

SERIES 6300 PARTS MANUAL



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This manual contains description, unpacking/assembly, operation, and troubleshooting information for the model 6300 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 or 815-654-0212.

SECTION 1 - GENERAL DESCRIPTION

The 6300 Series English Mark Darts machine is a patented microprocessor controlled dart game (patent #4057 251) where players may select one of several different games. It is a coin operated game offering players a choice of 1 credit games or more challenging 2 credit 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 players an instantaneous displayed score.

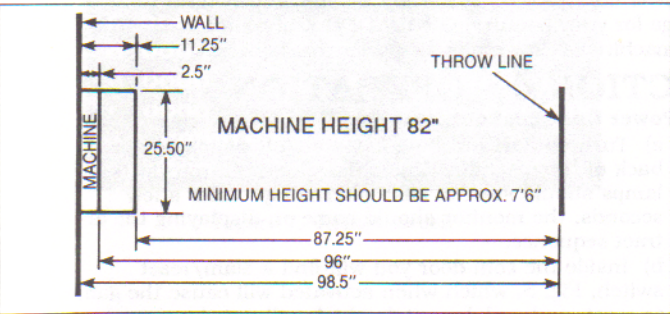


Figure 1. Plan view of the 6300 Series play field.

SECTION 2 - UNIQUE FEATURES OF THE 6300 SERIES GAME

There are several features that are unique to the 6300 series English Mark Dart Game from previous series games, such as:

1. There are several games on the 6300. These games are: 301, Count-Up, Tic Tac Darts, 501 Team Doubles-Open in/open out, 701, 301 Double in/double out, three versions of Cricket: Regular, Cut Throat and Team.

A. 301 - 1 credit per player - 20 round maximum
A count down game for one to four players where each player starts with 301 points. The first person to hit zero exactly or the lowest score after 20 rounds wins the game.

B. Count up - 1 credit per player - 8 round maximum
A 24 dart game for one to four players where each player tries to score the most points in 24 darts thrown (three per round.)

C. Tic Tac Darts - 1 credit per player - 20 round maximum
A game for two players. The numbers will come up at random to start the game. The bull is always in the center square. To mark an X or O a player must hit a number 4 times. Hitting a number more than 4 times will score points for that player. Singles score 1 hit, doubles score 2 hits, and triples score 3 hits and the bull scores 1 hit. When one player gets 3 X's or 3 O's in a row, he wins. In case of a tie game where it is not possible to have 3 in a row, the high score wins.

D. 501 Team Doubles - Open in/open out - 2 credits per player. 35 round maximum.
One to four players or teams, played the same as 301. This is usually played by two-person teams.

E. 701 - Open in/double out - 2 credits per player - 35 round maximum

One to four teams or players, played the same as 301 except to go out a double or bullseye must be hit (Inner bull if double bull active). Count down game popular with three or four person teams.

F. 301 Double in/double out - 2 credits per player - 35 round maximum

This is for the more experienced players. One to four players, played the same as 301 except the player must start counting down and end the game by hitting a number in the outer double score ring or by hitting the bullseye (Inner bull if double bull active).

G. Cricket - Two to four players - 2 credits per player - 35 round maximum.

The game of Cricket is played with the numbers 15 through 20 and the bullseye. Each player must hit a number three times to close the number and score before the number is closed by the opponent. The winner is the first person to close all the numbers and have the highest or equal score. Cricket can be limited to 200 points over opponents at the operator's discretion. See section 4.3 for instructions on how this is done.

Three options are offered when playing Cricket on the 6300:

- 1) Two to four players can use the regular game. The highest or equal score with all the numbers closed wins.
- 2) Two to four can play the game of Cut Throat Cricket. Close a number and give points to your opponents. In this game, the lowest or equal score wins.
- 3) Four players participate as two teams. Both you and your partner must close the number before your team can score.

2. Credit Accumulation. Players may insert as much money as they wish, and the game will accumulate up to 99 credits, using only the amount that is necessary for the particular game chosen. This feature allows the use of large denomination coin mechanisms and bill acceptors with this game. See special insert on the Coin Credit option for information on how to use this feature to its full advantage.

3.. Target lamps surround the target head with light. Darts already stuck in the board no longer cast shadows on other segments. In the "off" condition, the lamps go dim, just enough to let the dart player see the target without giving him enough light to play for free. The level of light is adjustable internally to suit the ambient light conditions at the locations. The fact that the lamp doesn't get "cold" gives longer life as the surges of current when turned on are reduced (i.e. a warm bulb has a higher resistance than a cold bulb.)

4. Warm Up Mode. The target lamps come on when coins are inserted, and a warm-up round consisting of 3 darts per credit can be thrown. After all darts are thrown, the lamps will go dim until a game is selected. The operator may also choose to have the game emit a tone whenever a dart is thrown during this "dim" state. This is accomplished with a small set up routine, done during the game's test mode (see section 4.2A). The tone will also sound when there are no credits on the game. This feature will call attention to the fact that someone is throwing darts without inserting coins.

5. Bullseye Options. By flipping a single D.I.P. switch on the main P.C. board (described in section 4.3), the operator can choose to have a 25 point/50 point bullseye, or our original 50 point only bullseye. Also, with a small setup routine done during the game's test mode, the operator may choose to enable the game to sound off in a special way if a player throws a hattrick (3 bullseyes in one round) in 301, 501, 701 and Count-Up only. When the double bull is activated, the outer bull (25 points) counts as a single hit, and the inner bull (50 points) counts as a double hit. This is important to know when playing cricket and double/in or out games.

Note: 25/50 point bullseye is only active on 2 credit games.

6. League Slot™ In the 6300 Series game, a league money slot is provided so that league captains may deposit their money envelopes into the safety of the game cabinet for operators to collect later.

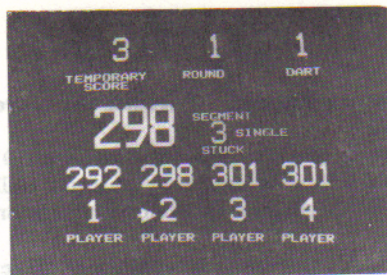


Figure 2. Stuck segment indicator display

7. **External video** is available for displaying the scores to large crowds at tournaments or to attract other player's attention. Section 5.8 shows how to do this.

8. **Electronic popularity meter and coin meter** to keep track of statistics. You can tell how many times each game was selected and total number of coins inserted. (See section 4.2 Test Mode for further information). A mechanical counter is mounted inside the coin door as well, due to the fact that the electronic meter can be reset.

9. **Stuck segment indication** on screen to immediately let the player know to check for broken tips or any other foreign objects holding a segment back. It indicates which segment is closed by flashing its location on the screen. (See Figure 2.)

10. **Instructions** can be read any time a game is not being played by pressing "ENTER" to bring up the instruction menu, selecting the game you want to see instructions on with "SELECT", and pressing "ENTER" again. Return to attract mode is automatic after approximately a minute and 30 seconds or by inserting a coin or pressing "ENTER". After inserting coins, instructions can still be selected as it is the last item of the menu.

11. **Other On-Screen Features.** On the 6300 series game, the temporary score will flash while the remove darts indicator is on, to help alert the player that it is not yet time to throw darts.

At game over, the screen will show if the winner went out in 6,7,8, or 9 darts (Known as 9 dart out or better) in 301, 301 double in/double out and 501 only.

When a game is over and game select screen is called up again, the pointer will be resting at the last game selected. This will be convenient for those who wish to replay a previous game selection, or for locations where there are only one or two popular games.

SECTION 3 - UNPACKING/ASSEMBLY

3.1 Unpacking

- Using a sharp knife, cut the plastic bands.
- Slide the top of the container straight up.
- Remove the individual pieces from the cardboard base. The machine is now ready for assembly.

-CAUTION-

DO NOT LIFT BASE UNIT BY ITS INSTRUCTION PANEL.



Figure 3. Attaching top assembly to base.



Figure 3A. Hex cap bolt holding top to bottom

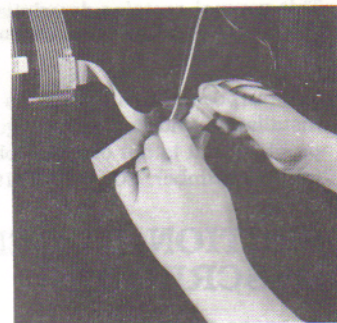


Figure 4. Attaching speaker harness

3.2 Assembly

- Remove back of top assembly.
- Feed ribbon cable and lamp plugs through the hole in center of bottom.
- Attach top assembly into base assembly as shown in Fig. 3 using four 1/4-20 carriage bolts and nuts and two 1/4" hex cap bolts (Fig. 3A) and washers. See hardware instructions (37-0134) in your accessory kit for detailed assembly information.
- Feed speaker connector up through the hole in base of top assembly and connect (Fig. 4).
- Power cord plugs into a 120V AC (or proper input voltage for your country) GROUNDED wall outlet. The machine is now ready for power up sequence.

SECTION 4 - OPERATION

4.1 Power Up, Checkout, and Test

- Turn on dart machine using on/off switch on the back of the machine. The remove darts/throw darts lamps should start to flash alternately. After a few seconds, the monitor should come on displaying the attract sequence.
- Inside the coin door you will find a slam/reset switch, Fig. 5, 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.

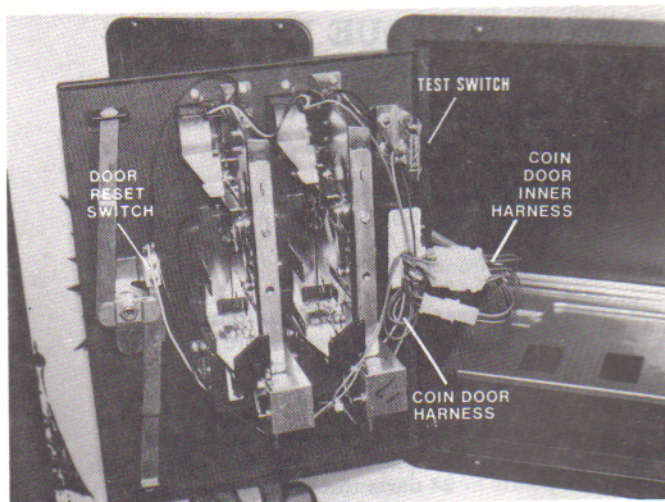


Figure 5. Coin door showing coin mechanism, reset switch and test switch

- Slide the test switch down and release. The screen will show a crosshatch test pattern plus a message that the lamp test is starting. At this time all lamps on the machine will illuminate to check for proper operation. These lamps are:

- target lamps (3)
- remove darts (2) on PC board
- throw darts (2) on PC board
- select push button lamp
- enter/player change lamp

While the lamps are lit, the sounds of the game are played. Next the lamps will go out and the message "TEST TARGET HEAD" will appear at the top and other messages will appear at the bottom, as shown in figure 6. If you press any segment in the dart head at this time, the score should appear in the center of this screen.

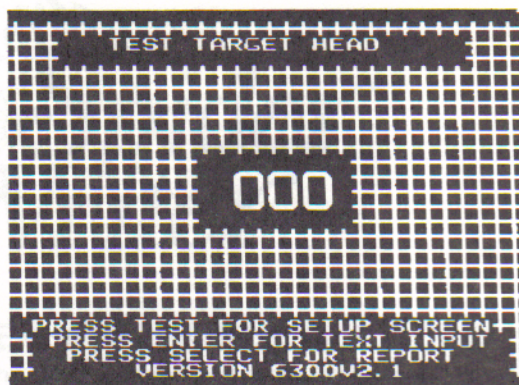


Figure 6. Test mode ready for dart head test

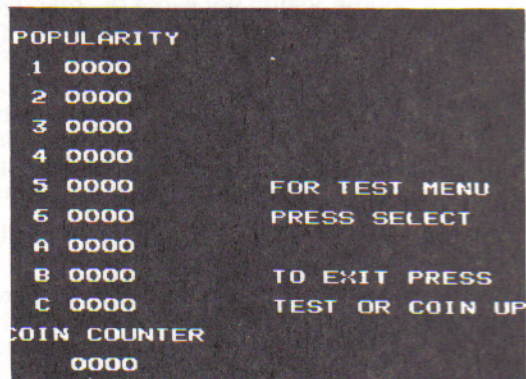


Figure 7. Report screen

4.2 Test Mode Setup and Report Screens. From the screen displayed in Fig. 6, you can select several different modes to view or change screens or operations of your dart game.

A. Setup Screen. Press the test switch again, and the setup screen for free dart sound appears. If you wish to enable this option, press enter, if not, press select. Next the screen for hattrick sound will appear. Do the same for this option. (See section 2.4 and 2.5 for description of these options.) Once both options are selected, the game will return to the selection screen (Fig. 6 except crosshatch and target head test will be gone). Pressing the test switch or inserting a coin will bring you out of this mode.

B. Spider Writer screen. Press enter, and the spider writer screen will become accessible. See Spider Writer page (Fig. 10) for instructions on how to use it. If you press select while in this mode, it will bring you back to the selection screen.

C. Popularity Report Screen. Press select, and the popularity report screen appears. From this screen, you can tell how many times each game has been played. In the bottom left corner is an electronic coin counter, which keeps track of the number of credits issued by the game (Fig. 7). The numbers displayed on the popularity report screen can be cleared by pressing the bullseye when this screen is on. NOTE: the electronic coin counter will also reset to zero when this is done.

All screen options listed above will be retained when the power is turned off. (See section 5.2.6) Closing the slam switch or turning the power off and on will always cancel any mode you're in. Otherwise, follow these written instructions or screen instructions to change modes or exit.

4.3 Main P.C. Board dip switch options

There is a four position D.I.P. (S1) located near U20 on the Main P.C. Board. This switch package has many functions. Switch numbers 1 and 2 are used for certain coin accumulation options. See Coin Credit insert for more information on the settings of these. Switch number 3 is used to select a single, 50 point bullseye, or a 25/50 point double Bullseye. In the "Off" position, the Bullseye is 50 points, in the "On" position the Bullseye's outer ring is 25 points and its inner ring is 50 points for 2 credit games. This option makes games like Cricket more challenging to expert dart players. If you opt for the 25/50 point double Bullseye, you may change the Bullseye to the two-piece double Bullseye included in your accessory kit. Simply follow the instructions for disassembling the Dart Head in Section 5, replace the Bull segment, and reassemble per instructions.

Switch number 4 is used to select cricket 200. When this switch is in the "on" position, the player with the highest score cannot score more than 200 points above the closest opponent's score. This discourages extended "practice" play during a game. "Cricket 200" will be displayed on the screen during the cricket game when this option is activated.

SECTION 5 - TECHNICAL DESCRIPTION

5.1 General

Figure 8 and Figure 9 show the main components of the game.

- Main CPU Board (Behind front door)
- Power Supply
- 9" Monitor
- Target Interface Board
- Dart Head Assembly
- Coin Credit Card

The assembly containing the main board, monitor, Coin Credit Card, and power supply is designed for easy access as shown in Fig. 8. Most service can be performed by swinging the front door open. However, if desired, the component tray can be removed entirely by unplugging game, unscrewing three screws in the bottom of the tray, disconnecting target lamp wire, ribbon cable, speaker wire, and coin door harness. This way the unit can be bench tested by attaching a dart head w/target interface, a low wattage (40W) lamp, and switches to simulate the coin up, test, and reset.

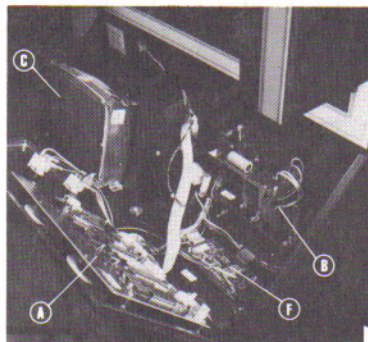


Figure 8. Front view of 6300 game.

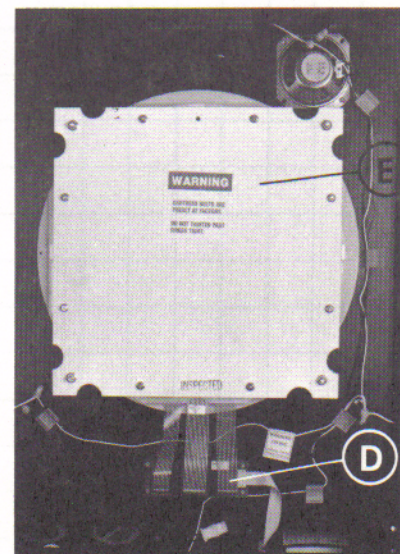


Figure 9. Rear view of 6300 series game



SPIDER WRITER INSTRUCTIONS: EASY AS 1 2 3

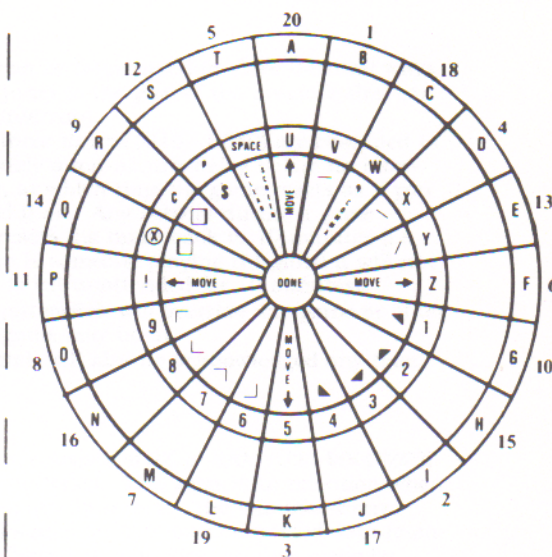
1. Put the game into the test mode by depressing the slide switch inside the coin door. At the end of the test mode the message "press Enter for text input - press Select for report" will appear. Press the Enter button.
2. A cursor will appear in the upper left corner of the screen. Use the dart head as a "keyboard" to move the cursor around and to enter your custom message. The diagram to the right illustrates which symbols are represented by segments in the single, double and triple rings.
3. Press the bullseye when you are satisfied with the screen you have created. The Spider Writer will remain in the input mode for ten minutes before returning to normal game operations. If time expires while you are entering a screen, simply put the game back in Test mode and continue where you left off. The screen you were working on was automatically saved.

HELPFUL HINTS:

Use the 32 x 16 grid below to create the screen on paper before writing it on the game. It will save you time in deciding where to place words or graphics. Make copies of this original and draw on the copies, saving the original to make additional copies from.

Be careful of the Single 5! It clears the screen completely and should only be pressed when you wish to change the entire screen.

Note: A game that is not properly grounded may place strange characters in random locations on the screen. Please make sure the ground plug on the wall receptacle is properly connected.



Keyboard Legend

Each segments in the Singles, Doubles, and Triples rings correspond to the letter, number or graphic represented on the diagram above. Use "Move" segments to position the cursor on the screen. Be careful of the single 5 - It clears the screen completely.



SPIDER WRITER WORKSHEET

Use this grid to design your custom screen



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
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Figure 10. Spider Writer instruction page

5.2 Main CPU Board

The main CPU board (Figure 19, page 14) contains a 6809 microprocessor and associated IC's consisting of:

TMS4416 16KX4 Dynamic Memory - U12, U13
TMS9118 Video Generator - U11
74LS32 2 Input OR Gate - U10
MK48Z02 2KX8 Memory W/Battery - U23
27256 32 K Eprom - U15
74LS04 Hex Inverter - U1
556 Dual Timer - U2
6821 Peripheral Interface Adapter - U4, U17
74LS138 3 Line to 8 Line Decoder - U14
LM340-15 15 V Regulator - U22
LM383T Audio Amp - U21
6840 Programmable Timer - U16
ULN2003 Transistor Network - U7, 18, 24
Capacitor Network - .01uF DX8 - U8, 9
Resistor Network - 2KX8 - U5
Resistor Network - 10KX8 - U19, 20
Diode Network - IN4148X8 - U6

5.2.1. Monitor - See monitor manual

5.2.2 Player Change - Select

The player change and select push buttons are located on the front slanted panel. When the player change is closed, pin 3 of U17 is shorted to ground. When select is closed, it shorts pin 2 of U17 to ground. When the switches are open, the inputs are held high by a 10K OHM resistor network. C22 and C23 (.01uF) are used for noise suppression.

5.2.3 Sound Circuit

Sound is generated in U16 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 top of the main PC board. U21 (LM383T) is an 8 watt audio power amplifier whose gain is controlled by the ratio of R23 and R24. The voltage for U21 is controlled by U22 (LM340-15) 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.

a) The slam switch on the coin door is buffered with two sections of U7. When the switch is closed, pin 2 of U7 is grounded. U7 inverts this signal twice so the effect on the reset line is that it goes low. C6 is used for preventing electrical noise from triggering a reset.

b) 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 Pin 7 on U3, but must be delayed a few clock cycles for reset to work properly.

5.2.5 Interrupts

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

- Two of the three timers (U16 - 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.

5.2.6 Memory

Memory in this system consists of 2K of RAM (U23-MK48Z02) with internal lithium batteries. This gives data retention when power is off for the popularity screen. The manufacturers data sheet (MOSTEK) states the minimum expected data retention time as 10 years based on statistical studies made by MOSTEK.

Eprom memory (U15-27256) holds the main program. The window on the IC should always be covered with our stick-on label as Eproms are erasable when exposed to ultraviolet light over a period of time.

5.2.7 Address Decoding

Address decoding is done with U14, a three line to one of 8 line decoder. This IC determines if the microprocessor is addressing memory, one of the two peripheral interface adapters, the 6840 sound IC, memory, or the video 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 12. 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 11). 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. Another method of opening the switch is to disconnect the ribbon cable from the main P.C. board.

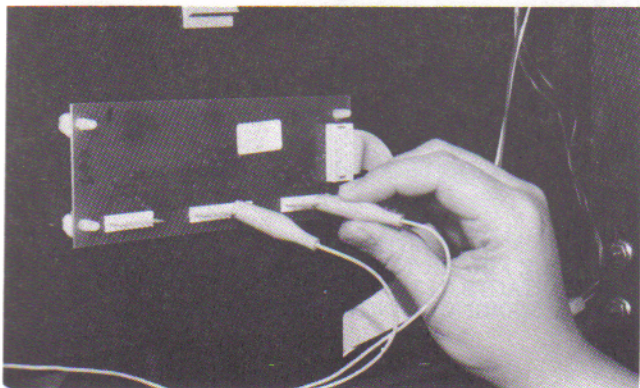


Figure 11. Target interface board with test jumper

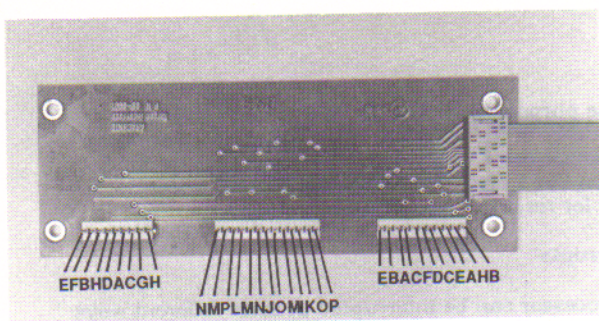


Figure 12. Target interface board letter designations

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

5.4 Target Illumination

The target illumination consists of three frosted "show case" bulbs 5 1/2" long. These are used for illuminating the dart head during attract mode as well as during play. In the attract mode, the brightness of the lamps should be adjusted so the dart head is barely visible, not bright enough to allow free play. This is adjusted with a screwdriver or thumb and forefinger turning knob on the base of the power supply inside the component tray (see Figure 13).

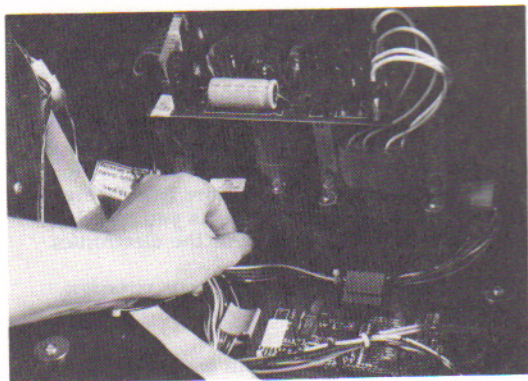


Figure 13. Adjusting "off" condition target illumination

The off brightness is a result of (see power supply schematic) R4, C10, and a ST-4 DIAC. These components turn on the gate of the Triac (SC146D) for only a portion of each cycle of AC, the same as a wall dimmer switch would do.

When the game is coined up, the gate of the Triac is turned on all the time through the MOC3030. This off brightness also keeps the filament of the bulb warm which greatly reduces the turn-on shock and should give longer life to the lamps and Triac.

5.5 Power Supply

The power supply consists of three voltage levels, +5V, +12V, and +21VDC. The 5V and 12V come from the same transformer output. The 12V supply consists of two regulators, a MC78T12 for the monitor rated at 2 amps and a LM340-12 for the lamps rated at 1 amp.

The 5V regulator should be $\pm .1V$ 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 2.0 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 and 12 volt circuits. 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.

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 darthead remove the back of the game and set it aside. Then disconnect the three switch matrix connectors from the target interface P.C. board, remove the four large nuts holding the darthead in place, and gently pull darthead assembly out of the cabinet. Now, disassemble and assemble the darthead as follows:

- Remove the 8 nuts and lift off target back.
- Remove the switch matrix.
- Remove the matrix cushion.
- Check for dirt and broken tips or other foreign matter between spider, cups, matrix and cushion, etc.
- Replace any worn or broken cups.
- Clean and re-install matrix cushion. (Also see note below)

- IMPORTANT -

THERE SHOULD BE A SMALL U SHAPE CUTOUT ON THIS CUSHION. POSITION IT TO THE LEFT OF CENTER (BEHIND THE "DOUBLE ONE" SEGMENT) AT THE TOP AS SHOWN IN FIGURE 14. THE SWITCH MATRIX ALSO HAS A CUTOUT IN A SIMILAR LOCATION.

- Place the switch matrix with the tails on the left and the 9 pin connector on top, lining up the U shape cutout close to the one on the matrix cushion.
- Clean and re-install target back and 8 nuts, tighten 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.

-NOTE-

ALTHOUGH THE DART HEAD IS DISASSEMBLED AND REASSEMBLED AS IN THE PAST (WITH 4500 AND 5000 SERIES GAMES), WITH THE 6300 IT IS INSTALLED WITH THE 3 LEADS IN THE DOWNWARD DIRECTION. THIS MEANS THAT THE "20" ON THE YELLOW SPIDER IS NOT AT THE TOP. THE PROGRAM WAS CHANGED TO REFLECT THIS CHANGE. MAKE SURE THAT IF USING A DART HEAD FROM ANOTHER SERIES GAME THAT THE RED AND BLACK SEGMENTS ARE IN THEIR PROPER PLACE. (SINGLE 20 IS RED).

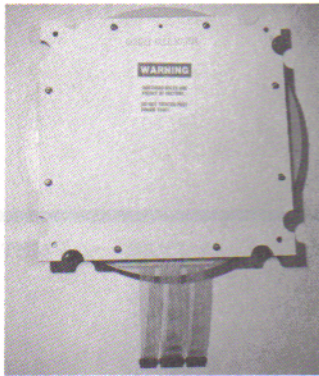
5.8 Video

The video signal is created with the TMS9118, U11, along with video RAM chips U12 and U13, TMS4416 dynamic memory. The output signal is at pin 36 of the TMS9118 and is buffered to protect the video chips with TR1.

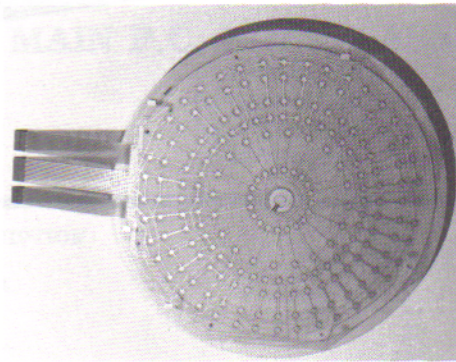
On the main printed circuit board there is one RCA style phono jack. (see Fig. 15 and 16). It is to be used if external TV's are desired to be set up. To do this, run a cable from the RCA jack to an RF modulator or the video input of a VCR. The output of the modulator or VCR is usually on channel 3 or 4 and should be connected appropriately to the TV. This is a great way to display games at tournaments or just to create added interest in the location.

The TMS9118 contains circuitry for a 10.7 MHZ crystal and divides it by 3 to create a CPUCLK signal. This way a separate crystal is not necessary to run the microprocessor.

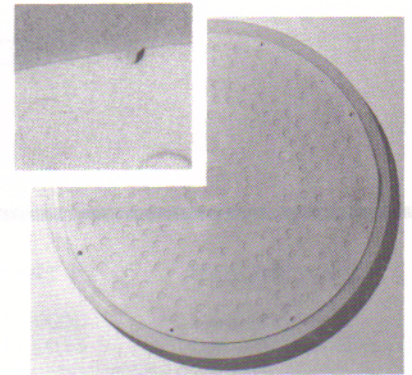
Figure 14. Dart Head Assembly



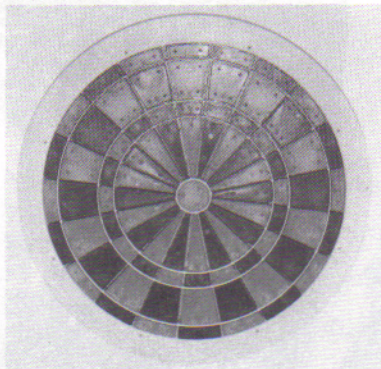
A - Complete Assembly from back






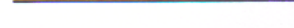
B - Matrix, on top of Dart Head Assembly



C - Matrix Cushion



D - Spider Assembly

-  **Target Back**
-  **Switch Matrix**
-  **Matrix Cushion**
-  **Spider Assembly**

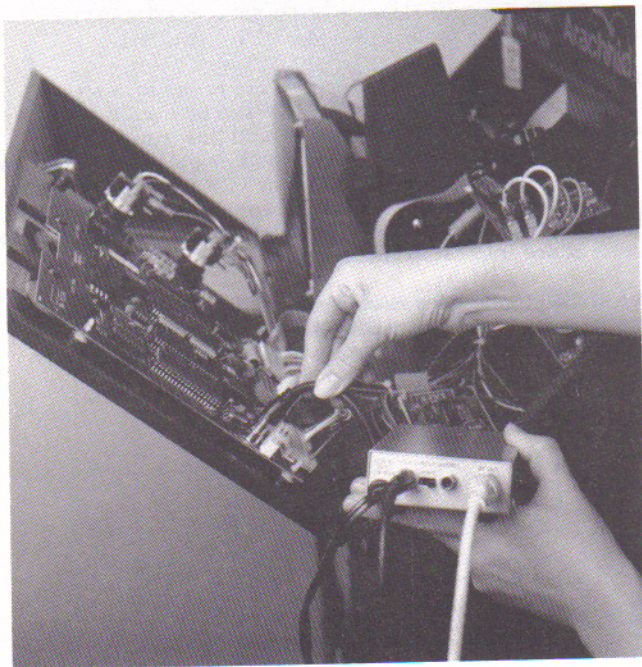


Figure 15. Hooking up a modulator for external TV



Figure 16. External TV

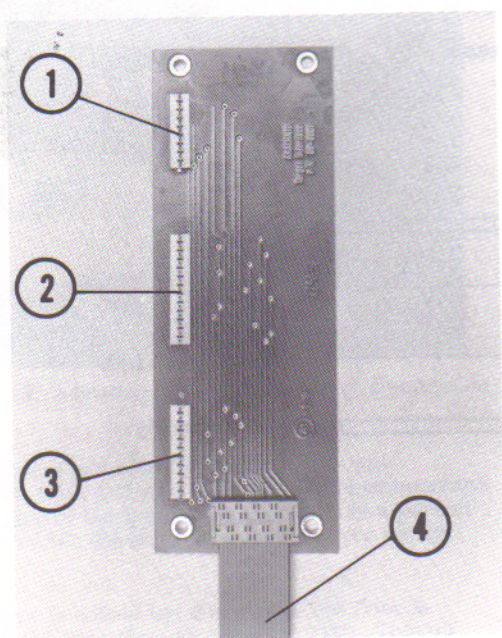


Figure 17 Target interface
P.C. board

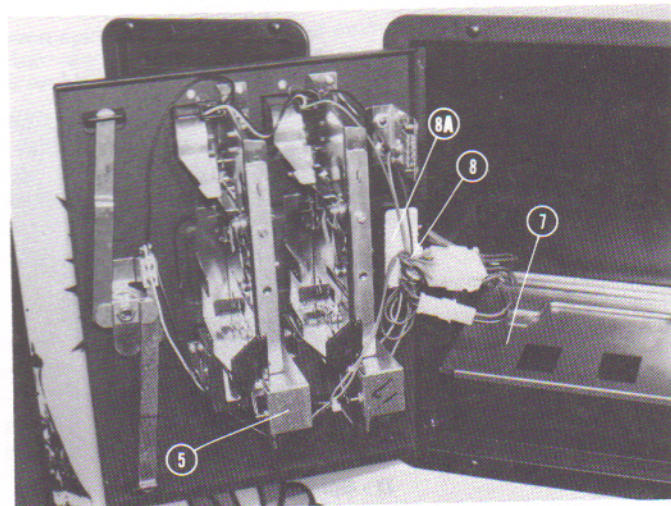


Figure 18 Coin door assembly

COIN DOOR ASSEMBLIES

SECTION 6 - PARTS LISTING

TARGET INTERFACE BOARD

00-6000-02R

FIG.#	ITEM #	PART #	DESCRIPTION
17	1	10-0020	Connector-9 pin
17	2	10-0022	Connector-13 pin
17	3	10-0021	Connector-11 pin
17	4	15-0144	Ribbon cable-16 wire

FIG. #	ITEM #	PART #	DESCRIPTION
		00-6200-04R	U.S.A. 25 Cents
		00-6201-04R	German 1DM/5DM
		00-6202-04R	Belgium 20 Bel. Francs
		00-6203-04R	Sweden 1 Krone/5 Krone
		00-6204-04R	Holland 1 Guilder
		00-6205-04R	France 5F/10F
		00-6206-04R	Italy 500 Lire
		00-6207-04R	Spanish 25 Pesetas
		00-6208-04R	England 10 Pence
		00-6209-04R	Swiss 1 Swiss Franc/5 SW. FR.
		00-6210-04R	Japan 100 Yen
		00-6211-04R	New Zeland 50 Cents
		00-6212-04R	Canada 25 Cents
		00-6213-04R	Austria 10 Shillings
		00-6214-04R	Australia 20 Cents
18	5	13-0043-01	Coin Mechanism - U.S.
18	5	13-0043-02	Coin Mechanism - Canadian
18	7	18-0131	Cash Box, Plastic
18	7	18-0130	Lid for Plastic Cash Box
18	8	15-0209	Coin Door Harness
18	8A	18-0029	CoinCounter, 4.5V,w/Int.Diode

MAIN P.C. BOARD ASSEMBLY

00-6300-01R (USA)

00-6301-01R (German)

00-6305-01R (French)

00-6307-01R (Spanish)

FIG. #	ITEM #	PART #	DESCRIPTION	FIG. #	ITEM #	PART #	DESCRIPTION
19	9	01-0014	74LS04	19	27	13-0020	Heat Sink
19	10	01-0035	556	19	28	11-0013	Lamp with Socket (4)
19	11	01-0056	6809				
19	12	01-0037	6821 (2)	19	29	02-0003	Resistor 2.2 ohm 1/4W
19	13	01-0015	74LS138	19	30	02-0055	Resistor 75 ohm 1/4W
19	14	01-0052	TMS4416 Memory (2)	19	31	02-0011	Resistor 220 ohm 1/4W
19	15	01-0053	TMS9118 Video	19	32	02-0056	Resistor 470 ohm 1/4W
19	16	01-0054	74LS32	19	33	02-0017	Resistor 1K ohm 1/4W (10)
19	17	01-0055	MK48Z02 Memory w/ battery				
19	18	01-0120R	Eprom U.S.A. Plus II	19	34	02-0047	Resistor 3.3K ohm 1/4W(5)
19	18	01-0122R	Eprom Spanish Plus II	19	35	02-0021	Resistor 10K ohm 1/4W (3)
19	18	01-0123R	Eprom German Plus II	19	36	02-0048	Resistor 12K ohm 1/4W
19	18	01-0124R	Eprom French Plus II	19	37	02-0049	Resistor 510K ohm 1/4W
				19	38	02-0036	Resistor 1 MEG ohm 1/4W (2)
19	19	01-0039	6840				
19	20	02-0045	Resistor Network-2K ohm	19	39	02-0041	Resistor 10K ohm Variable
19	21	02-0001	Resistor Network-10K ohm (2)	19	40	03-0044	Capacitor 33pf. 16V (2)
				19	41	03-0002	Capacitor .01 mfd 50V (23)
19	22	19-0018	Transistor Network-HLN2003A (3)	19	42	03-0005	Capacitor .1 mfd 16V (2)
19	23	19-0020	Diode Network-TND903	19	43	03-0007	Capacitor .22 mfd 16V
19	24	01-0033	LM340-15 (15V Regulator)				
19	25	01-0027	LM383T	19	44	03-0008	Capacitor .33 mfd 100V
19	26	06-0005	Crystal 10.738635 MHZ	19	45	03-0009	Capacitor .47 mfd 16V
				19	46	03-0012	Capacitor 1 mfd 50V (2)
				19	47	03-0021	Capacitor 100 mfd 25V
				19	48	03-0031	Capacitor 1000 mfd 25V (2)
				19	49	03-0032	Capacitor 4.7 mfd 25V Tantalum
				19	50	03-0042	Capacitor Network .01x8 (2)
				19	51	19-0007	Diode IN4148 (3)
				19	52	19-0011	Transistor, 2N4400
				19	53	10-0076	Phono Jack, Panel Mount
				19	53A	08-0020	Dip Switch, 4 Position
				19	54	10-0069	Video Connector, 2 Pin

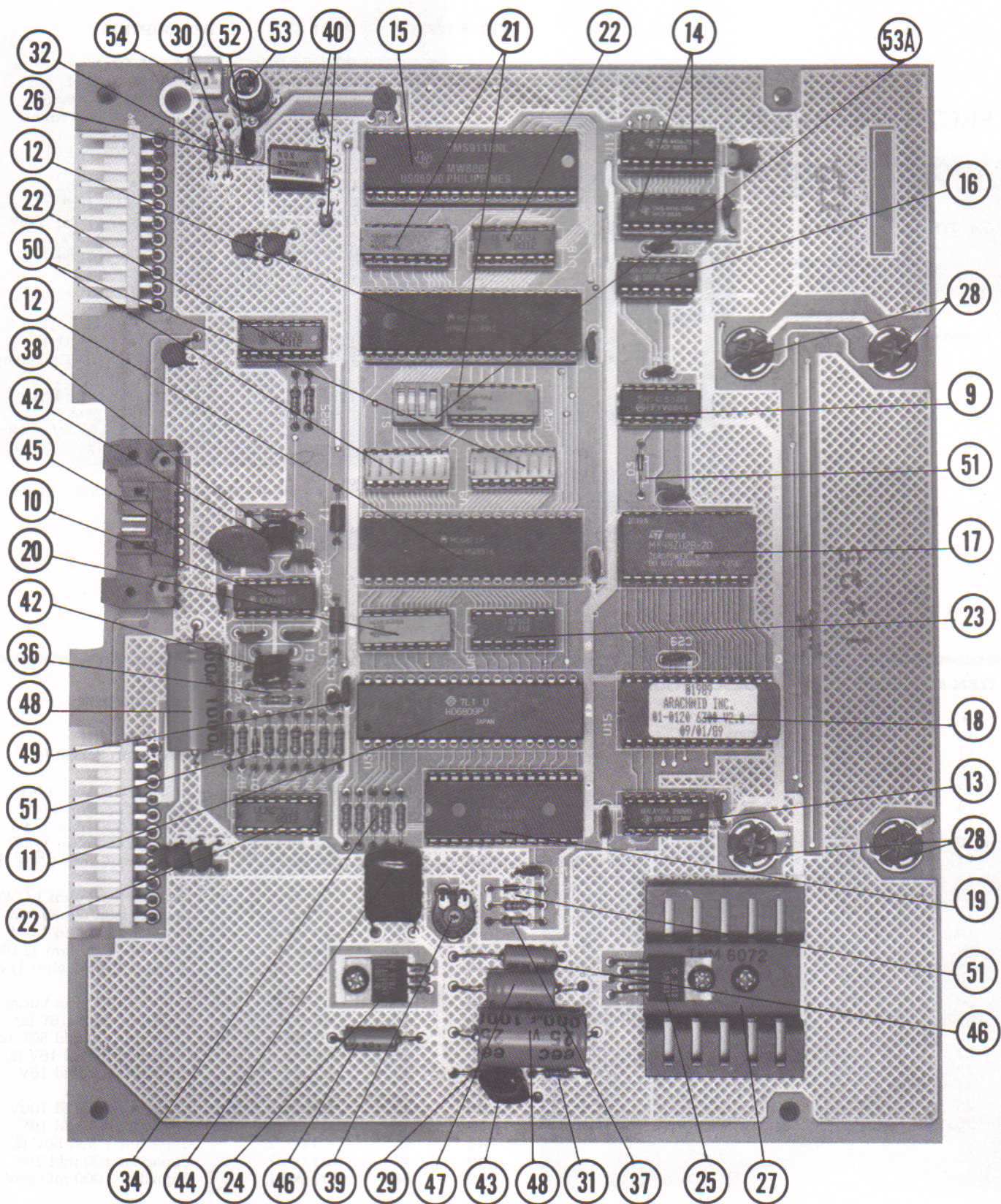


Figure 19

MAIN CABINET ASSEMBLY

FIG#	ITEM#	PART#	DESCRIPTION
20	55	16-0130	Bottom decal lexan
20	57	18-0034	Top cabinet unassembled
20	58	16-0036	Top decal
20	59	17-0001	Competitor strip
20	60	18-0033-02	Cabinet bottom unassembled
22	61	13-0009	Lock back door
23	62	00-4500-12R	Speaker and harness
20	63A	16-0128	Decal, Games List, USA, Plus II
20	63A	16-0136	Decal, Games List, Spain, Plus II
20	63A	16-0171	Decal, Games List, England, Plus II
20	63A	16-0138	Decal, Games List, France, Plus II
20	63	16-0129	Decal, Instructions, USA, Plus II
20	63	16-0137	Decal, Instructions, Spain, Plus II
20	63	16-0139	Decal, Instructions, France, Plus II
21	64	04-0024	Socket, Lamp, Med. Base (3)
21	65	11-0007	Lamp, 120V, 40W, 5 1/2" Long (3)
21	66	17-0036	Deflectors, Lamp (3)
21	66A	13-0069	Aluminum Foil Light Reflectors
24	67	00-6200-08R	Main Harness
24	68	15-0206	Switch & Lamp Harness
24	69	15-0193	Video Harness
20	70	00-6200-29R	Component Tray Assy.
25	71	08-0009	Switch, Illuminated W/O bulb
25	72	11-0021	Bulb GE658
24	72A	11-0019	Monitor, 9" Amber
24	72A	09-1002	PC Board, Monitor, Complete, Kristel
24	72A	09-1003	PC Board, Monitor, Complete, Omnivision
24	72A	11-0022	CRT for Monitor, (9")
24	72B	00-4500-35R	Coin Credit P.C. Board

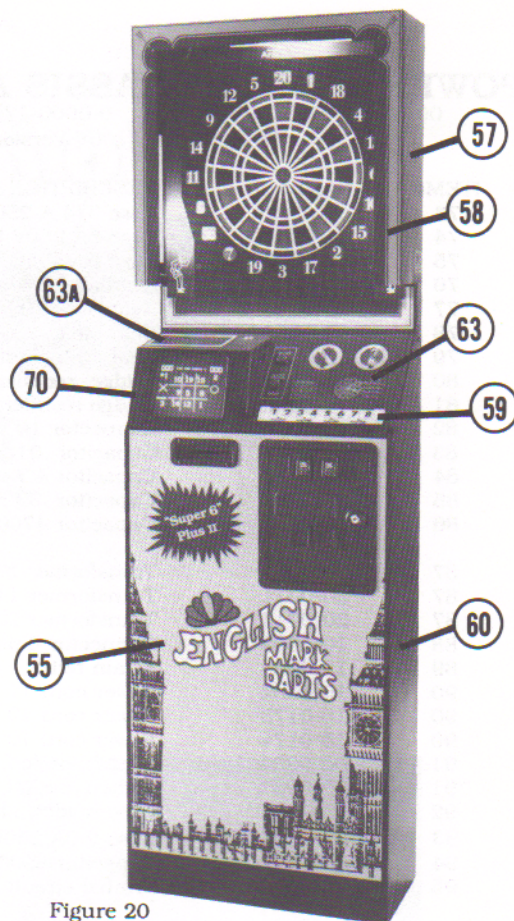


Figure 20

- 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.

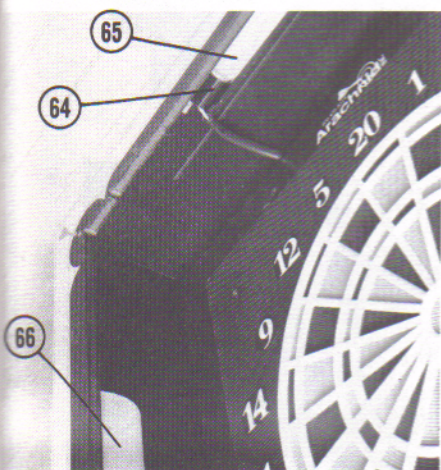


Figure 21

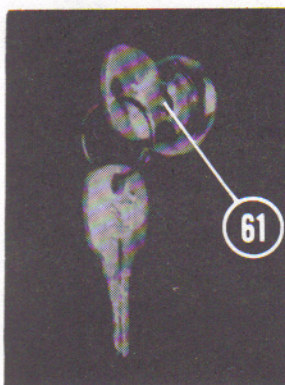


Figure 22.

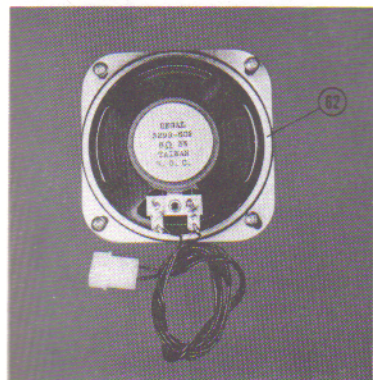


Figure 23.

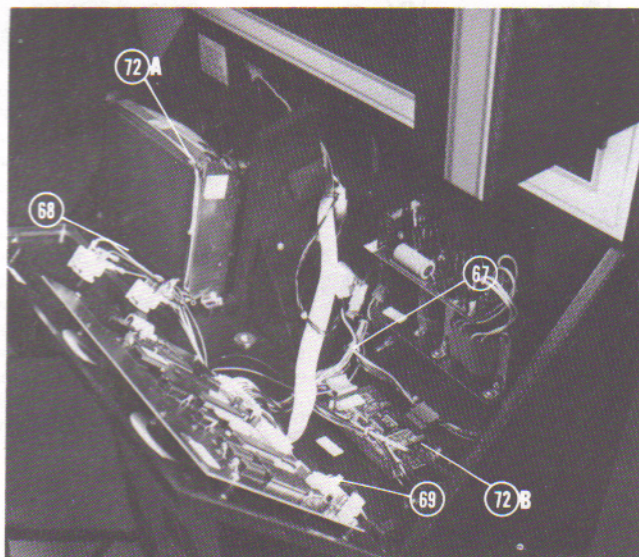


Figure 24

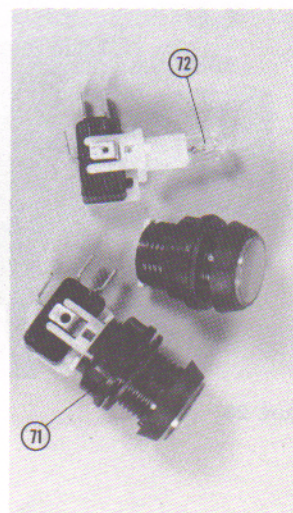


Figure 25

POWER SUPPLY CHASSIS ASSEMBLY

00-6006-17R (230V Version) 0-6000-17R (110V Version)
00-6008-17R (100V Version)

FIG#	ITEM#	PART#	DESCRIPTION
26	73	07-0007	Fuse 3/4 A 250V Slow Blow
26	74	07-0003	Fuse 5A 250V Slow Blow
26	75	13-0003	Fuse clips P.C. mount (4)
26	76	01-0032	Regulator 5V - LM323K
26	77	13-0040	Heat Sink T03 (2)
26	78	13-0020	Heat sink
26	79	13-0041	Heat sink, square
26	80	19-0021	Bridge rectifier 8A 200PIV
26	81	19-0022	Bridge rectifier 2A 200 PIV
26	82	10-0035	Connector 10 pin
26	83	03-0002	Capacitor .01 mfd 50V (2)
26	84	03-0032	Capacitor 4.7 mfd 25V (3)
26	85	03-0008	Capacitor .33 mfd 100V (2)
26	86	03-0026	Capacitor 4700 mfd 35V
27	87	20-0015	Transformer 100V Primary
27	87	20-0011	Transformer 115V primary
27	87	20-0013	Transformer 230V primary
27	88	10-0009	Connector 6 pin chassis mount
27	89	13-0034	Strain relief
27	90	15-0002	Power cord 12' USA
27	90	15-0173	Power cord 10' French/German
27	90	15-0174	Power cord 10' England
27	91	08-0004	Switch, on/off, push button, round
27	91	08-0031	Switch, on/off, rocker, square
27	92	13-0125	Fuse holder, chassis mount
27	93	07-0005	Fuse 2.0A 250V Slow Blow
27	94	03-0033	Capacitor 8900 mfd 25V
27	95	00-6000-05R	Printed circuit assy. top
29	96	19-0015	Triac SC 146D
29	97	01-0025	Opto isolator MOC 3030
29	98	02-0010	Resistor 180 ohm 1/4 W
29	99	02-0007	Resistor 120 ohm 1/4 W
29	100	02-0017	Resistor 1K ohm 1/4 W
29	101	03-0034	Capacitor .022 mfd 600V (2)
29	102	19-0014	Varistor V150LA20A (110V units)
29	102	19-0024	Varistor V250LA20A (220V units)
29	104	00-6000-24R	Printed Circuit Assy. bottom
29	104	00-6001-24R	Printed Circuit Assy. bottom, 230V
26	105	01-0059	12V regulator MC78T12ACK, T03-2A
26	106	01-0060	12V regulator, LM 340-12, TO-220
28	107	02-0057	Resistor, 1 MEG Variable
29	108	19-0026	Asymetrical bilateral switch, ST4
28	109	03-0045	Capacitor .47 ufd 400V
29	110	20-0012	Inductor, 50 mh, 3 amp
29	111	03-0043	Capacitor, .1mfd 600V

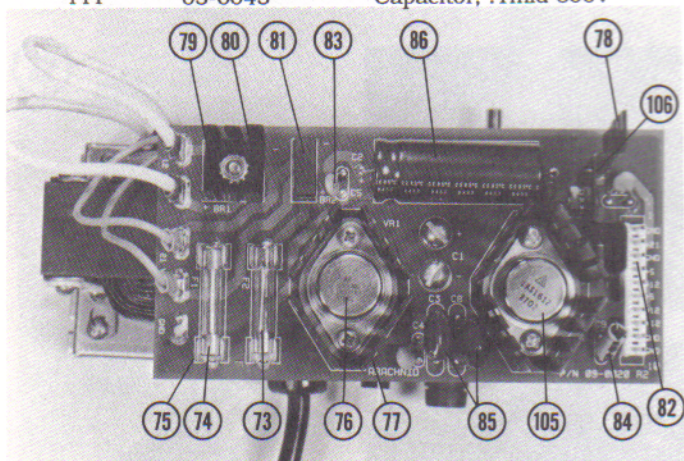


Figure 26

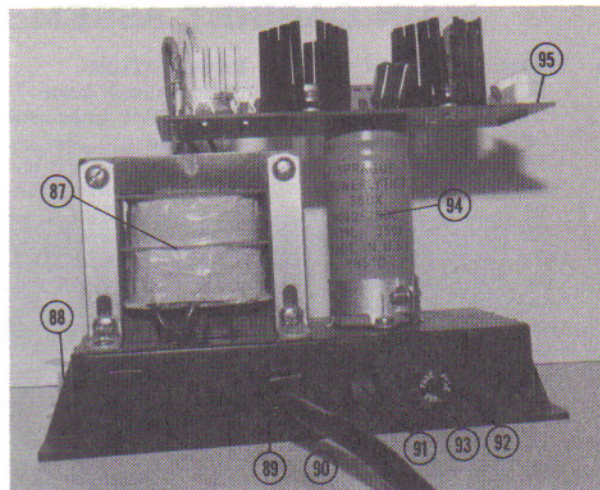


Figure 27

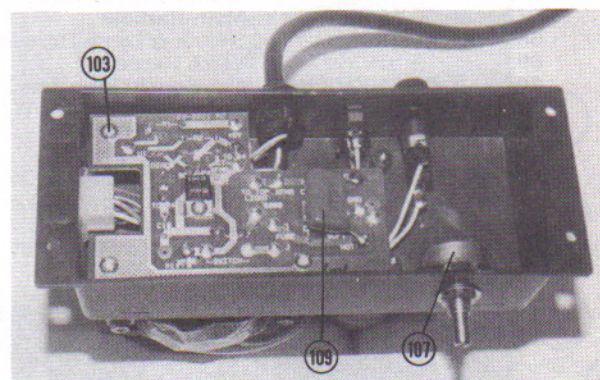


Figure 28

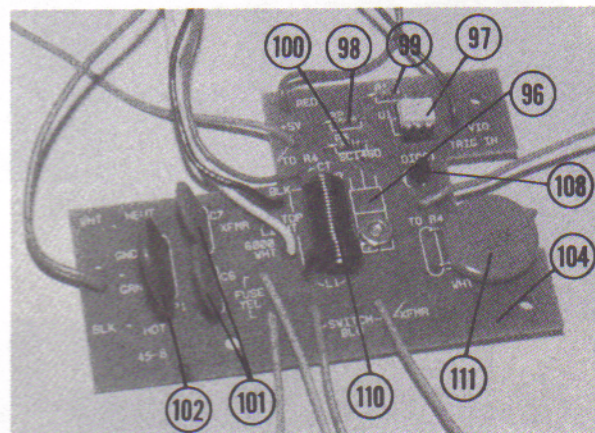


Figure 29

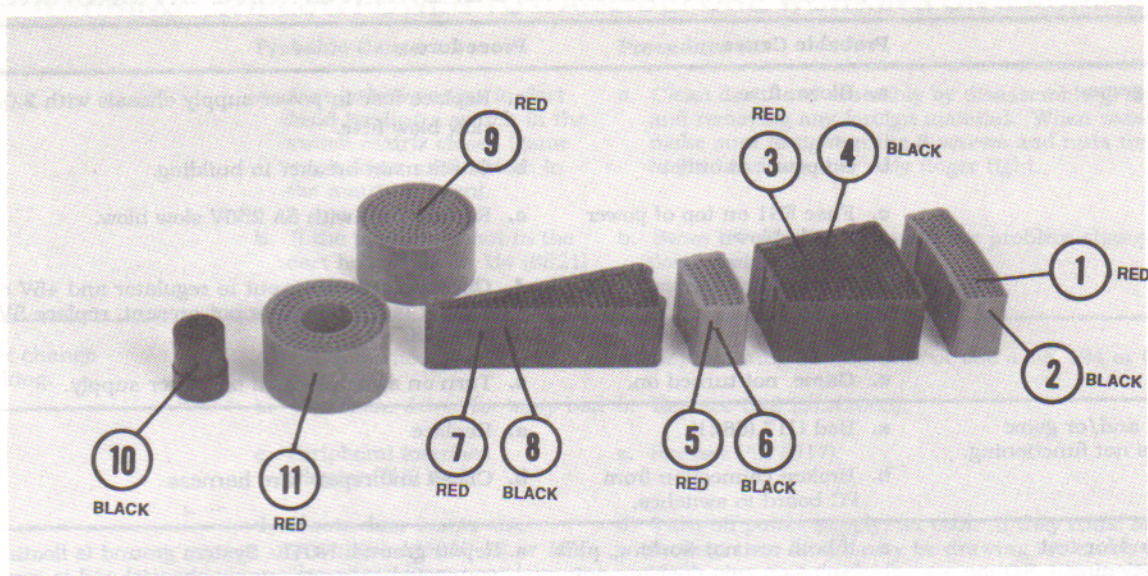


Figure 30

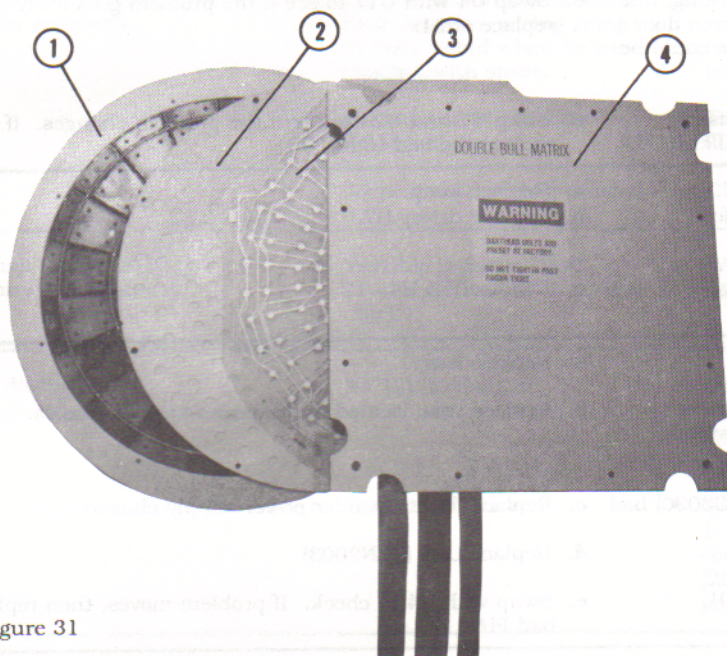


Figure 31

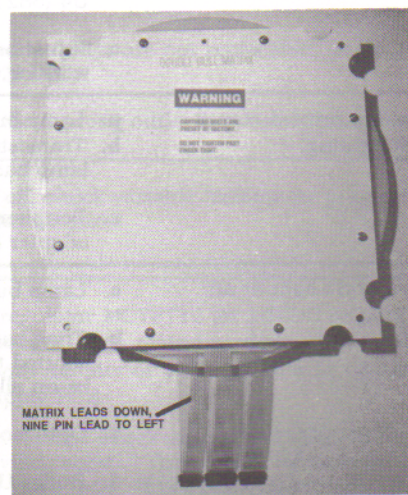


Figure 32

DARTHEAD SEGMENTS

FIG #	ITEM#	PART#	DESCRIPTION
30	1	17-0003	A segment, red, double
30	2	17-0008	A segment, black, double
30	3	17-0005	C segment, red, single
30	4	17-0009	C segment, black, single
30	5	17-0006	D segment, red, triple
30	6	17-0010	D segment, black, triple
30	7	17-0007	E segment, red, pie single
30	8	17-0011	E segment, black, pie single
30	9	17-0004	B segment, red Bullseye
30	10	17-0073	B segment, double bullseye, Center, Black
30	11	17-0074	B segment, double bullseye, outer ring, red

DARTHEAD ASSEMBLY

FIG#	ITEM#	PART#	DESCRIPTION
31	1	17-0002	Spider w/o segments
31	2	17-0076	Matrix Cushion
31	3	08-0018	Switch matrix double bull
31	4	18-0003	Target back
32		00-6300-06R	Dart head assy., Complete

SECTION 7 - TROUBLESHOOTING

WARNING - UNPLUG POWER TO GAME BEFORE WORKING ON MACHINE

Problem	Probable Cause	Procedure
Nothing lit on game.	<ul style="list-style-type: none"> a. Blown fuse b. No power at outlet c. Fuse FS1 on top of power supply blown d. 5 volt regulator bad. e. Game not turned on. 	<ul style="list-style-type: none"> a. Replace fuse in power supply chassis with 2.0A 250V slow blow fuse. b. Check main breaker in building. c. Replace fuse with 5A 250V slow blow. d. Check for 15V on input to regulator and +5V on output. If input is OK but +5 is not present, replace 5V regulator LM323K. e. Turn on switch located on power supply.
Player change and/or game select switches not functioning.	<ul style="list-style-type: none"> a. Bad U17 (6821). b. Broken connection from PC board to switches. 	<ul style="list-style-type: none"> a. Replace b. Check and repair wire harness
Coin Switch and/or test mode not functioning.	<ul style="list-style-type: none"> 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 U7. 	<ul style="list-style-type: none"> 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 U17 to see if the problem goes away; if so replace 6821. c. Swap U7 and U24 to see if the problem changes. If so, replace the bad ULN2003.
Small lamps on printed circuit board not lighting.	<ul style="list-style-type: none"> a. Lamp burned out. b. Transistor driver for lamp bad. c. Peripheral interface adapter (PIA) bad. 	<ul style="list-style-type: none"> a. Replace lamp. b. Replace driver U7. c. Replace PIA U4.
Target lamps won't light at all.	<ul style="list-style-type: none"> 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 is bad. e. PIA U17 (bad 6821). 	<ul style="list-style-type: none"> 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 to check. If problem moves, then replace bad PIA.
Sound problems	<ul style="list-style-type: none"> a. Blown fuse, FS2, on top of power supply. b. 15V regulator (LM340-15) faulty on main board. c. Amplifier faulty(LM383T) d. Timer IC U16 (8640). e. Sound is fuzzy or garbled Bad 4700 mfd 35V cap. on power supply board. f. Sound sticks on: game must be shut off to stop it. 	<ul style="list-style-type: none"> a. Replace with 3/4A 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, R22). If no square wave is 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 U16 (during the time that sound is supposed to be present), replace either U16 or U14 (74LS138 address decoder). e. Resolder connections first to make sure that the problem is not a cold solder joint. If no improvement, replace C2. f. Replace capacitor C19 on the main PC board.

SECTION 7 - TROUBLESHOOTING(CONTINUED)

WARNING - UNPLUG POWER TO GAME BEFORE WORKING ON MACHINE

Problem	Probable Cause	Procedure
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 is open). 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 U17 to see if the problem changes. If it does, replace bad 6821.
Select or player change lamps not working.	a. Lamp burned out b. Transistor driver for lamp bad c. Peripheral interface adapter (PIA) bad. d. If coin door lamps also out, check LM340-12 or 12V Also check for proper lamps GE 658.	a. Replace with GE 658 (do not use a GE 194 or GE 161 lamps). b. Replace U18 (ULN2003). c. Replace PIA (U17). d. Turn off power supply, let cool. If they come on after cooling, then lamps may be drawing too much current. Make sure that the bulbs are not GE 194 or GE 161.
Popularity screen has garbage for numbers	a. Service person has touched main board or wiring going to main board when he was charged with static. b. Batteries in MK48Z02 RAM bad. c. Game not properly grounded	a. Reset popularity screen by pressing bull's eye while popularity screen is being displayed. Discharge static to front coin door before touching electronics in component tray. b. Batteries inside device are not replaceable; replace (IC MK48Z02) U23. c. Check that the 3 prong outlet is properly grounded.
Target lamp in off condition doesn't vary in brightness	a. Variable resistor, DIAC ST-4 or C10 .1 ufd Capacitor bad.	a. With power off, check variable resistor for proper resistance. Replace defective parts.
No video display	a. No 12V to monitor. b. Transistor TR1 bad.	a. Check 12V regulator MC78T12 for 12VDC or plug in external modulator, then main board circuitry is OK. Problem is with monitor or 12V regulator or capacitor C9 on power supply PCB. b. With an oscilloscope check output of TMS9118 for about 1-1/2V P-P video signal. Then check for same at center connector of video jack. If not present, replace TR1 (2N4400). TR1 is used as a buffer for the TMS9118 for protection against accidental shorting.
Garbage on display.	a. Video memory bad. b. Video chips bad.	a. Replace U12 and U13, TMS4416. b. Replace U11 TMS9118.

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.



ArachnidTM
The Originator of Electronic Darts

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