

Owner's Manual

ENGLISH MARK DARTS® MACHINE

INTRODUCTION

This manual contains description, unpacking/assembly, operation, and troubleshooting information for the Model AD 5000 English Mark Darts Machine.

The purpose of this manual is to provide the user with a basic field service guide. If you should encounter a problem that is not covered, please call the factory, using our toll-free number, 800-435-8319. In Illinois use 815-962-3919.

SECTION I — GENERAL DESCRIPTION

The 5000 series English Mark Darts machine is a patented (Patent #4057 251) microprocessor controlled dart game where players may select one of eight different games. It is a coin operated game offering players a choice of quarter games or more challenging fifty-cent games.

Occupying only 2.5 square feet of floor space (see figure 1), this unit uses a revolutionary sealed switch matrix scoring system behind the dart face. As the darts strike the target, the machine's computerized digital scoring gives the player an instantaneous displayed score.

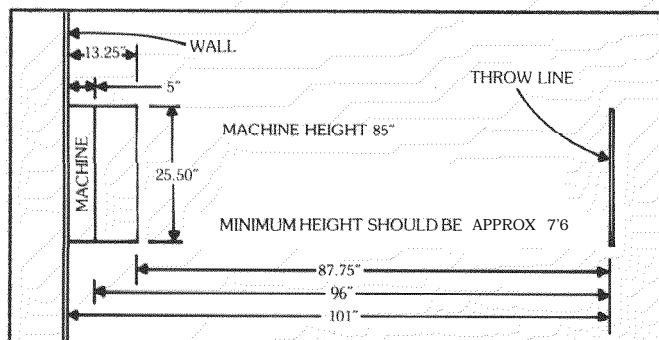


Figure 1. Plan view of 5000 Series play field.

SECTION II — UNPACKING/ASSEMBLY

2.1 Unpacking

- Using a sharp knife, slit all four corners of the shipping container from top to bottom, allowing the sides of the container to fall away from the machine.
- The top assembly is packed inside back of the base unit, and the top light is set on top of the base in a box board stabilizer. The bolts and keys are contained inside the stabilizer on top of the instruction panel.
- Remove the top from base and unpack the dart board assembly. The machine is now ready for assembly.

— CAUTION —

DO NOT lift the base unit by its instruction panel.

2.2 Assembly

- Screw top assembly onto top of dart board.
- Plug light into top receptacle (see figure 2).

— CAUTION —

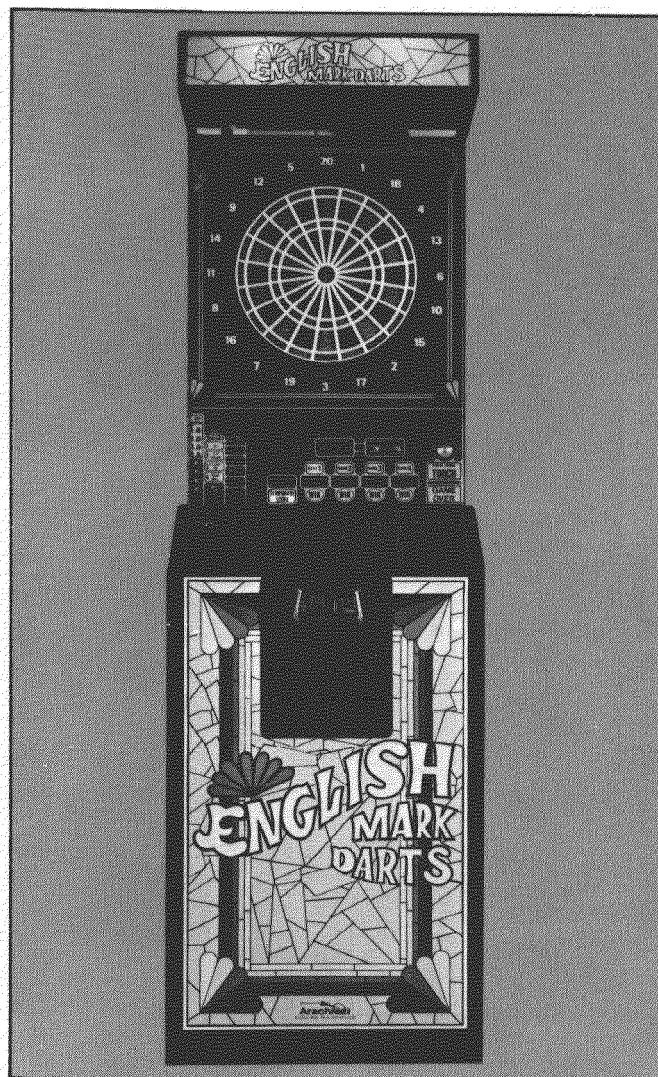
Game warranty is void if anything other than top light is plugged into receptacle.

- Install completed top assembly into base as shown in figure 3.
- Install carriage bolts so nuts are on inside of machine as shown in figure 4.
- Connect coin door harness to main harness at lower left corner of upper section (figure 5).

— NOTE —

The speaker plug is connected at the factory.

- Plug the power cord into a 120V AC wall outlet. The machine is now ready for the Power Up Sequence (Section III).



SECTION III — OPERATION

3.1 Power Up Sequence

- Turn on dart machine, using ON/OFF switch at top of machine. If machine is in self test mode, the following sequence occurs:
 - Dart board will lite. ROUND and TEMPORARY SCORE lamps are lit.
 - REMOVE DARTS and GAME OVER lamps will flash twice and go off.
 - Each display flashes a single zero and then goes blank.
 - ROUND lamp goes off and DARTS and PLAYER CHANGE lamps are lit.
- If the machine is in operating mode, when turned on, the following sequence occurs:
 - Dart board will lite.
 - ROUND, REMOVE DARTS, TEMPORARY SCORE, and GAME OVER lamps are lit and all PLAYER SCORES display a single zero.
- Perform the 5000 Series Test Routine as detailed in figure 6.
- After running the 5000 Series Test Routine outlined in figure 6, the English Mark Darts game is ready to play.

If Power Up Sequence is incorrect, use of the reset switch will reset the game to the correct sequence. The reset switch is located inside the coin door next to the coin mechanism (figure 7).



Figure 2. Top light is attached to top of dart board.



Figure 3. Attaching top assembly to base.

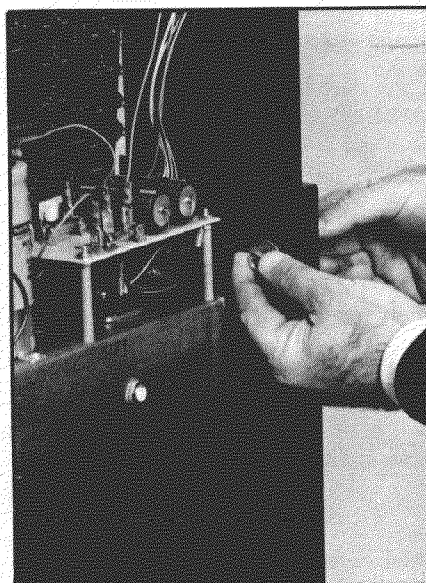


Figure 4. Bolting top to base, with bolts inserted from outside.

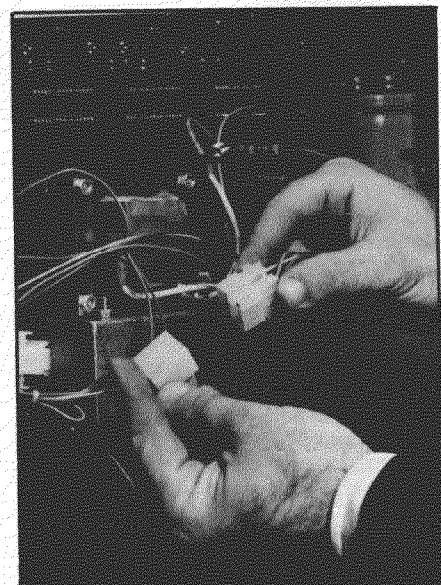


Figure 5. Connecting coin door plug to main harness.

SECTION IV—TECHNICAL DESCRIPTION

4.1 General

The rear views of the 5000 Series game (figure 8A) show exposed views of boards used in the game machine: (1) Main CPU Board; (2) Target Interface Board; (3) Lampboards; (4) Power Supply Board. These boards are described in paragraphs 4.2 through 4.5.

The hinged door (figure 8B) swings open to allow easy service access to the dart head and lamp boards. (See CAUTION on door).

4.2 Main CPU Board (figure 9)

The Main CPU Board (mother board) contains the main control circuitry. It is the heart of the machine, consisting of an 8749 microprocessor and peripheral integrated circuits (ICs) as described in Table I.

TABLE I

Description of components or equivalent cross reference on Main CPU Board.

| Fig. 9 Ref. No. | Description |
|--------------------|--|
| 1 | 8749 Microprocessor (1A 6 megahertz crystal) |
| 2-5 | 8243 Input/Output Expanders |
| 6 | 316B103 10K Ohm Resistor Network |
| 7-8 | 74LS244N 3-State Octal Buffer |
| 9-13 | 74LS04N Hex Inverter |
| 14-16 | 74LS138N 10F8 Decoder/Demultiplexer |
| 17 | 74LS02 Quad 2 Input NOR Gate |
| 18 | 74LS273 Octal D Flip Flop |
| 19-20 | 7407 Hex Buffer/Driver |
| 21 | LM383T 8-Watt Audio Amplifier |
| 22 | LM7815 15-Volt Regulator |
| 23 | LM358 Dual Operational Amplifier |

5000 SERIES TEST ROUTINE

1. On the Main CPU Board (back side), push slide switch to up. The following lamps should be lit: DART, TEMPORARY SCORE, PLAYER CHANGE, panel numbers and top display.
2. Press PLAYER CHANGE once. Machine should go into self test mode.
3. All displays will begin counting "0" through "9" at the same time. Watch displays for missing segments and missing digits.
4. After displays have counted to "9", each lamp will be lit in a logical sequence one by one. Check for defective bulbs.
5. When the GAME OVER lamp lites, the dart board illumination lamp will flash once.
6. After the last win lamp is lit, all 20 number lamps will lite (one at a time). While this is happening, the machine will play all four sounds.

— NOTE —

- The self test can be stopped anywhere in the cycle by pressing PLAYER CHANGE. When you are ready to resume, the cycle can be restarted by pushing the PLAYER CHANGE button again.
7. After the last sound made by the machine during self test, the test for the dart head's scoring ability can be performed.
 8. All displays will be off and the TEMPORARY SCORE lamps will be lit.
 9. Tap each segment. You should be able to see the score in TEMPORARY SCORE. Make a note of any number that doesn't match the segment number you hit, or doesn't score.
 10. On the Main CPU Board, push slide switch to down position. This returns game to normal operation.
 11. Activating the machine with quarters, push each GAME SELECT pushbutton. The corresponding GAME lamp should lite and then go off when the next game is selected.
 12. The eighth game pushbutton pushed will be "split second." This game is played one round for each of the four players displayed.
 13. When the game begins, tap three segments for each of the four players.
 14. After the fourth player, push the PLAYER CHANGE button again. Machine will go back to player one. Watch the machine count from 1 to 20 by individually turning on and off, in sequence, the back lit numbers.
 15. After the machine has gone to 20, the PLAYER CHANGE lamp will lite and the number "1" lamp will be lit.
 16. Test the slam switch on coin door as follows:
 - (a) Close and lock coin door.
 - (b) Hit the coin door with your hand. If adjusted properly, the machine will reset.
 - (c) Reopen the coin door and push the Reset button on the inside (see figure 7). The machine should reset.
 17. Replace the back door, checking the fit and ease of locking.
 18. Make note of any problems in closing and locking of the coin door, back door, or anything else that may not be correct.

(Ref. Para. 3.1 (c))

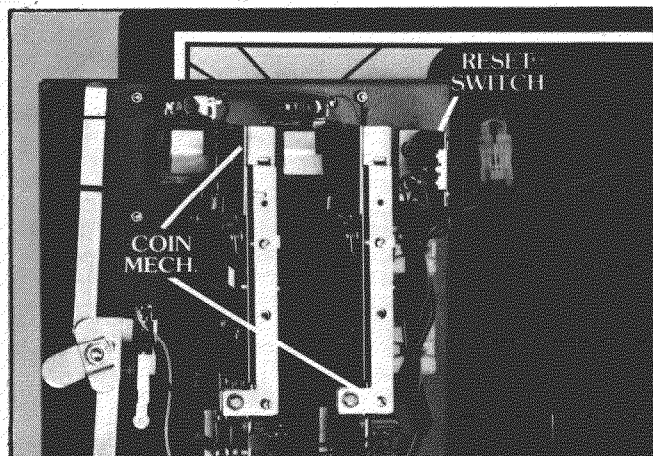


Figure 7. Coin door open, showing coin mechanism and reset switch.

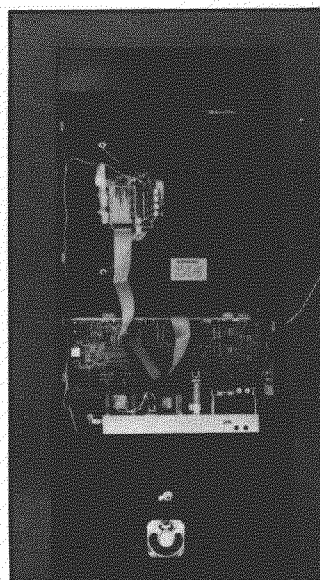


Figure 8A. Rear view of 5000 Series game machine.

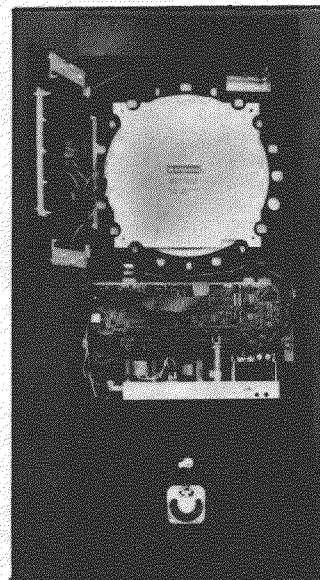


Figure 8B. Door opens for access to dart head.

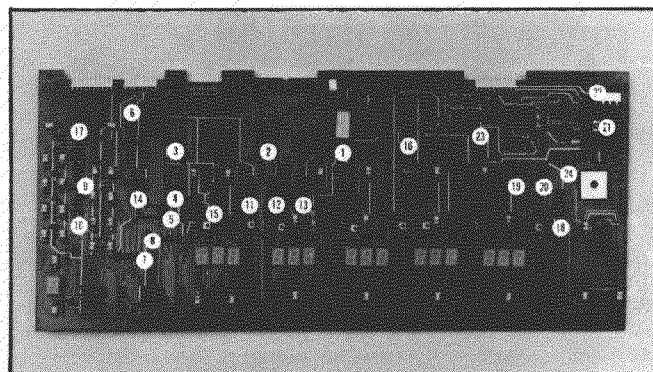


Figure 9. Front view of Main CPU Board.

TABLE II

Lamp driving components on Main CPU Board

| Light | Transistor | IC No. (74LS138) | Pin No. | IC NO. (8243) | Pin No. | Notes |
|----------|------------|------------------|---------|---------------|---------|-------------|
| GAME 1 | Q34 | U4 | 15 | U5 | — | |
| GAME 2 | Q36 | U4 | 13 | U5 | — | |
| GAME 3 | Q38 | U4 | 11 | U5 | — | |
| GAME 4 | Q40 | U4 | 9 | U5 | — | |
| GAME 5 | Q35 | U4 | 14 | U5 | — | |
| GAME 6 | Q37 | U4 | 12 | U5 | — | |
| GAME 7 | Q39 | U4 | 10 | U5 | — | |
| GAME 8 | Q41 | U4 | 7 | U5 | — | |
| SELECT | | | | | | |
| GAME | Q42 | — | — | U5 | 21,22 | a. (1 of 2) |
| SELECT | | | | | | |
| GAME | Q43 | — | — | U5 | 23 | b. (2 of 2) |
| REMOVE | | | | | | |
| DARTS | Q44 | U6 | 15 | U5 | — | |
| GAME | | | | | | |
| OVER | Q45 | U6 | 14 | U5 | — | |
| PLAYER | | | | | | |
| CHANGE | Q46 | U6 | 13 | U5 | — | |
| BUST | Q47 | U6 | 12 | U5 | — | |
| THROW | | | | | | |
| DARTS | Q48 | U6 | 11 | U5 | — | |
| ROUND | Q49 | — | — | U5 | 17 | |
| DARTS | Q50 | — | — | U5 | 17 | |
| PLAY'R 1 | Q2 | — | — | U11 | 2 | |
| PLAY'R 2 | Q4 | — | — | U11 | 4 | |
| PLAY'R 3 | Q6 | — | — | U11 | 1 | |
| PLAY'R 4 | Q8 | — | — | U11 | 22 | |
| 1 WIN | Q3 | — | — | U11 | 3 | |
| 2 WIN | Q5 | — | — | U11 | 5 | |
| 3 WIN | Q7 | — | — | U11 | 23 | |
| 4 WIN | Q9 | — | — | U11 | 21 | |

Other components include eight MPSU51 transistors in a line above seven segment displays.

The lamps on the mother board are driven by 2N4400 transistors. Table II lists the transistor and corresponding IC numbers to check for each lamp.

All driver transistors are next to the lamps they drive. The TEMPORARY SCORE lamps have no driver.

4.2.1 Seven Segment Displays

Located above the displays are eight MPSU51 transistors. These provide the main power to the displays in the following sequence:

| MPSU No. | Number from left to right | Display No. |
|----------|---------------------------|-------------|
| 1 | 1 & 2 | |
| 2 | 3 & 4 | |
| 3 | 5 & 6 | |
| 4 | 7 & 8 | |
| 5 | 9 & 10 | |
| 6 | 11 & 12 | |
| 7 | 13 & 14 | |
| 8 | 15 & 16 | |

The ROUND counter is counted as number 1.

The segments in each display are driven by 2N4400 transistors in sequence with two 74LS244 buffers and an 8243 I/O expander. The I/O expander receives a signal from the 8049 microprocessor and outputs it to the 74LS224N buffers, which in turn, deliver the signal to the transistors driving the segments. The drive control sequence is shown in Table III.

TABLE III

Drive control sequence of Segment Displays

| 8243 (IC 13) Out Pin No. | 74LS244 In Pin No. | 74LS244 Out Pin No. | Transistor | Display | Seg-ment | 74LS244 IC No. |
|--------------------------|--------------------|---------------------|------------|---------|----------|----------------|
| 2 | 2 | 18 | Q18 | ODD | A | 14 |
| 3 | 17 | 3 | Q19 | ODD | B | 14 |
| 4 | 4 | 16 | Q20 | ODD | C | 14 |
| 5 | 15 | 5 | Q21 | ODD | D | 14 |
| 1 | 6 | 14 | Q22 | ODD | E | 14 |
| 23 | 13 | 7 | Q23 | ODD | F | 14 |
| 22 | 8 | 12 | Q24 | ODD | G | 14 |
| 21 | 11 | 9 | Q25 | ODD | D.P | 14 |
| 20 | 2 | 18 | Q26 | EVEN | A | 15 |
| 19 | 17 | 3 | Q27 | EVEN | B | 15 |
| 18 | 4 | 16 | Q28 | EVEN | C | 15 |
| 17 | 15 | 5 | Q29 | EVEN | D | 15 |
| 13 | 6 | 14 | Q30 | EVEN | E | 15 |
| 14 | 13 | 7 | Q31 | EVEN | F | 15 |
| 15 | 8 | 12 | Q32 | EVEN | G | 15 |
| 16 | 11 | 9 | Q33 | EVEN | D.P | 15 |

4.2.2 Player Change

The player change switch grounds pin 38 of U16 through a 560 ohm resistor.

4.2.3 Sound Circuitry

The sound section of the mother board revolves around three components: a LM7815CT 15V DC voltage regulator, a LM358 low power dual operational amplifier, and a LM383T 8-watt audio power amplifier. Also included are three 10K ohm potentiometers (volume controls) located in the upper right corner of the mother board: Pot 1 is a signal control; Pot 2 is an optional speech control; and Pot 3 is the master volume. Pots 1 and 2 are preset at 50% value.

4.3 Target Interface Board

This board interfaces the target to the Main CPU Board. It carries the scoring signals from the dart board to the main board. It also drives the number lamps located around the dart board and the machine's top light assembly.

There are three main types of components on the Target Interface Board (figure 10) as shown in Table IV.

There are 20 transistors on the target interface board. These control the number lamps around the dart board in the sequence shown in Table V, column 2.

Starting with Q1, transistors are numbered right to left and top to bottom (see figure 10). These transistors are controlled by four ICs (Type 74LS04) on the target interface board and two

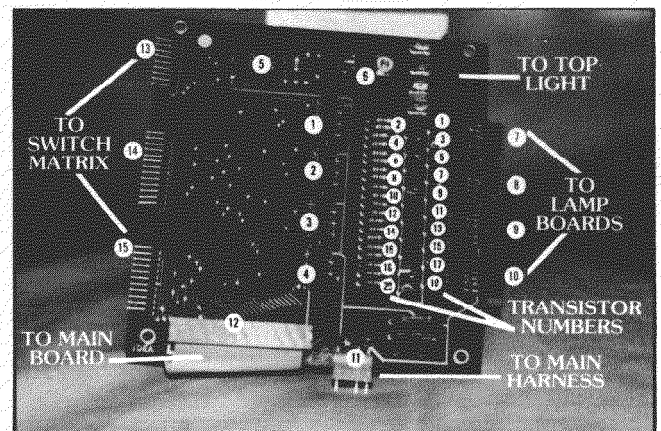


Figure 10. Target Interface Board.

TABLE IV

Description of components on Target Interface Board

| Fig. 10 Ref. No. | Description |
|---------------------|-------------------------------|
| 1-4 | 74LS04 IC Hex Inverter |
| 5 | MOC3030 Triac Driver |
| 6 | SC146D Triac |
| 7-10 | Lamp Board Connectors |
| 11 | Main Harness Power Connector |
| 12 | 40-Pin Ribbon Cable Connector |
| 13 | Connectors to Switch Matrix |

I/O expanders (Type 8243) on the mother board. The pins interconnecting these and the line number in the ribbon cable are shown in Table V, columns 3-8.

The ribbon cable numbers start from the colored edge. On the 74LS04 ICs, Pin 7 is ground; Pin 14 Vcc.

4.3.1 Top Light

The top light consists of two sources. The two lamps behind the English Mark Darts® display panel are tied directly into the line through a 3/4 amp fuse on the power chassis. These lamps are lit whenever the machine is plugged in. The light that illuminates the dart board is driven by IC MOC3030 and a SC146D triac on the target interface board. This light is lit only during the actual playing of a game. When the game ends, the light will flash and then go out.

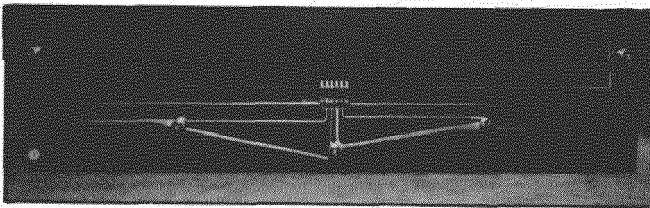


Figure 11. Lamp Board contains a six-pin connector and five lamps.

TABLE V

Target Interface transistors with corresponding lamp (score) numbers and interconnecting pin numbers

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|----------------|------------------|---------------|---------|--------|----------------------|----------------|---------|
| Transistor No. | Lamp No. (Score) | IC No. (7404) | Pin Out | Pin In | Ribbon Cable Pin No. | IC No.* (8243) | Pin Out |
| Q1 | 12 | 1 | 2 | 1 | 18 | 12 | 21 |
| Q2 | 5 | 1 | 13 | 12 | 5 | 12 | 2 |
| Q3 | 20 | 1 | 4 | 3 | 12 | 12 | 16 |
| Q4 | 1 | 1 | 10 | 11 | 21 | 5 | 13 |
| Q5 | 18 | 1 | 6 | 5 | 10 | 12 | 14 |
| Q6 | 16 | 1 | 8 | 9 | 11 | 12 | 17 |
| Q7 | 8 | 2 | 2 | 1 | 4 | 12 | 5 |
| Q8 | 11 | 2 | 13 | 12 | 15 | 12 | 22 |
| Q9 | 14 | 2 | 4 | 3 | 13 | 12 | 19 |
| Q10 | 9 | 2 | 10 | 11 | 8 | 12 | 1 |
| Q11 | 2 | 2 | 6 | 5 | 22 | 5 | 14 |
| Q12 | 17 | 2 | 8 | 9 | 7 | 12 | 13 |
| Q13 | 3 | 3 | 2 | 1 | 19 | 5 | 15 |
| Q14 | 19 | 3 | 13 | 12 | 9 | 12 | 15 |
| Q15 | 7 | 3 | 4 | 3 | 3 | 12 | 4 |
| Q16 | 4 | 3 | 10 | 11 | 20 | 5 | 16 |
| Q17 | 13 | 3 | 6 | 5 | 17 | 12 | 20 |
| Q18 | 6 | 3 | 8 | 9 | 6 | 12 | 3 |
| Q19 | 10 | 4 | 2 | 1 | 16 | 12 | 23 |
| Q20 | 15 | 4 | 13 | 12 | 14 | 12 | 18 |

*Located on Main CPU Board

4.4 Lamp Boards

The lampboards contain one six-pin connector, five 4999-004 lamp sockets, and five CM7373 type incandescent bulbs (see figure 11).

4.5 Power Supply

The 5000 Series Power Supply (figure 12) consists of the components described in Table VI. It uses two transformers. One is specially designed for Arachnid (the smaller of the two). The larger transformer is a standard 12-volt, 8-amp power transformer. Both transformers have a 120V AC primary. A 5V DC regulator (LM323, or equivalent) supplies the voltage to all integrated circuits in the game. The regulator receives its voltage from the standard transformer through an MT980-2 bridge rectifier, 1.5-ohm, 10-watt resistor; and a 7.5-amp fuse.

The audio supply comes from a special transformer through four MR501 diodes in a rectifier alignment and a 3/4-amp fuse. The output is on Pin 2 of the connector.

The main line voltage is on a 3-amp circuit breaker mounted on the front of the supply.

4.6 Dart Head (Scoring)

The dart head is set to exact specifications at the factory. The bolts that hold the board together are tightened to finger tight only. Do not tighten any further or this will crush the switch matrix and cause inaccurate scoring.

If the machine does begin to miss-score, reference the troubleshooting chart. The scoring lines on the target interface board are direct connections through the ribbon cable to the 8049 microprocessor on the mother board.

TABLE VI

Description of Power Supply Components

| Fig. 12 Ref. No. | Description |
|---------------------|--|
| 1 | 12.6V 8-Amp Power Transformer |
| 2 | 16V 2-amp Audio Transformer |
| 3 | 18,000µfd Capacitor |
| 4 & 5 | 4700µfd Capacitors |
| 6 | Motorola MD980-2 Bridge Rectifier |
| 7 | 7.5-Amp Fuse |
| 8 | 3/4-Amp Fuse |
| 9 | (4) MR501 Diodes |
| 10 | 1.5-Ohm 10-Watt Resistor |
| 11 | 3/4 Amp Fuse |
| 12 | Heatsink Mounted LM323 5V Regulator |
| 13 | Main Power Cord (under chassis) |
| 14 | V150 LA20A GE Varistor (under chassis) |
| 15 | 3-Amp Circuit Breaker (under chassis) |

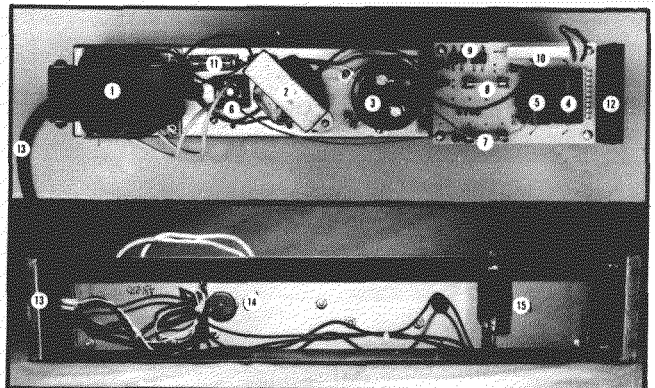


Figure 12. Top and bottom view of 5000 Series Power Supply

— **WARNING** — Unplug power to game before working on machine.

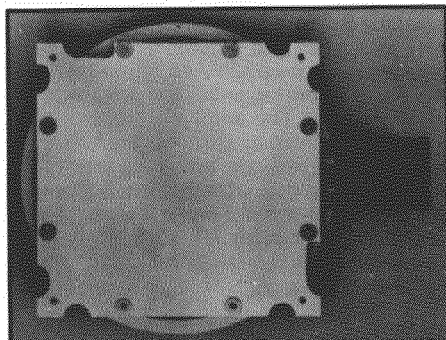
4.7 Dart Head Dissassembly/Reassembly

To replace the switch matrix in the dart head it is necessary to disassemble and reassemble as follows:

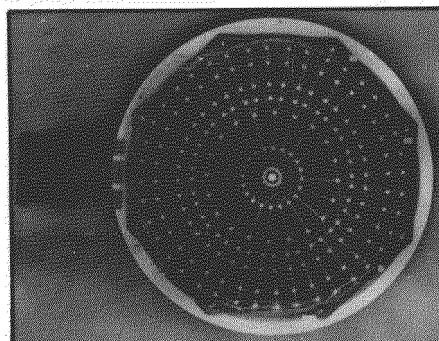
- Remove the bolts holding the particle board to the back of matrix.
- Remove switch matrix.

- Remove .020 gasket.
- Remove rubber damper
- Clean and replace rubber damper and gasket.
- Place new switch matrix on back of the gasket (figure 13A).
- Replace targetback and bolt, using fingers for tightening (figure 13C).

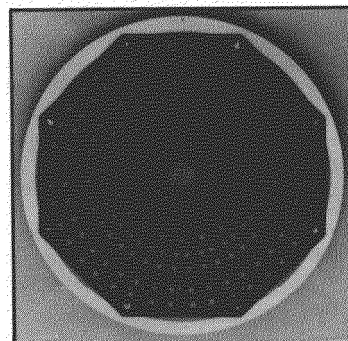
— **CAUTION** — Bolts must be finger tight only. Any tighter will crush contacts in the matrix and cause inaccurate scoring.



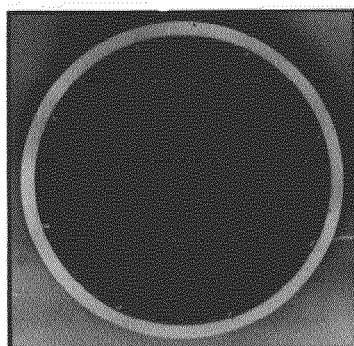
A. Complete assembly from back.



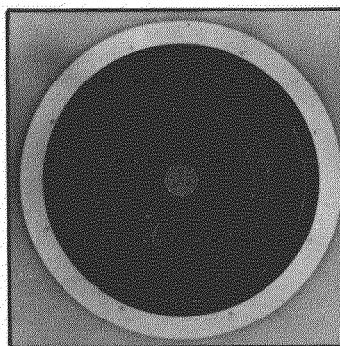
B. Matrix, on top of dart head assembly



C. .020 gasket

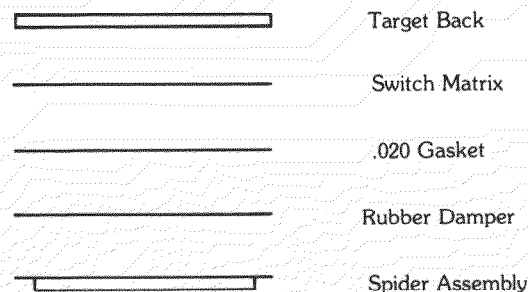


D. Silicone Rubber Damper



E. Spider Assembly

Figure 13.



SECTION V—TROUBLESHOOTING

— **WARNING** — Unplug power to game before working on machine.

5.1 Troubleshooting

NOTE: Before troubleshooting ascertain that the machine is properly grounded.

| Problem | Probable Cause | Procedure | References |
|---------------------------|---|---|-------------------------------------|
| Segment display failure | <ol style="list-style-type: none"> 39Ω resistor between grd. and drive resistor is faulty. Single display All displays - odds or evens | <ol style="list-style-type: none"> Check resistor on applicable transistor. If bad, replace. Change LED display Transistors (2N4400) (Q18-Q33) 74LS244 (IC14 Odds) (IC15 Evens) 8243 (IC13) | Table III Para. 4.2.1 Sec. IV |
| Player change not working | Switch | Replace switch, and/or 560 ohm resistor, and/or micro (U16) | Sec. IV Para. 4.2.2 |
| Sound problems | <ol style="list-style-type: none"> Volume Control (3 pots) Faulty 15V regulator (ML7815) | <ol style="list-style-type: none"> The 2 pots next to the 10-pin connector are: 1st pot, a signal control factory-set at half value (may be adjusted for more volume); 2nd pot, for the optional voice circuitry, set at half value; and the 3rd pot, the master, which can be adjusted as required. Using Pin 2 as ground, check for +24V DC on Pin 1 and +15V DC on Pin 3. If incorrect, replace regulator. | Para. 4.2.3 Sec. IV Table I |

| Problem | Probable Cause | Procedure | References |
|--|---|---|--|
| Sound problems (continued) | | <p>- NOTE - If just the input is incorrect, check the power supply output voltage on Pin 2 or the P.S. connector.</p> <p>(c) Faulty IC (LM 358)</p> <p>(d) LM 3831 (5-pin package next to regulator)</p> <p>(e) 8243 I/O expander</p> | |
| Ripple in audio output. | Faulty filter capacitor C1. | Replace C1, a 4700 ufd capacitor, on power supply. | <p>Para. 42.3 Para. 4.5 Table VI Sec. IV</p> |
| Dart Board illumination light does not lite. | <p>(a) Faulty bulb.</p> <p>(b) Faulty Triac (SC146D) or Driver MOC3030.</p> | <p>(a) Check bulb. Replace, if required.</p> <p>(b) Check Triac. If faulty, replace. If correct, check resistors and input to MOC3030 Triac.</p> | <p>Para. 4.3 Fig. 10 Table IV</p> |
| Machine is operational, but some lampboard lights do not lite. | If all components are good, see Table V for inter-connections. | Check solder connections for cold junctions, and run continuity check on wiring harness. | <p>Fig. 11 Sec. IV Table V</p> |
| Power-Up Sequence is incorrect and doesn't correct itself after hitting reset. (Should be hit more than once.) | LM 323 5V regulator (mtd. on P.S. heat sink.) | <p>Check regulator. If faulty, replace.</p> <p>Check soldered points to PC board on P.S.</p> <p>Check reset switch. If faulty, see below.</p> <p>If, in addition, no lights on except temporary score 5volt supply is faulty. Change LM 323.</p> <p>Replace Micro (U16)</p> <p>Replace 74LS138 (U17)</p> <p>Replace 8243 (U5, U11-13)</p> | <p>Para. 3.1 Fig. 7 Fig. 12 Sec. IV Sec. III Para. 4.2 Table I</p> |
| Reset switch does not work. | <p>(a) Open in wiring between coin door and mother board.</p> <p>(b) If (a) is correct, the switch is faulty.</p> <p>(c) Microprocessor</p> | <p>(a) Run continuity check and inspect plugs for poor connections.</p> <p>(b) Replace switch.</p> <p>(c) If reset still does not work, after checking plugs and replacing switch, contact factory for details.</p> | <p>Para. 3.1 Fig. 7 Fig. 12 Sec. IV Sec. III Para. 4.2 Table I</p> |
| Top display light does not lite. | <p>(a) Faulty bulb.</p> <p>(b) 120V AC source</p> <p>(c) Common to target interface</p> | <p>(a) Check bulb, replace if required.</p> <p>(b) Check 3/4-amp fuse (located on chassis next to transformer). If blown, replace.</p> <p>(c) Check connections: black and white wires to target interface.</p> | <p>Para. 4.3.1 Fig. 12 Sec. IV</p> |

| Problem | Probable Cause | Procedure | References |
|--|---|---|---------------------------------|
| Game selects not operating correctly. | (a) Switches and/or wiring harness. (b) If (a) is correct, 8243 output expander may be faulty. (c) Coin switch jammed. (d) Selects game only once. | (a) Check switches and run continuity test on harness. (b) Check 8243 (U11) Pins 13-20. (c) Check to see if wire has returned to original position. (d) Check Player Change switch for short or 560 ohm series resistor. Also R96 and .1 ufd capacitor on Pin 38 of U16. | |
| No score. | Dart tip stuck in cup. Main Board | Remove broken tip. (To check electronics, disconnect three leads to matrix. Short any pin from middle conn.(J6) to any pin from top conn.(J4) on target interface to score.) Change 74LS273(U25). Change Micro (U16) | Sec. IV Para. 4.6 Fig. 13 |
| "Remove" and "Throw Darts" lights are on at the same time. | 40-pin ribbon cable connector backwards | | |
| Game stays on "Remove Darts" | Change 74LS138(U17) on Main CPU Board | | |

Warning: This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instructions manual, may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference in which case the user at his own expense will be required to take whatever measure may be required to correct the interference. Note: Proper grounding through power cord is necessary for compliance.



6421 Material Avenue
 P.O. Box 2901
 Rockford, Illinois 61132-2901
 800/435 8319 or 815/654-0212 in Illinois

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SERIES 5000 PARTS MANUAL



The Originator of Electronic Darts

- I. MAIN
CABINET
ASSEMBLY
- II. HARNESS
ASSEMBLIES
- III. TARGET
ASSEMBLY
- IV. BOARD
SEGMENTS
- V. MAIN
PC BOARD
ASSEMBLY
- VI. TARGET
INTERFACE
ASSEMBLY
- VII. LAMP BOARD
PC ASSEMBLY
- VIII. **POWER**
SUPPLY
CHASSIS
ASSEMBLY
- IX. PARTS NOT
SHOWN

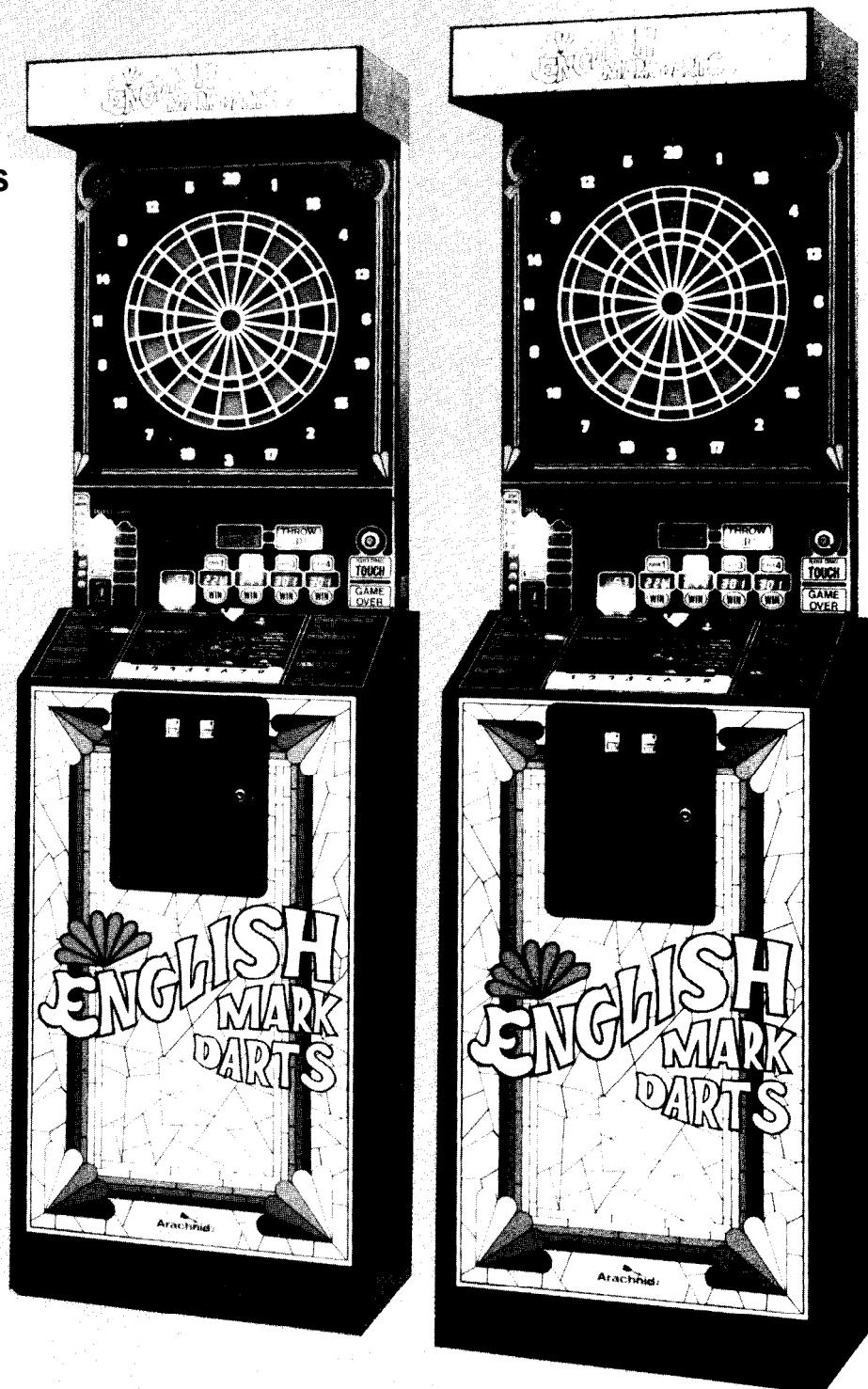
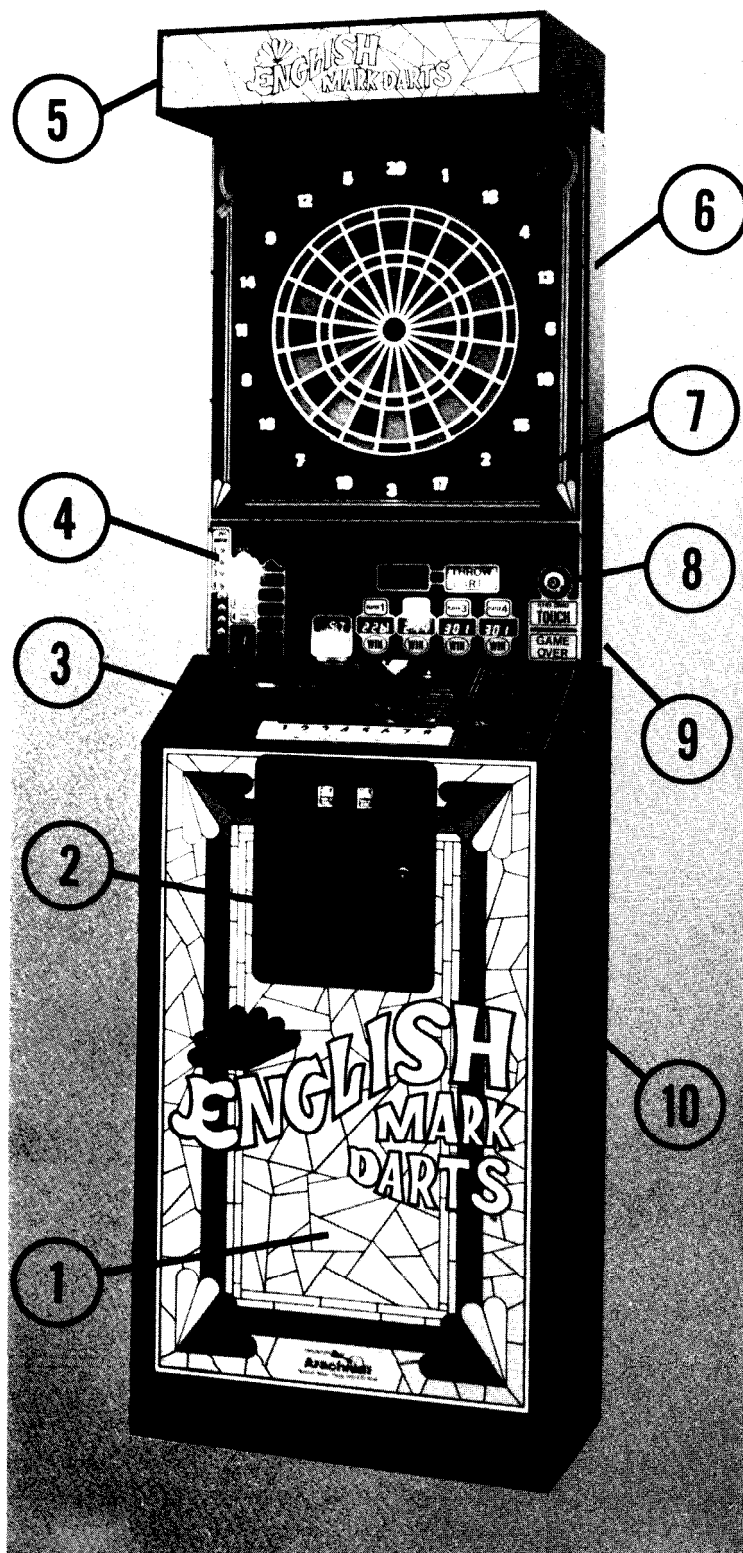


FIGURE 1



NOTE: The part numbers listed are the Arachnid part numbers. Please use these numbers when placing your order. Some descriptions are followed by a number in parentheses. This number is the quantity used in that assembly.

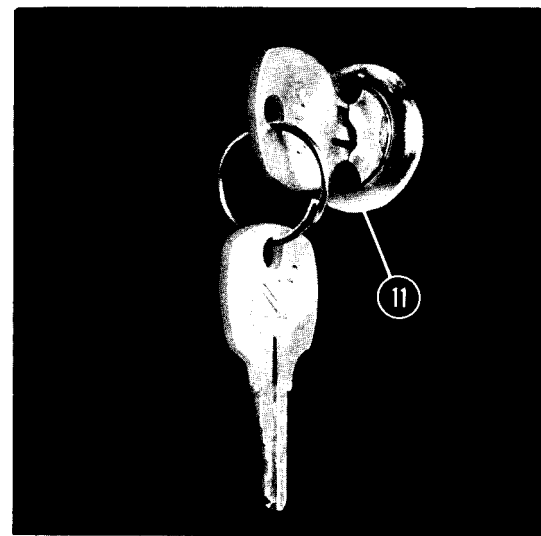


FIGURE 2

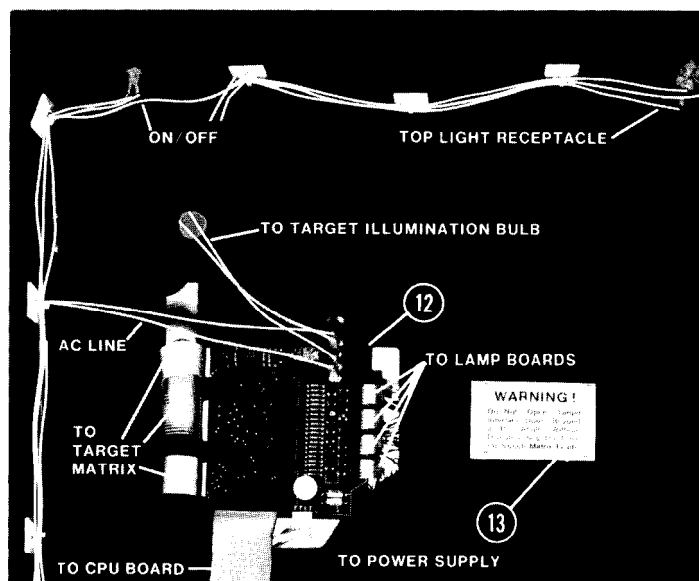


FIGURE 3

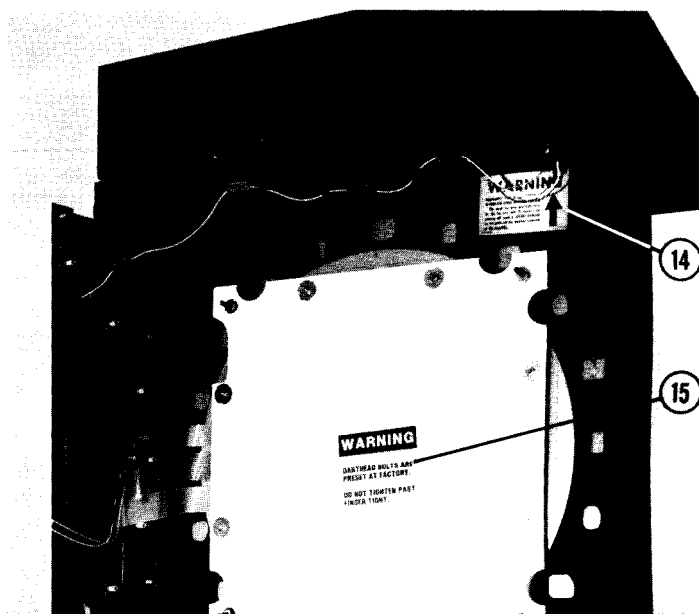


FIGURE 4

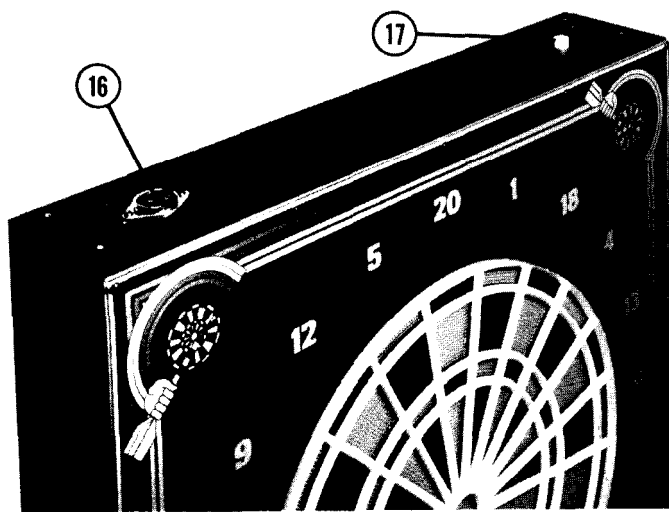


FIGURE 5

I. MAIN CABINET ASSEMBLY

| Fig. # | Item # | Part No. | Description |
|--------|--------|----------|--|
| 1 | 1 | 1106 | Bottom Decal - Yellow |
| 1 | 2 | 5004 | Coin Door With Cash Box |
| 1 | 3 | 242 | Instruction Panel - English |
| 1 | 4 | 710 | Game Select Switch (8) |
| 1 | 5 | 5018 | Top Light Assembled |
| 1 | 6 | 17028 | Cabinet Top - Unassembled |
| 1 | 7 | 232 | Top Caption Panel |
| 1 | 7 | 5007 | Top Caption Panel With Push Buttons And Wire Harness |
| 1 | 8 | 711 | Player Change Button Only |
| 1 | 8 | 716 | Player Change Button Assembly |
| 1 | 9 | 1120 | Serial No. Label |
| 1 | 10 | 1702A | Cabinet Bottom - Unassembled |
| 2 | 11 | 810 | Back Door Lock |
| 3 | 12 | 5002 | Target Interface Board (1) |
| 3 | 13 | 1130 | Target Interface Door Warning |
| 4 | 14 | 1112 | Warning Label - Electrical |
| 4 | 15 | 1128 | Darthead Bolts Warning Label |
| 5 | 16 | 818 | Top Light Receptacle |
| 5 | 17 | 708 | ON/OFF Switch |
| 6 | 18 | 224 | Top Lamp Panel |
| 6 | 19 | 842 | Top Light Cord - 3 Ft. |
| 6 | 20 | 808 | 40 Watt Round Bulb |
| 6 | 21 | 845 | Light Socket For Round Bulb |
| 7 | 22 | 1709 | White Baffle For Top Light |
| 7 | 23 | 831 | Bulb - Sylvania 7C7 (3) |
| 7 | 24 | 817 | Sockets - Top Light Bulbs (3) |
| 8 | 25 | 1753 | Coin Mechanism - U.S. |
| 8 | 25 | 1751 | Coin Mechanism - Canadian |
| 8 | 26 | 5010 | Coin Door Harness |
| 8 | 27 | 1716 | Coin Box |
| 8 | 28 | 506 | Capacitor -.1uf 16V - Coin Door (2) |

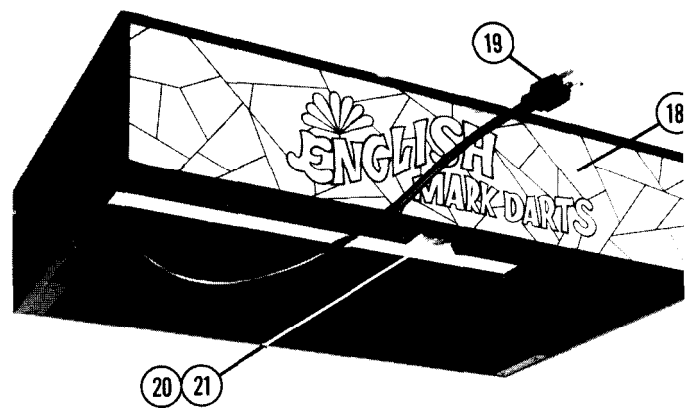


FIGURE 6

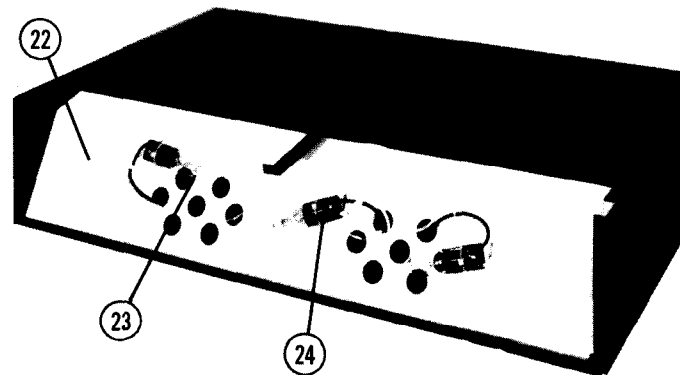


FIGURE 7

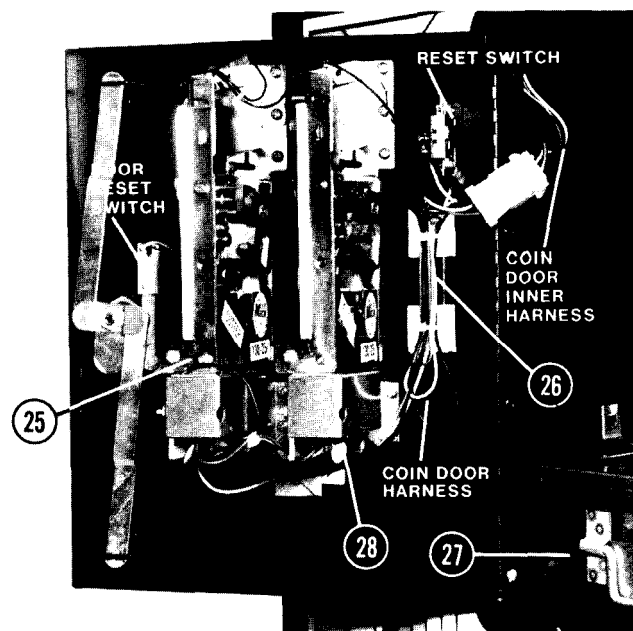


FIGURE 8

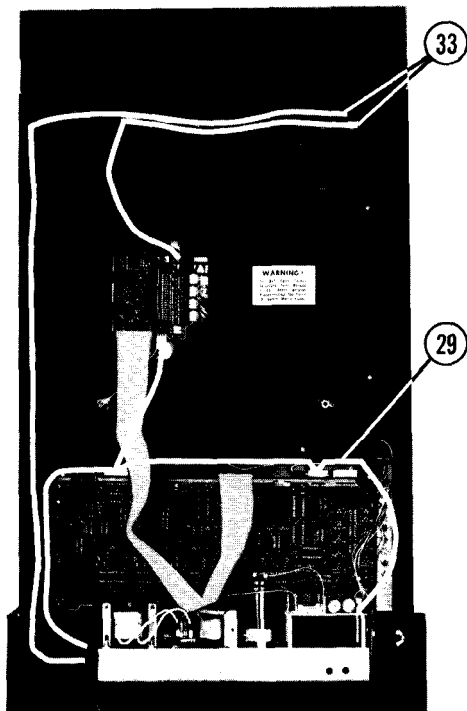


FIGURE 9

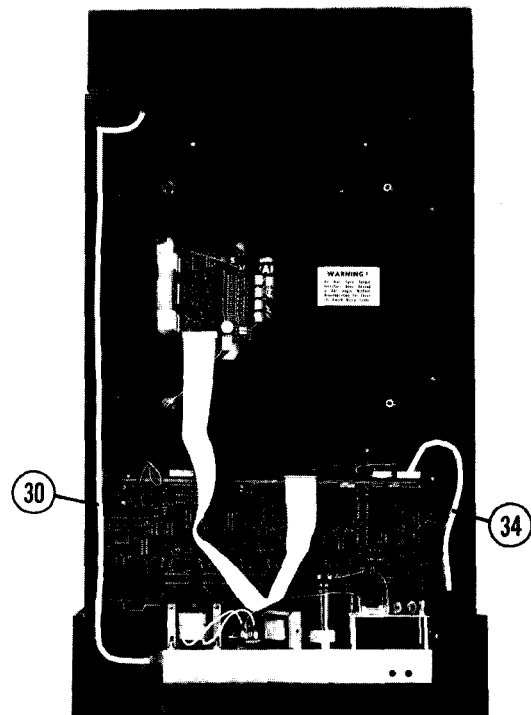


FIGURE 10

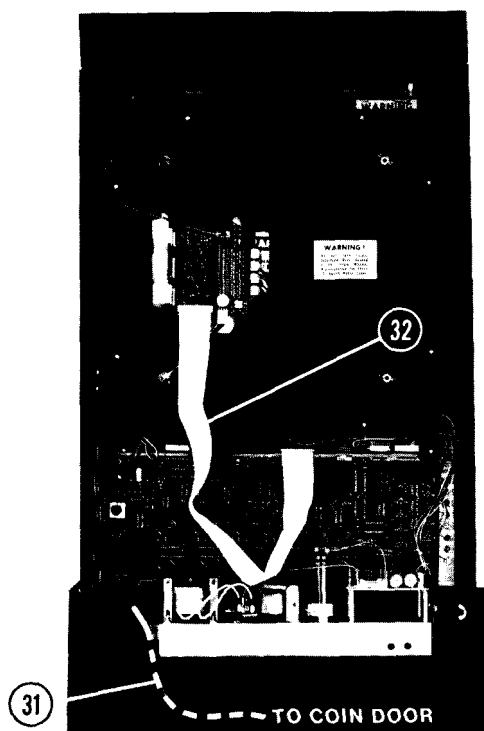


FIGURE 11

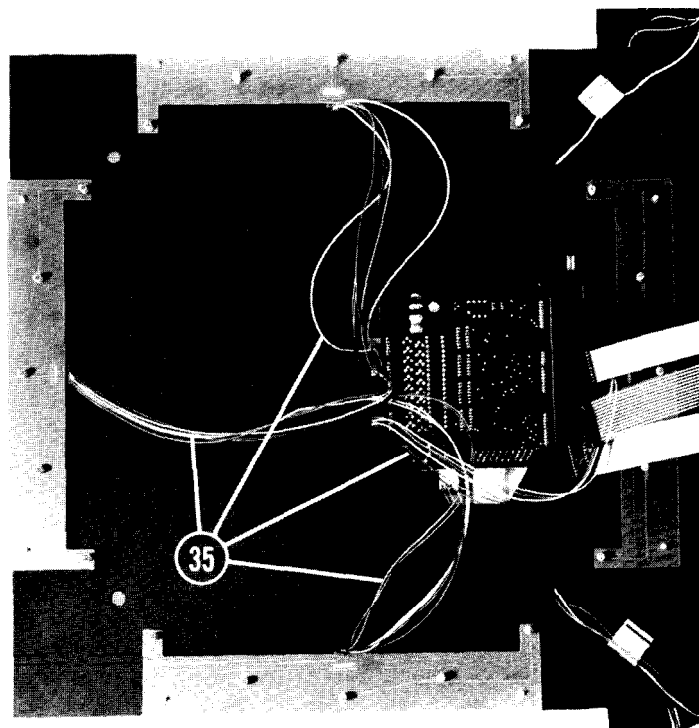


FIGURE 12

II. HARNESS ASSEMBLIES

| Fig. # | Item # | Part No. | Description |
|--------|--------|----------|-----------------------------|
| 9 | 29 | 5008 | Main Game Harness |
| 10 | 30 | 5009 | A/C Harness |
| 11 | 31 | 5011 | Coin Door Inner Harness |
| 11 | 32 | 5013 | 40 Pin Ribbon Cable Harness |
| 9 | 33 | 5014 | Receptacle Harness |
| 10 | 34 | 5015 | Game Select Harness |
| 12 | 35 | 5016 | Lamp Board Harness (4) |
| 13 | 36 | 5012 | 4" Speaker And Wire Harness |

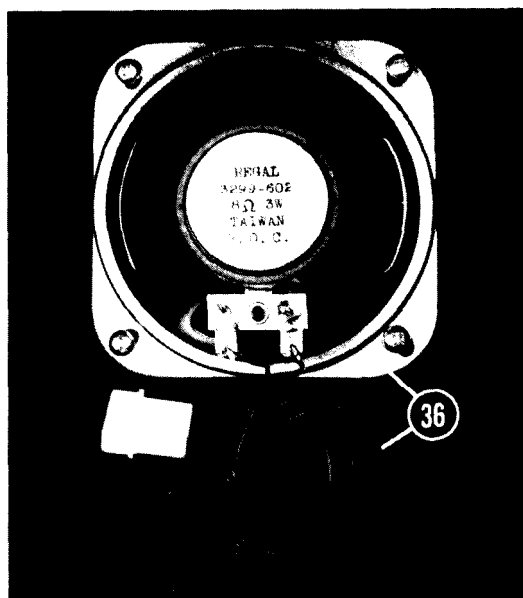


FIGURE 13

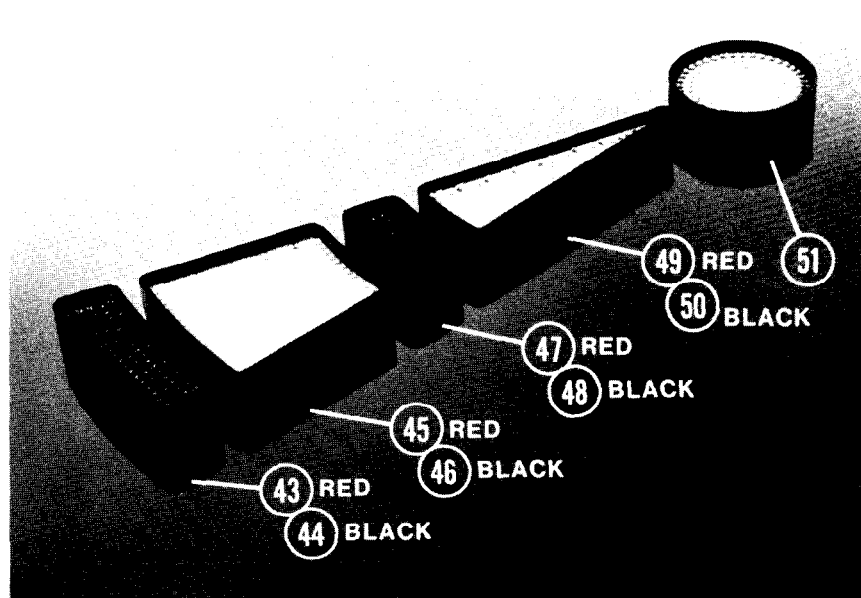


FIGURE 15

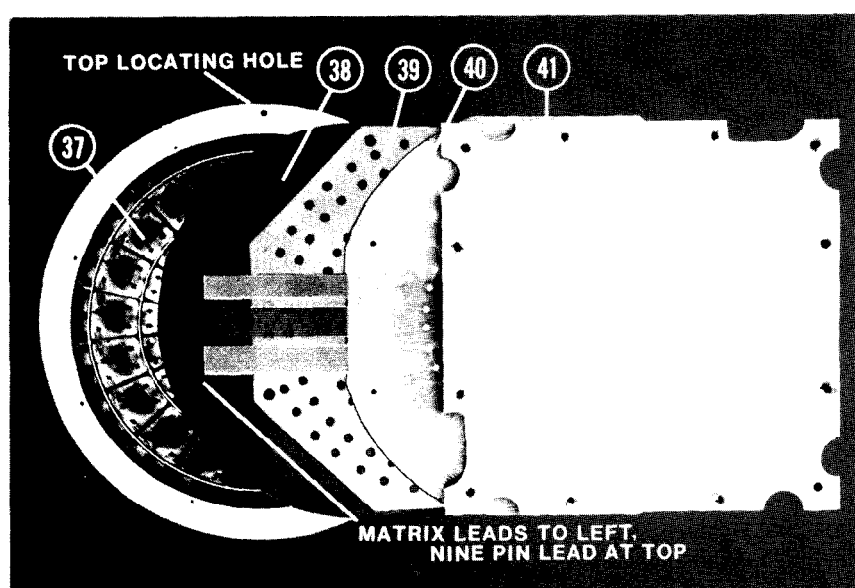


FIGURE 14



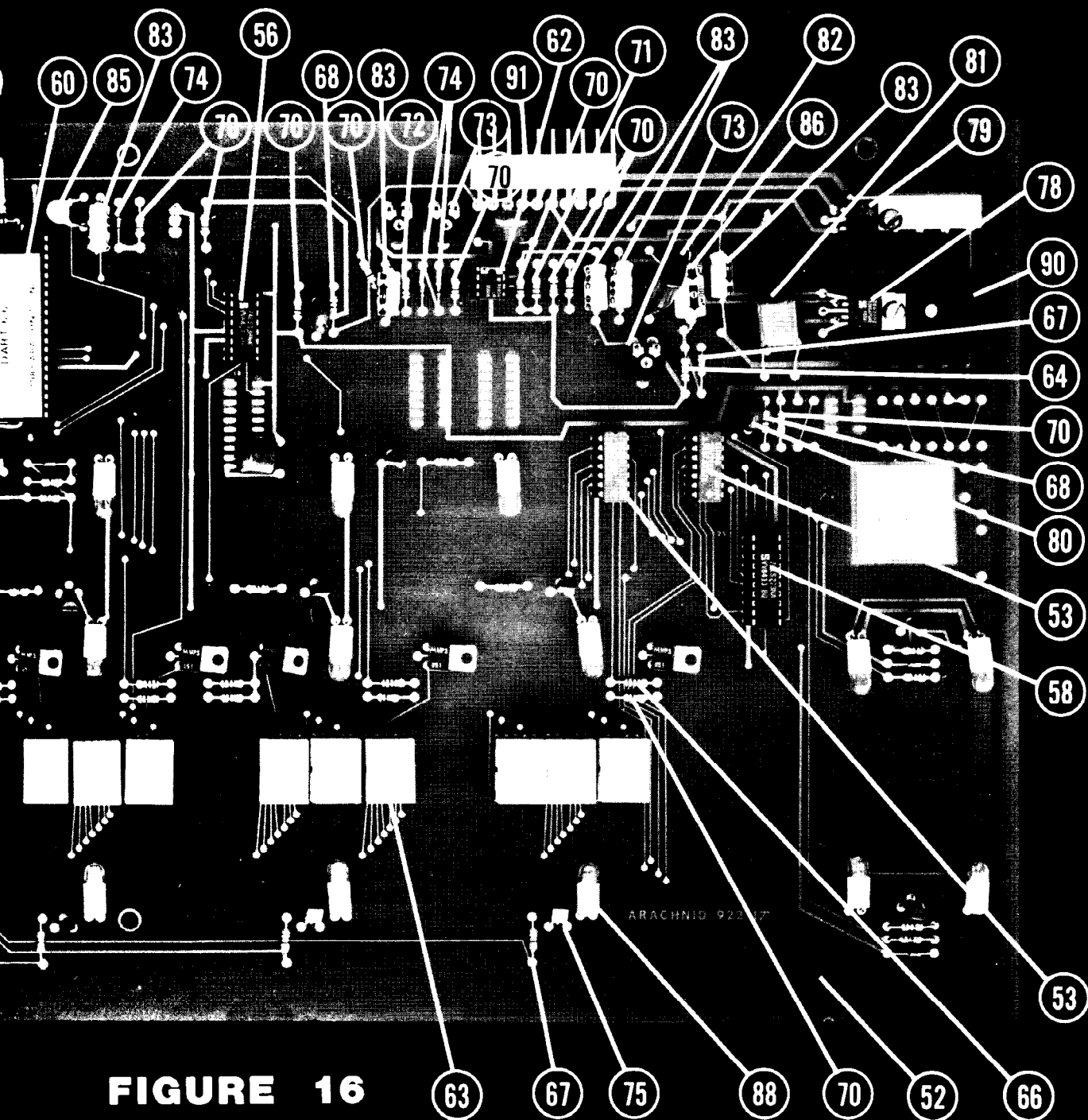
FIGURE 14A

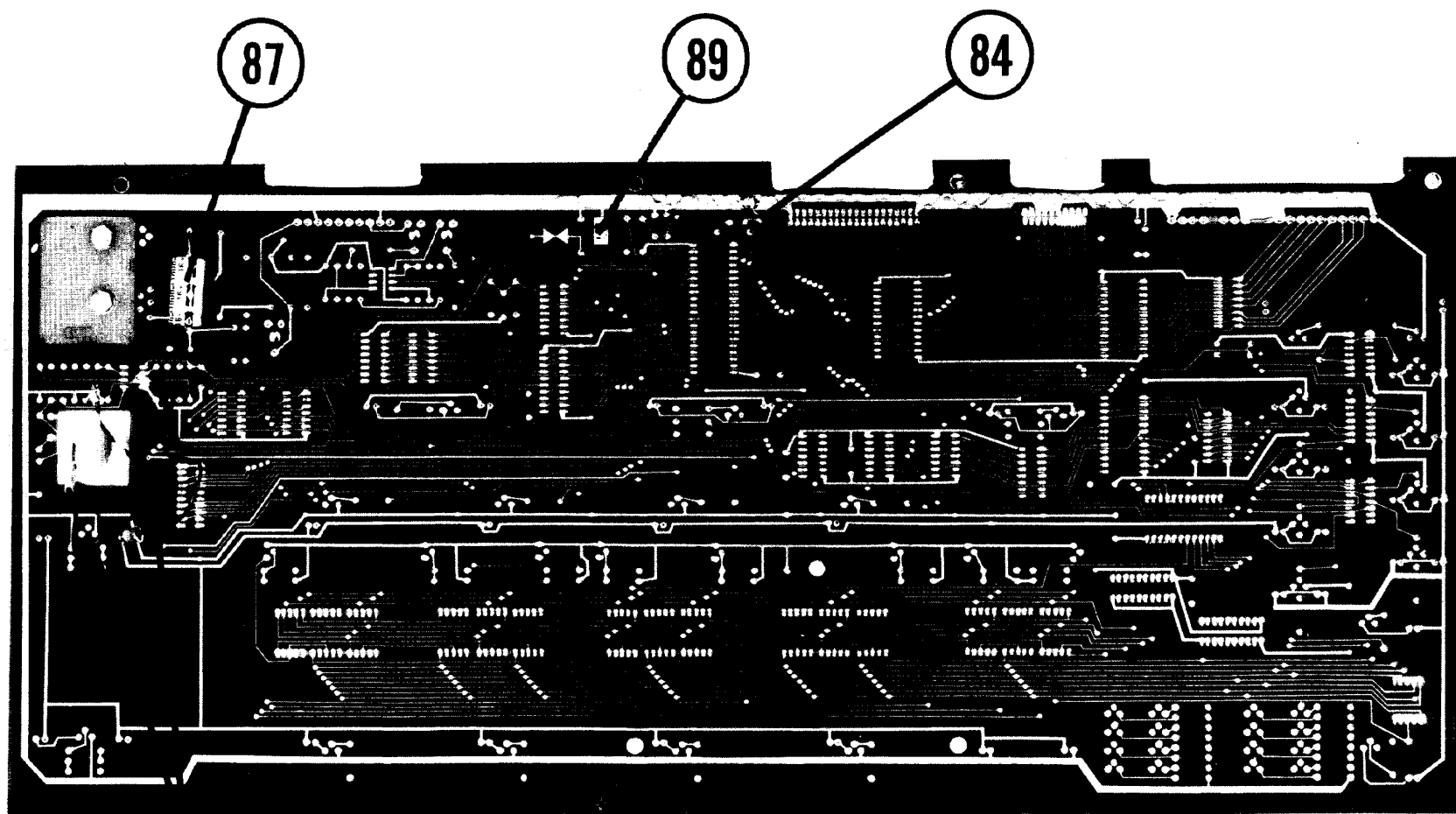
III. TARGET ASSEMBLY

| Fig. # | Item # | Part No. | Description |
|--------|--------|----------|-------------------------------|
| 14 | 37 | 1600 | Spider w/o Segments |
| 14 | 38 | 822 | Rubber Damper For Dart Head |
| 14 | 39 | 828 | .020" Gasket For Dart Head |
| 14 | 40 | 234 | Switch Matrix For Dart Head |
| 14 | 41 | 1650 | Target Back |
| 14A | 42 | 5006 | Dart Head Assembly - Complete |

IV. BOARD SEGMENTS

| Fig. # | Item # | Part No. | Description |
|--------|--------|----------|--------------------------------|
| 15 | 43 | 6001 | A Segment - Red - Double |
| 15 | 44 | 6006 | A Segment - Black - Double |
| 15 | 45 | 6003 | C Segment - Red - Single |
| 15 | 46 | 6007 | C Segment - Black - Single |
| 15 | 47 | 6004 | D Segment - Red - Triple |
| 15 | 48 | 6008 | D Segment - Black - Triple |
| 15 | 49 | 6005 | E Segment - Red - Pie Single |
| 15 | 50 | 6009 | E Segment - Black - Pie Single |
| 15 | 51 | 6002 | B Segment - Red - Bulls Eye |





TO PLAY  R CHANGE SWITCH

V. MAIN PC BOARD ASSEMBLY

| Fig. # | Item # | Part No. | Description |
|--------|--------|----------|-----------------------------------|
| 16 | 52 | 5001 | Main PC Board Complete |
| 16 | 53 | 106 | SN7407 (2) |
| 16 | 54 | 124 | SN74LS02 (2) |
| 16 | 55 | 126 | SN74LS04 (5) |
| 16 | 56 | 128 | SN74LS138 (3) |
| 16 | 57 | 130 | SN74LS244 (2) |
| 16 | 58 | 132 | SN74LS273 (1) |
| 16 | 59 | 134 | SN8243 (4) |
| 16 | 60 | 136 | 8749H Microprocessor (1) |
| 16 | 61 | 142 | Resistor Network (1) |
| 16 | 62 | 150 | LM358P (1) |
| 16 | 63 | 168 | LED Number Display (16) |
| 16 | 64 | 301 | 2.2 ohm - 1/4 w (1) |
| 16 | 65 | 304 | 39 ohm - 1/4 w (16) |
| 16 | 66 | 308 | 100 ohm - 1/4 w (14) |
| 16 | 67 | 318 | 220 ohm - 1/4 w (28) |
| 16 | 68 | 324 | 560 ohm - 1/4 w (2) |
| 16 | 69 | 330 | 1k ohm - 1/4 w (1) |
| 16 | 70 | 338 | 10k ohm - 1/4 w (32) |
| 16 | 71 | 346 | 51k ohm - 1/4 w (1) |
| 16 | 72 | 360 | 620k ohm - 1/4 w (1) |
| 16 | 73 | 376 | 10k Pot. - Horizontal (3) |
| 16 | 74 | 404 | 1N4148 or 1N914 Diode (8) |
| 16 | 75 | 412 | 2N4400 or MPS2222 Transistor (41) |
| 16 | 76 | 416 | MPSU51 Transistor (8) |
| 16 | 77 | 422 | 6.0 Mhz Crystal (1) |
| 16 | 78 | 426 | LM383T Audio Amp. (1) |
| 16 | 79 | 428 | LM7815CT Regulator (1) |
| 16 | 80 | 506 | Capacitor - .1uf 16V (15) |
| 16 | 81 | 510 | Capacitor - .22uf 16V (1) |
| 16 | 82 | 512 | Capacitor - .33uf 16V (1) |
| 16 | 83 | 518 | Capacitor - 1uf 50V (5) |
| 17 | 84 | 525 | Capacitor - 5pf 50V (1) |
| 16 | 85 | 526 | Capacitor - 15pf 100V (1) |
| 16 | 86 | 536 | Capacitor - 1 00uf 16V (2) |
| 17 | 87 | 540 | Capacitor - 1000uf 16V (1) |
| 16 | 88 | 702 | Lamp - CM7373 (40) |
| 17 | 89 | 706 | Slide Switch - Test Mode (1) |
| 16 | 90 | 1002 | Heat Sink - Audio (1) |
| 16 | 91 | 675 | 10 Pin Connector (2) |
| 16 | 92 | 673 | 8 Pin Connector (1) |
| 16 | 93 | 687 | 40 Pin Connector (1) |

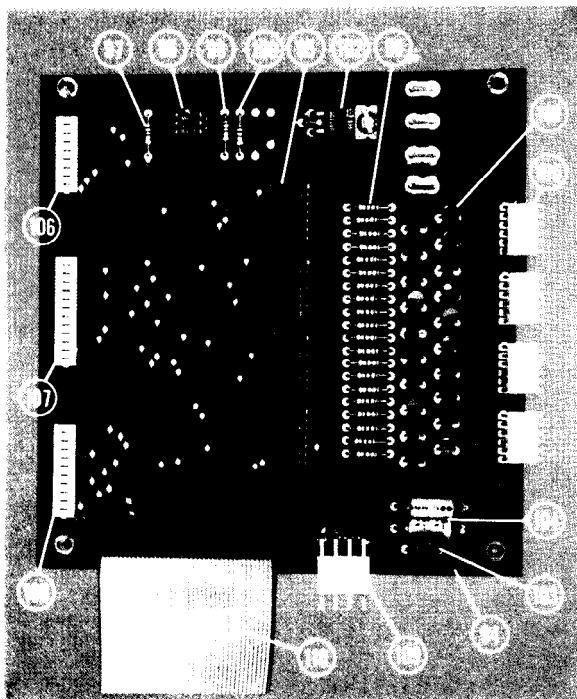


FIGURE 18

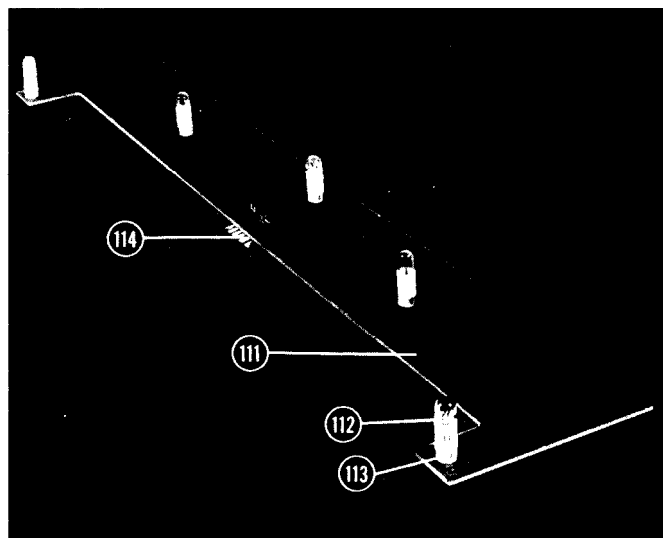


FIGURE 19

VI. TARGET INTERFACE ASSEMBLY

| Fig. # | Item # | Part No. | Description |
|--------|--------|----------|---|
| 18 | 94 | 5002 | Target Interface PC Board Assembly With Cable |
| 18 | 95 | 126 | 74LS04 (4) |
| 18 | 96 | 144 | MOC 3030 (1) |
| 18 | 97 | 310 | 120 ohm - 1/4 w (1) |
| 18 | 98 | 316 | 180 ohm - 1/4 w (1) |
| 18 | 99 | 318 | 220 ohm - 1/4 w (21) |
| 18 | 100 | 330 | 1k ohm - 1/4 w (1) |
| 18 | 101 | 412 | 2N4400 or MPS2222 Transistors (20) |
| 18 | 102 | 420 | SC146D Triac 6 amp (1) |
| 18 | 103 | 502 | Capacitor -.1uf 16V (1) |
| 18 | 104 | 518 | Capacitor - 1 uf (2) |
| 18 | 105 | 641 | Connectors - 6 Pin - To Lamp Board (4) |
| 18 | 106 | 647 | Connector - Switch Matrix - 9 Pin (1) |
| 18 | 107 | 651 | Connector - Switch Matrix - 13 Pin (1) |
| 18 | 108 | 649 | Connector - Switch Matrix - 11 Pin (1) |
| 18 | 109 | 671 | Connector - Power Supply (1) |
| 18 | 110 | 5013 | 40 Pin Cable Assembly (1) |

VII. LAMP BOARD PC ASSEMBLY

| Fig. # | Item # | Part No. | Description |
|--------|--------|----------|----------------------------------|
| 19 | 111 | 5003 | Lamp Board Assembly Complete (4) |
| 19 | 112 | 703 | CM7373 Lamp (20) |
| 19 | 113 | 704 | Socket Only For CM7373 (20) |
| 19 | 114 | 641 | Connector (4) |

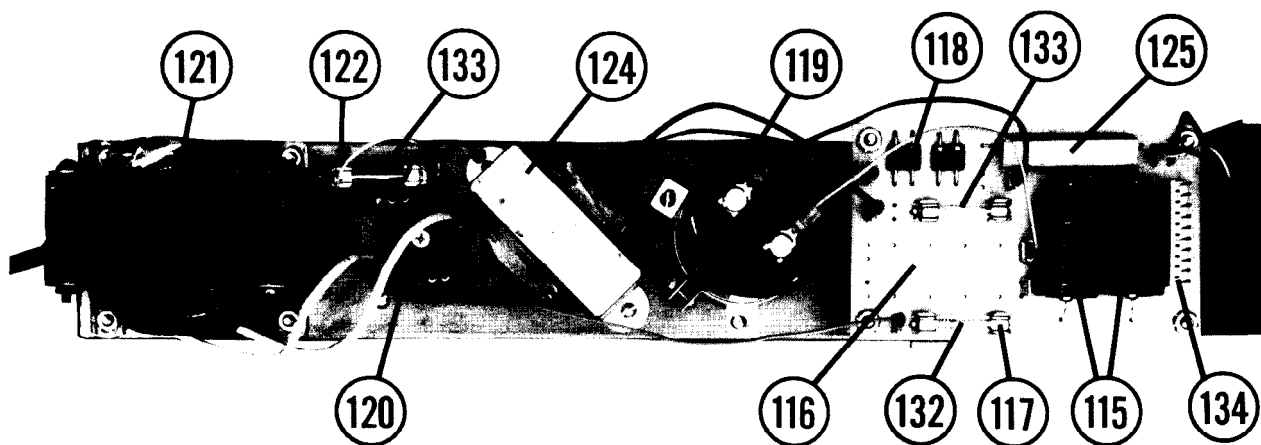


FIGURE 20

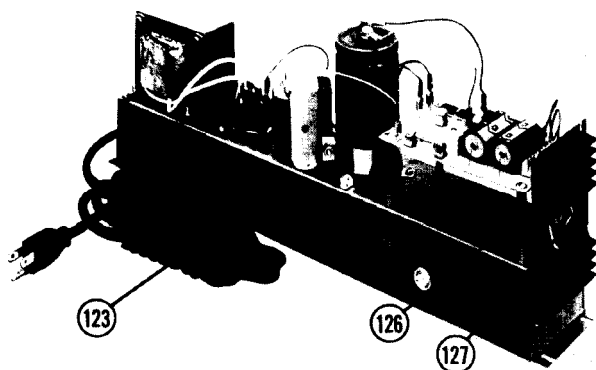


FIGURE 21

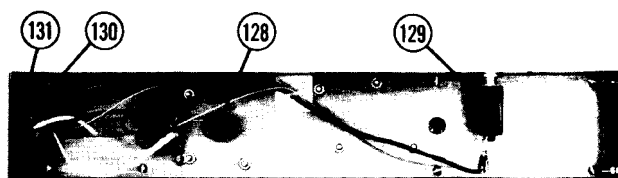


FIGURE 22

VIII. POWER SUPPLY CHASSIS ASSEMBLY

| Fig. # | Item # | Part No. | Description |
|--------|--------|----------|--------------------------------------|
| 20 | 115 | 544 | Capacitor - 4700uf 50V (2) |
| 20 | 116 | 5005 | Power Supply PC Board Complete |
| 20 | 117 | 603 | PC Mount Fuse Clips (4) |
| 20 | 118 | 408 | MR501 Diode (4) |
| 20 | 119 | 546 | Capacitor - 18,000uf 25V (1) |
| 20 | 120 | 170 | Bridge Rectifier (1) |
| 20 | 121 | 1032 | Transformer - Main (1) |
| 20 | 122 | 601 | Fuse Block - Single (1) |
| 21 | 123 | 840 | Power Cord - 12 Ft. (1) |
| 20 | 124 | 1030 | Transformer - Audio Power Supply (1) |
| 20 | 125 | 382 | 1.5 ohm - 10 w (1) |
| 21 | 126 | 1004 | Heat Sink (1) |
| 21 | 127 | 428 | LM323K Regulator (1) |
| 22 | 128 | 418 | V150 Varistor (1) |
| 22 | 129 | 602 | 3A Circuit Breaker (1) |
| 22 | 130 | 633 | Connector - 6 Pin Chassis Mount (1) |
| 22 | 131 | 1051 | Strain Relief (1) |
| 20 | 132 | 605 | Fuse - 7 1/2 Amp (1) |
| 20 | 133 | 610 | Fuse - 3/4 Amp (2) |
| 20 | 134 | 677 | Connector - 10 Pin (1) |

IX. PARTS NOT SHOWN

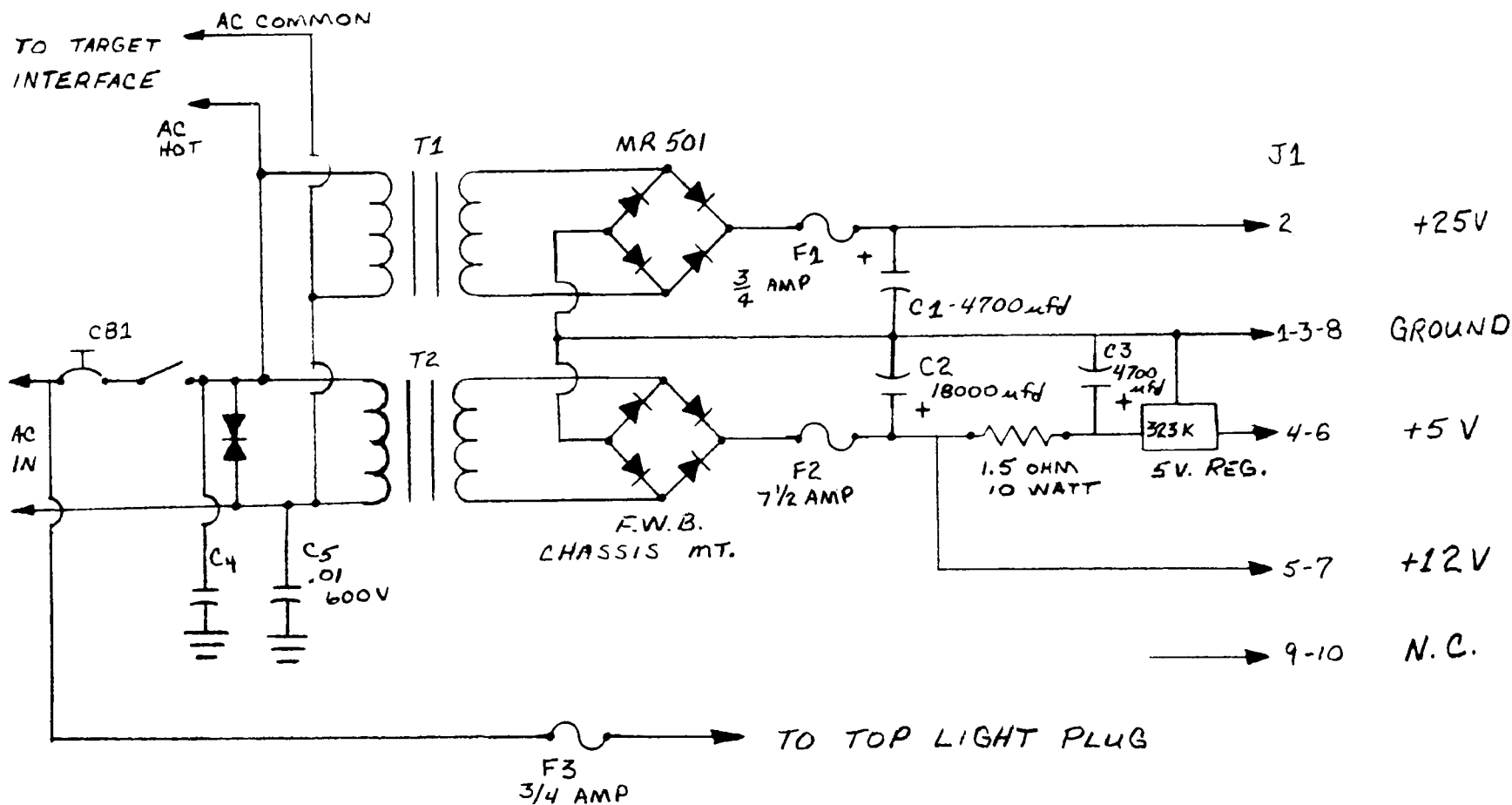
| Part No. | Description |
|----------|-------------------------------|
| 984 | Romex Clamp (Top Light) |
| 1920 | Target Interface Schematic |
| 1924 | Power Supply Schematic |
| 1928 | Main CPU Schematic (Sheet 1) |
| 1928A | Main CPU Schematic (Sheet 2) |
| 1024 | Ty-rap Mounting Clamp |
| 1020 | P-Clip (Power Cord Hold Down) |



by  Arachnid TM

The Originator of Electronic Darts

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Post Office Box 2901
Rockford, Illinois 61132-2901
800/435-8319 or 815/654-0212 in Illinois



ARACHNID INC.
208 N. MADISON
ROCKFORD IL 61104

SCALE:

APPROVED BY:

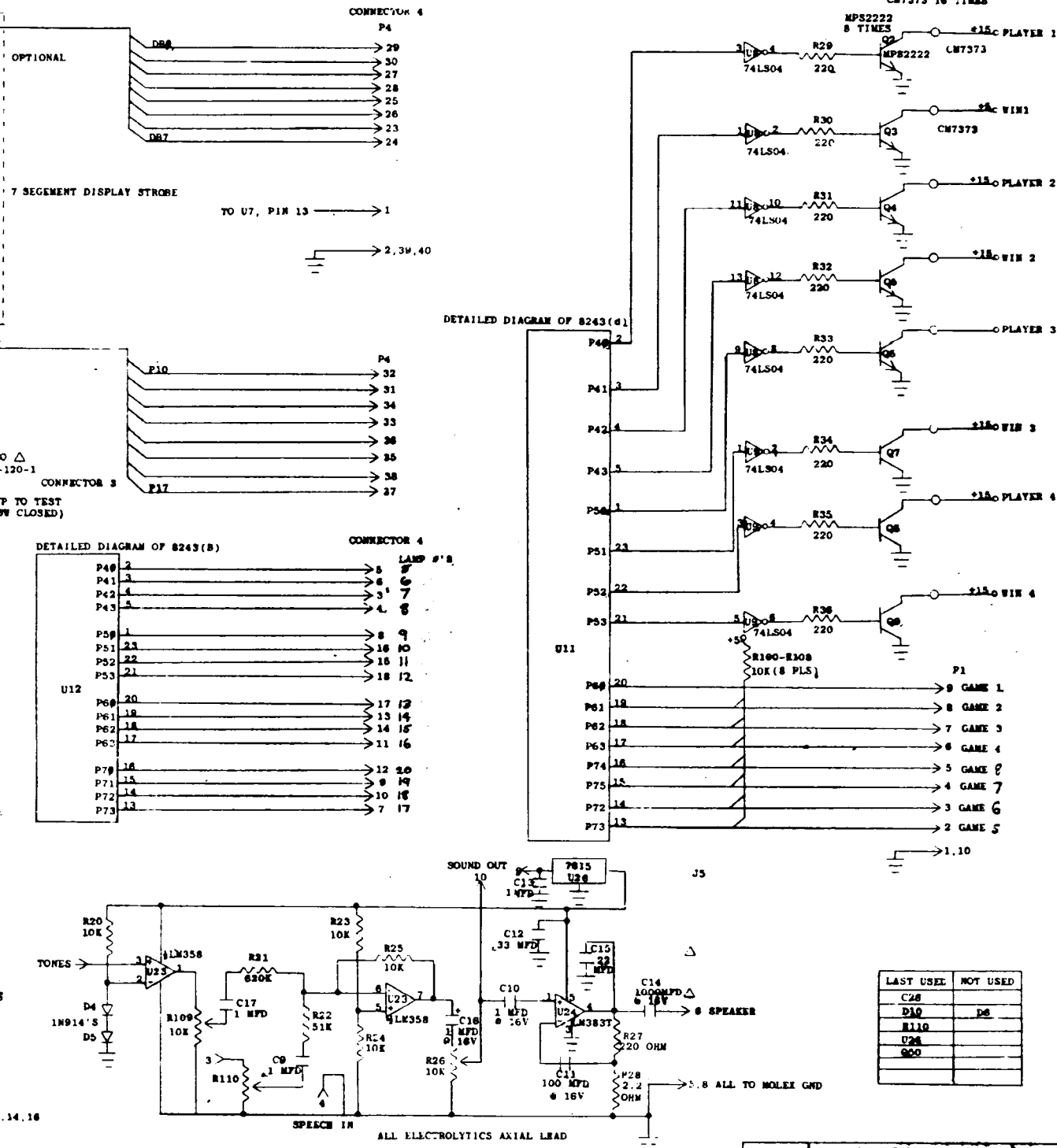
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DATE: 4-30-84

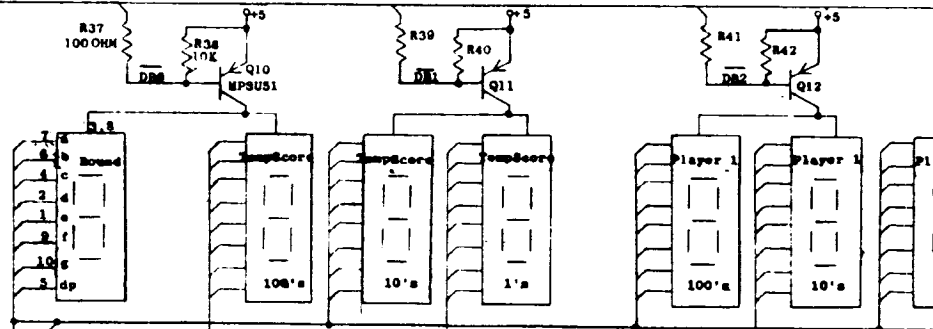
REVISED

5000 SERIES POWER SUPPLY

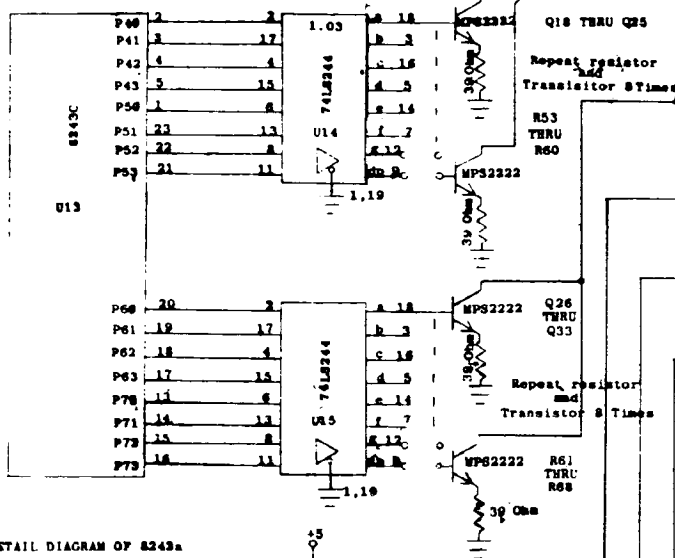
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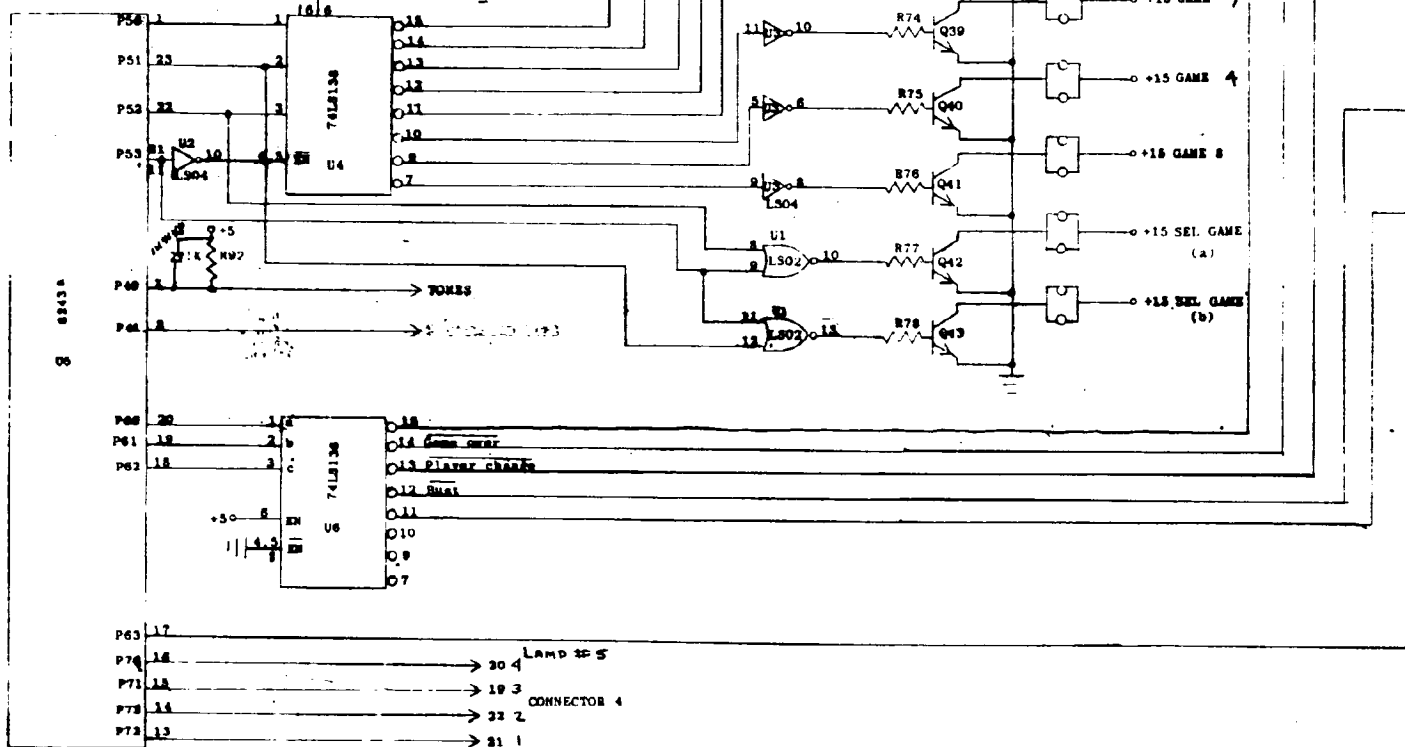
MAN 6760 16 Times

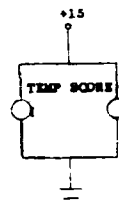
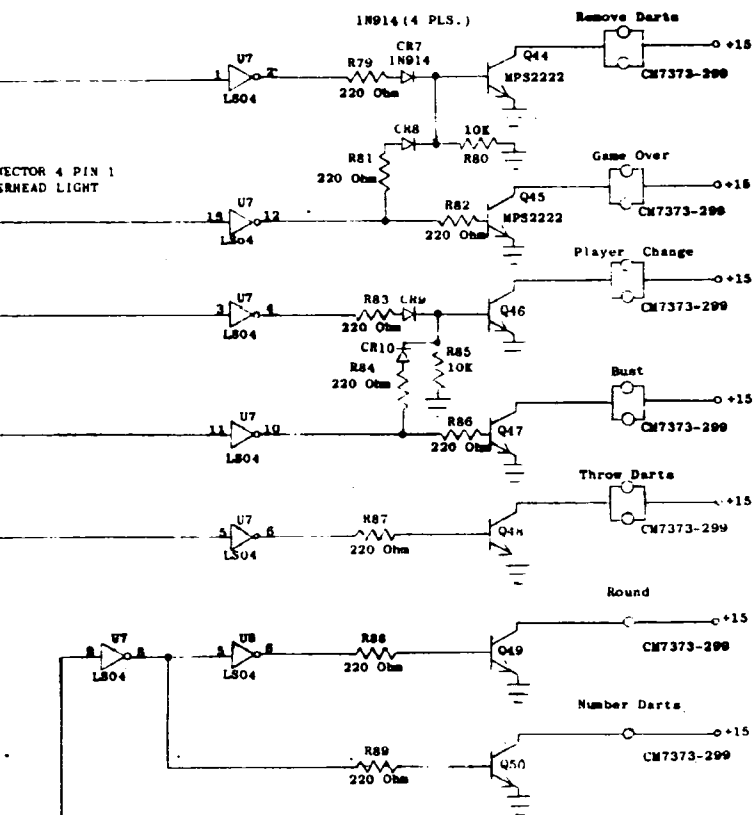
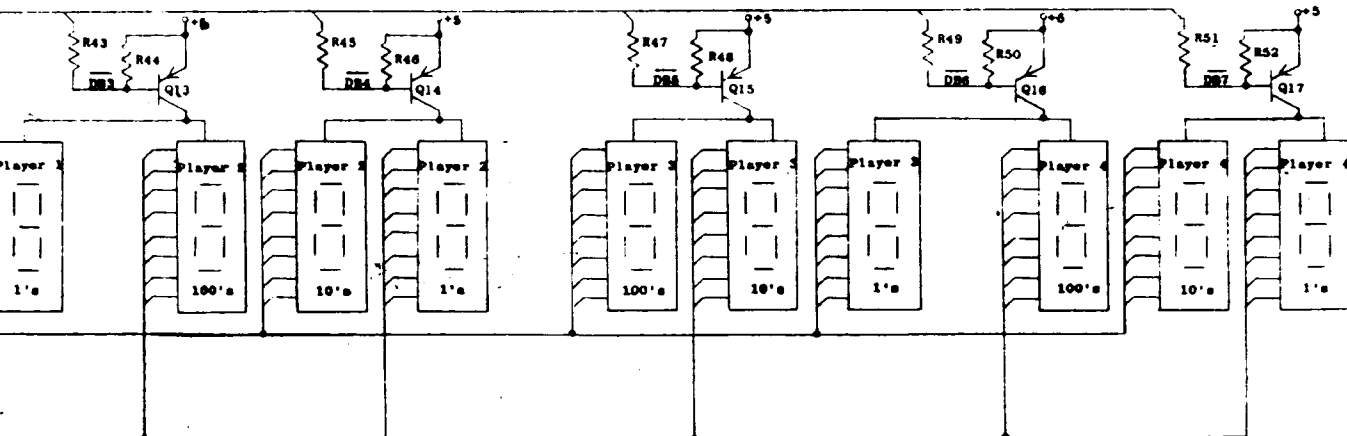


012



54





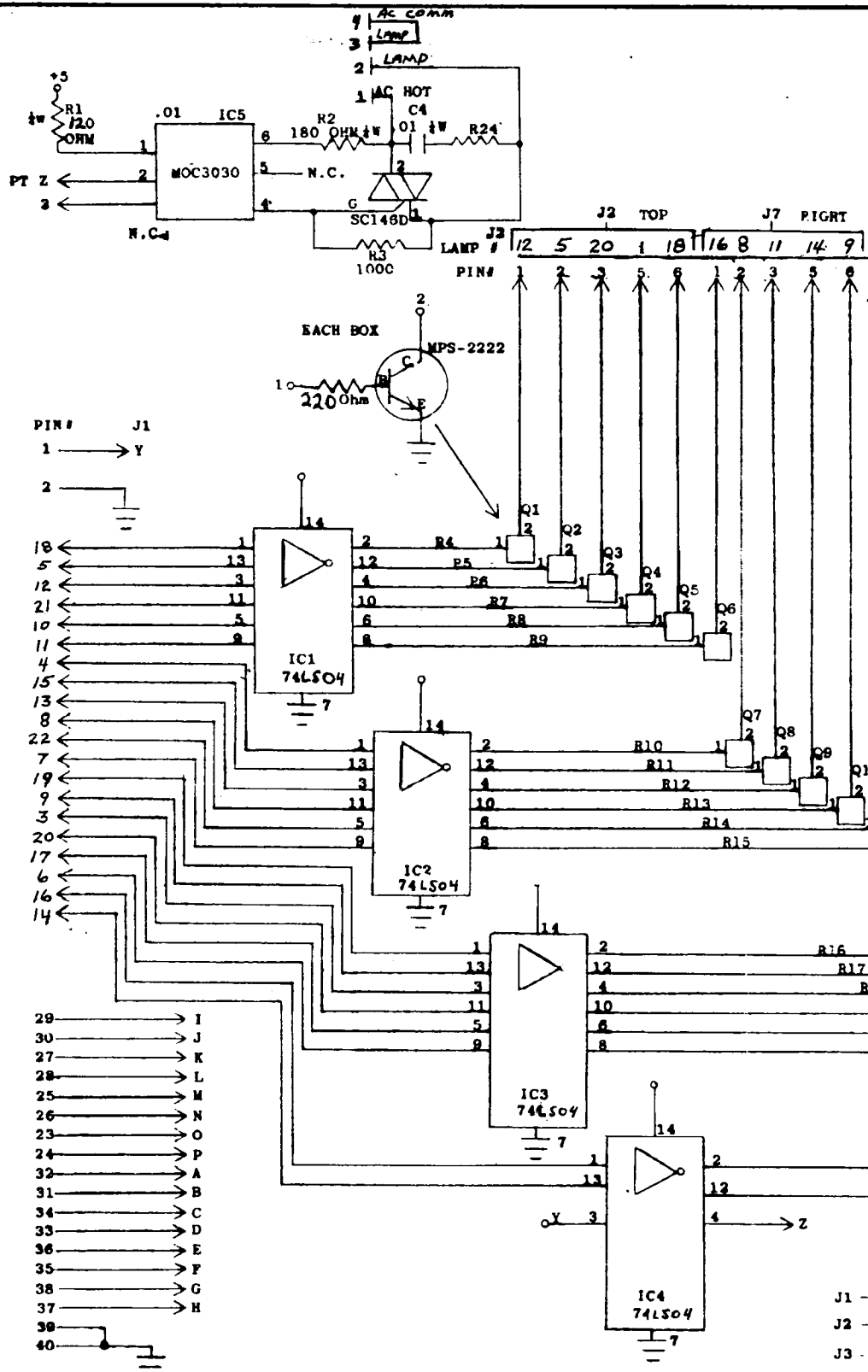
DRAWING #38-0004: SCHEMATICS, 5000 SERIES

| NAME | SHEET | REVISION | ORIGINAL DRAWING SIZE | NEGATIVE SIZE | REDUCTION SIZE |
|---------------------|----------------------------|-------------|-----------------------------|------------------|-------------------|
| TARGET INTERFACE | 1 of 1 1 of 1 1 of 1 | C C D | C C C | C C C | B |
| POWER SUPPLY | 1 of 1 | | A | A | |
| MAIN BOARD | 1 of 2 2 of 2 | | D | | |
| | 1 of 2 2 of 2 | F F | D D | A A | |
| | 1 of 2 2 of 2 | G G | D D | | B B |

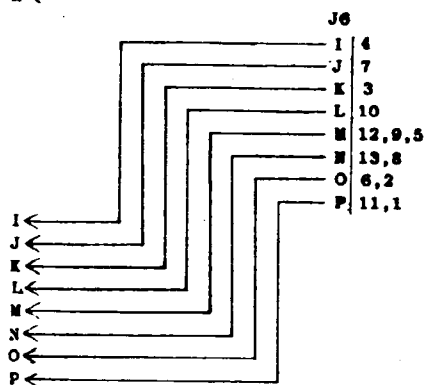
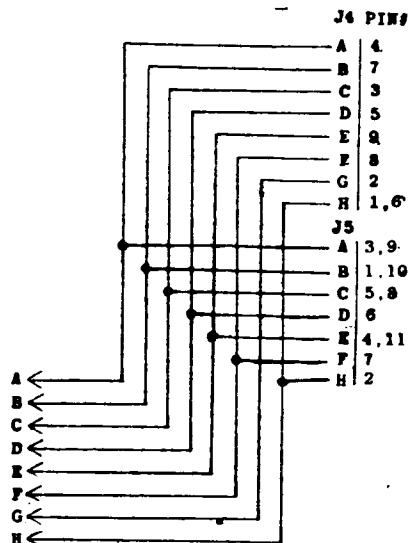
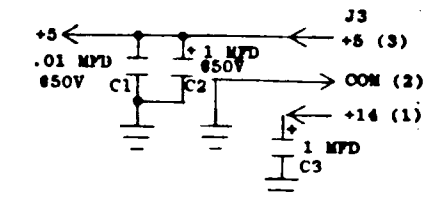
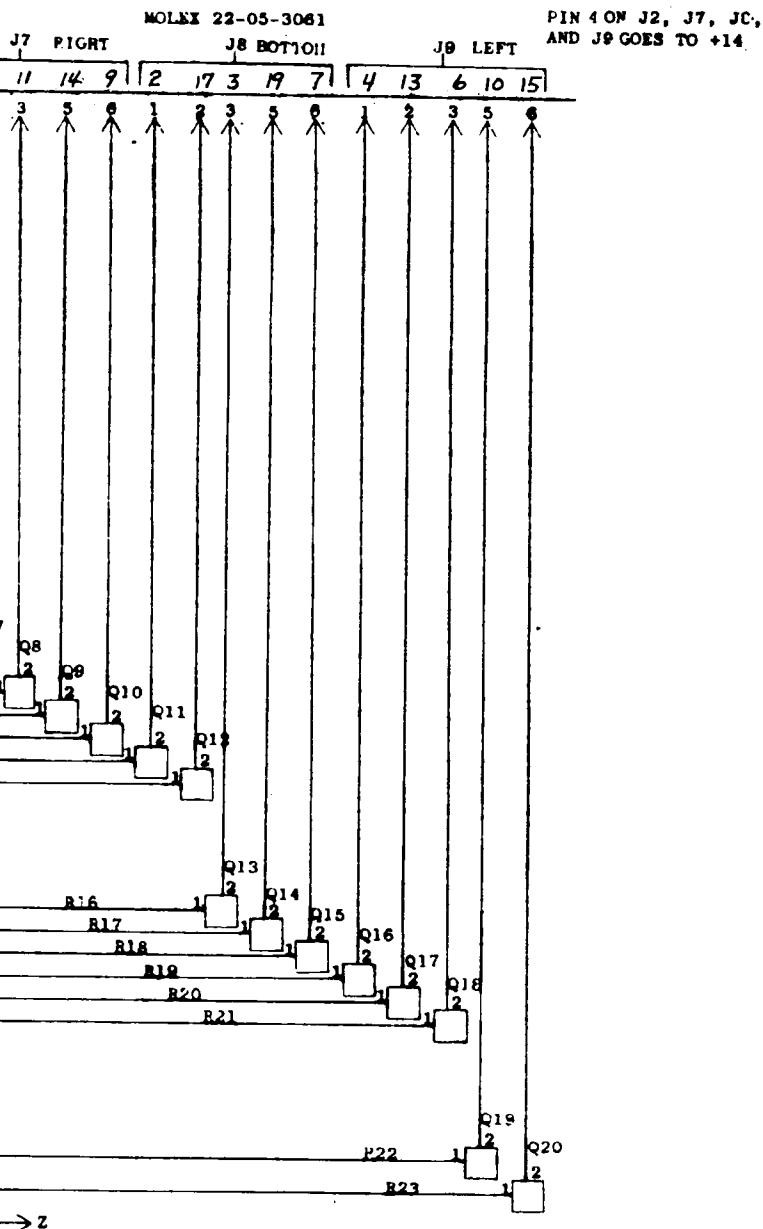
MAIN CPU

| | | | |
|------------------------------------|--------------|----------------|--|
| ARABICID | | SCHEMATIC | |
| SCALE: 1/1 | APPROVED BY: | DRAWN BY: J.E. | |
| DATE: 9/4/90 | | REVISION | |
| MAIN BOARD, 5000 SERIES SHT 2 of 2 | | | |
| DF-5000-01 | | REV 17 00 | |

38-0004



| REV | DESCRIPTION | DATE | INT |
|-----|--|--------|------|
| A | CHANGED PIN #S ON COMM. 11 | 7/1/80 | J.M. |
| B | CHANGED " " " " " " AND EMITTER ? PIN #S (4/5) ON TEE | 9/1/80 | J.M. |
| C | CHANGED PIN #S ON COMM. 12 AND 13 | 2/6/81 | J.M. |



DRAWING 138-0004: SCHEMATIC, 5000 SERIES

| NAME | SHEET | REVISION | ORIGINAL DRAWING SIZE | NEGATIVE SIZE | REDUCTION SIZE |
|------------------|--------|----------|-----------------------|---------------|----------------|
| TARGET INTERFACE | 1 of 1 | | C | | |
| | 1 of 1 | C | C | | |
| | 1 of 1 | D | C | | B |
| POWER SUPPLY | 1 of 1 | | A | A | |
| | | | | | |
| MAIN BOARD | 1 of 2 | | D | | |
| | 2 of 2 | | D | | |
| | 1 of 2 | F | D | A | |
| | 2 of 2 | F | D | A | |
| | 1 of 2 | G | D | | B |
| | 2 of 2 | G | D | | B |

- J1 -- SCOTCHFLEX 3418-0000T PCB 40 PIN CONNECTOR
 J2 -- MOLEX 6373 SERIES 40 CIRCUIT
 J3 -- MOLEX 2373 SERIES 3 CIRCUIT
 J4, J5, J6 -- MOLEX 4094 SERIES
 (OR EQUIVELANT)

| | | |
|--|--------------|--------------------------|
| ARACHNID 502-C | | |
| SCALE: N/A | APPROVED BY: | DRAWN BY J.M. |
| DATE: 10-16-80 | | REVISED |
| SCHEMATIC 5000 SERIES TARGET INTERFACE - REVISION D | | |
| DT-5000-03 | | DRAWING NUMBER 828-10 |

Arachnid, Inc.

208 North Madison Street • Rockford, Illinois 61104 • 815/962-3919

ENGINEERING BULLETIN

In response to the problem of wear on the Switch Matrix in the 5000 Series Game, there has been a change made in the construction of the darthead. To convert your 5000 Series Game to this system, the procedure is as follows:

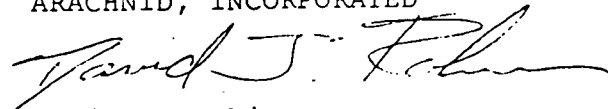
1. Remove .065 gasket from behind matrix.
2. Clean gasket of all foreign substances. It is extremely important that the gasket be thoroughly cleaned before it is placed on the front of the matrix. If not, mis-scoring can occur.
3. Replace gasket on the front of the switch matrix and rebuild head.

Note: Holes must be punched in the gasket to match those in the switch matrix so the gasket does not slip.

If you have any questions, please call for assistance at 815-962-3919.

Sincerely,

ARACHNID, INCORPORATED



David J. Robinson
Engineering Department

Arachnid, Inc.

208 North Madison Street • Rockford, Illinois 61104 • 815/962-3919

ENGINEERING UPDATE: July 28, 1983

As a result of engineering tests on the Series 5000 "English Mark Dart" Game, a defect in the crystal control circuitry has been discovered. This will, on occasion, cause the microprocessor unit to become unstable, resulting in an incorrect function of the game.

To correct this problem simply add (1) one 5 Picofarad Capacitor to the Main C.P.U. Board from Pin 2 of the microprocessor to ground.

ENGINEERING UPDATE: November 14, 1983

Due to requests for a more sensitive touchplate, the following change is recommended by Arachnid, Inc.:

1. Remove the 47K Resistor above the touchplate (R90).
2. Replace with 22K, $\frac{1}{4}$ Watt Resistor.

This change will enhance touchplate sensitivity.

ENGINEERING UPDATE: July 6, 1983

Due to the increasing number of problems concerning the longevity of the bulbs around the darthead, the following changes have been made:

1. On the target interface, replace the four 7404 IC's with 74LS04's.
2. Replace the 1K Resistors in the transistors drive circuitry with 220 ohm Resistors.

ENGINEERING UPDATE: November 15, 1983

Due to an increasing problem with vibration on the 40 pin socket in the 5000 Series Game, Arachnid recommends the use of a zero insertion force socket on all 5000 Series Main C.P.U. Boards. Please contact Arachnid for further details.

ENGINEERING UPDATE: November 15, 1983

Also, to enhance servicability of the top light, the illumination bulb may now be removed through the hole in the front of the top light.

If you have any further questions regarding these updates, please contact our Engineering Department at (815) 962-3919, or toll free at (800) 435-8319.

Sincerely,

ARACHNID, INC.

David J. Robinson
Engineering



SERVICE BULLETIN

SERVICE TIPS - CONCERNING THE 5000 SERIES GAME

WARNING---Disconnect electrical power before attempting service.

2-27-85

The 5000 Series of English Mark Darts has been manufactured since 1981. The following is a list of improvements that we have made to the 5000 Series game and/or suggestions on how you can make servicing easier.

APPROXIMATE DATE AND S/N STARTED

November - 1984

- 1) **PROBLEM:** Target head segments breaking allowing small pieces to drop between the cup and the spider. This will prevent the switch from opening and causing the target head to "Lock Up".

SOLUTION: Currently the "E" segment (pie shaped) is being made in a new configuration and of a new material. The new material is a nylon mixture which has proved to be much longer lasting under heavy testing. The new style segment also has a pop-off back so broken tips can be removed if it was ever found necessary to do so. In the near future (late March of 1985) we will be manufacturing all of our segments with the new material and style.

June - 1984
S/N 12735

- 2) **PROBLEM:** Heat build up inside game cabinet

SOLUTION: Vent holes in back door have been added to reduce heat build-up inside the cabinet. This should make components last longer. If you add holes to your back door, make sure to cover them with nylon screening mesh so someone won't be putting their fingers where they shouldn't. We added approximately 42 square inches at the bottom and the same at the top of the door letting convection take place. It will reduce the inside temperature up to 20 degrees fahrenheit.

August - 1984

- 3) PROBLEM: Audio amplifier failing or blowing audio fuses.

SOLUTION: In some older games the audio heat sink had the ability to swivel. If it touched the leads on the audio amp it could short out. We recommend three things:

- A) Remove heat sink from board and grind down the end closest to leads on audio amp by about 1/16".
- B) When reinstalling to board, drill a second hole through board so the heat sink won't swivel.
- C) Check that the fuse is a 250V not a 32V.

January - 1985
S/N 17422

- 4) PROBLEM: Player change push button - skipping.

SOLUTION: Player change pushbutton skipping over players can be made less of a problem by installing a .47mfd capacitor instead of a .1mfd on pin 38 of the microprocessor to ground. Since the "jumping" is caused by multiple spikes from the button, the larger value capacitor will smooth it out (just as a capacitor does in a power supply). In our newest revision of software DART 8.0, a delay has been added to prevent it from skipping but yet allowing player change to be pressed repeatedly as needed to skip over a player in team play.

March - 1985

- 5) PROBLEM: Short life of 7C7 bulbs in marquee - hard to change.

SOLUTION: As soon as stock arrives, we will be switching to a fluorescent light in place of the three 7C7 lamps to give longer life and more even illumination of the marquee.

- 6) PROBLEM: Short life of target illumination bulb.

SOLUTION: Several operators have told us that switching from the Sylvania round 40W high intensity lamp to either a Norelco or ABCO that the problems with them burning out have dropped considerably. We have heard it often enough that we are switching our supplier as well.

October - 1984
S/N 14412

- 7) PROBLEM: Count-Up - players think they only get 7 rounds.

SOLUTION: On software revisions before 7.0 and 8.0, the round counter would jump back to seven rounds (even though the player really had eight rounds) after the win sound. All new revisions incorporated the change so the round count stays on 8 in Count-Up only.

- 8) PROBLEM: Small lamps on PC board and around dart head - short life.

SOLUTIONS: A) Many times we have heard the comment that an operator will be changing bulbs and "by the time he gets the back door closed, more are burned out. It is our feeling that he was probably changing bulbs with power on to the game (as it is easy to do around the dart head). With power applied, the vibration of swinging the door and bumping it would be enough to break the filaments as, when the bulbs are lighted, the filaments would be very soft. Always turn power off when changing lamps.

B) On the power supply is a large capacitor (18,000mfd) used for filtering of the power supply. In most cases this capacitor is not needed and the plus lead can be disconnected and taped up (the power supply has enough filtering with the 4700mfd capacitor also in the circuit). By disconnecting the plus lead the lamp voltage will fall from 14V to less than 12V (depending on your line voltage). With only 12V on the lamps they could last much longer although with somewhat less illumination. In my evaluation, I demonstrated it to different people who couldn't tell the difference until it was pointed out what the change was. The only time it caused a problem was with a game that had a marginal component. When that was replaced, all was ok.

C) We are switching to a 50,000 hour bulb made by Lumex instead of the 10,000 hour bulb we are currently using. Along with this change is a new style socket for the main board so the bulb won't be soldered in and can be changed easily.

9) PROBLEM: Intermittent scoring.

SOLUTION: If the swing out door is accidentally opened too far, the switch matrix would pull the pins on the target interface board sideways cracking the connection or the foil - Usually, resoldering the connectors will solve this problem. This is a hard problem to see and will cause some very intermittent scoring problems.

If there are any questions or comments on the above information, please contact Gene Harlan, Chief Engineer at 1-800-435-8319.



SERVICE BULLETIN

CONCERNING THE 5000 SERIES DART GAMES

WARNING: DISCONNECT ELECTRICAL POWER BEFORE ATTEMPTING SERVICE

SUBJECT: Changeover from Player Change Touchplate to Pushbutton and/or changing to Poker Style Pushbutton.

Retrofit Kit #00-5000-27

If changing from Touchplate start at "A". If changing from small Pushbutton to larger Poker Pushbutton start at "B".

- A -
 1. Remove components from main CPU board as shown inside the dotted lines in photo (1).
 2. Also remove the .1mfd capacitor and the 1 meg ohm resistor.
 3. Solder the .47mfd 25v capacitor onto the board where the .1mfd was removed.
 4. Solder the 560 ohm $\frac{1}{4}$ w resistor where the 1 meg ohm resistor was removed.
 5. Solder the two hookup wires as indicated in photo (2).

- B - To install our new Player Change Pushbutton (Part number 08-0009), some modifications to the existing game are necessary:
 1. Remove Main CPU board from game.
 2. Remove old Pushbutton and aluminum bezel from lexan caption panel, (if applicable).
 3. Enlarge hole in lexan panel from .900" to .970" (this is not much so be careful). Use a round file and check size often by trying to insert Pushbutton from front (without switch attached at this point).
 4. When hole is large enough, insert Pushbutton, fastening with nut from behind lexan circuit.

B - Continued

5. Enlarge hole in main printed circuit board as shown in figures 3 and 4 using a $1\frac{1}{4}$ " chassis punch. Center the new hole in the area where there are no traces. You will cut some close to the edge of the board, but these are not used.
6. Connectors on the two black wires should be $\frac{1}{4}$ " spades.
7. Reinsert PC board into the game and snap switch onto button.
8. With board and switch in place, attach wires to middle connector and the connector closest to you (looking in from the back of the game).

NOTE 1: The light bulb is not used in this button.

NOTE 2: If switch were wired backwards (N/C instead of N/O) Player Change will work but never go to "THROW DARTS".

If there are any questions or suggestions, please feel free to call me toll free 1-800-435-8319 (out of Illinois) or 1-815-654-0212 (in Illinois).

Gene Harlan
Chief Engineer

Figure 3

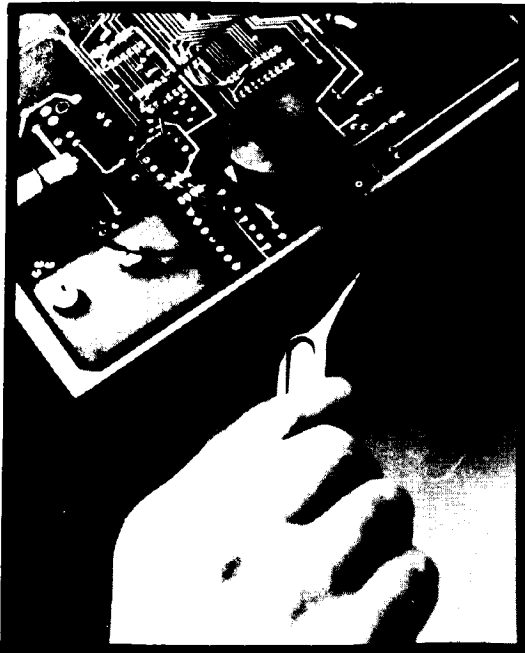
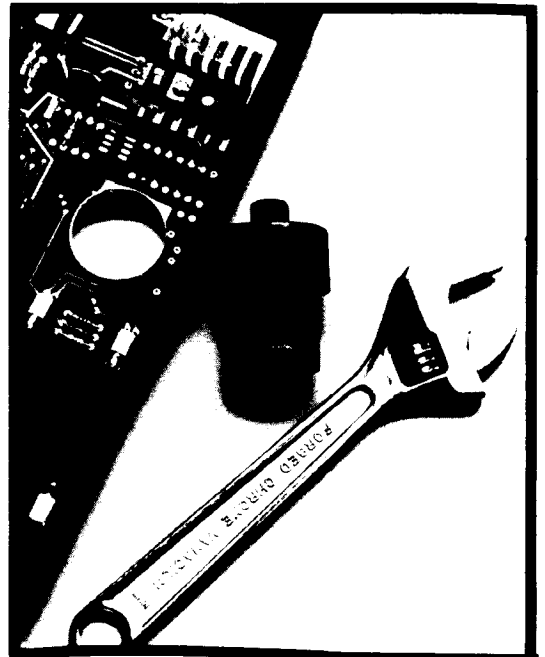


Figure 4





SERVICE BULLETIN

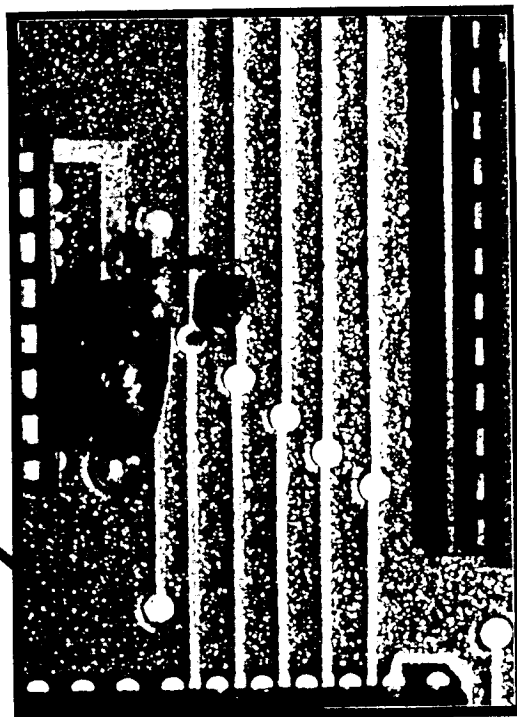
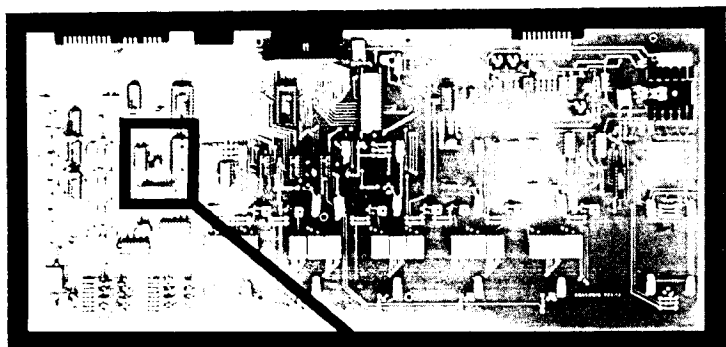
CONCERNING 5000 SERIES GAME

6-6-84

WARNING---Disconnect electrical power before attempting service

MICROPROCESSOR CHIP PROBLEMS

If a particular board seems to have problems with the microprocessor chip itself failing, install a 1N914 (or 1N4148) diode from the PROG pin (pin 25 on 8749 microprocessor) to +5V (cathode end to +5V). This can most easily be accomplished on the main PC board between IC4 and IC5. Insert the anode end into the plated through hole as shown in the photo below. Solder the cathode end (banded end) to the same pad as the top capacitor lead, as this is +5V.





SERVICE BULLETIN

CONCERNING 5000 SERIES GAMES

6-6-84
UPDATED--6-20-84

WARNING---Disconnect electrical power before attempting service.

ELECTRICAL NOISE PROBLEMS

If a game at a particular location has been bothered by electrical noise caused by RFI from fluorescent lights and/or static discharge from people walking on carpeting in front of the game, the following modification should help.

1. Remove black wire on main harness between pin 6 of coin harness plug and pin 2 of J5 at CPU board. This is the ground wire from the CPU board to the coin door.
2. Remove black wire from coin door inner harness.
3. On the coin door, remove the black ground wire going to the 6 prong plug.
4. Make a new wire (18ga. green stranded- 48") with #8 screw eyelets on each end. Attach one end to the coin door at the point where the black wire was removed. Snake the wire beside the coin door inner harness to the power supply chassis. Attach to the metal chassis on one of the screws holding the transformer by using another nut on top. This completes the change of routing ground direct to the power supply chassis instead of to ground on the CPU board. It has helped in several cases involving electrical noise.
5. Remove the black wire from J5 (pin 8) to P2 (pin 8). This wire is not needed and could cause ground loops.
6. If problems believed to be caused by electrical noise still persist, install 2) .01 600V capacitors, one from each side of the AC line cord to green (ground) wire in the power cord. This can be done on the terminal strip under the power supply chassis.

UPDATE----- NOTE:On some games pin 2 of J5 on CPU Board (see step 1) is not connected to the ground bus. If this is the case, add a short jumper to ground pin 2. If this is not done, you will have no sound.

Gene Harlan
Chief Engineer



SERVICE BULLETIN

SERVICE TIPS - CONCERNING THE 5000 SERIES GAME

WARNING---Disconnect electrical power before attempting service
3-6-85

PROBLEM: Small lamps on PC Boards and around the dart head - short life.

SOLUTIONS: A) Many times we have heard the comment that an operator will be changing bulbs and "by the time he gets the back door closed, more are burned out" It's our feeling that he was probably changing bulbs with the power to the game on (as it is easy to do around the dart head) With power applied, the vibration of swinging the door and bumping it would be enough to break the filaments as, when the bulbs are lighted, the filaments would be very soft. Always turn power off when changing the lamps.

B) On the power supply is a large capacitor (18,000 MFD) used for filtering of the power supply. In most cases, this capacitor is not needed and the plus lead can be disconnected and taped up (the power supply has enough filtering with the 4700 MFD capacitor also in the circuit). By disconnecting the plus lead, the lamp voltage will fall from 14V to less 12V (depending on your line voltage). With only 12V on the lamps, they should last much longer although with somewhat less illumination. In my evaluation, I demonstrated it to different people who couldn't tell the difference until it was pointed out to them what the change was. The only time it caused a problem was with a game that had a marginal component. When that was replaced, all was ok.

If there are any questions or comments on the above information, please contact Gene Harlan, Chief Engineer, at 800-435-8319



SERVICE BULLETIN

SERVICE BULLETIN

CONCERNING THE SERIES 5000 DART GAMES

WARNING: DISCONNECT ELECTRICAL POWER BEFORE ATTEMPTING SERVICE.

4-8-85

Fluorescent Lamp Retro-fit Package - Part #00RET0000010000

We have put together a retro-fit package for those who may wish to update their English Mark Dart 5000 Series Games. The fluorescent bulb replaces the three 7C7 Lamps behind the marquee giving much more life and even illumination. The package includes all parts, instructions, and a drilling template(only 4 holes are needed to be drilled) and is priced low to encourage you to change.

If there are any questions or suggestions, please feel free to contact or call.

GENE HARLAN
CHIEF ENGINEER

SERVICE BULLETIN

CONCERNING THE 5000 SERIES DART GAMES

WARNING: DISCONNECT ELECTRICAL POWER BEFORE ATTEMPTING SERVICE

APRIL 8th, 1985

NEW PLAYER CHANGE PUSHBUTTON

To install our new Player Change Pushbutton (PartNo.723), some modifications to the existing game are necessary;

- 1) Remove Main CPU board from game.
- 2) Remove old Pushbutton and aluminum bezel from lexan caption panel.
- 3) Enlarge hole in lexan panel from .900" to .970" (this isn't much so be careful). Use a round file and check size often by trying to insert pushbutton from front (without switch attached at this point).
- 4) When hole is large enough, insert pushbutton, fastening with nut from behind lexan circuit.

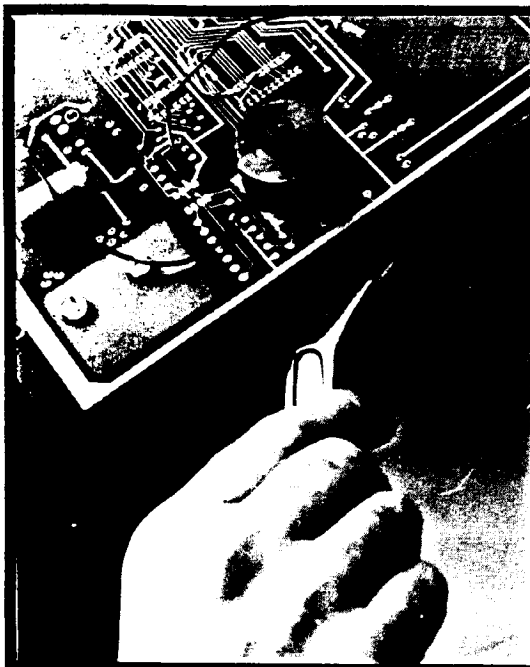


fig 1

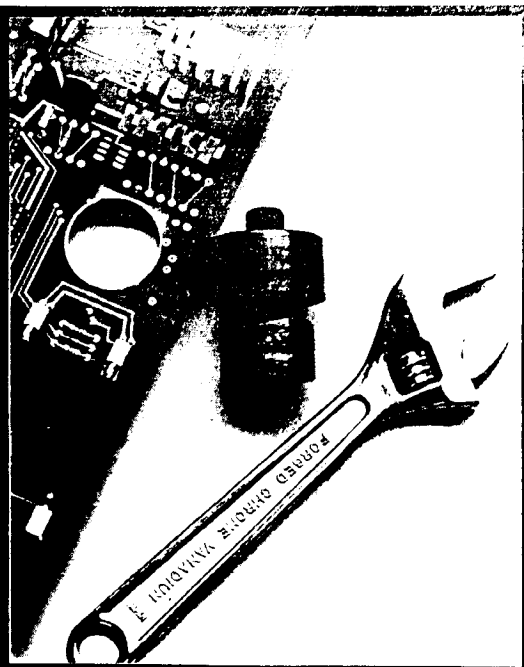


fig 2

SERVICE BULLETIN

(Continued)

- 5) Enlarge hole in main printed circuit board as shown in figures 1 and 2 using a 1¼" chassis punch. Center the new hole in the area where there are no traces. You will cut some close to the edge of the board, but these are not used.
- 6) Change connectors on the two Black wires to ¼" spades.
- 7) Reinsert PC Board into the Game.
- 8) With board in place, attach wires to middle connector and the connector closest to you (looking in from the back of the game).

NOTE 1: The Light bulb is not used in this button.

NOTE 2: If switch were wired backwards (N/C instead of N/O)
Player change will work but never go to "THROW DARTS".

If there are any questions or suggestions, please feel free to contact or call me.

GENE HARLAN
CHIEF ENGINEER



SERVICE BULLETIN

December 30, 1986

5000 SERIES GAMES

In some locations, players have discovered that 301 Double In/Double Out can be played for 25 cents by pressing game select buttons one and five and releasing at the same time (doesn't always work however). The attached minor wiring change to the game select pushbuttons will prevent this from occurring. Thanks goes to Bob Amin of Pioneer Sales, Milwaukee, for this idea!

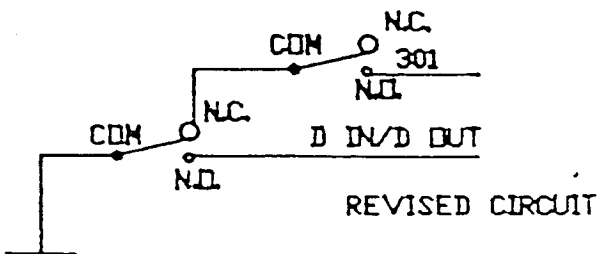
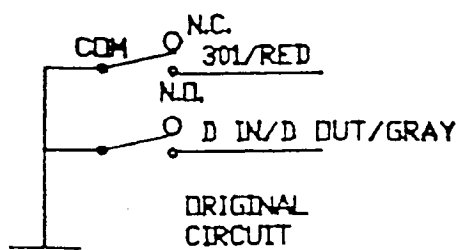
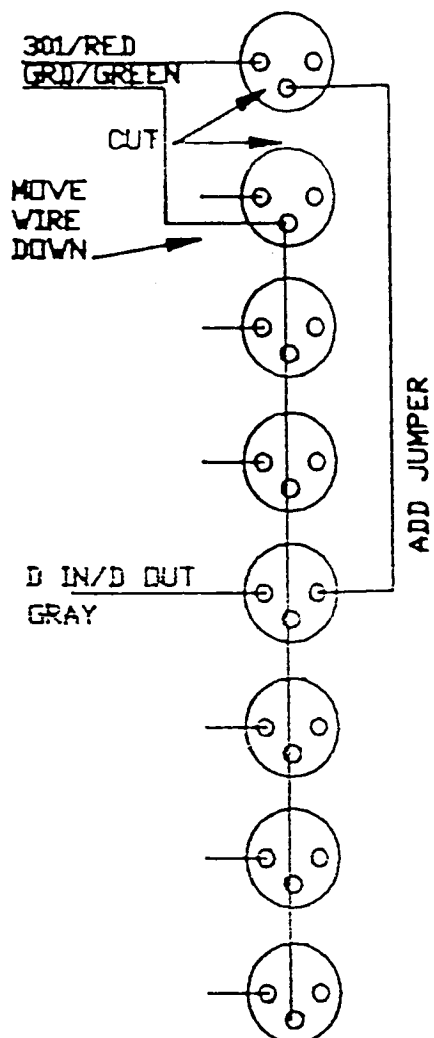
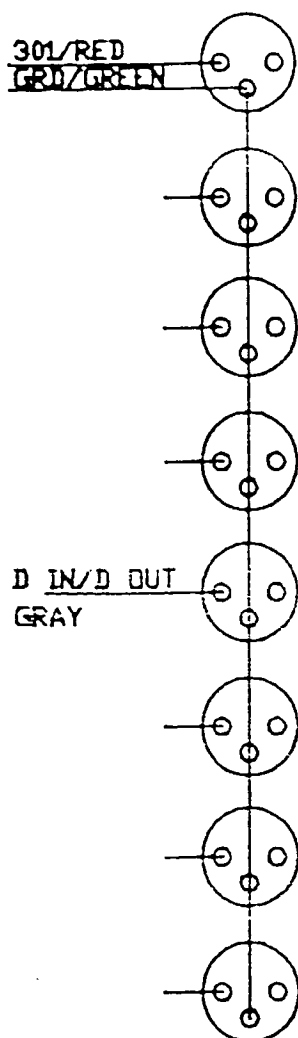
For further questions or assistance, you may call 1-800-435-8319.
In Illinois 1-815-654-0212.

ARACHNID, INC.

Gene Harlan

Chief Engineer

5000 DART SWITCH PANEL WIRING UPDATE



ARACHNID INC.

DRAWING NO.

DRAWN BY:

DATE _____

12-30-66

CHECKED BY

DATE

MATERIAL

SCALE
NONE

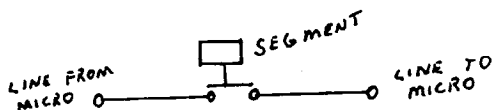
REVISION

Arachnid, Inc.

6421 Material Avenue • P.O. Box 2901 • Rockford, Illinois 61132-2901
815/654-0212 • 800/435-8319 • TLX 270-57601

MATRIX SCORING SYSTEM

A dart hitting the Dart Head Segment momentarily closes a switch contact in the matrix, which shorts two input lines from the Processor together. The equivalent circuit is below.



The lines coming out of the matrix all have a letter designation for specific scores. Check chart "Letter Designation of Scores". The Pin numbers given below are for the target interface board connectors. All connector pins are counted with pin (1) at the bottom of the board. The top connector is a (9) pin, the middle is a (13) pin and the bottom is a (11) pin.

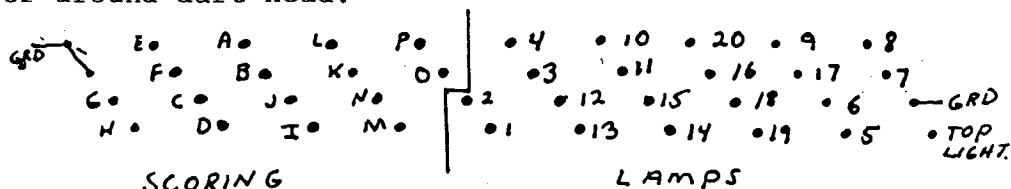
Lines a thru H are found on the top and bottom connectors.

| <u>LETTER DESIGNATION</u> | <u>9 PIN</u> | <u>11 PIN</u> |
|---------------------------|--------------|---------------|
| A | 4 | 3+9 |
| B | 7 | 1+10 |
| C | 3 | 5+8 |
| D | 5 | 6 |
| E | 9 | 4+11 |
| F | 8 | 7 |
| G | 2 | NC |
| H | 1+6 | 2 |

Lines I thru P are found on the middle connector.

| <u>LETTER DESIGNATION</u> | <u>13 PIN</u> |
|---------------------------|---------------|
| I | 4 |
| J | 7 |
| K | 3 |
| L | 10 |
| M | 5, 9 + 12 |
| N | 8 + 13 |
| O | 6 + 2 |
| P | 11 + 1 |

After the lines come into the target interface board, it runs them down to the (40) pin ribbon cable connector. Pin Designation for target interface side follows and also covers lamp drivers for around dart head.



From the ribbon cable connector the lines go straight to the Micro Processor. They are as follows:

| <u>LETTER DESIGNATION</u> | <u>MICRO PIN</u> |
|---------------------------|------------------|
| A | 27 |
| B | 28 |
| C | 29 |
| D | 30 |
| E | 31 |
| F | 32 |
| G | 33 |
| H | 34 |
| I | 12 |
| J | 13 |
| K | 14 |
| L | 15 |
| M | 16 |
| N | 17 |
| O | 18 |
| P | 19 |

LETTER DESIGNATION OF SCORES

| <u>SCORE</u> | <u>SINGLE</u> | <u>DOUBLE</u> | <u>TRIPLE</u> |
|--------------|---------------|---------------|---------------|
| 1 | AI | BI | CI |
| 2 | AJ | BJ | CJ |
| 3 | AK | BK | CK |
| 4 | AL | BL | CL |
| 5 | AM | BM | CM |
| 6 | AN | BN | CN |
| 7 | AO | BO | CO |
| 8 | AP | BP | CP |
| 9 | DI | EI | FI |
| 10 | DJ | EJ | FJ |
| 11 | DK | EK | FK |
| 12 | DL | EL | FL |
| 13 | DM | EM | FM |
| 14 | DN | EN | FN |
| 15 | DO | EO | FO |
| 16 | DP | EP | FP |
| 17 | GI | HJ | GM |
| 18 | GJ | HJ | GN |
| 19 | GK | HK | GO |
| 20 | GL | HL | GP |
| BULL | | HM | |