

# 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:

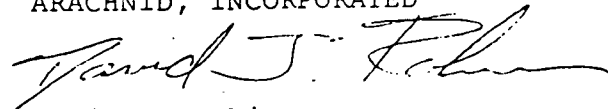
1. Remove .065 gasket from behind matrix.
2. Clean gasket of all foreign substances. It is extremely important that the gasket be thoroughly cleaned before it is placed on the front of the matrix. If not, mis-scoring can occur.
3. Replace gasket on the front of the switch matrix and rebuild head.

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.**

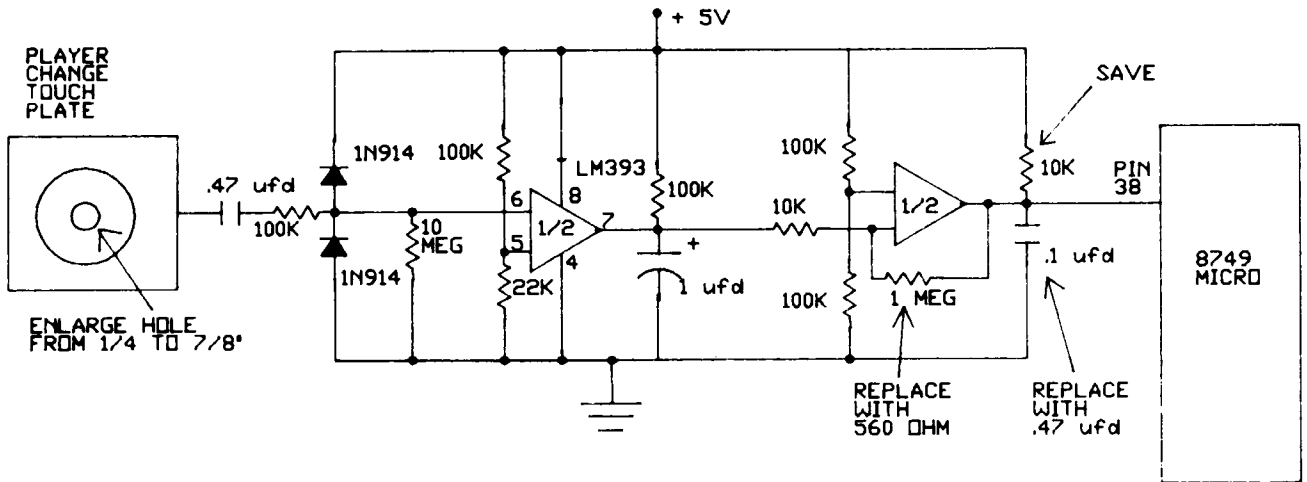
### **Retrofit Kit #00-5000-27**

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.



# TOUCHPLATE CIRCUIT



# PUSHBUTTON CIRCUIT

PARTS SUPPLIED FOR PUSHBUTTON CHANGEDOVER:

- 1- .47 ufd CAPACITOR
- 1- 560 OHM RESISTOR
- 2- WIRES WITH PUSH ON CONNECTORS
- 1- PUSHBUTTON
- 1- BUSHING WITH NUT
- 1- SERVICE BULLETIN

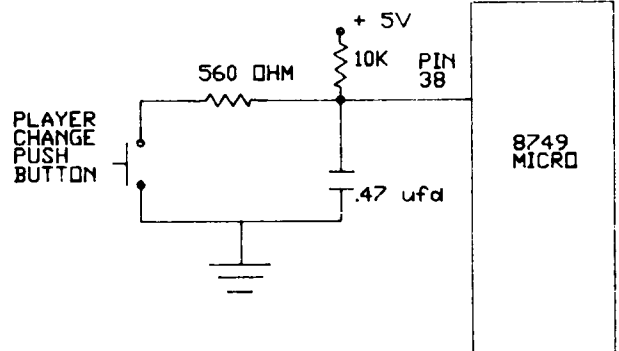


Photo 1

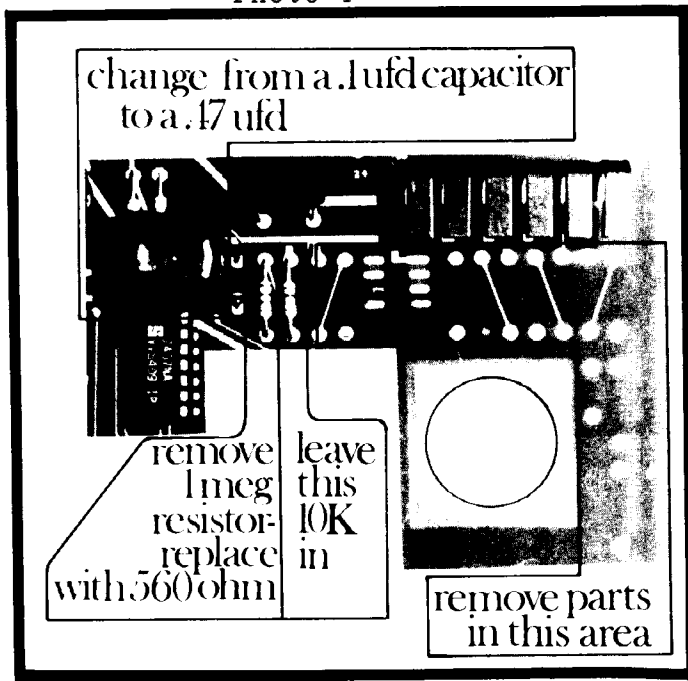
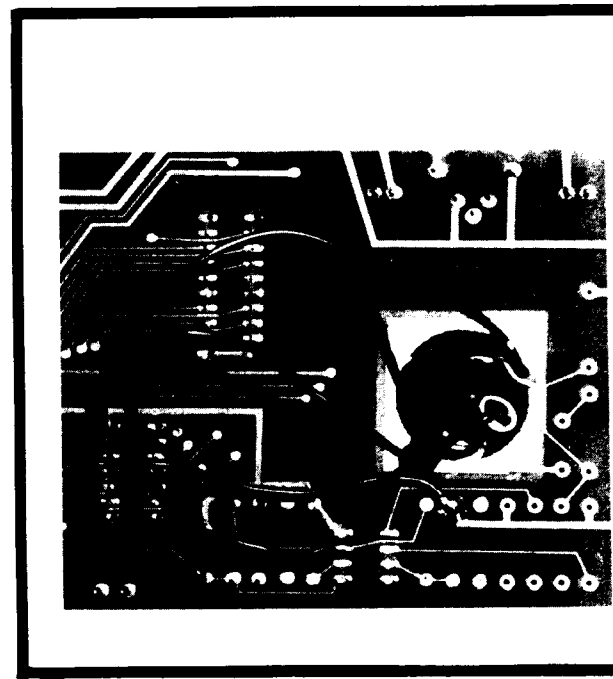


Photo 2



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

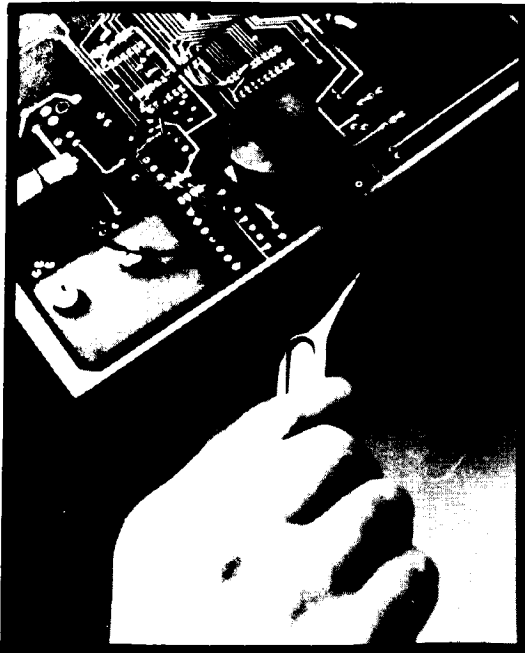
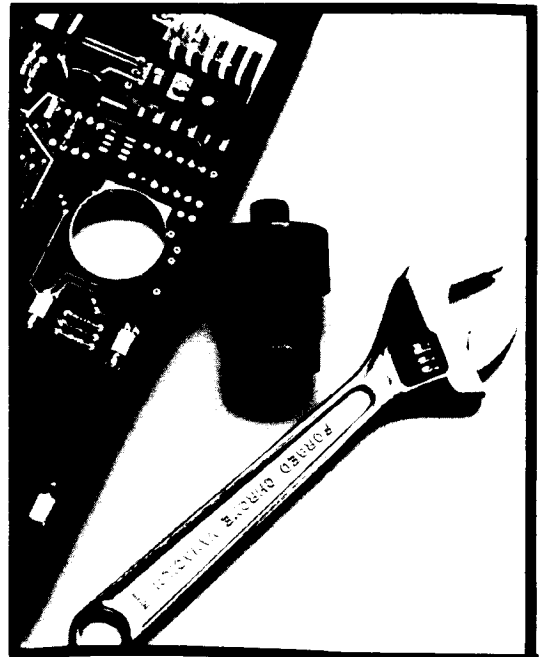


Figure 4





# SERVICE BULLETIN

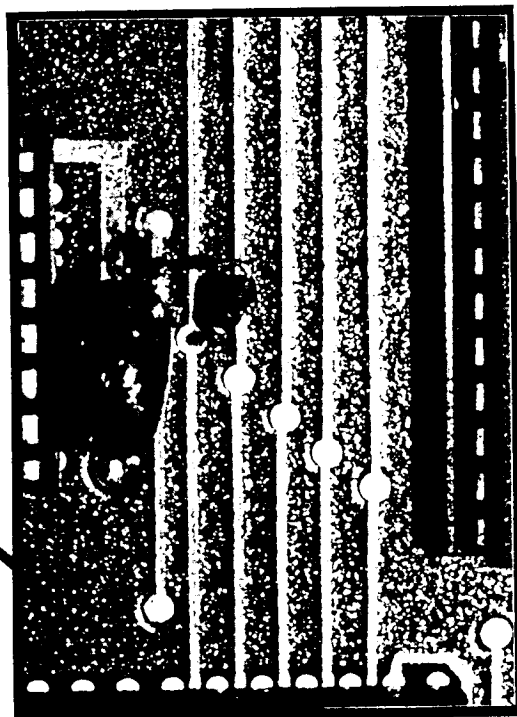
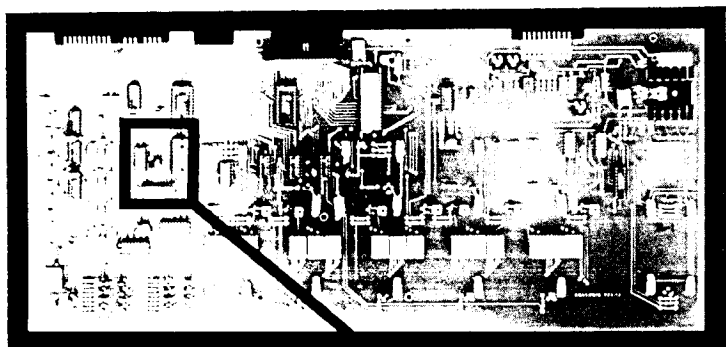
CONCERNING 5000 SERIES GAME

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.

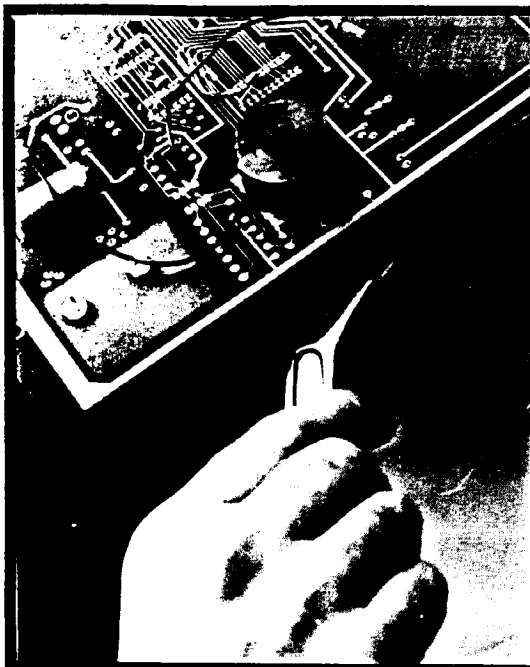


fig 1

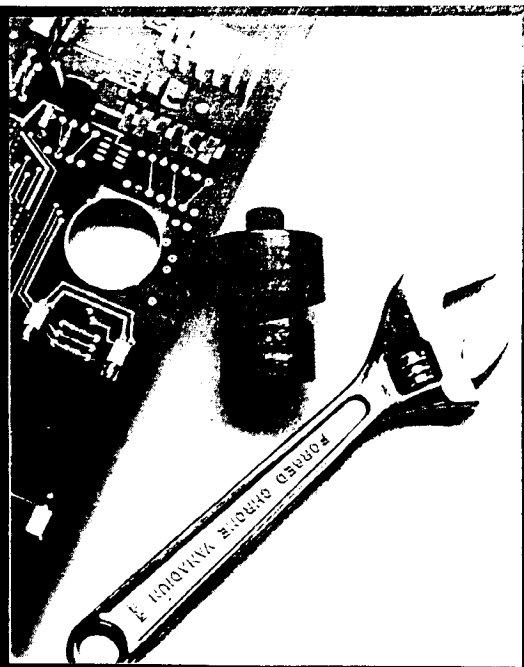


fig 2

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!

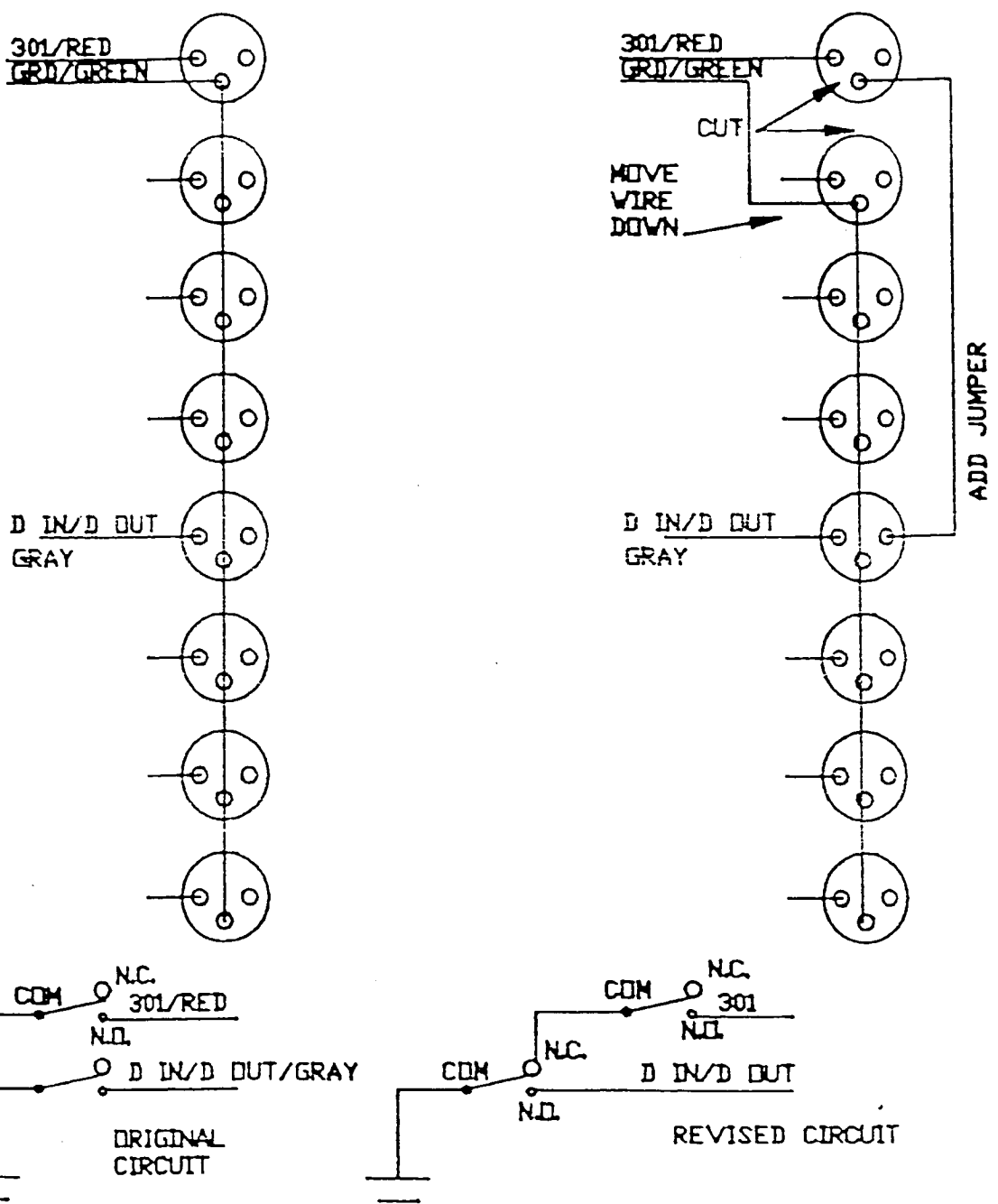
For further questions or assistance, you may call 1-800-435-8319.  
In Illinois 1-815-654-0212.

ARACHNID, INC.

Gene Harlan

Chief Engineer

# 5000 DART SWITCH PANEL WIRING UPDATE



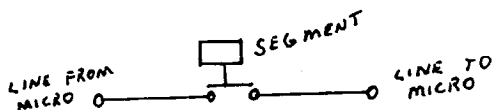
ARACHNID INC.			
DRAWING NO.			
DRAWN BY:	DATE:	CHECKED BY:	DATED:
E.G.H.	12-30-86		
REVISION			SCALE: NONE

# 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.

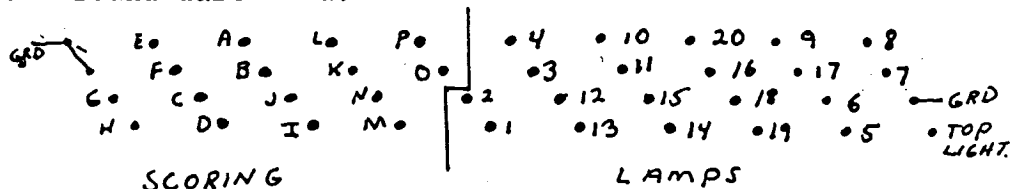
Lines a thru H are found on the top and bottom connectors.

<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	