



SERIES 4500 PARTS MANUAL

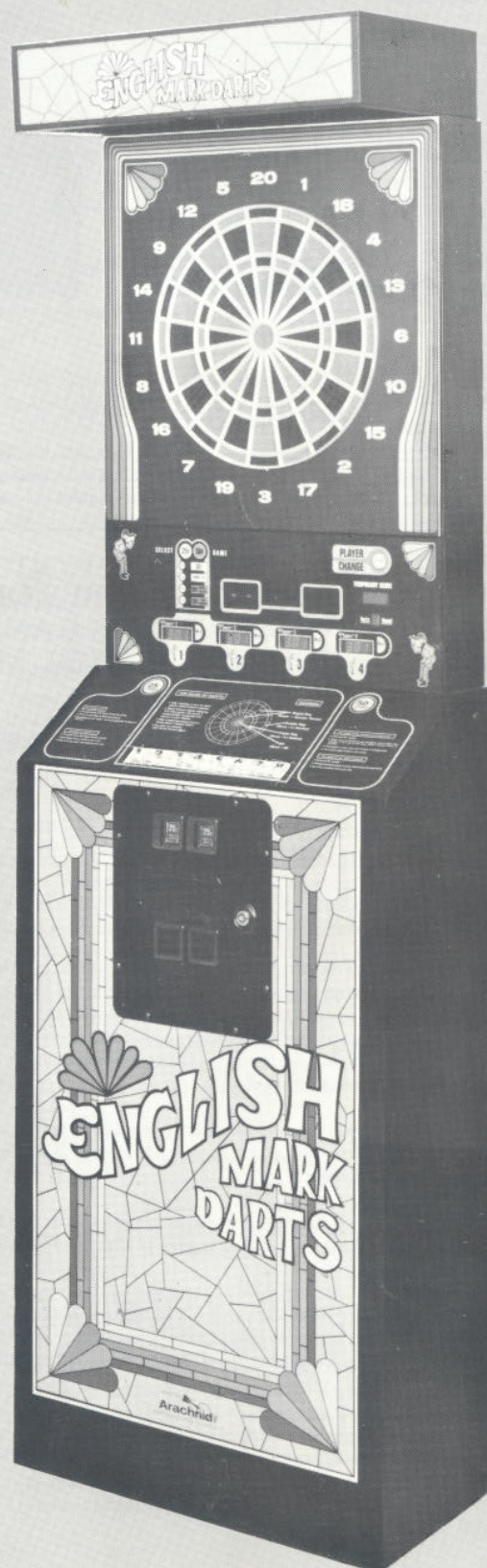


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INTRODUCTION

This manual contains description, unpacking/assembly, operation, and troubleshooting information for the model 4500 English Mark Darts Machine.

The purpose of this manual is to provide the user with a basic installation and 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 815-654-0212.

SECTION 1 - GENERAL DESCRIPTION

The 4500 series English Mark Darts machine is a patented microprocessor controlled dart game (patent #4057 251) where players may select one of four 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 system gives the player an instantaneous displayed score.

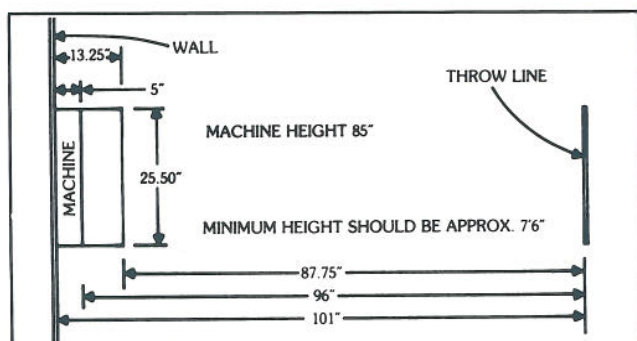


Figure 1. Plan view of the 4500 Series play field.

SECTION 2 - UNIQUE FEATURES OF THE 4500 SERIES GAME

There are several features that are unique to the 4500 series English Mark Dart Game from previous series games, such as:

1. The four games on the 4500 series game are the most popular games played with darts. They are:

A - 301	25¢
B - Count Up	25¢
C - 301 Double In/Double Out	50¢
D - 501 Team Doubles	50¢
2. New front switch panel with special hardcoat surface to resist damage from darts and to give long life.
3. Warm up mode. The target light comes on when quarters are inserted. The microprocessor counts the number of quarters and will allow three free warm up shots (for each quarter inserted) after which the target lamp is turned off. The player can then select game to be played at which time the target lamp will come back on and stay on till the game is finished.
4. The round/darts counter will display the round being played until the first dart hits the target at which time it switches to display of the number of darts thrown.
5. Attract mode. About every four minutes the game over and remove darts lights will flash to catch the eye of the dart players and encourage play.
6. Reset mode. If there is no play within a 10 minute period, the game will reset as if it had just been turned on. This will help when a player leaves the game, as other players will know that no one is currently playing.

SECTION 3 - UNPACKING/ASSEMBLY

3.1 UNPACKING

- a) 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.
- b) The top assembly is packed inside the base unit, and the top light is set on the top of the base in a box board stabilizer. The bolts and keys are contained inside the stabilizer on top of the instruction panel.
- c) Remove the top from the 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.

3.2 ASSEMBLY

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

—CAUTION—

GAME WARRANTY IS VOID IF ANYTHING OTHER THAN TOP LIGHT IS PLUGGED INTO RECEPTACLE.

- c) Install completed top assembly into base as shown in Figure 3.
- d) Install carriage bolts so nuts are on inside of machine as shown in Figure 4.
- e) Connect coin door harness to main harness at lower right corner of upper half of game (see Figure 5).

—NOTE—

THE SPEAKER IS CONNECTED AT THE FACTORY.

- f) Plug the power cord into a 120V AC grounded wall outlet. The machine is now ready for the power up sequence.

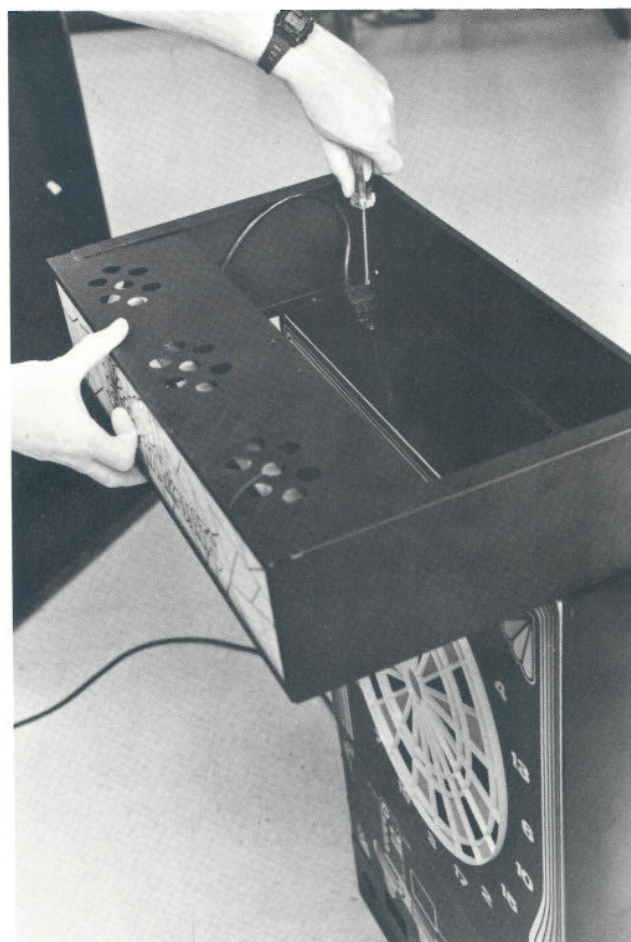


Figure 2. Top light is attached to top of dart board.

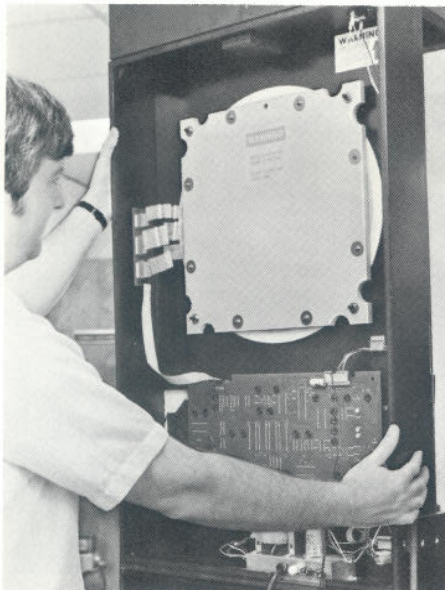


Figure 3. Attaching top assembly to base.

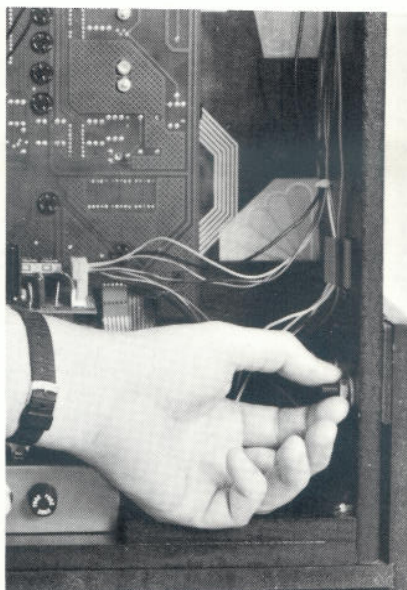


Figure 4. Bolting top to base, with bolts inserted from outside.

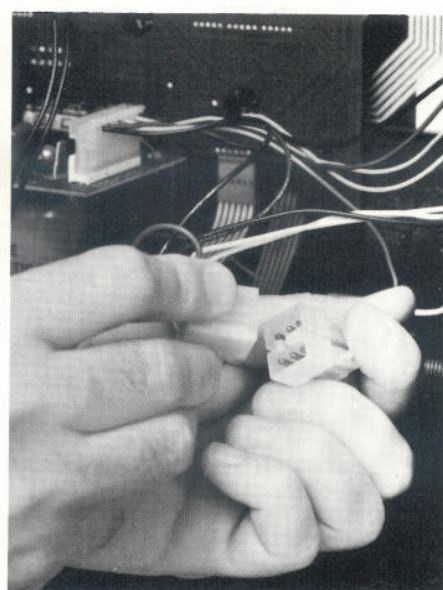


Figure 5. Connecting coin door plug to main harness.

SECTION 4 - OPERATION

4.1 POWER UP AND CHECKOUT

- Turn on dart machine using on/off switch on the back of the machine. The game over lights and remove darts should alternately flash three times after which they both light along with temporary score, round, select game, 25¢, and 50¢. The players' scores should each show one "zero" in the least significant digit position as should round count.
- Inside the coin door you will find a slam switch which when activated will cause the game to reset, and a slide switch which will put the game into test mode when depressed and released.
- Slide the test switch down and release. The seven segment displays should all show zeros for about one second, then ones, etc. through nines. Then the small 14 volt bulbs will light one at a time in the following sequence:

1. 301	12. Darts
2. Count Up	13. Round
3. 301 Double In/Double Out	14. 1
4. 501 Team Doubles	15. 1 Win
5. Bust	16. 2
6. Remove Darts	17. 2 Win
7. Throw Darts	18. 3
8. Game Over	19. 3 Win
9. Select - 50¢	20. 4
10. 25¢ - Game	21. 4 Win
11. Player Change	22. Target Lamp

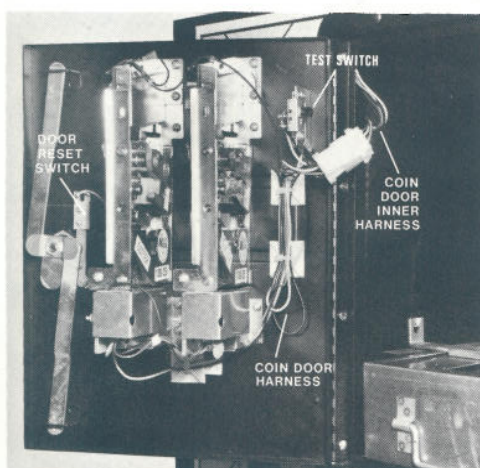


Figure 6. Coin door open, showing coin mechanism, reset switch, and test switch.

After all the lamps have gone out the machine will make all the sounds, followed by lighting the throw darts and target illumination plus a zero is inserted in the temporary score. At this point any segment that is pressed will display its score when released so all segments can be tested for proper function.

Pressing the test switch, inserting a coin, closing the slam switch, or turning power off and on will cancel test mode.

SECTION 5. TECHNICAL DESCRIPTION

5.1 GENERAL

The rear view of the 4500 series game (Figure 7) shows the main components used in the game machine:

- Main CPU Board
- Target Interface Board
- Power Supply
- Dart Head Assembly

These components are discussed in more detail in the following paragraphs.

5.2 MAIN CPU BOARD

The main CPU board (Figure 14, page 8) contains a 6802 microprocessor. This IC contains its own oscillator and 128 bytes of RAM memory. The remaining circuit consists of 11 active IC's, 8 transistor networks, 4 resistor networks, and 1 diode network:

74LS04	Hex Inverter - U1
556	Dual Timer - U2
74LS138	3 line to 8 line Decoder - U6
2764	Eprom - 8K bytes - U7
6821	Peripheral Interface Adapter - U4, 5, 8, 9
6840	Programmable Timer - U25
LM383T	Audio Amp - U21
LM7815T	15V Regulator - U22
ULN2003	Transistor Network - U11, 14, 15, 16, 20, 23, 24
UDN2580	Transistor Network - U19
TND903	Diode Network - U13
	Resistor Network - 2K Ohm - U10
	Resistor Network - 10K Ohm - U12
	Resistor Network - 10 Ohm - U17, 18

5.2.1 SEVEN SEGMENT DISPLAYS

The displays are turned on in pairs (i.e., multiplexed - only two are on at any one time). The pairs are turned on by U9 (pins 2 thru 9) with only one of these outputs being low at any one time. When a line is low (line 2 as an example) it will turn on a transistor in U19 which then applies 5 volts to the output (pin 18 which is connected to the round/dart display and the most significant digit of the temporary score). With 5 volts on the display pair it is now possible to light individual segments and show a score.

5.2.1 Seven Segment Displays (continued)

Which segments within a display will light depend on the outputs from U5. Pins 2 thru 8 will have information for the left hand digit in the pair displayed, and pins 11 thru 16 will be information for the right hand digit.

To light a segment on the left hand display, for an example, the output on pin 2 of U5 must go high which turns on a transistor in U15. When the transistor is turned on it in effect shorts pin 16 to ground allowing current to flow through the 10 ohm current limiting resistor (U17) and the "a" segment. Since 5 volts is not applied to any other pairs of LED displays the only "a" segment that is turned on is the one in the pair being addressed.

5.2.2 PLAYER CHANGE

The player change pushbutton is incorporated into the front touch panel. When the switch is closed, pin 6 of U8 is shorted to ground. When the switch is open it is held high by a 10K ohm resistor in U12. C14 (.01ufd) is used for noise suppression.

5.2.3 SOUND CIRCUIT

Sound is generated in U25 by programming timer 1 (of three timers) to free run at specific frequencies. The sound is output at pin 27 (O1) and is fed thru R9 which is the volume control accessible from the rear of the game. U21 (LM383T) is an 8 watt audio power amplifier whose gain is controlled by the ratio of R10 and R11. The voltage for U21 is controlled by U22 (LM7815CT) a 15 volt regulator. Input should be 21 to 24 volts DC depending on line voltage.

5.2.4 RESET

The microprocessor can be reset either by shutting off power for a few seconds and then turning back on, or by closing the slam switch inside the coin door.

- The slam switch on the coin door is buffered with two sections of U23. When the switch is closed, pin 2 of U23 is grounded. U23 inverts this signal twice so the effect on the reset line is that it goes low. C23 is used for preventing electrical noise from triggering a reset.
- The purpose of half of the 556 timer is to give a short delay to the reset line after power up. The reset line cannot come to 5 volts at the same time as the 5 volts on pins 35 and 8, but must be delayed a few clock cycles for reset to work properly.

5.2.5 INTERRUPTS

The microprocessor can be interrupted in four different ways at which time it will jump to the part of the program that controls that particular interrupt.

- One-half of the 556 timer supplies a 1000 Hz signal (pin 5) to PIA U8 (input on pin 40). This interrupt controls the rate

of refresh for multiplexing the displays, checking for coins, and checking for test mode. If this were to stop, only two displays would light very brightly.

- Two of the three timers (U25 - 6840) are cascaded to give approximately a ten-minute delay before an interrupt will occur, at which time the game resets as if you had just turned it on. Any activity during a game automatically resets the timer back to 10 minutes (i.e., as long as there is someone playing the game it will not reset, only if it is left unattended for 10 minutes).
- The coin input switch will override any game or other mode that the game may be in.
- The test switch will also be acknowledged any time, although if pressed during a game nothing will happen until player change is also pressed.

5.2.6 MEMORY

Memory in this system consists of 128 bytes of RAM located inside the 6802 microprocessor, and 8K bytes of Eeprom (U7 -2764). The main program is located in the Eeprom. The window on this IC should always be covered with our stick-on label as Eeproms are erasable when exposed to ultraviolet light over a period of time.

5.2.7 ADDRESS DECODING

Address decoding is done with U6, a three line to one of 8 line decoder. This IC determines if the microprocessor is addressing memory, one of the four peripheral interface adapters, or the 6840 sound IC.

5.3 TARGET INTERFACE BOARD

The target interface board is used to combine the 33 conductors from the switch matrix into 16 conductors. At times it can be important to know which pins on the target interface board will give a particular score. This information is in Table 1 and Figure 8. With the game in test mode (at the end of test when the dart head is sensitive) or in game mode, shorting, momentarily, the correct pair of pins in the target interface board with a jumper wire will give a score (see Figure 8). Doing this might save troubleshooting time as you can determine if a problem is in the switch matrix or the electronics.

—NOTE—

THE SCORE WILL NOT APPEAR UNTIL THE JUMPER WIRE IS REMOVED.

You will note from Table 1 that the 13 pin connector is common to all switches. Since the microprocessor won't score until the switch opens, pulling off the 13 pin connector while in test mode will give you the score of a stuck segment or switch. The effect is that the switch gets opened so the microprocessor can give the score. This can save troubleshooting time.

TABLE 1
Letter Designation of Scores

SCORE	SINGLE	DOUBLE	TRIPLE
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	HI	GM
18	GJ	HJ	GN
19	GK	HK	GO
20	GL	HL	GP
BULL		HM	

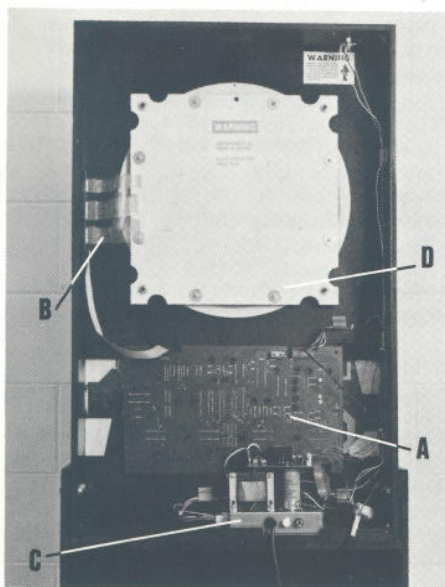


Figure 7. Rear view of 4500 Series game machine.

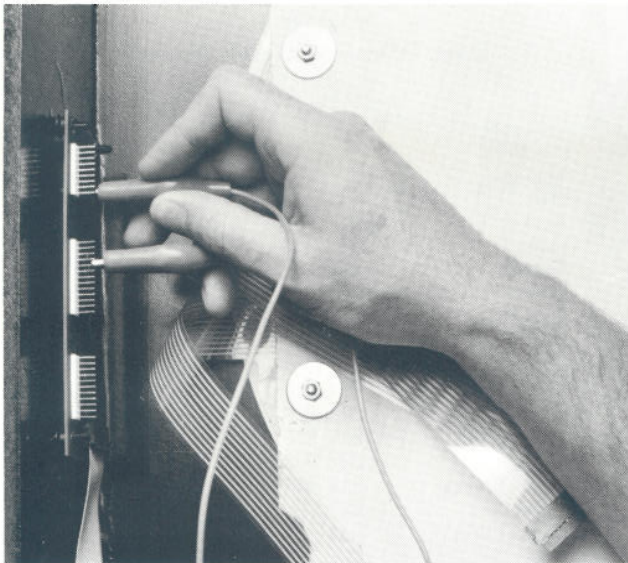


Figure 8. Target Interface Board with Test Jumper.

5.4 TOP LIGHT

The top light has two separate lamps, a fluorescent to light the marquee, and a round 40W high intensity for lighting the target.

The fluorescent lamp should be on anytime the game is plugged in. The starter is built into the ballast.

The target illumination bulb only comes on after a quarter has been inserted. It will go off at the end of a game and also before a game is selected if more than three darts per quarter inserted are thrown. The target illumination will come back on as soon as more quarters are inserted or the game is selected.

—CAUTION—

NOTHING EXCEPT FOR THE TOP LIGHT SHOULD BE PLUGGED INTO THE RECEPTACLE ON THE TOP OF THE GAME AS IT HAS SPECIAL WIRING.

5.5 POWER SUPPLY

The power supply consists of three voltage levels, +5V, +12V, and +21V DC. The 5V and 12V come from the same transformer output. The 12V is unregulated and will vary with line voltage. This voltage is used to drive the small lamps plus drive the +5V regulator.

The 5V regulator should only vary $\pm 1V$ with load and line. All of the logic is powered from this supply.

The +21V supply is unregulated and will vary with line and load. This supply feeds the +15V regulator located on the main PC board. The 15V regulator powers the audio circuit.

There are three fuses in the power supply. The main fuse is located on the chassis. It is a 1.5 amp 250 volt slow blow 3AG size. Nothing will function if this fuse blows.

The other 2 fuses are located on the small printed circuit board on top of the power supply. The one closest to the edge is FS1, a 5 amp 250 volt slow blow 3AG size. This protects the lamps and 5 volt circuit. The fuse next to it (FS2) protects the sound circuit. It is a .75 amp 250 volt slow blow 3AG size.

—NOTE—

THE GROUND ON THIS GAME IS FLOATING AND MUST NOT BE CONNECTED TO THE POWER SUPPLY CHASSIS GROUND. THEREFORE, ALL VOLTAGE MEASUREMENTS SHOULD BE REFERENCED TO THE GROUND ON THE SMALL PC BOARD ON TOP OF THE POWER SUPPLY OR GROUND ON THE MAIN BOARD (See Figure 10).

5.6 DART HEAD

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 as this can close switches in the switch matrix and cause the dart head to lock up or misscore.

5.7 DART HEAD DISASSEMBLY/REASSEMBLY

To clean or replace parts in the dart head it is necessary to disassemble and reassemble as follows:

- Remove 8 nuts holding the target back to the spider.
- Remove switch matrix.
- Remove .020" gasket.
- Remove rubber damper.
- Check for dirt and broken tips between spider and cups.
- Replace any worn or broken cups.
- Clean and re-install rubber damper.
- Re-install gasket, making sure that it is installed right side up and in the right rotation. There should be a small U shaped cutout to the left of center at the top as shown in Figure 11.
- Place the switch matrix with the tails on the left and the 9 pin connector on top.
- Clean and re-install target back and 8 nuts, tightening only finger tight.

—NOTE—

BOLTS MUST BE FINGER TIGHT ONLY. ANY TIGHTER WILL CLOSE CONTACTS IN THE MATRIX AND CAUSE INACCURATE SCORING OR NO SCORING AT ALL.

—NOTE—

IT IS IMPORTANT TO KEEP DIRT OUT OF THE AREA BETWEEN THE SPIDER AND SEGMENTS AS THIS CAN CAUSE NON-SCORING OR IMPROPER SCORING. ON A HEAVILY PLAYED GAME IT IS A GOOD IDEA TO DO PREVENTIVE MAINTENANCE ON A REGULAR BASIS IN THE FORM OF DISASSEMBLING THE DART HEAD, CLEANING, AND REASSEMBLING. THIS CAN HELP PREVENT SERVICE CALLS IN BETWEEN REGULAR VISITS.

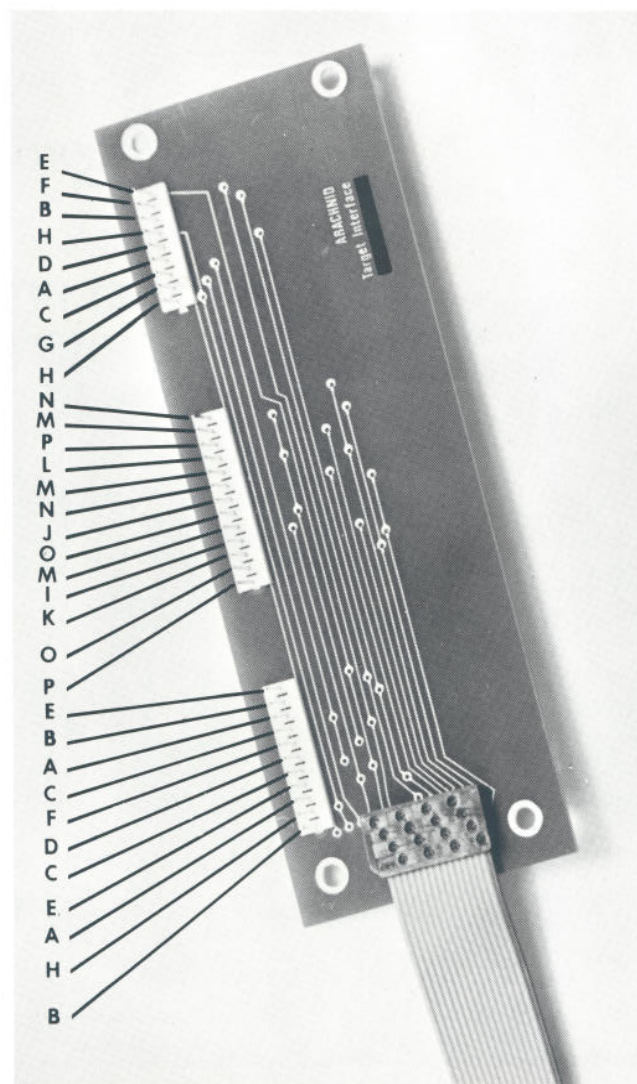


Figure 9. Target interface Board Letter Designations.

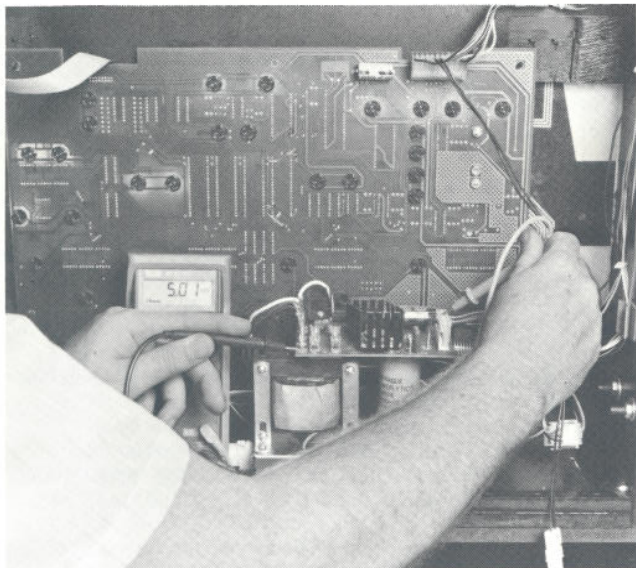


Figure 10. Taking voltage measurement on power supply.

TABLE 2
Lamp Drivers — 14 Volt Lamps

LAMP		DRIVEN BY	DRIVER TURNED ON BY:
Dart	B1	U11	U4
Round	B2	U11	U4
Game1	B3	U11	U8
Game2	B4	U11	U8
Game3	B5	U11	U8
Game4	B6	U14	U8
Bust	B7, B8	U14	U8
Remove Darts	B9, B10	U14	U8
Throw Darts	B11, B12	U14	U8
Game Over	B13, B14	U14	U8
Select & 50¢	B15, B16	U14	U8
Game & 25¢	B17, B18	U14	U8
Player Change	B19, B20	U11	U8
Player 1	B23	U20	U9
Player 1 Win	B24	U20	U9
Player 2	B25	U20	U9
Player 2 Win	B26	U20	U9
Player 3	B27	U20	U9
Player 3 Win	B28	U20	U9
Player 4	B29	U20	U9
Player 4 Win	B30	U20	U9

Temporary Score: B21, B22 - Hard Wired to +13 volts.

SECTION 6. PARTS LISTING

TARGET INTERFACE BOARD

00-4500-02

FIG. #	ITEM #	PART #	DESCRIPTION
12	1	10-0020	Connector - 9 Pin
12	2	10-0022	Connector - 13 Pin
12	3	10-0021	Connector - 11 Pin
12	4	15-0033	Ribbon Cable - 16 Wire

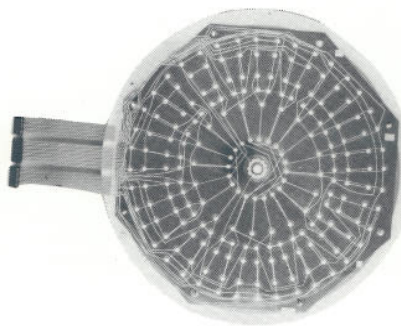
COIN DOOR

00-4500-04

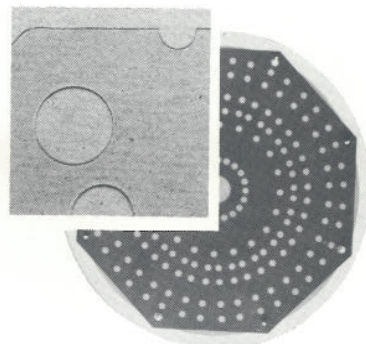
FIG. #	ITEM #	PART #	DESCRIPTION
13	5	13-0043	Coin Mechanism - U.S.
13	5	13-0044	Coin Mechanism - Canadian
13	6	03-0005	Capacitor .1 mfd 16V (2)
13	7	18-0014	Cash Box
13	8	00-4500-10	Coin Door Harness



A. Complete assembly from back.



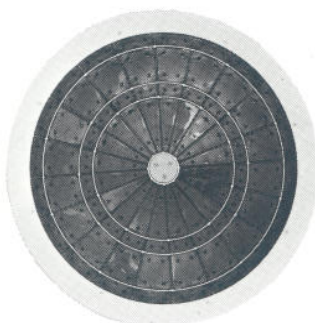
B. Matrix, on top of dart head assembly.



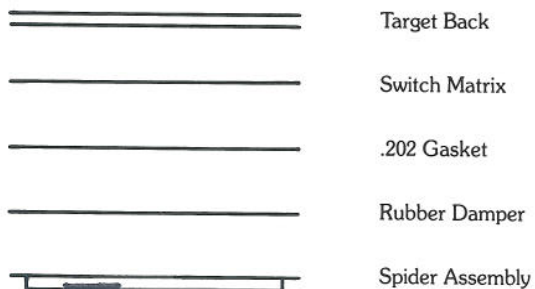
C. .020 gasket.



D. Silicone Rubber Damper.



E. Spider Assembly.



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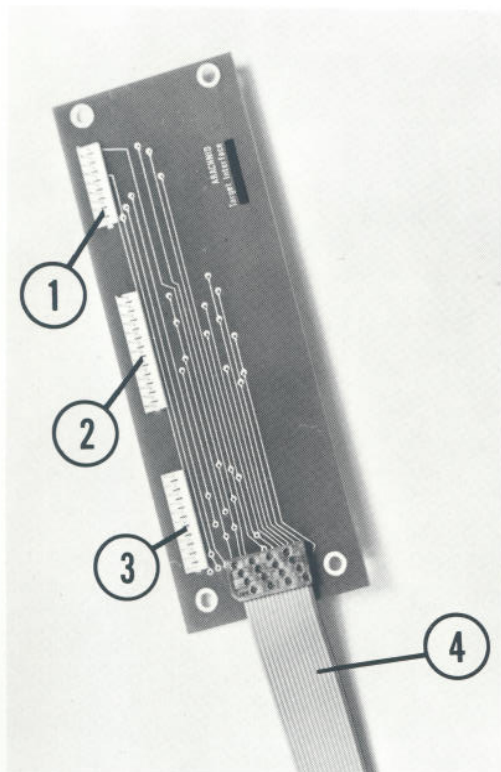


Figure 12. Target Interface Board

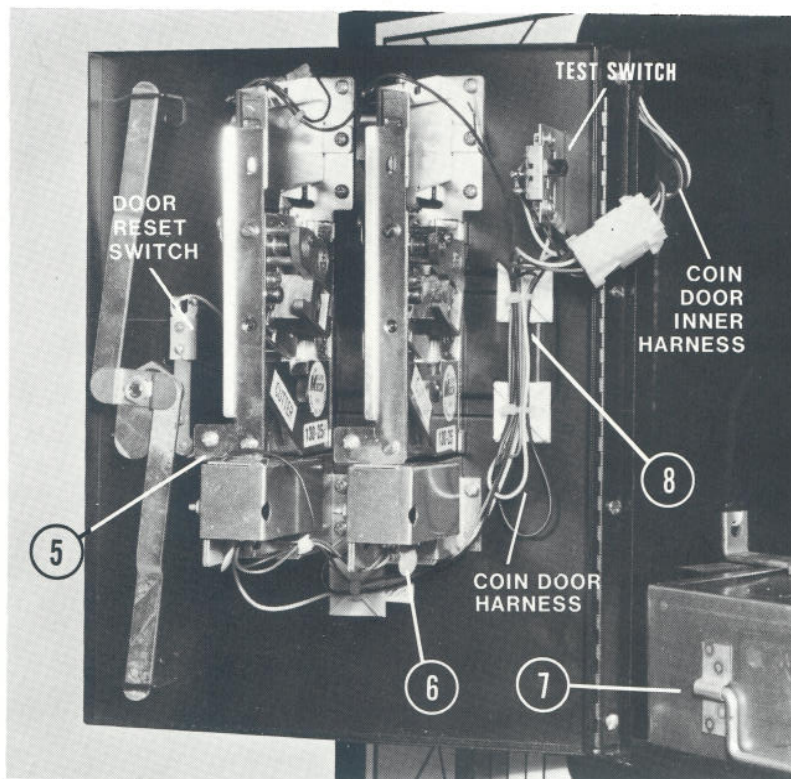
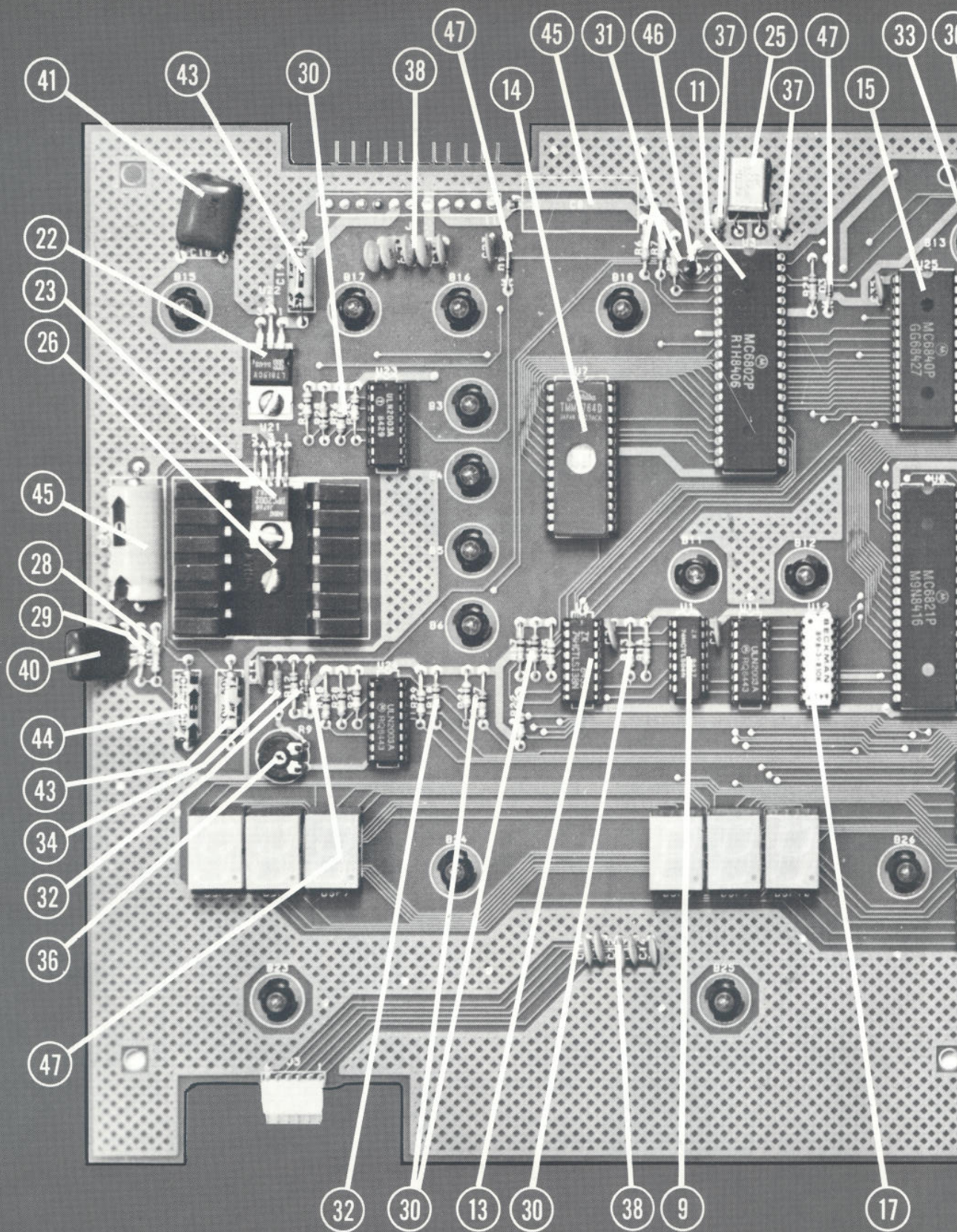


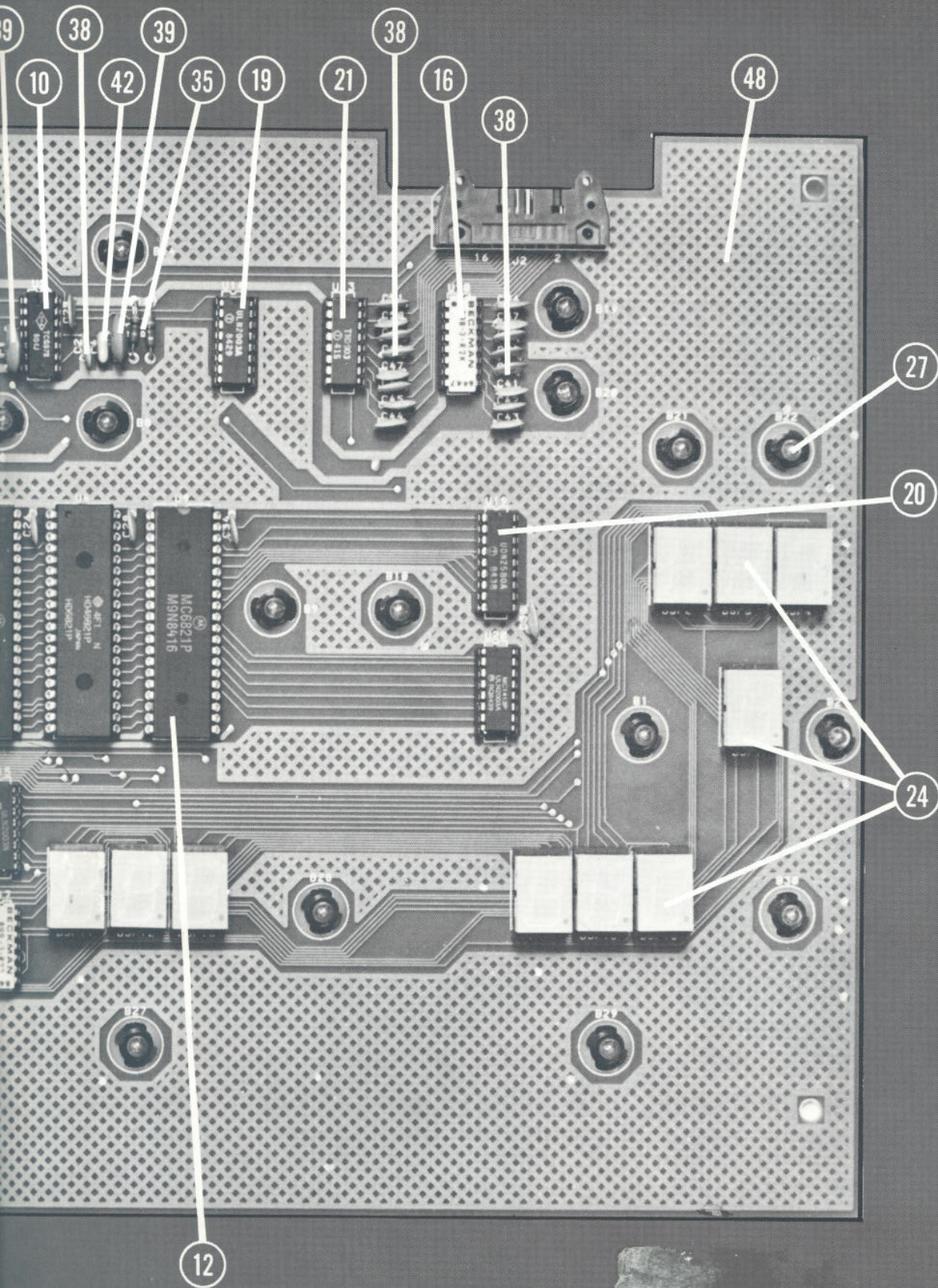
Figure 13. Coin Door



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MAIN P.C. BOARD ASSEMBLY

00-4500-01

FIG. #	ITEM #	PART #	DESCRIPTION
14	9	01-0014	74LS04
14	10	01-0035	556
14	11	01-0036	6802
14	12	01-0037	6821 (4)
14	13	01-0015	74LS138
14	14	01-0038	2764
14	15	01-0039	6840
14	16	02-0045	Resistor Network - 2K ohm
14	17	02-0001	Resistor Network - 10K ohm
14	18	02-0046	Resistor Network - 10 ohm (2)
14	19	19-0018	Transistor Network - HLN2003A (7)
14	20	19-0019	Transistor Network - UDN2580A
14	21	19-0020	Diode Network - TND903
14	22	01-0033	MC7815CT
14	23	01-0027	LM383T
14	24	11-0002	Seven Segment Display (16)
14	25	06-0003	Crystal 3.5795 MHz
14	26	13-0020	Heat Sink
14	27	11-0013	Lamp With Socket (30)
14	28	02-0003	Resistor - 2.2 ohm 1/4 W
14	29	02-0011	Resistor - 220 ohm 1/4 W
14	30	02-0017	Resistor - 1K ohm 1/4 W (19)
14	31	02-0047	Resistor - 3.3K ohm 1/4 W (3)
14	32	02-0021	Resistor - 10K ohm 1/4 W (2)
14	33	02-0048	Resistor - 12K ohm 1/4 W
14	34	02-0049	Resistor - 510K ohm 1/4 W
14	35	02-0036	Resistor - 1 MEG ohm 1/4 W (2)
14	36	02-0041	Resistor - 10K ohm Variable
14	37	03-0030	Capacitor 27pf 16V (2)
14	38	03-0002	Capacitor .01 mfd 50V (39)
14	39	03-0005	Capacitor .1 mfd 16V (2)
14	40	03-0007	Capacitor .22 mfd 16V
14	41	03-0008	Capacitor .33 mfd 100V
14	42	03-0009	Capacitor .47 mfd 16V
14	43	03-0012	Capacitor 1 mfd 50V (2)
14	44	03-0021	Capacitor 100 mfd 25V
14	45	03-0031	Capacitor 1000 mfd 25V (2)
14	46	03-0032	Capacitor 4.7 mfd 25V Tantalum
14	47	19-0007	Diode IN4148 (3)
14	48	00-4500-01	Main P.C. Board Complete



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MAIN CABINET ASSEMBLY

FIG. ITEM

#	#	PART #	DESCRIPTION
15	49	04-0015	Receptacle
16	50	16-0016	Bottom Decal - Lexan
16	51	00-4500-04	Coin Door Assembly With Cash Box
16	52	05-0013	Instruction Panel
16	53	00-4500-25	Touch Panel Assembly
16	54	00-4500-18	Top Light Assembly
16	55	18-0001	Top Cabinet - Unassembled
16	56	16-0017	Top Decal - Lexan
16	57	17-0001	Competitor Strip
16	58	18-0004	Cabinet Bottom - Unassembled
17	59	13-0009	Lock - Back Door
18	60	16-0013	Warning Decal - Dart Head Bolts
18	61	16-0007	Warning Decal - Receptacle
19	62	00-4500-08	Main Harness
19	63	00-4500-11	Inner Coin Door Harness
19	64	00-4500-14	Receptacle Harness
20	65	11-0009	Lamp - 40 W High Intensity
20	66	04-0018	Socket - Porcelain
20	67	15-0003	3 Prong Cord - 2½'
20	68	05-0004	Panel - Marquee
21	69	20-0004	Ballast With Built In Starter
21	70	04-0017	Socket - Fluorescent (2)
21	71	11-0008	Fluorescent Lamp F15T8/CW
21	72	18-0009	Reflector For Target Lamp
22	73	00-4500-12	Speaker & Harness

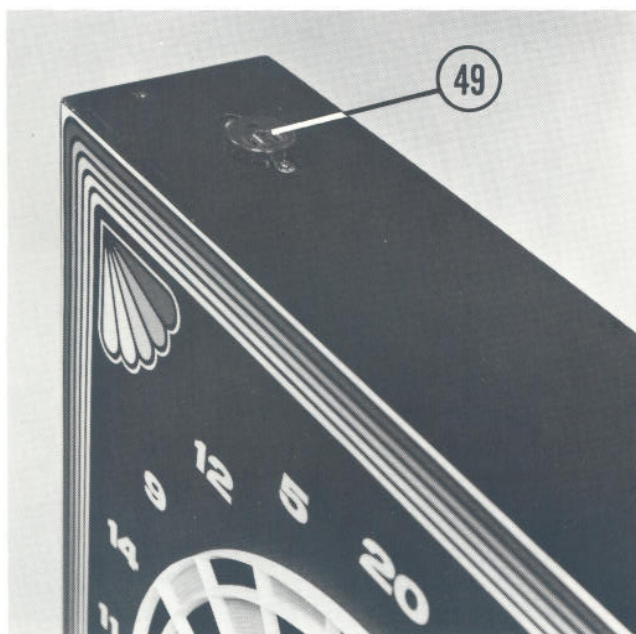


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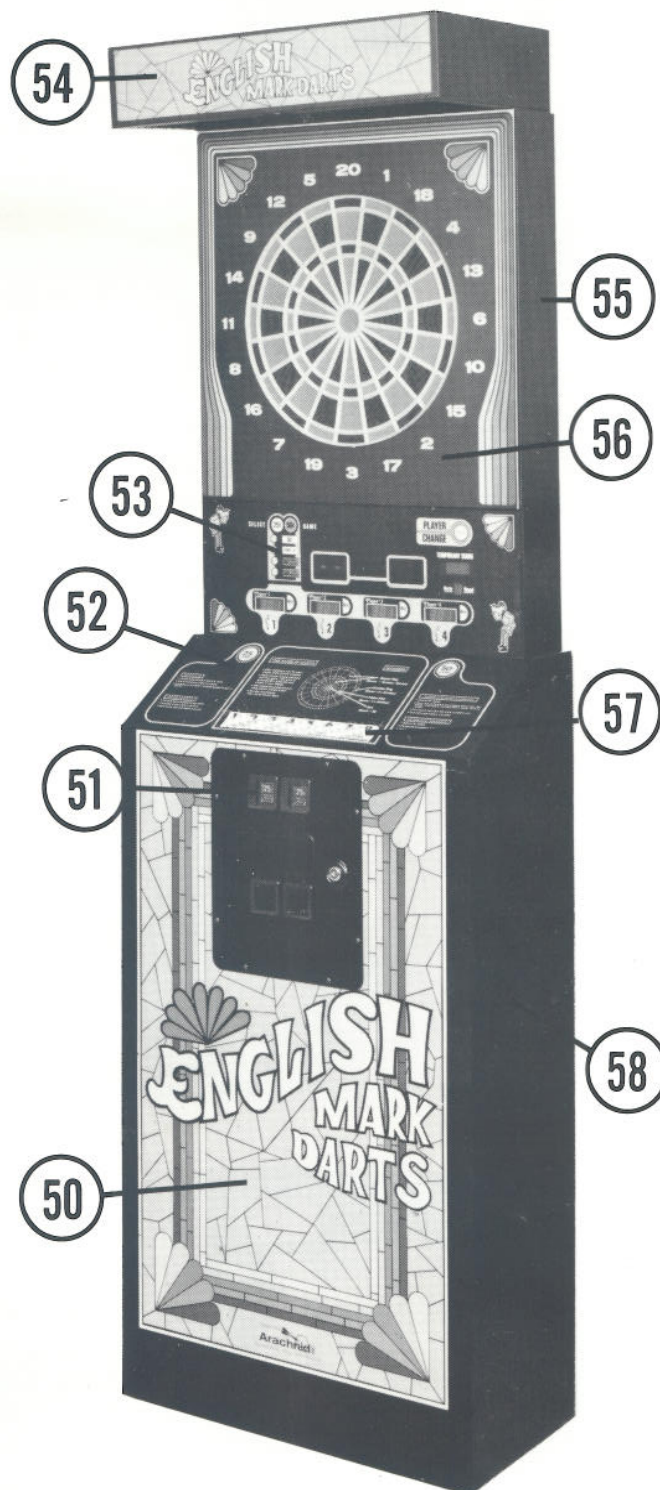


Figure 16.

—NOTE—

The part numbers listed are the Arachnid part numbers. Please use these numbers when placing your order. Part numbers are followed by a number in paren-



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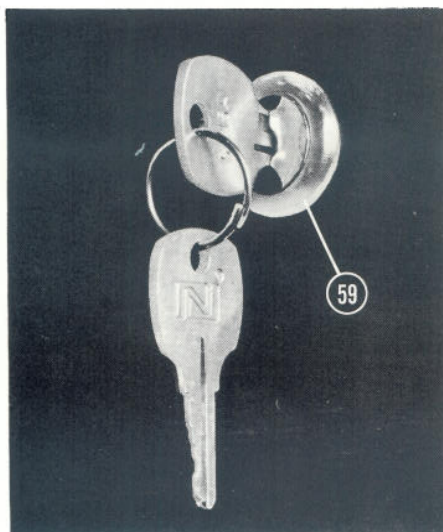


Figure 17.

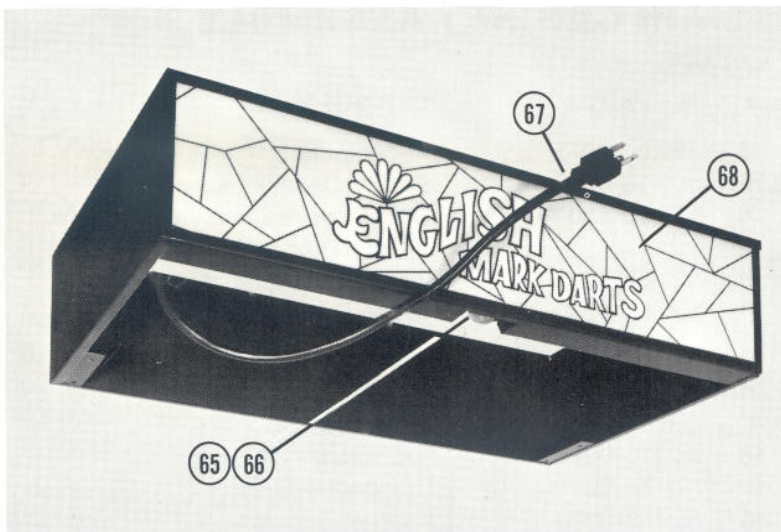


Figure 20.

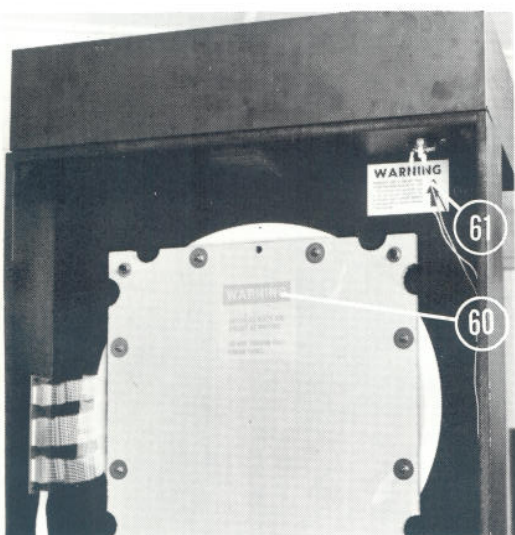


Figure 18.

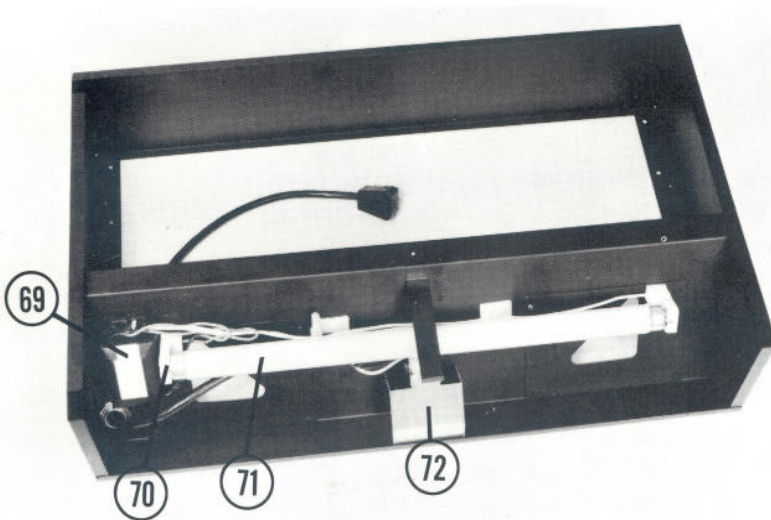


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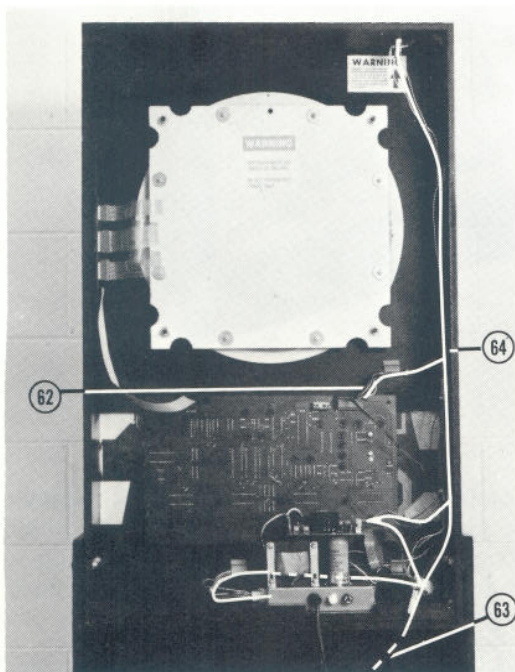


Figure 19.

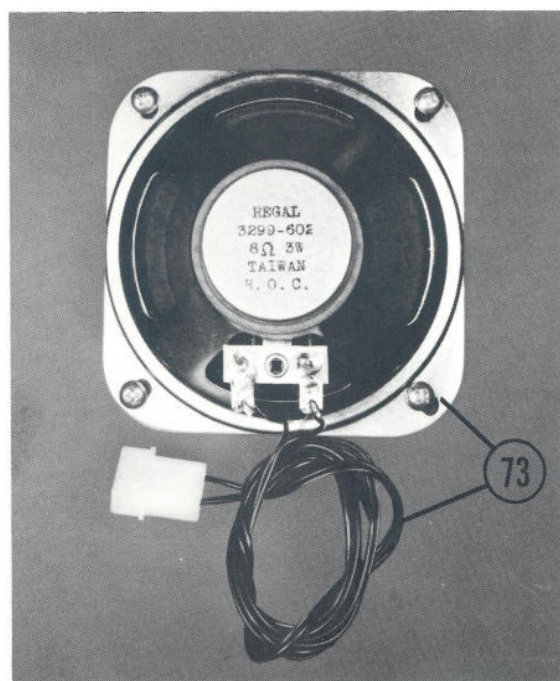


Figure 22.

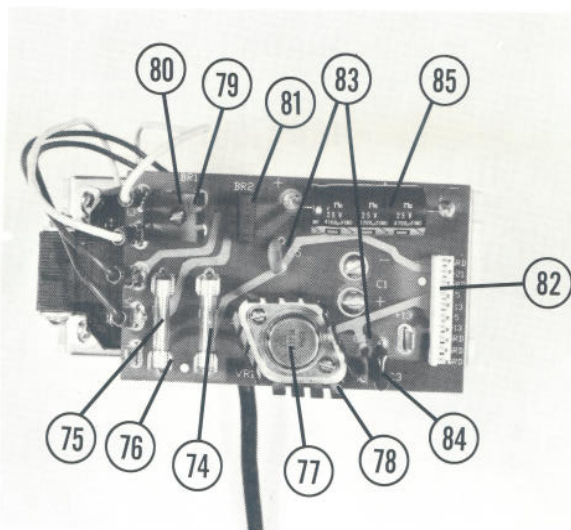


Figure 23.

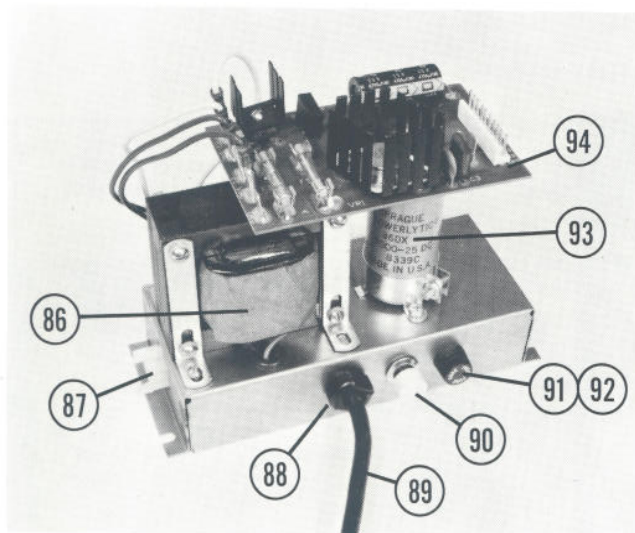


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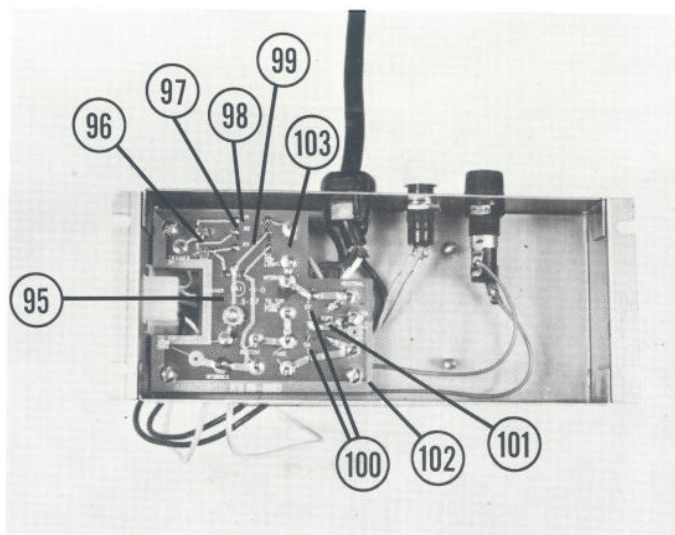


Figure 25.

POWER SUPPLY CHASSIS ASSEMBLY

FIG. ITEM

00-4500-17

#	#	PART #	DESCRIPTION
23	74	07-0007	Fuse - 3/4A 250V Slow Blow
23	75	07-0003	Fuse - 5A 250V Slow Blow
23	76	13-0003	Fuse Clips - P.C. Mount (4)
23	77	01-0032	Regulator - 5V
23	78	13-0040	Heat Sink - TO3
23	79	13-0041	Heat Sink - Square
23	80	19-0021	Bridge Rectifier 8A 200 PIV
23	81	19-0022	Bridge Rectifier 2A 200 PIV
23	82	10-0035	Connector - 10 PIN
23	83	03-0002	Capacitor .01 mfd 50V (2)
23	84	03-0008	Capacitor .33 mfd 100V
23	85	03-0026	Capacitor 4700 mfd 35V
24	86	20-0001	Transformer - 115V Primary
24	87	10-0009	Connector - 6 Pin Chassis Mount
24	88	13-0034	Strain Relief

FIG. ITEM

#	#	PART #	DESCRIPTION
24	89	15-0002	Power Cord - 12'
24	90	08-0004	Switch - On/Off
24	91	13-0039	Fuse Holder - Chassis Mount
24	92	07-0008	Fuse - 1.5A 250V Slow Blow
24	93	03-0033	Capacitor 8900 mfd 25V
24	94	00-4500-05	Printed Circuit Assy. - TOP
25	95	19-0015	Triac - SC 146D
25	96	01-0025	Opto Isolator - MOC 3030
25	97	02-0010	Resistor - 180 ohm 1/4 W
25	98	02-0007	Resistor - 120 ohm 1/4 W
25	99	02-0017	Resistor - 1K ohm 1/4 W
25	100	03-0034	Capacitor .022 mfd 600V (2)
25	101	19-0014	Varsistor V150LA20A
25	102	13-0042	Standoffs 5/8" (3)
25	103	00-4500-24	Printed Circuit Assy. - BOTTOM



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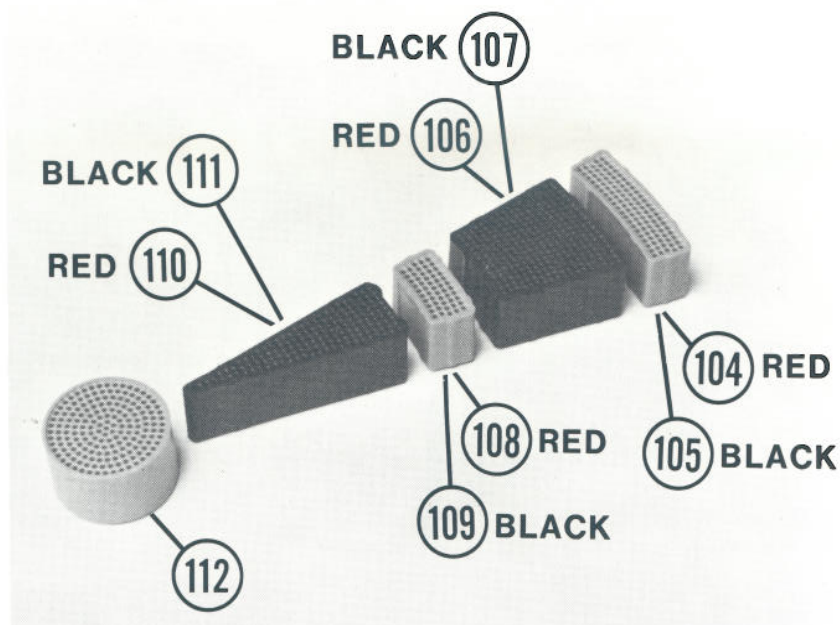


Figure 26.

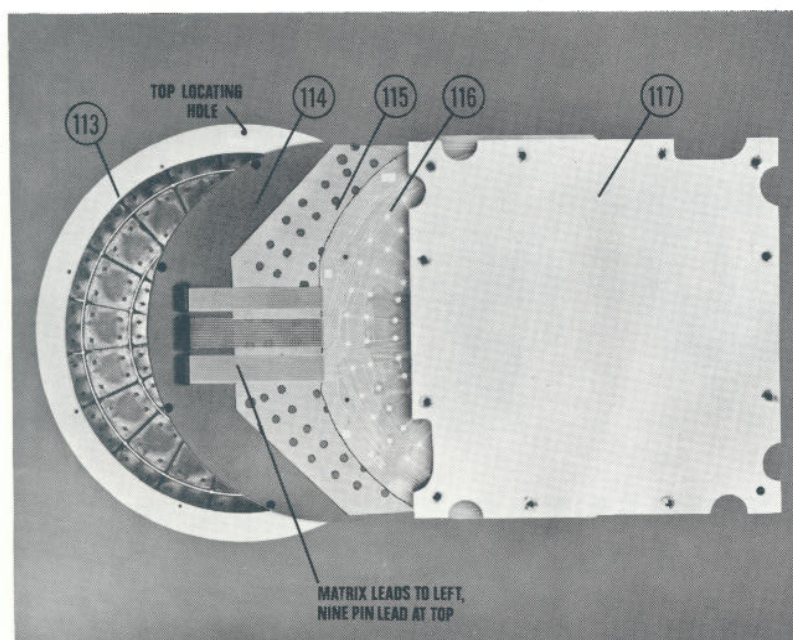


Figure 27.



Figure 28.

BOARD SEGMENTS

FIG. ITEM

#	#	PART #	DESCRIPTION
26	104	17-0003	A Segment - Red - Double
26	105	17-0008	A Segment - Black - Double
26	106	17-0005	C Segment - Red - Single
26	107	17-0009	C Segment - Black - Single
26	108	17-0006	D Segment - Red - Triple
26	109	17-0010	D Segment - Black - Triple
26	110	17-0007	E. Segment - Red - Pie - Single
26	111	17-0011	E Segment - Black - Pie - Single
26	112	17-0004	B Segment - Red - Bullseye

TARGET ASSEMBLY

FIG. ITEM 00-4500-06

#	#	PART #	DESCRIPTION
27	113	17-0002	Spider Without Segments
27	114	12-0001	Rubber Damper
27	115	12-0004	Gasket - .020"
27	116	08-0001	Switch Matrix - 6" Leads
27	117	18-0003	Target Back
28	118	00-4500-06	Dart Head Assy. - Complete

SECTION 7. TROUBLESHOOTING

WARNING — UNPLUG POWER TO GAME BEFORE WORKING ON MACHINE

Problem	Probable Cause	Procedure
Nothing lit on game.	a. Blown fuse. b. No power at outlet.	a. Replace fuse in power supply chassis with 1.5A - 250V slow blow fuse. b. Check main breaker in building.
Marquee lit but nothing else (possibly the temporary score lamps)	a. Fuse FS1 on top of power supply blown. b. 5 volt regulator bad. c. Game not turned on.	a. Replace fuse with 5A - 250V slow blow. b. check for lamp voltage and +5V. If lamp voltage is OK but +5V is not present, replace 5V regulator LM 323K. c. Turn on - switch located on power supply.
Two 7 segment displays light up very bright with "88"	a. U2 - 556 timer not putting out 1000 Hz interrupt signal. b. One segment of U19 shorted, causing 2 digits to always be on. c. One output line of U9 latched on.	a. Replace 556 IC - U2 b. Replace UDN2580 - U19 c. Try resetting game (slam switch in coin door) or replace U9 (6821).
A single segment is out on every other display.	a. A driver transistor is bad (U15 for odd # displays, U16 for even # displays). b. Bad current limit resistor (U17 for odd # displays, U18 for even # displays). c. If only one segment in one display is bad, then the display itself is bad.	a. Swap U15 and U16 to see if problem switches from even to odd (or vice-versa). If so, replace U15 or U16. b. Swap U17 and U18 as above. If problem switches, replace U17 or U18. c. Replace the seven segment display.
Player change and/or game select switches not functioning.	a. Bad U8 - 6821 b. Front touch panel not plugged in or broken connector.	a. Replace b. Plug in or replace front panel.
Coin switch and/or test mode not functioning.	a. If both are not working, plus lamps on coin door are not lighting, there may be a bad ground to the coin door. b. If both are not working, but the lamps on the coin door are lit, the problem could be U4 - 6821. c. If just one switch isn't working, check buffer IC's: U23 for the coin switch, U24 for the test mode.	a. Repair ground - NOTE: System ground is floating (not connected to power supply chassis) and is connected only to the PC board on top of the power supply. b. Swap U4 with U8 to see if the problem goes away; if so, replace 6821. c. Swap U23 and U24 to see if the problem changes. If so, replace the bad ULN2003.
Small lamps on printed circuit board not lighting.	a. Lamp burned out. b. Transistor driver for lamp bad. c. Peripheral interface adapter	a. Replace lamp. b. Replace drive - see Table 2. c. Replace PIA - see Table 2.



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SECTION 7. TROUBLESHOOTING (continued)

WARNING — UNPLUG POWER TO GAME BEFORE WORKING ON MACHINE

Problem	Probable Cause	Procedure
Target lamp not lighting.	a. Lamp burned out. b. Triac bad (if triac were shorted the lamp would be on all the time). c. Opto isolator (MOC3030) bad. d. Buffer U24 bad. e. PIA U9 bad (6821).	a. Replace lamp. b. Replace triac located under power supply chassis. c. Replace - located under power supply chassis. d. Replace U24 - (ULN2003) e. Swap with U4, 5, or U8 to check. If problem moves, then replace bad PIA.
Sound problems	a. Blown fuse - FS2 - on top of power supply. b. 15V regulator (LM7815CT) faulty on main board. c. Amplifier faulty (LM383T). d. Timer IC - U25 (6840) e. Sound is fuzzy or garbled - bad 4700 mfd 35V capacitor (C2) on power supply board.	a. Replace with ¼ A - 250V slow blow. b. Check for +24V on pin 1 and +15V on pin 3. If +15V is not present on pin 3, replace regulator. If +24V is zero, replace fuse (FS2 on power supply) or check wiring from power supply to main board. c. Check input (pin 1) with an oscilloscope to see if square waves are coming in (make sure volume is turned up - R9). If no square waves present, see "D" below. If square waves are present, but not coming out of pin 4, replace U21 - LM383T - amplifier. d. If no square wave is present on pin 27 of U25 (during the time that sound is supposed to be present), replace either U25 or U6 (74LS138 address decoder). e. Resolder connections first to make sure that the problem is not a cold solder joint. If no improvement, replace C2.
Top marquee light doesn't light.	a. Bulb burned out. b. If game also is not working, fuse FS1 bad. c. Ballast bad.	a. Replace bulb (F15T8/CW). b. Replace FS1 in power supply chassis with 1.5A 250V slow blow. c. Check for 115VAC on input to ballast. If present, then replace ballast. If not, check wiring from power supply (NOTE: starter for lamp is internal to ballast and is replaced as a unit).
No score.	a. Dirt or broken tips in dart head holding a switch in the switch matrix closed (game won't score until switch in the matrix opens). b. If the problem is not in the dart head, may be U4 (6821) on the main board.	a. Clean dart head assembly by disassembling/reassembling and removing any foreign material. When reassembling, make sure to tighten the 8 screws and nuts that hold the target head together only finger tight. b. Swap U4 with U5, U8 or U9 to see if problem changes. If it does, replace bad 6821.


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WARNING: This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instruction 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.

