in

the CPU by its INT input. Once processed, the CPU send a pulse by IO7 which resets such memorization (both flip-flop are in the same integrated circuit (2)).

The TIMER COUNTER (4), generates a pulse every 2,77 miliseconds which is carried to the INT input of the CPU through the flip-flop located on the right producing an interrupt so that the CPU refresh the information loaded in the multiplexed display.

The -RST signal coming from the PSU power supply is low when the machine is disconnected from the line and also a few tenth of a second after connecting it. In this situation, it disconnects the RAM to preserve their contents and makes the CPU start the reading of the ROM programme by the start of it.

The signal SYNC generated in the PSU board is high during a line half cycle and low during the following and so successively. It is connected to the CPU by -EP3 and it is used by that in order to know whether to activate the little lamps connected to the 10 Volts A or else to the 10 Volts B.

DESCRIPTION OF THE IOS BOARD

This board is the connection between the rest of the system and the machine with the MPU, where there is the micriprocessor set.

It uses the following devices:

- 5 INPUT/OUTPUT PORTS (2), (3), (4), (7) & (8) 1852.
- 1 PROGRAMMABLE DIVIDER (5) GDP1863
- 2 DARLINGTON & TRANSISTOR ARRAYS (1) 75492 & (9) 3086.
- 1 SHIFT REGISTER (6) 4021.

The devices of the PORTS I/O, DIVIDER & SHIFT REGISTER, receive or send information to the CPU through the data bus BUS0 to BUS7 when the corresponding signal IO1-IO7 is valid and TPB is also valid.

The ports (3) & (4) are used as input ports. All the connections from the push buttons and machine contacts reach them. At the port (4) the contacts from the playfield are connected in array, C1 to C6 by one side and O1 to O8 by the other side. At the port (3) the cabinet push buttons are connected as well as the one for the resetting of the accumulators, which is located in this board.

The inputs coming from the micro switch, corresponding to the coin rejectors 1M, 2M & 3M, have a delay network composed of a resistor and a capacitor, whose work is to prevent the pulses from being too short (the ones produced when shaking the door) reach the input port (4).

The ports (7) & (8) are used as output ports. To them are connected the boards that control the lights, relays, etc.

The port (2), connected as output port, sends to the display the information that controls the anodes of the multiplexed digits through the darlington drivers of the device (1) and the transistors TR1 to TR6. From the collector of such transistors the information which controls the columns of the input array C1 to C6 is derived by means of resistors.

The PROGRAMMABLE DIVIDER (5), divides the oscillation coming from the CPU through the line TPB by a programmable value from the CPU. At the output nominated OUT it is found the square wave which is applied to the gain controlled amplifier composed of the device (9) and the associated components. The gain of this amplifier is controlled by the output DO7 of the port (2) and by the potentiometer. A power transistor BD244 supplies the necessary amplification to attack the loud-speaker.

The capacitor connected to the pin 6 of the device (9) is powered by an internal transistor of this device when DO7 of the device (2) is high. When making DO7 low, such capacitor is slowly discharged through a snunt resistor. The voltage of such capacitor is applied through another internal transistor of the device (9) and the potentiometer of the amplifier. When loosing power the volume diminishes obtaining the fading effect of the sound.

The SHIFT REGISTER (6), receives the information in paralel coming from the CPU by BUS~~0~~-BUS7 when IO2 is valid and transmits in serial to the display boards synchronously by means of the clock CKD.

DESCRIPTION OF THE BLC BOARD (CONTROL OF LIGHTS)

This board, (which in number of three equips this machine) has the job of controlling the lights of the game, which are the ones that lit in accordance to the progress of the play. They control up to sixteen groups of little lamps.

It is composed of a decoder 4028, eight thyristors C106F, eight resistors and

sixteen rectifier diodes. Each thyristor can control two groups of little lamps which are powered from the transformer with two half-cycles opposite to the a.c. voltage.

The control inputs D \emptyset , D1, D2 & D3, come from the device output (8) of the IOS board.

The inputs D \emptyset , D1 & D2 are in charge of determining the address to which of the eight outputs must be connected. The fourth input D3 is high when such address must not be connected and low when it must be connected.

The pulse applied to the port of the thyristors is of a very short length of time, around 20 microseconds and enough to turn-on the thyristors which, once fired, will not disconnect until the end of the corresponding half-cycle. These pulses repeat in each half-cycle while the corresponding little lamp must be lit.

DESCRIPTION OF THE BTC BOARD (DROP TARGETS)

This board, whose job is the one of dropping the targets as they were when the player stop playing his ball, is composed of a BCD to decimal decoder 4028 and ten thyristors SCR C106F. It controls up to ten solenoids together or by separate, used to drop the targets.

The control inputs TRA, TRB, TRC, TRD, come from the device output (7) of the IOS board. These inputs are in charge of determining the address, that is to say, the outputs G1-G10 which must be connected. The pulse thus applied to the thyristors port fires them and become conductors activating the corresponding solenoids. This pulse is maintained during 100 miliseconds, time enough to make the dropping of the wished target.

DESCRIPTION OF THE PSU (POWER SUPPLY UNIT) BOARD

The power supply unit provides the necessary voltages for the electronic operation of the machine.

The given voltages are: +6, +12, -5 volts and, in the same board the signals RST, -RST, INTR and SYNC are generated.

The 6 volts voltage is obtained from a full wave rectifier formed by two diodes

of 3 amperes (BYS51), filter capacitor, power transistor (BD244), monolithic voltage regulator (LM341-6) and power resistors which with the diodes protect the power transistor in case of overload.

The voltage of 12 volts is obtained from a full wave doubler formed by a monolithic bridge rectifier (VMI8) and three capacitors, that circuit gets a voltage from 15 to 27 volts (according to the voltage of the primary) which is subsequently reduced and stabilized by mean of a monolithic voltage regulator of 0'5 amperes (LM341-12).

The voltage of -5 volts is obtained from a full wave rectifier formed by two diodes of 1 ampere (IN4001).

The signal of INTR is derived from the two opposite voltages of supply, so thus a pulse whose rising edge is at the beginning of each half cycle of the a.c. line. That signal will be used to synchronize the shot of the thyristors that control the lights of the game, with the beginning of the half cycle of the a.c. line voltage. The same pulses are carried to a RC network which integrates them so thus their output will be high if one only half cycle is missing in some of both inputs of 11 volts a & B coming from the transformer. Amplified and inverted by means of a logic gate, this signal is used to charge, slowly through a resistor and discharge quickly through a diode, an electrolitic capacitor. This signal is once more amplified by two invert gates. From the first output it is obtained RST and from the second output -RST.

When connecting the machine to the a.c. line RST are = 6 volts and -RST = 0 volts. After 0'5 seconds, when the capacitor has been charged RST are = 0 volts and -RST = 6 volts. Both signals are used to initialize the electronic system.

The signal SYNC is one of the sinusoidal inputs of the 11 volts A & B of the transformer converted into a square wave by means of a logic gate. This signal is used in the MPU to determine whether the game lights connected to the 11 volts A or to the 11 volts B must be lit.

DESCRIPTION OF THE BSC (RELAYS) BOARD

This board whose work is the one of activating the different solenoids of the machine, ball return unit, "taca", etc. is equipped with a 8 bit adres-

sable latch (4724), an eight darlington driver (DS8863) and up to eight relays.

The six inputs coming from the IOS board are: -EN whose work is to open all relays; three nominated A, B & C, which correspond to the address of which one is transmitting the information; one nominated DATA, which will be high if the determined relay for A.B.C. must close or low if the determined relay must open; finally, the signal -EN indicates to this latch when the information of the A.B.C. & DATA inputs is stable and valid to be passed to the memory.

DESCRIPTION OF THE DPY (DISPLAY) BOARD

The display board is composed of one C.I. 8 bit shift register (74C164), an 8 darlington driver, 7 current limiting resistors and 6 digits of 10.000 points, etc. forming columns. Each one of these columns is supplied from the IOS board, independent from the others and sequentially, so that only one of the 6 digits of each board is lit in a given moment. As this process is effected at an speed of 50 times per second, the observer eyes creates the optical illusion that all digits are lit simultaneously.

Previous to the connexion of the anodes of each column, the cathodes of the segments of each digit to be lit are chosen, in order to form the wished number.

A shift-register as the ones used, when receiving a pulse from its CK input, situates at the A output the information which was at the DATA input. Simultaneously, the information which was at A passes to B, the one in B to C, and so on.

From the IOS board the 5 CK inputs of the 5 display boards and the DATA input of the display of the first PLAYER are driven. The output H of this display is connected to the DATA input of the display of the second PLAYER and so on until the display of the STATUS.

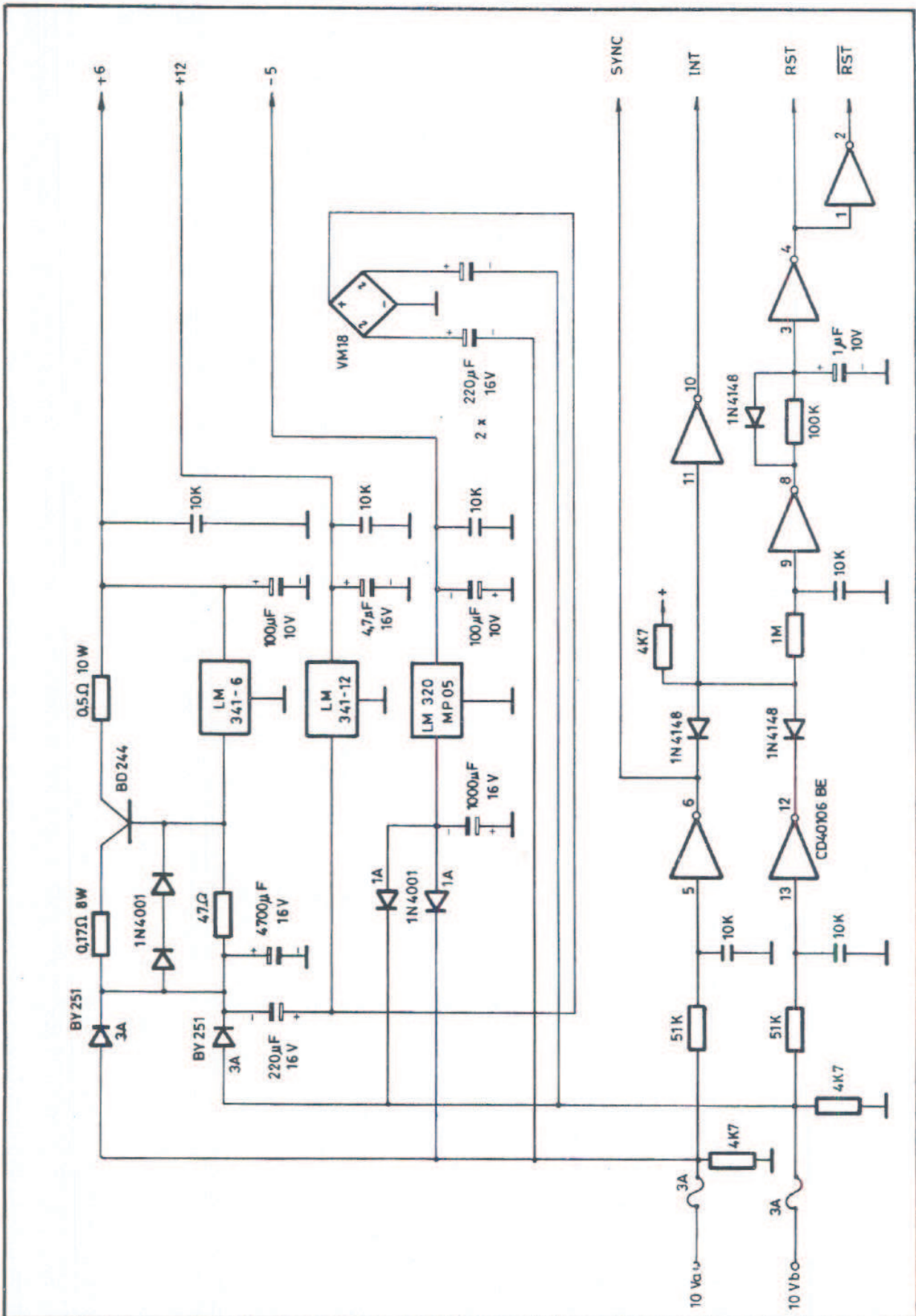
From the IOS board, before connecting a certain column, 40 pulses are sent for the connection CKD that supplies the inputs CK of the displays. Before every pulse DATA will be high or low, whether the segment to which such information must arrive will lit or not. Evidently, the eight first pulses correspond to the STATUS display, from nine to sixteen to the display of the fourth PLAYER,

from seventeen to twenty four to the display of the third PLAYER, from twenty five to thirty two to the display of the second PLAYER and from the thirty three to the forty to the display of the first PLAYER.

Once the segments have been selected, such informations, amplified by the drivers and limited their current by the resistors, are carried to the cathodes of the LED. The cathodes of the segments that occupy the same position in the six digits of every display are connected all together. Obviously, it will only lit the digits of the column which is supplied at this moment from the IOS board.

After 3 miliseconds, the dolumn is disconnected, the information of the following segments updated and the column supplied, and so on.

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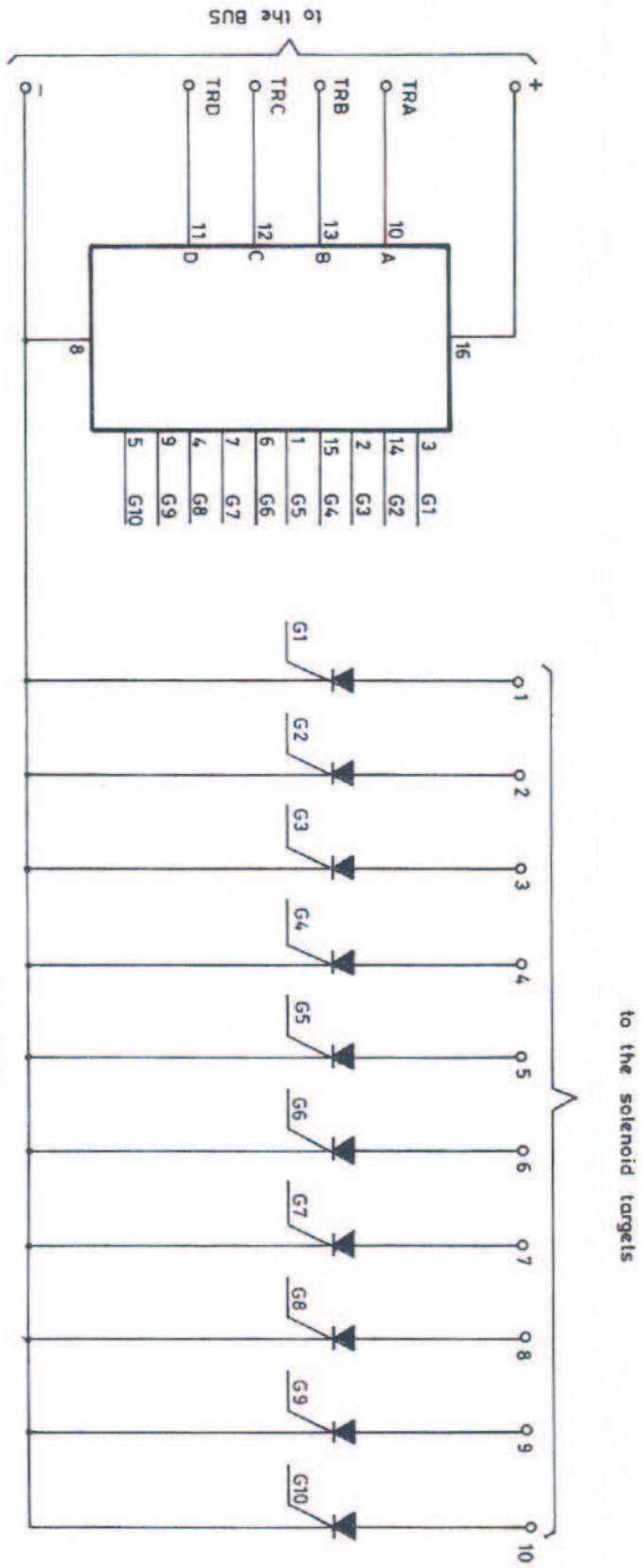
PIN - BALL MACHINE
P. S. U. board

DIBUJADO *Freyre*
COMPROBADO

playmatic s.a.

PIN-BALL MACHINE
B. T. C. board

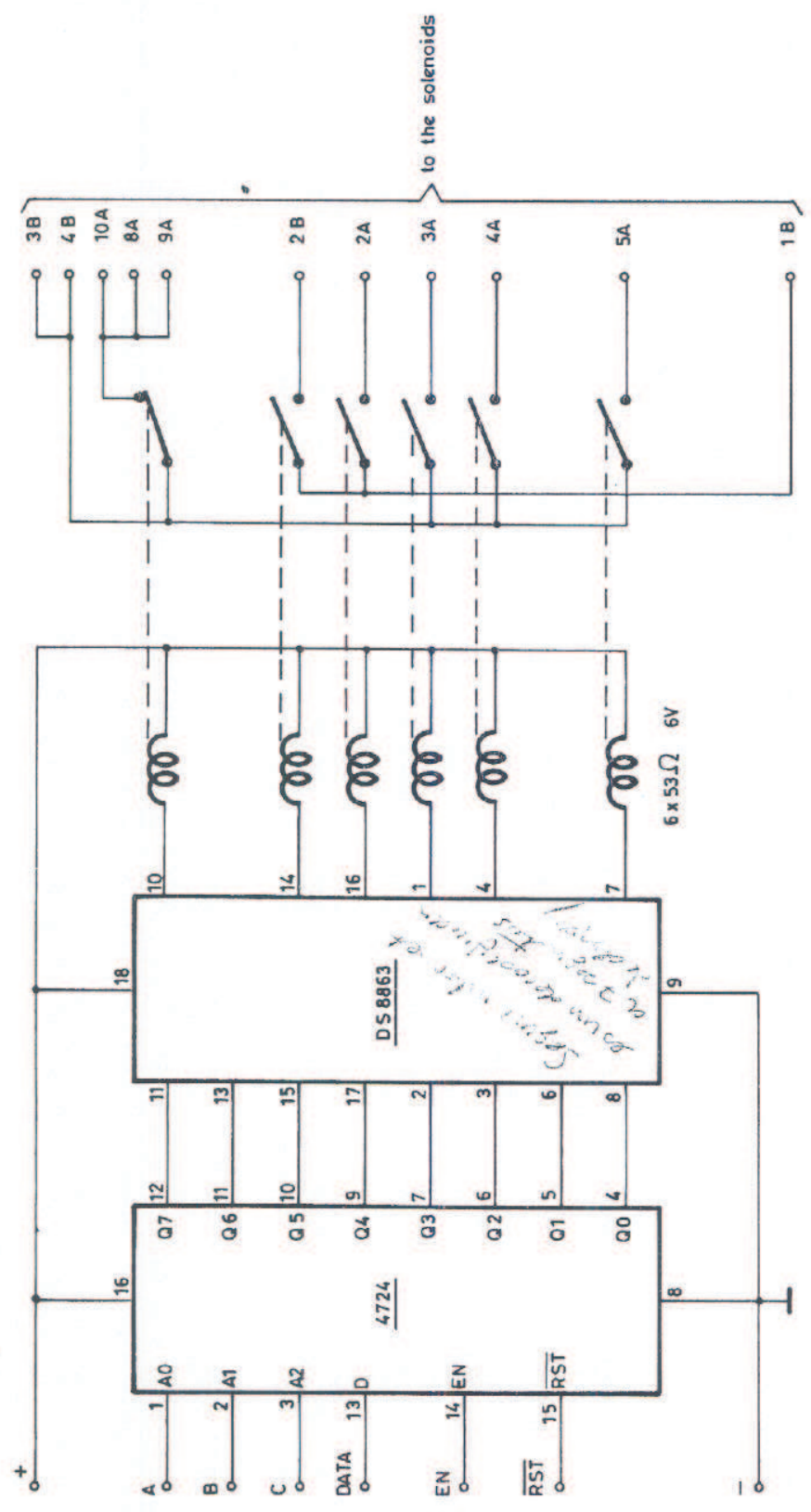
DIBUJADO
COMPROBADO

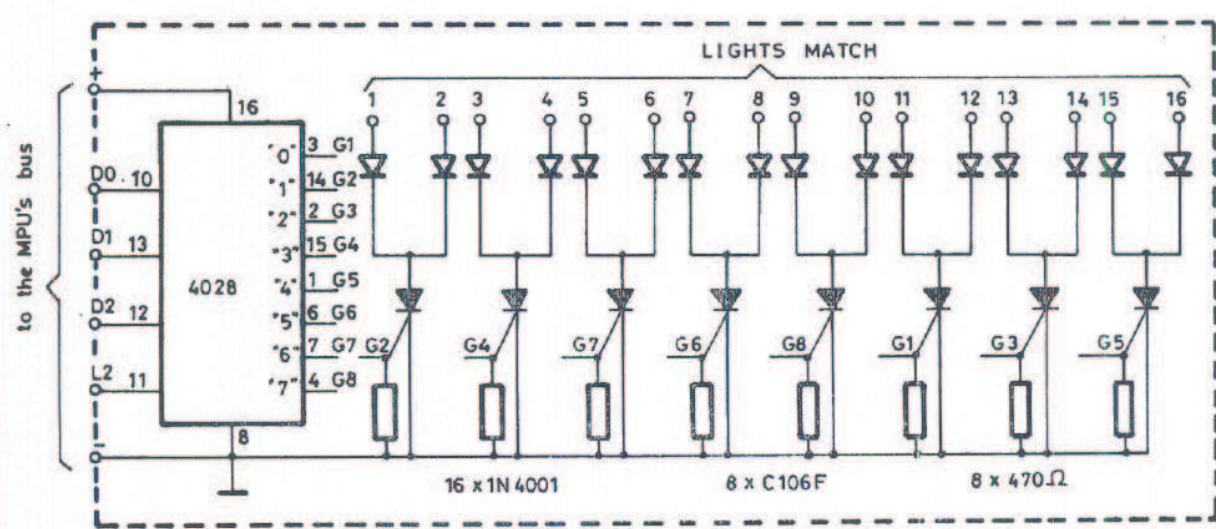
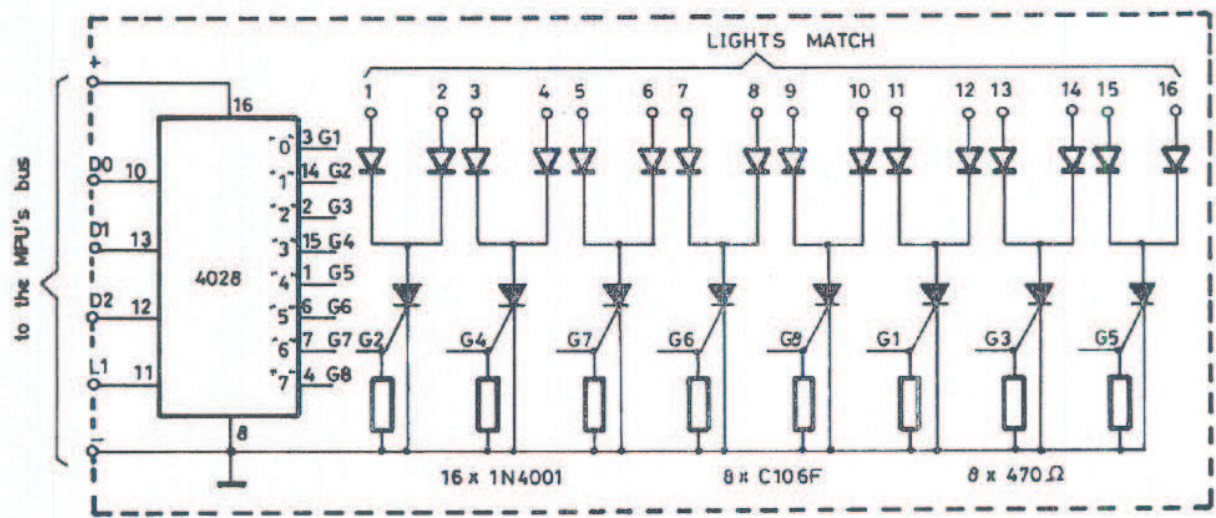
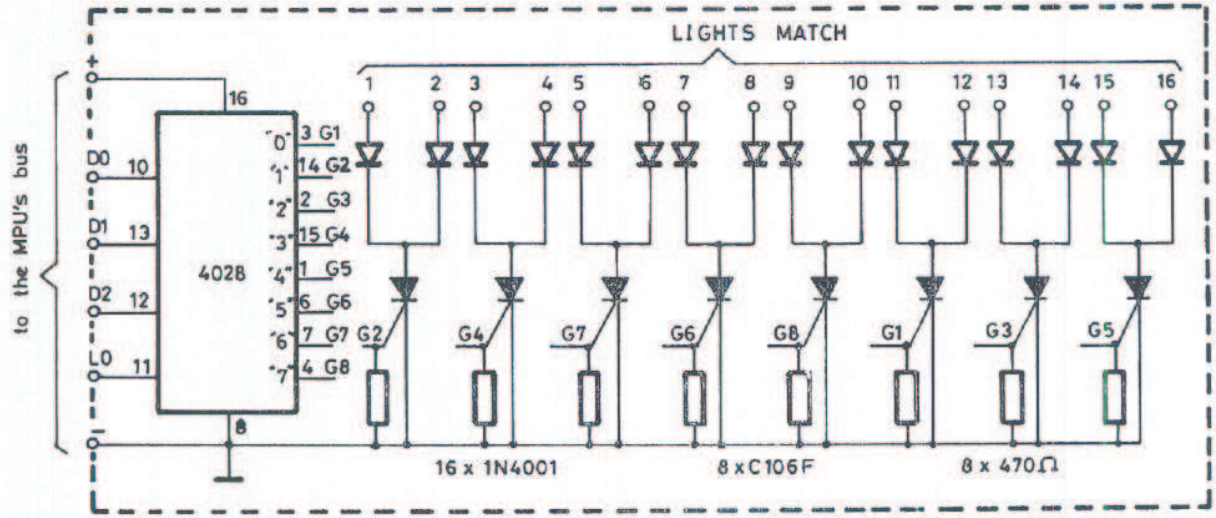


playmatic s.a.

PIN-BALL MACHINE
B.S.C. (RELAYS) board

DIBUJADO *Freygudo*
COMPROBADO

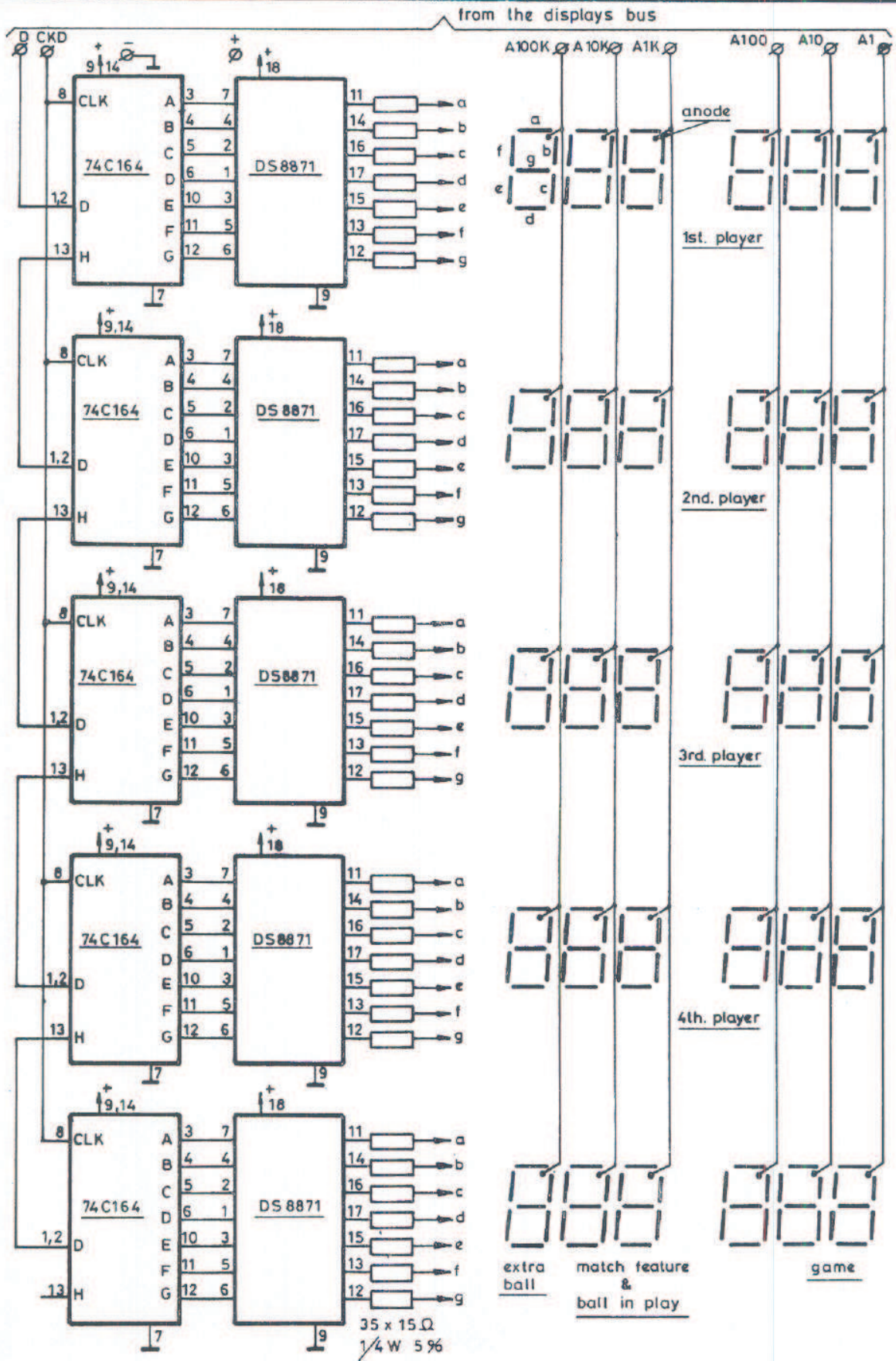


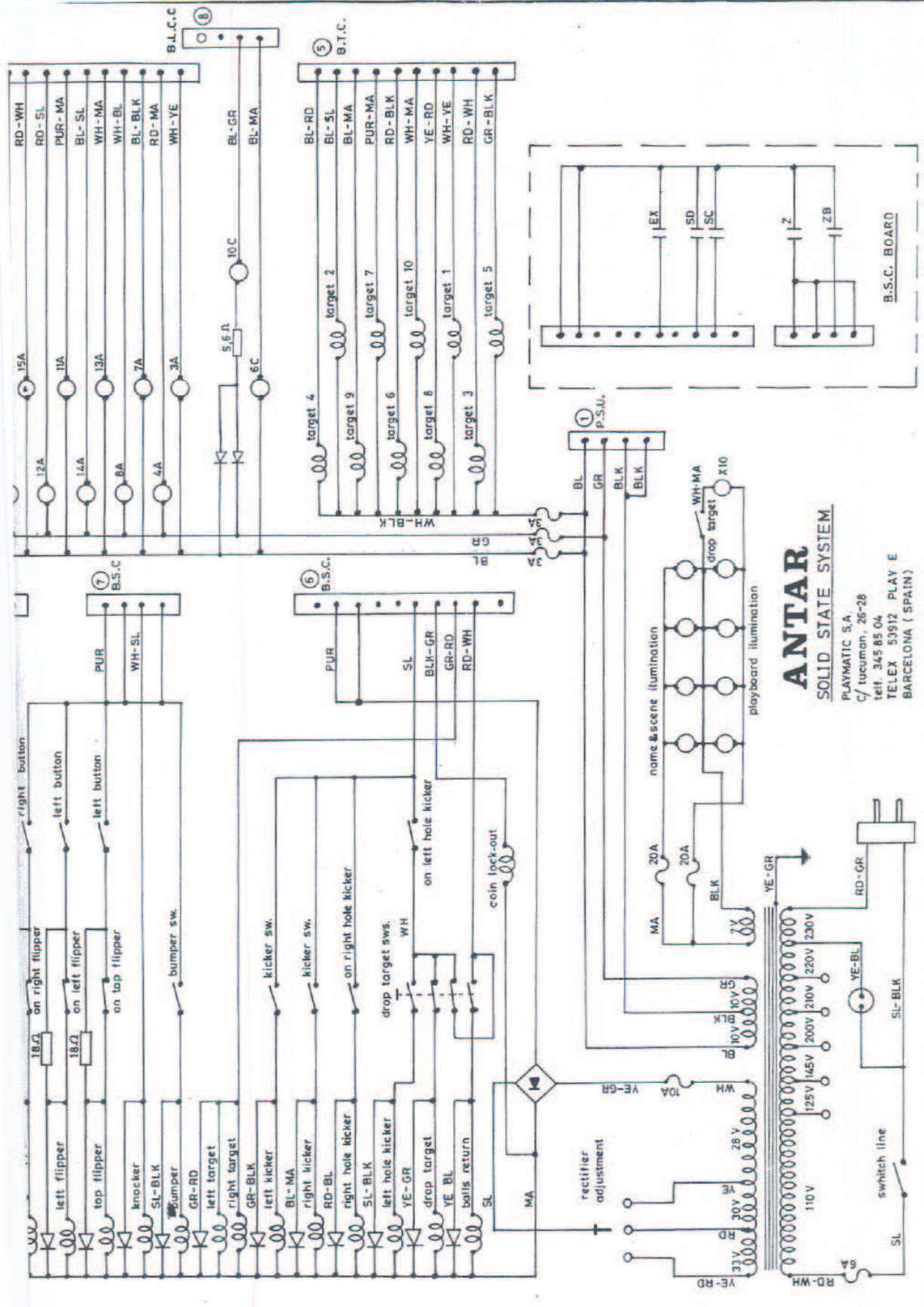


playmatic s.a.

PIN-BALL MACHINE
B.L.C. board (A,B,C)

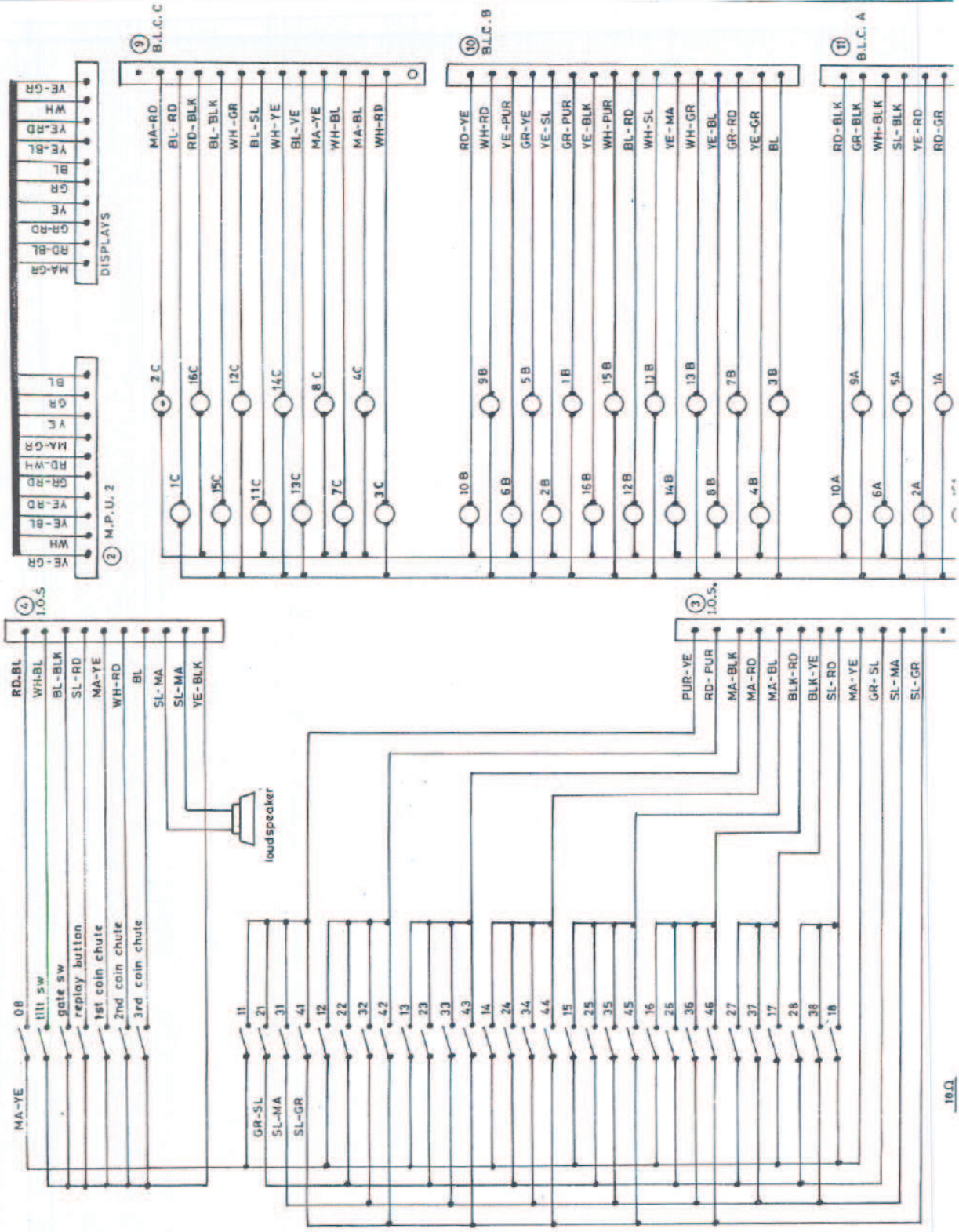
DIBUJADO *Toyano*
COMPROBADO

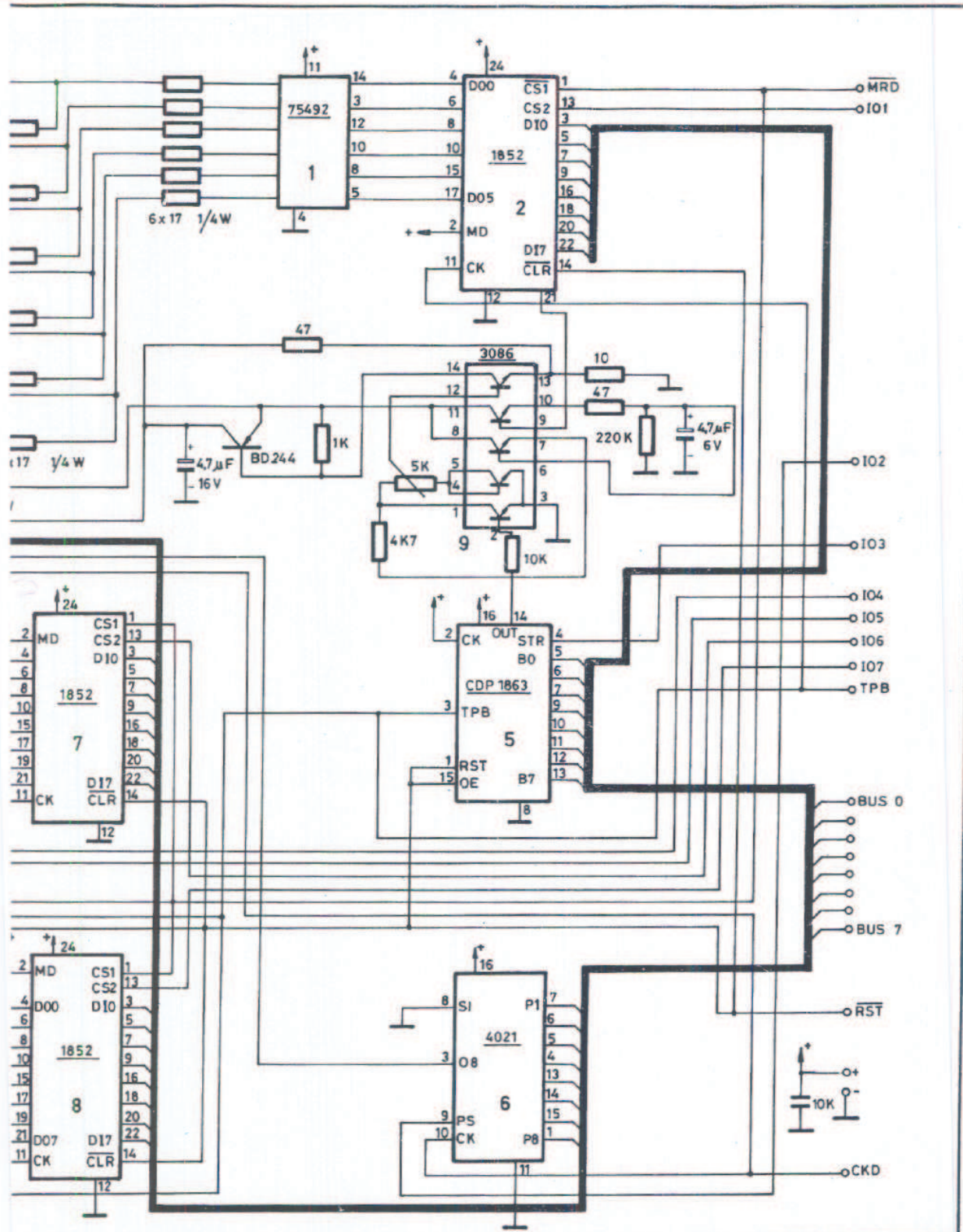




ANTAR
SOLID STATE SYSTEM

PLAYMATIC S.A.
C/ Tucuman, 26-28
tef. 345 85 04
TELEX 53912 PLAY E
BARCELONA (SPAIN)

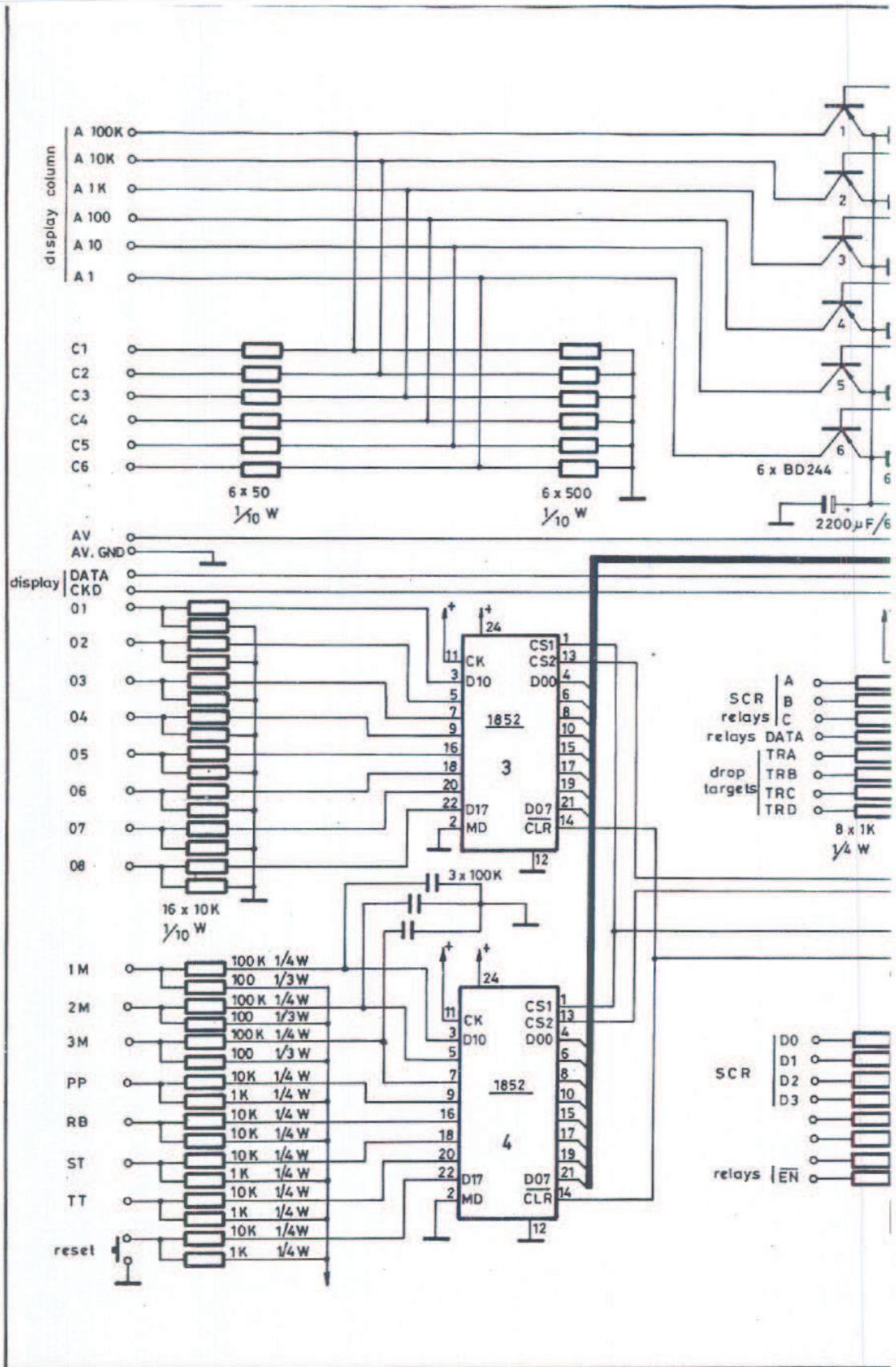


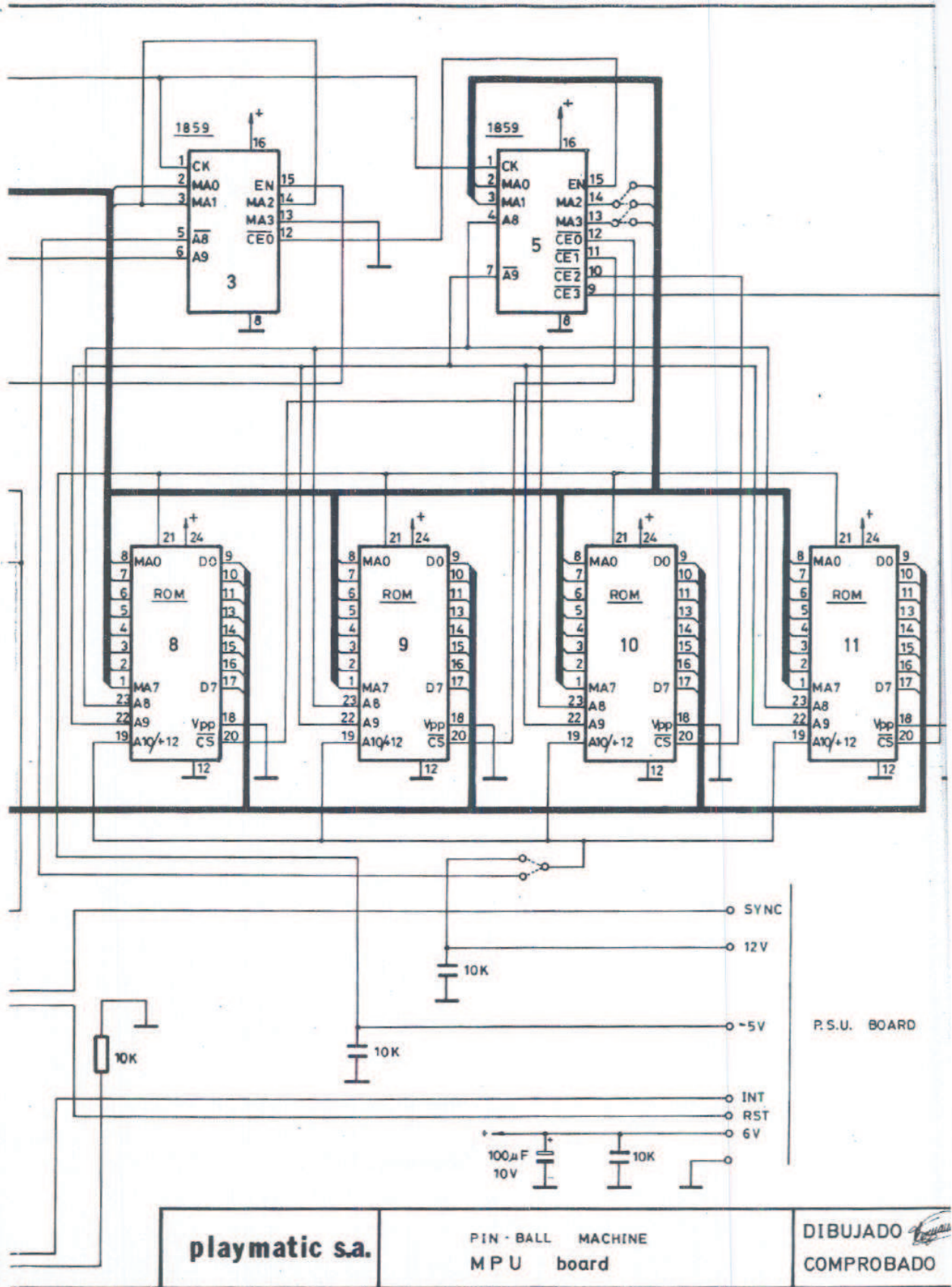


playmatic s.a.

PIN-BALL MACHINE
IOS - 11

DIBUJADO *Tejedor*
COMPROBADO

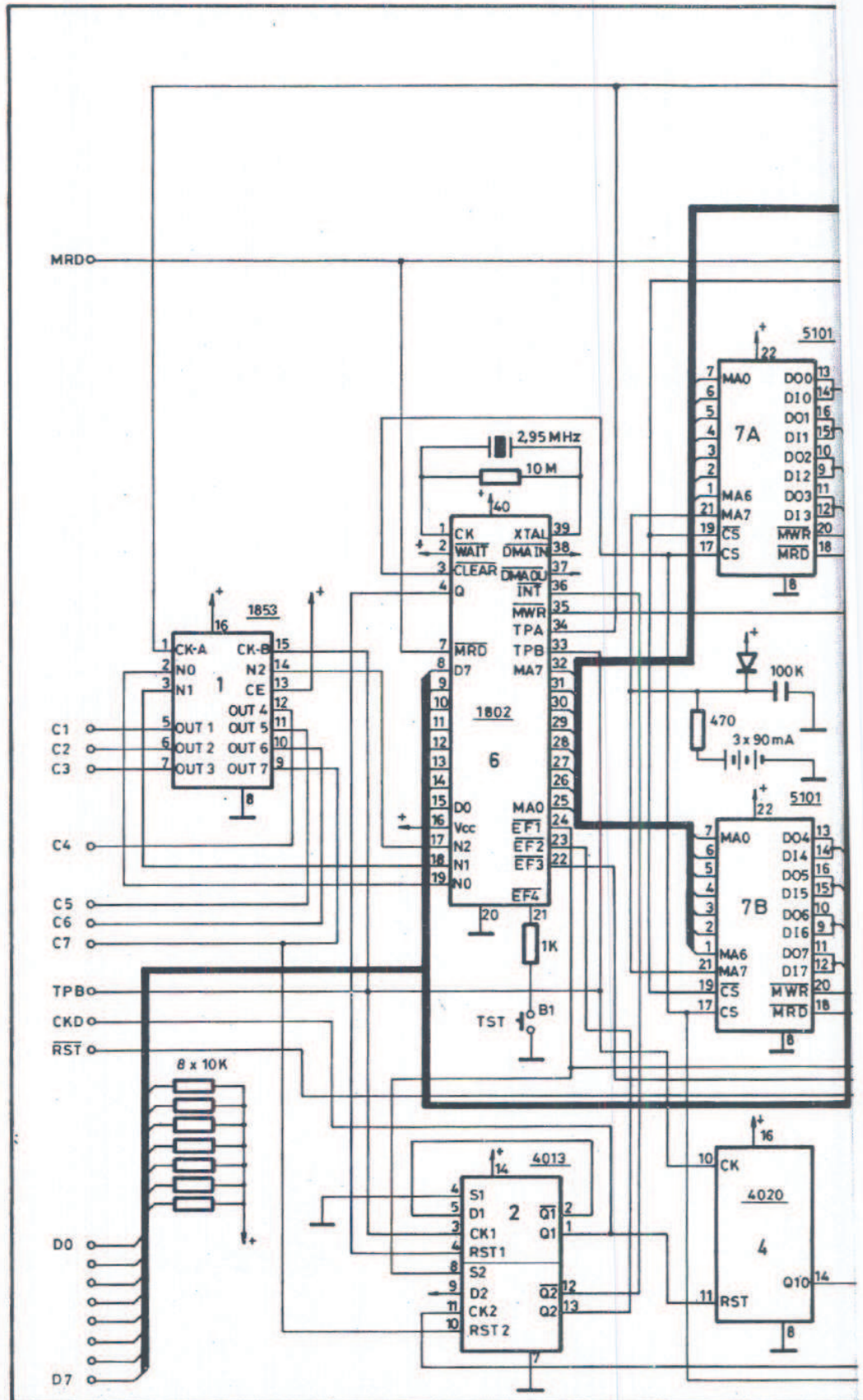




playmatic s.a.

PIN-BALL MACHINE
MPU board

DIBUJADO *[Signature]*
COMPROBADO

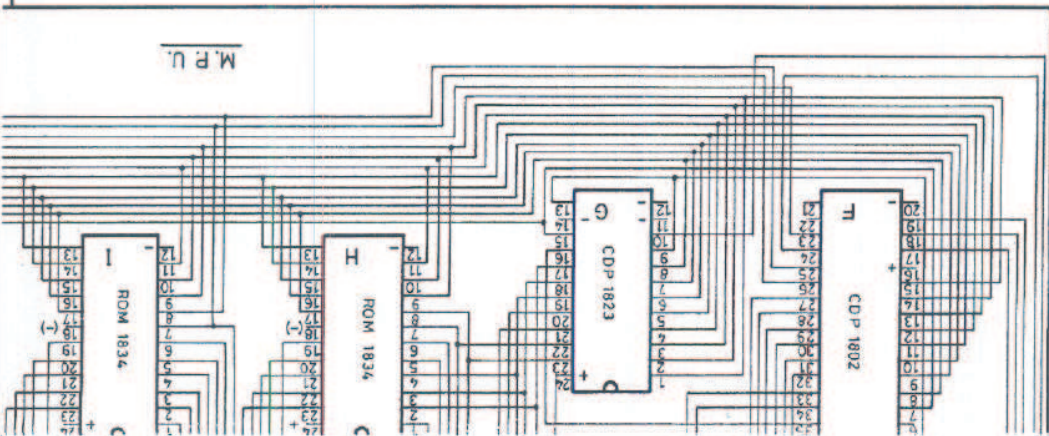
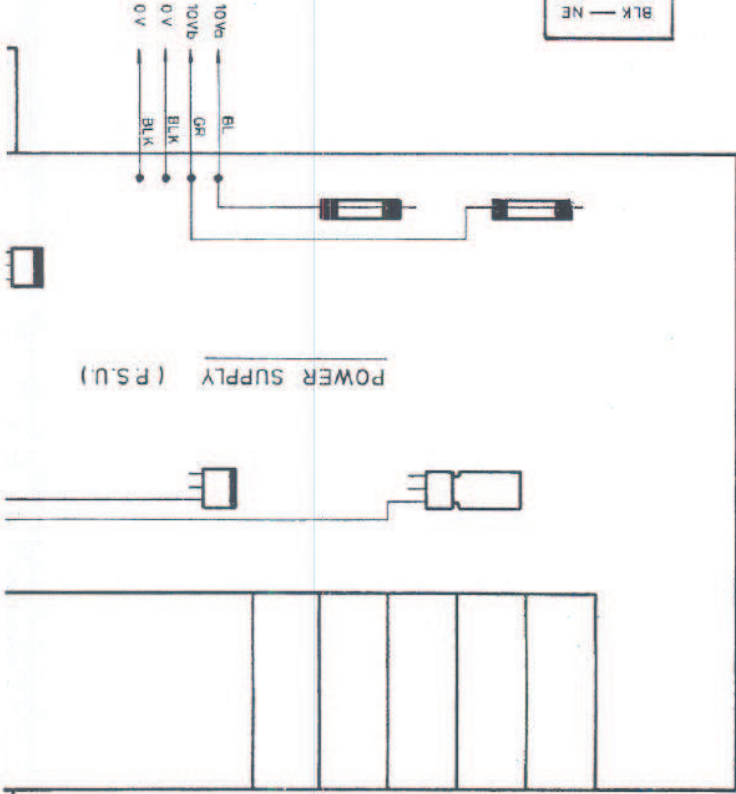


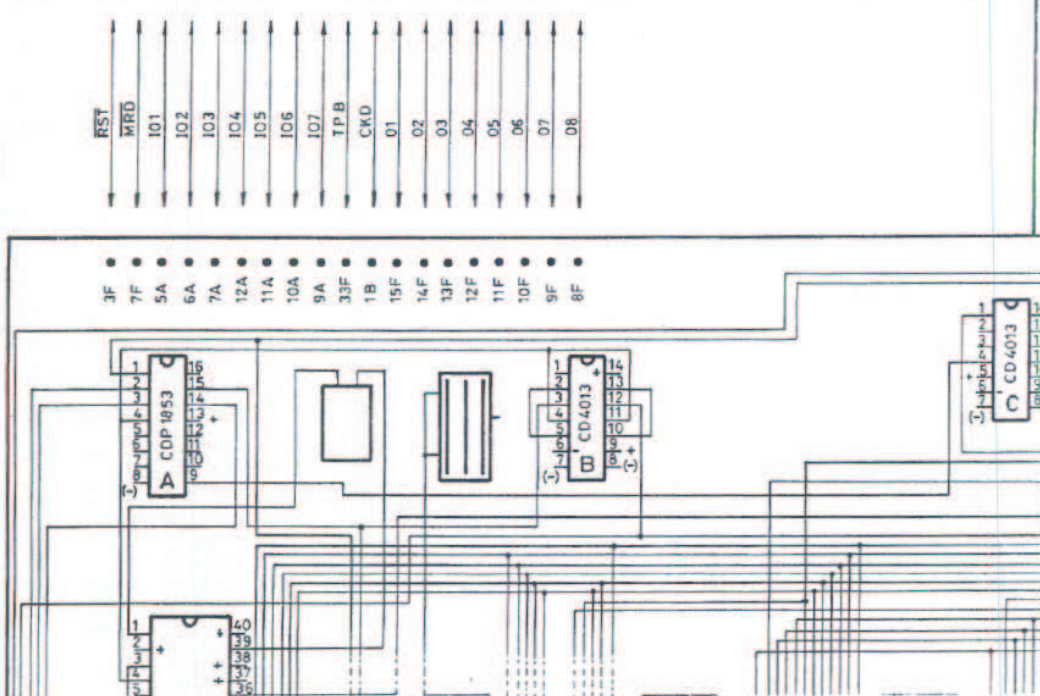
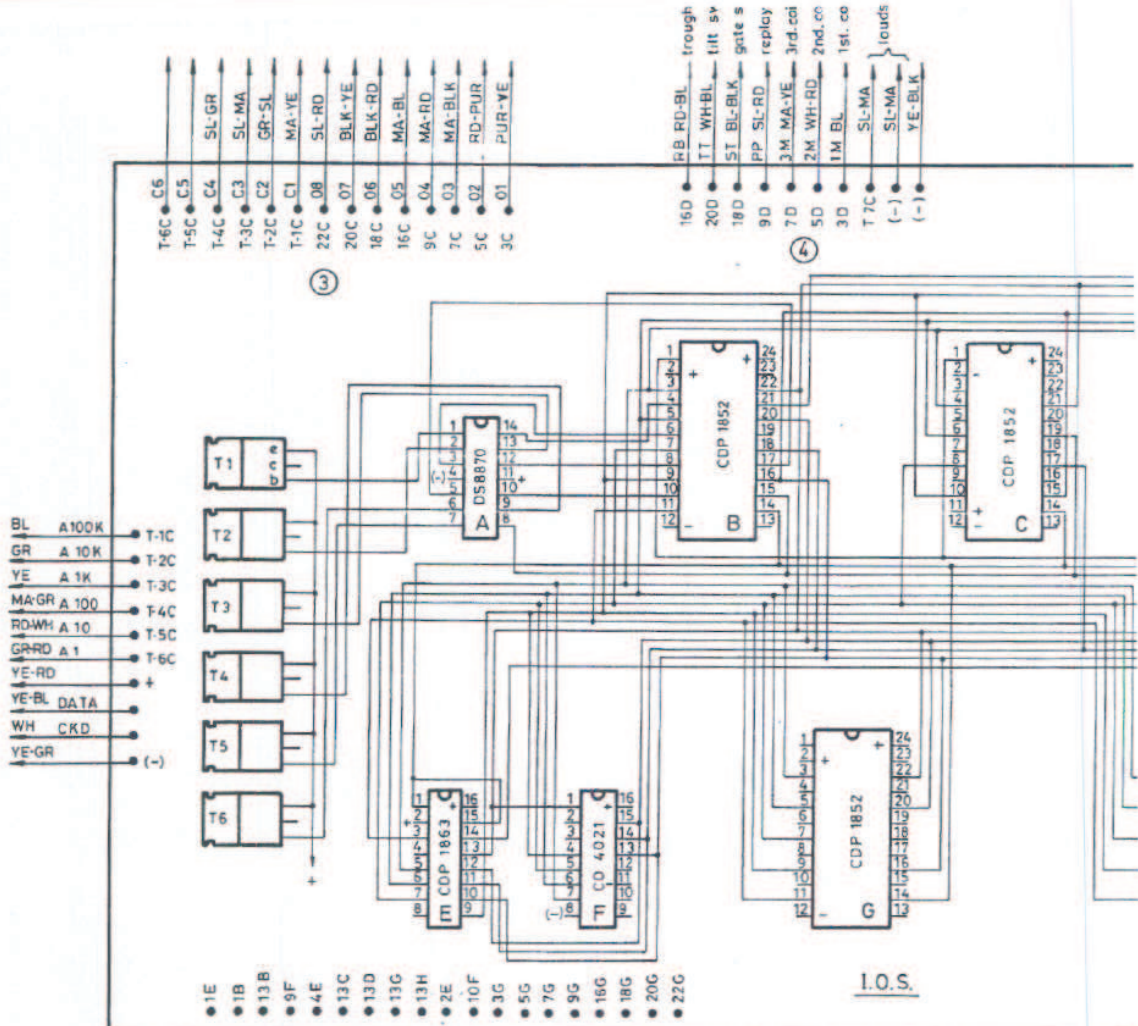
playmatic s.a.

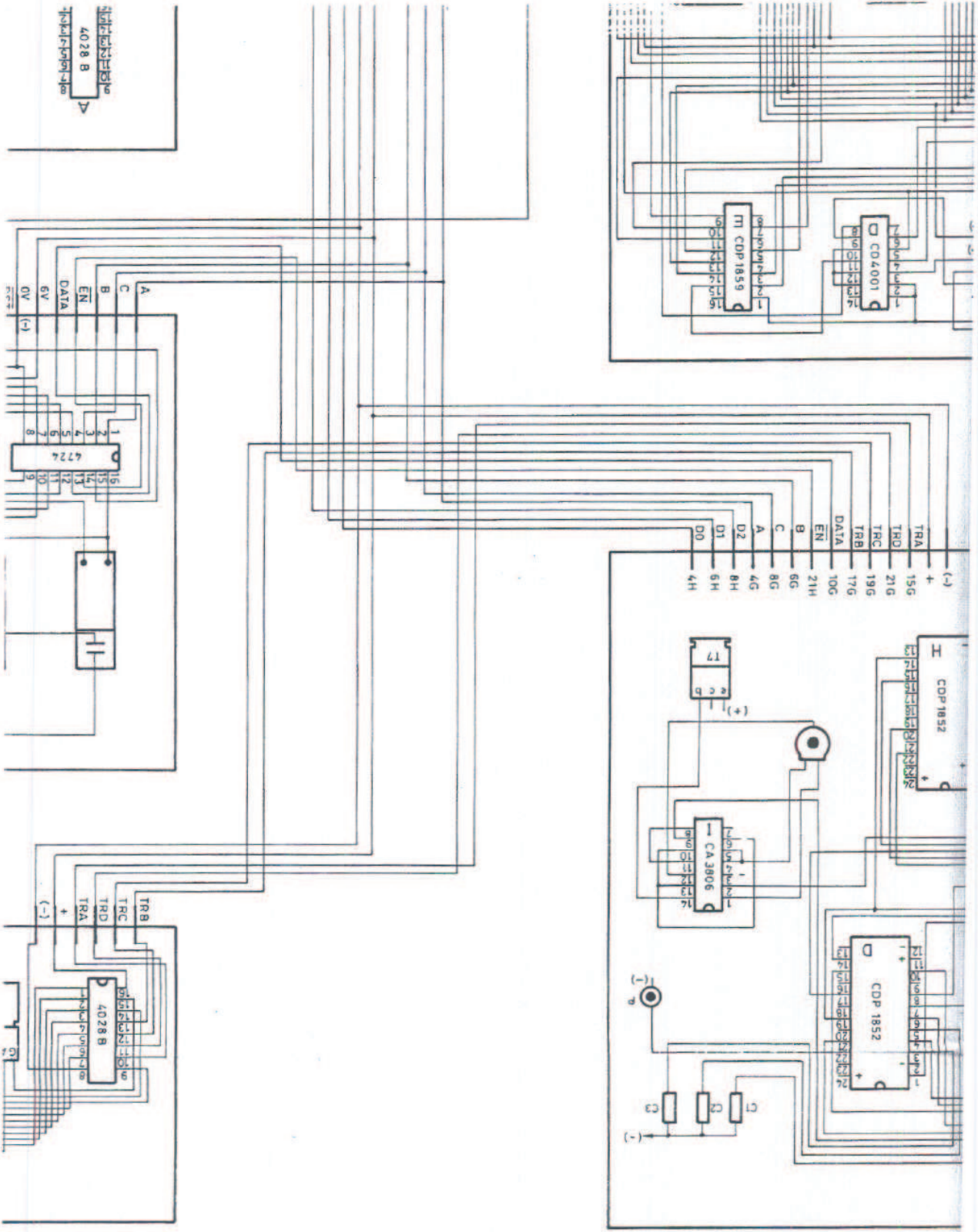
pin-ball machine
ANTAR

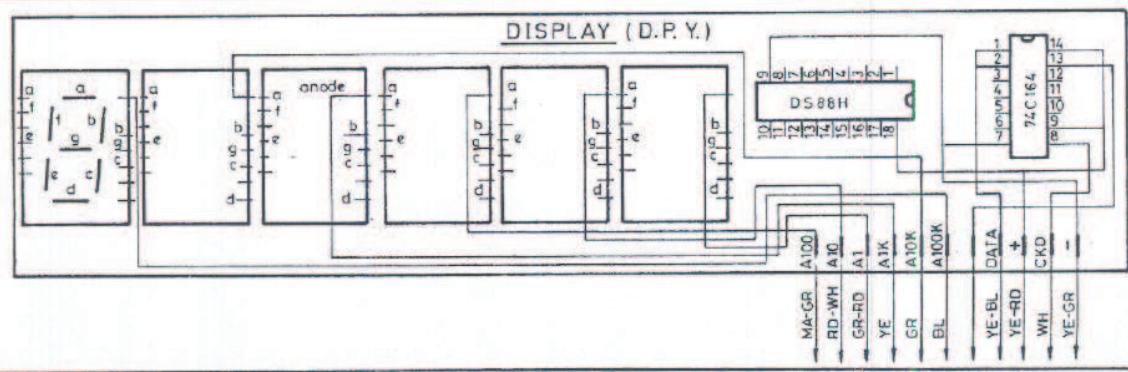
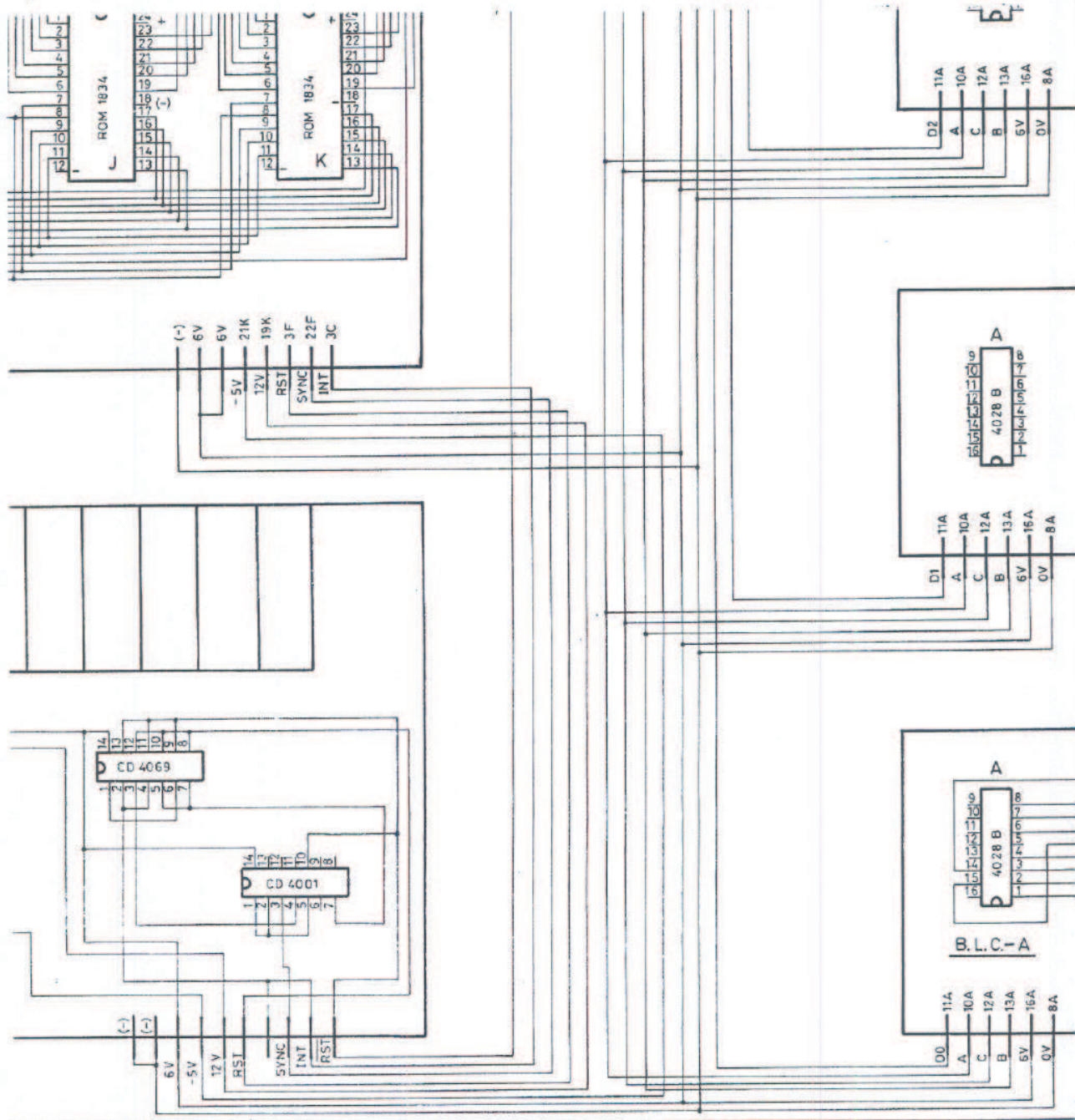
DIBUJADO *Alfonso*
COMPROBADO

- BLK — NE
- SL — GR
- BL — AZ
- YE — AM
- GR — VE
- MA — MA
- WH — BL
- PUR — VI
- RD — RO









C - 1 - C18

