



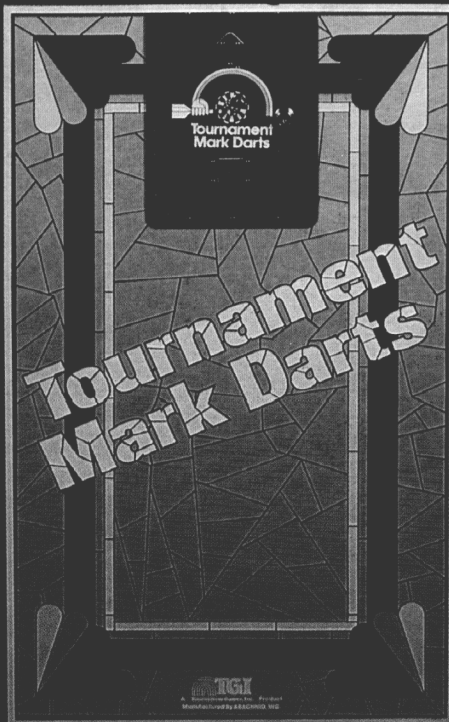
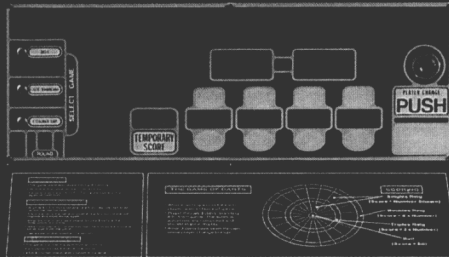
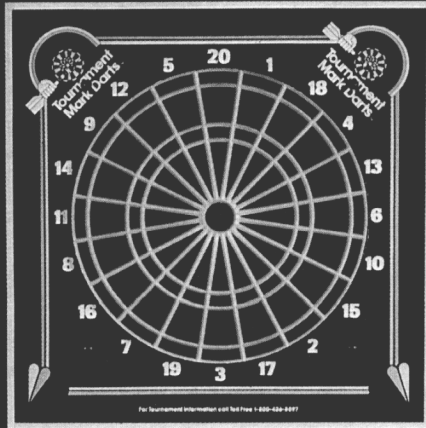
FAX NO. 815- 654-0447

P.O. Box 2901, Rockford, IL 61132-2901
815-654-0212

Information for the 4000 Series Dart Game

The following pages are being made available to those that need technical information on our older dart games. We realize that it is not in any way complete, and that some of the information is hand drawn, but we are furnishing what we have in case it will help someone. There are no parts available for these older games, nor is anyone at Arachnid familiar with them. We hope that what we can provide will be of some assistance.

4000
SERIES
TOURN. OR ENGLISH
DECALS
ON BOTTOM



TGI™
Tournament Games, Inc.

Arachnid, Inc.

2500 North Main Street • Rockford, Illinois 61103 • 815/962-3919

ENGLISH MARK DARTS - THEORY OF OPERATION

by RICHARD D. CLARK

THE PURPOSE OF THIS BRIEF IS TO DO JUST THAT - PROVIDE A BRIEF DESCRIPTION OF THE LOGIC USED IN ARACHNID'S DART GAME. IT IS NOT INTENDED TO BE AN IN-DEPTH LOOK AT THE FUNCTIONS OF THE GAME. IT COULD BE USED AS AN AID IN TROUBLE SHOOTING THE GAME, AND WE HOPE WILL BE USEFUL TO YOU.

THE COIN ACCEPTOR CIRCUIT CONSISTS OF A 74121, (I.C. 5), WHOSE OUTPUT PULSE IS EXTENDED TIME WISE, BY VIRTUE OF AN EXTERNAL R/C NETWORK, ITS OUTPUT, PIN 6, IS A POSITIVE GOING PULSE TO PIN 11 OF I.C. 4, A 7474. ITS OUTPUT IS PIN 9 WHICH GOES TO I.C. 25 PIN 13, A 74157 ITS OUTPUT GOES TO PIN 13 OF I.C. 2, ALSO A 74157 IT OUTPUTS ON PIN 12 TO I.C.35, ANOTHER 74157 ON PIN 13 WHOSE OUTPUT, PIN 12 GOES DIRECTLY TO THE PROCESSOR.

PIN 6 OF I.C.5 ALSO TRIGGERS THE CIRCUITRY RESPONSIBLE FOR AUTOMATICALLY SELECTING "301" ON COIN UP.

BY ROUTING I.C. 5's PIN 6 OUTPUT, WHICH IS A HIGH, THROUGH AN INVERTER, WE HIT Q50, WHICH ALLOWS A HIGH THROUGH R129 TO GET TO PIN 6 OF I.C. 1, A 74157. IT OUTPUTS ON PIN 7, GOING TO PIN 5 OF I.C. 35 WHICH OUTPUTS TO THE PROCESSOR ON PIN 7.

I.C. 5's PIN 1 IS ANOTHER OUTPUT USED IN COIN UP. IT OUTPUTS A LOW TO I.C. 10 PIN 10. I.C. 10 A 7474, BEING A FLIP-FLOP CHANGES STATE ON PIN 9, SUPPLYING A HIGH TO PIN 5 OF I.C. 44, WHICH IS A TWO INPUT NAND BUFFER.

THE OTHER INPUT OF THIS GATE, PIN 4, IS GIVEN A HIGH, LOW PULSE STRING BY I.C. 8 PIN 3. I.C. 8, A 555 TIMER, IS CONFIGURED AS AN ASTBLE MULTIVIBRATER, SO IT WILL CONTINUOUSLY SUPPLY THE PULSE STRING, AT A GIVEN RATE, TO I.C. 44, PIN 4. WITH THE PULSE STRING AND THE HIGH SUPPLIED BY I.C. 10, THE GATE OUTPUTS ON PIN 6 A LOW GOING PULSE EVERY .387 SECONDS - THIS OUTPUT GOES TO PIN 9 OF I.C. 21, A HEX INVERTER, WHICH OUTPUTS A HIGH GOING PULSE ON PIN 8

(CON'?.)

TO THE BASE OF Q49 WHICH THEN SINKS CURRENT THRU THE SELECT GAME LAMPS TO GROUND. THE SELECT GAME LAMPS ARE THEN FLASHING ON AND OFF ABOUT 23 TIMES A SECOND.

ON SELECTING A GAME, PIN 6 OF I.C.33 GOES LOW, AND SUPPLIES THAT LOW TO PIN 9, WHICH AS WE MENTIONED EARLIER, GOES TO PIN 5, I.C.44. THIS DISABLES THE GATE IN I.C.44 AND TURNS OFF THE GAME SELECT LIGHTS.

UPON COIN UP, '301' IS AUTOMATICALLY SELECTED, AND WILL PLAY OUT EVEN THOUGH THE SELECT GAME LIGHTS ARE FLASHING. WHEN PRESSING THE '301' GAME SELECT BUTTON, THE ONLY THING IT DOES THEN IS TURN OFF THE GAME SELECT LIGHTS.

SELECTING 'COUNT UP' OR 'CUT THROAT' HOWEVER; DOES A FEW OTHER THINGS IN ADDITION TO TURNING OFF GAME SELECT LIGHTS.

PUSHING 'COUNT UP' PUTS A HIGH ON PIN 14 OF I.C.1 WHICH OUTPUTS ON PIN 12 A HIGH GOING PULSE TO I.C. 35 PIN 14. THIS OUTPUTS A HIGH ON PIN 12 TO THE PROCESSOR.

PRESSING 'CUT THROAT' SELECT BUTTON PUTS A HIGH ON PIN 11 OF I.C.2 WHICH OUTPUTS ON PIN 9, GOES TO PIN.10 OF I.C.35 WHICH OUTPUTS ON PIN 9 TO THE PROCESSOR.

REMOVE AND THROW TIMER. I.C.6, A 555 TIMER, IS TRIGGERED ANYTIME COINS ARE FED TO MACHINE OR ANY GAME IS SELECTED. SEQUENCED AS FOLLOWS:

I.C. 33 PIN 5 IS TIED TO DIODES D2 THROUGH D7 Ah?) GETS A LOW GOING PULSE EVERY TIME COINS ARE FED OR GAME SELECTED. BEING AN IN-VERTER, IT OUTPUTS A HIGH ON PIN 6 WHICH GOES TO THE 555 TIMER TRIGGER INPUT PIN 2, I.C.6 WILL TIME OUT IN ABOUT 5 SECONDS. WHILE THE OUTPUT IS STILL HIGH, IT ENABLES TWO GATES WHICH ARE PART OF A STRING OF GATES.. SINCE WE ARE CONCERNED RIGHT NOW WITH THROW AND REMOVE LIGHTS, WE WILL EXAMINE THAT PART OF THIS STRING.

THE OUTPUT OF THE 555 TIMER IS HELD HIGH FOR A SPECIFIED AMOUNT OF TIME FEEDING AN INVERTER, I.C.7, ON PIN 1. ITS OUTPUT, PIN 2, IS HELD LOW UNTIL THE TIMER TIMES OUT. THE OUTPUT OF I.C.7 GOES TO I.C.50 PIN 10 AND I.C.11 PIN 10. I.C.50 AND I.C.11 ARE AND GATES, SO 2 LOWS IN GIVES A LOW OUT. I.C.13 PIN 10 SUPPLIES A LOW TO I.C.11 PIN 1. THE OTHER INPUT TO THAT GATE COMES FROM I.C.33 PIN 6. THIS ENABLES THE GATE AND IT OUTPUTS A LOW TO PIN 9 OF I.C.50, THIS SIGNAL, ALONG WITH THE LOW FROM I.C.7 GIVES A LOW OUT ON PIN 3 OF I.C.50 WHICH GOES TO I.C.9 PIN 1 AND PIN 4 OF I.C.11, PIN 5 OF WHICH SHOULD BE LOW BY VIRTUE OF THE LOW COMING FROM INVERTER I.C.33. THE LOW IS OUPUT ON PIN 6 OF I.C. 11 AND GOES TO PIN 9 OF I.c.11, PIN 10, OF WHICH IS RECEIVING THE SUSTAINED LOW FROM I.C.7. PIN 8 OF I.C.11 THEN OUTPUTS A LOW TO PIN 5 OF I.C.50. IT ALSO GOES TO PIN 4 OF I.C.12, PIN 5 BEING THE OTHER INPUT OF THIS GATE IS GIVEN A LOW BY I.C.13, PIN 14 WHICH IS HELD LOW ANYWAY. THIS GATE OUTPUTS A HIGH ON PIN 6 WHICH GOES TO PIN 9

OF I.C.23 AND TURNS OFF THE THROW DARTS LIGHT. IT ALSO GOES TO PIN 9 OF I.C.12, THE OTHER INPUT BEING SUPPLIED ON PIN 10 BY PIN 6 OF I.C.10, GIVING A LOW OUT ON PIN 8. THIS SIGNAL GOES TO I.C.23 PIN 5 WHICH OUTPUTS A HIGH ON PIN 6 GOING TO THE BASE LEAD OF Q36 BIASING IT ON AND TURNING ON 'REMOVE DARTS' LAMPS.

AFTER THE 555 TIMER, I.C.6, TIMES OUT, THE SYSTEM JUST DISCUSSED RELAXES AND THE 'REMOVE DARTS' LAMP GOES OUT AND 'THROW DARTS' LAMP COMES ON.

NOTE THAT WHILE TIMER I.C.6 IS ACTIVATED, I.C.11 PIN 8, OUTPUTTING A LOW, GOES TO I.C.50 PIN 5 WHOSE OTHER INPUT IS BEING HELD LOW BY I.C.36. THIS OUTPUTS A LOW ON PIN 6 TO I.C.27 PIN 13 WHICH ALONG WITH A LOW FROM I.C.39 PIN 16 PROVIDES A LOW OUTPUT ON PIN 11 OF I.C.27 WHICH DISABLES THE SCORING CIRCUIT ENTIRELY BY PLACING A LOW ON THE CLOCK INPUT PINS OF I.C.'S 4-16-17-18, AND GAME WILL NOT SCORE WHEN 'REMOVE DARTS' LIGHT IS ON.

THE DART HEAD IS BUILT SO AS TO PROVIDE A BINARY CODE TO THE I.C.'S 18-17-16-4 WHICH ARE 7474 FLIP-FLOPS. SCORING A BULLSEYE WILL APPLY A LOW TO I.C.18 PIN 4, I.C.17 PIN 10, I.C.16 PIN 4, AND I.C.16 PIN 10. EACH OF THE CORRESPONDING OUTPUTS OF THESE I.C.'S WILL OUTPUT A HIGH. THESE OUTPUTS ARE FED INTO I.C.25, THEN TO I.C.2, THEN TO I.C.35 AND THEN TO THE PROCESSOR.

IT CAN BE SEEN BY LOOKING AT THE SCHEMATIC THAT I.C.'S 41, 39, 24, 13, & 15 ALLOW COMMUNICATION FROM THE PROCESSOR TO US. THESE I.C.'S ON COMMAND FROM THE PROCESSOR, TAKE CARE OF ALL VISUAL INDICATIONS OF THE GAME'S PROGRESS, EXCEPT FOR THE SCORE DISPLAYS.

IT ALSO CAN BE SEEN THAT THE PROCESSOR RUNS THE SCORING DISPLAYS THROUGH SEVERAL INVERTERS WHOSE OPERATION IS STRAIGHT FORWARD AND NEEDS NO FURTHER DISCUSSION.

THE INITIALIZATION CIRCUIT FOR THE PROCESSOR IS MADE UP OF DIODE D1 AND CAPACITOR C1 WHOSE JUNCTION POINT IS THE INPUT TO THE PROCESSOR AT PIN 9, WHICH MUST BE HELD LOW OR THE PROCESSOR WILL NOT OPERATE.

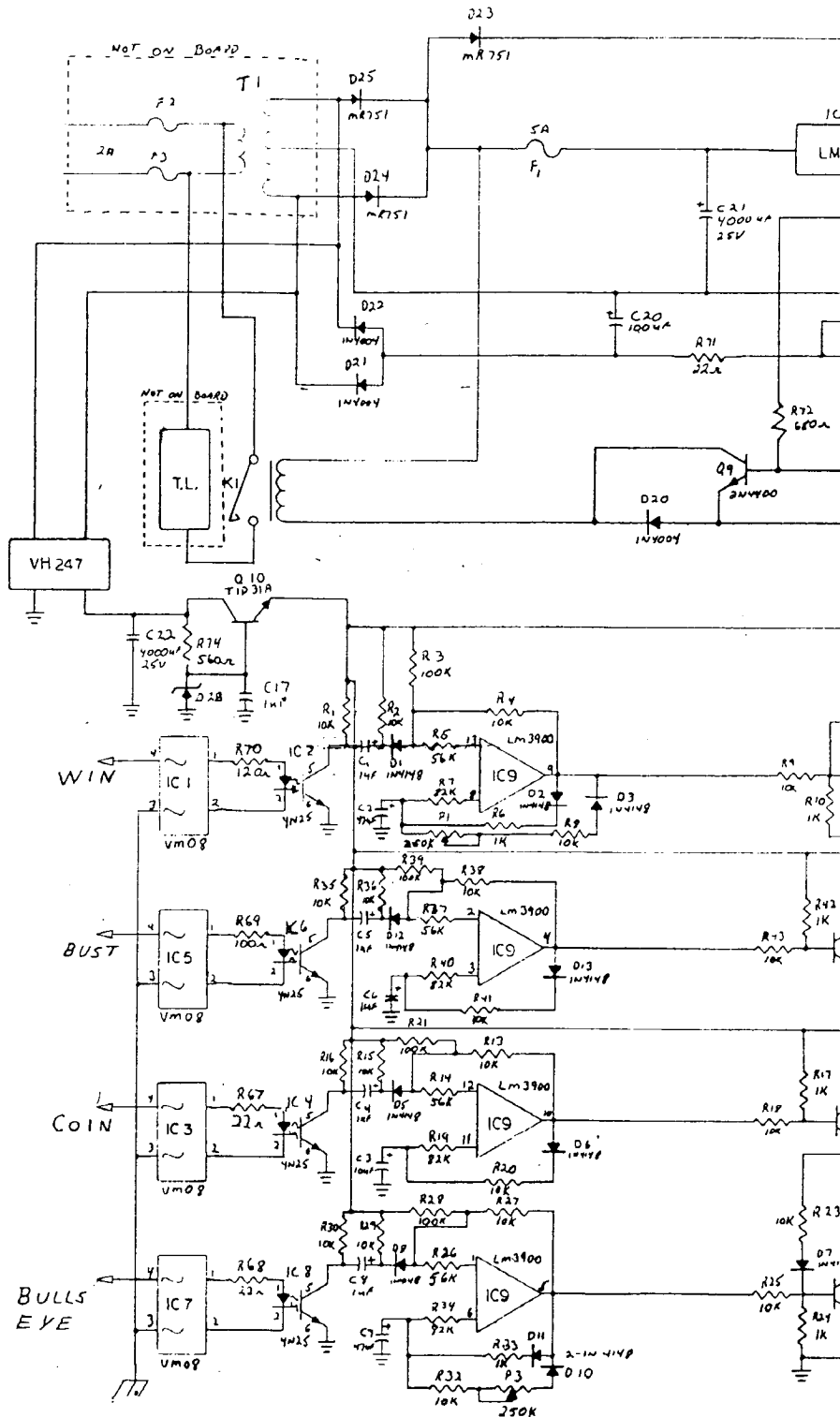
PINS 18 & 19 PROVIDE ACCESS TO THE INTERNAL CLOCK IN THE PROCESSOR. WE ARE NOT USING A 50PF. CAPACITOR AND A 22K RESISTOR, INSTEAD OF 100PF AND 33K.

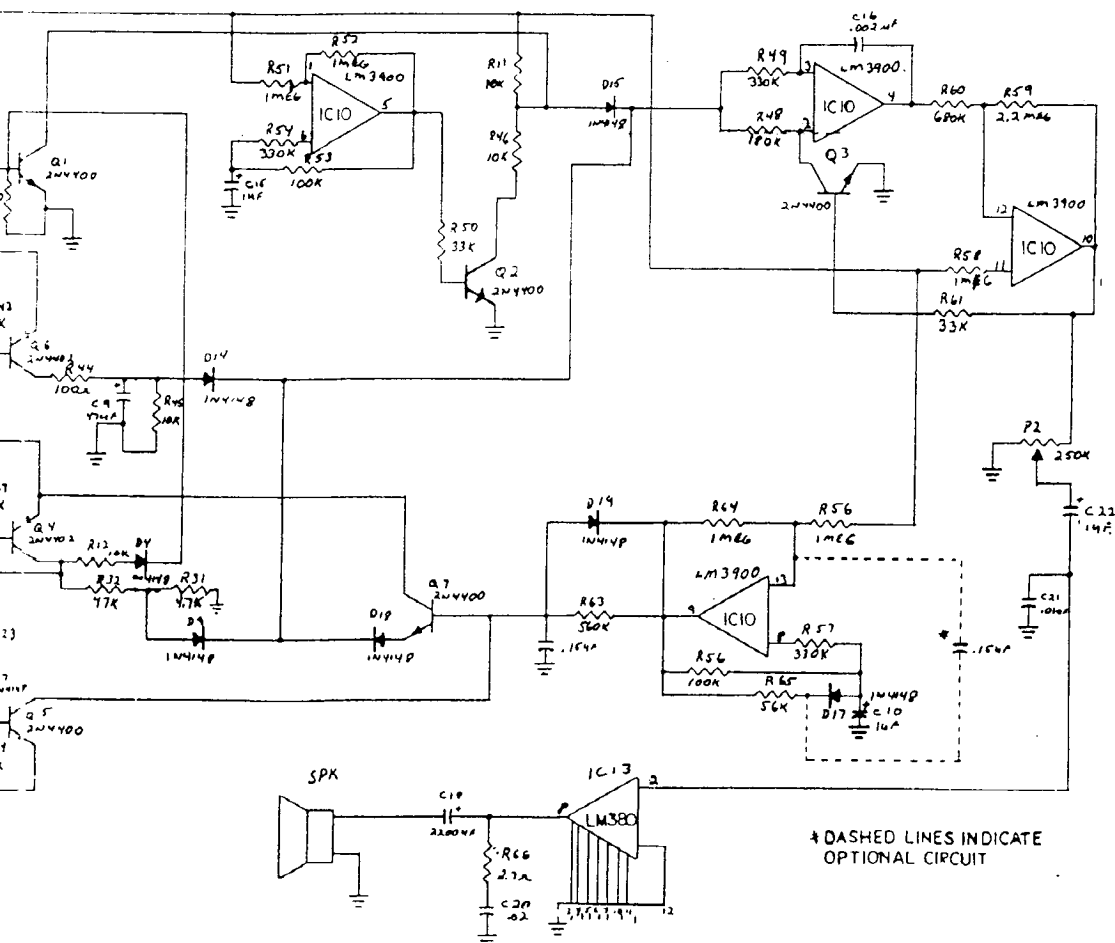
THESE COMPONENTS GIVE US A 417 K HZ. RATE WHICH STABILIZES THE LED'S.

LIKE WE SAID, THIS ISN'T MEANT TO BE 100% DESCRIPTIVE, BUT WE HOPE THERE IS ENOUGH DETAIL TO ALLOW USE AS AN AID IN TROUBLE SHOOTING, AND SHOULD SERVE TO FAMILIARIZE YOU WITH THE BASIC OPERATION OF THE GAME.

FEEL FREE TO CALL ANYTIME YOU HAVE A PROBLEM YOU WOULD LIKE HELP WITH. 1-815-962-3919 (ARACHNID, INC.).

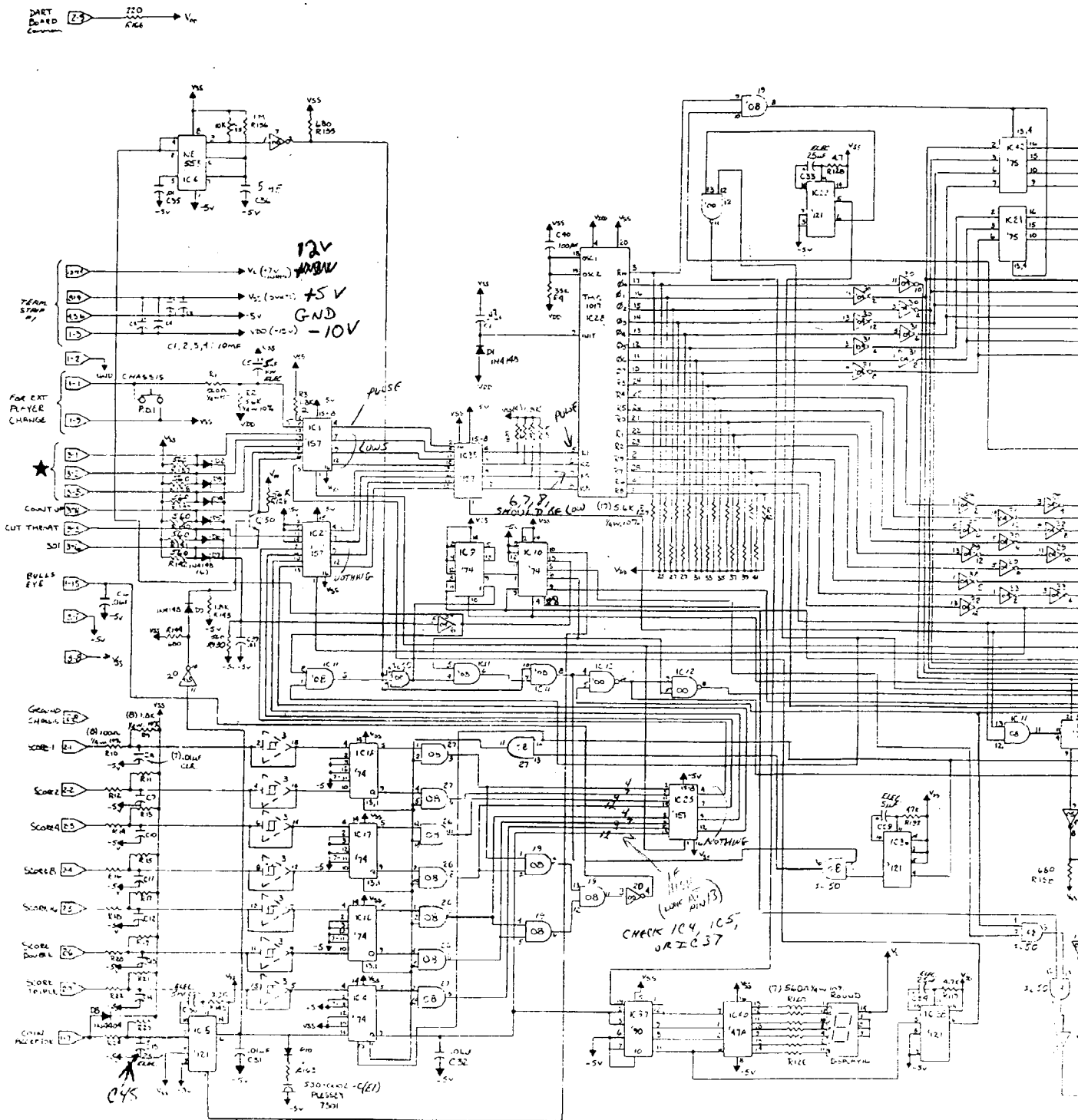
2 TRANSFORMERS
USED IN TANDEM.
REPLACE W/
RADIO SHACK HEAVY DUTY
12.6V CENTER TAP / 3 AMP
(CENTER TAP NOT USED)
273-1511 (9.00 EA)
NEED 2

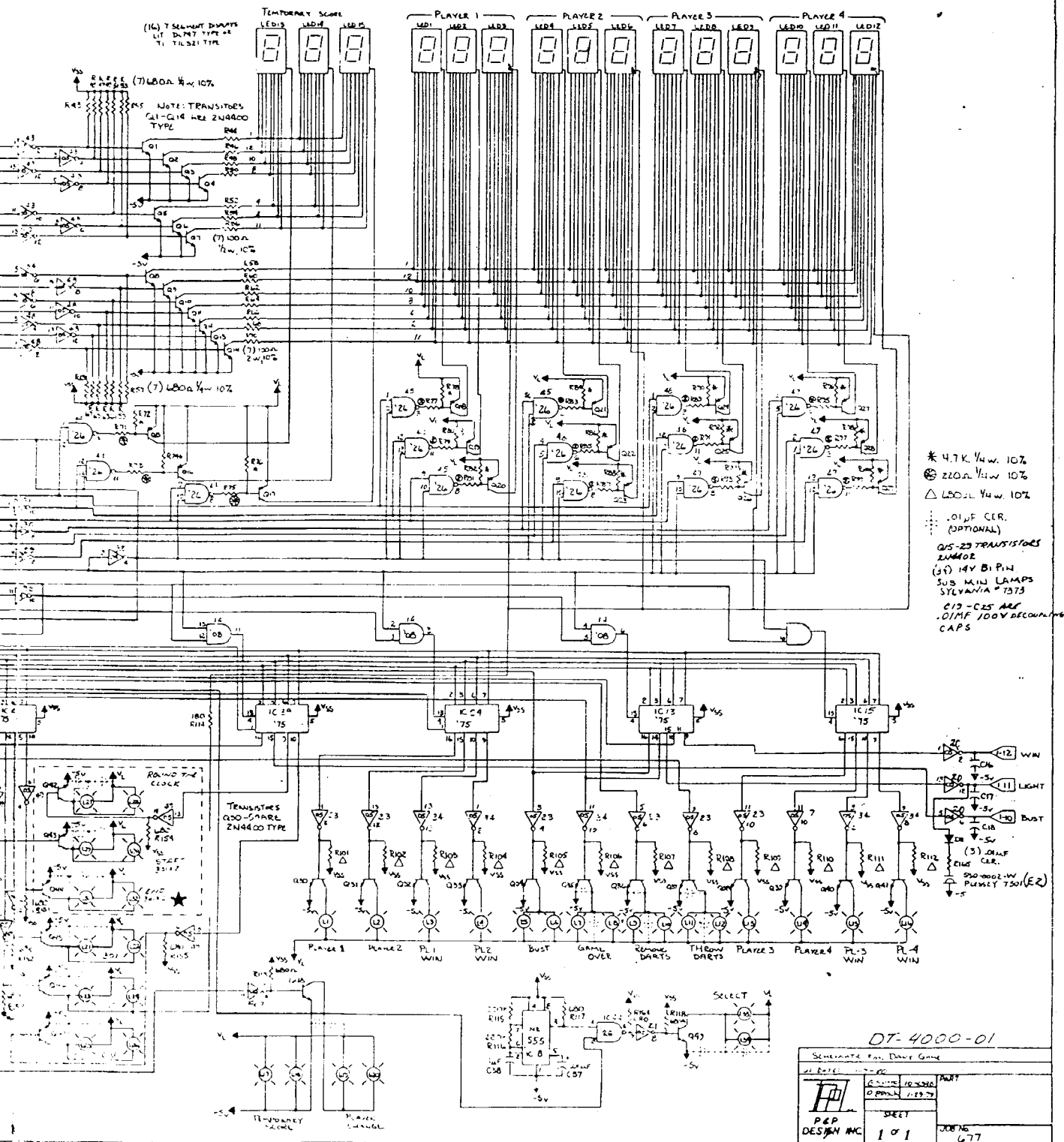


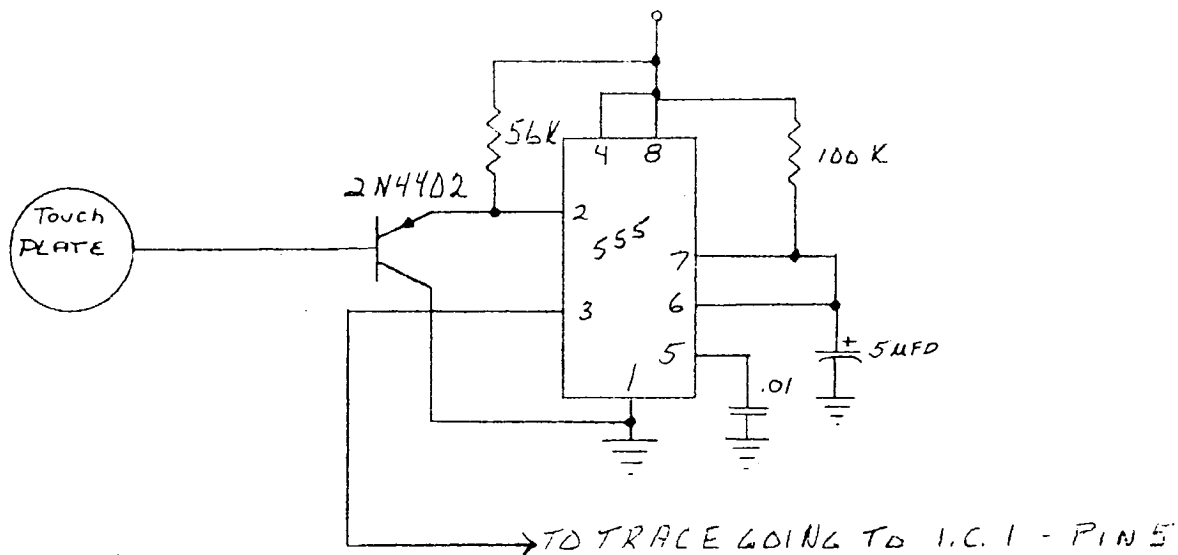


DT-4000-02

[illegible]







COMPONENT SIDE: MOTHER BOARD

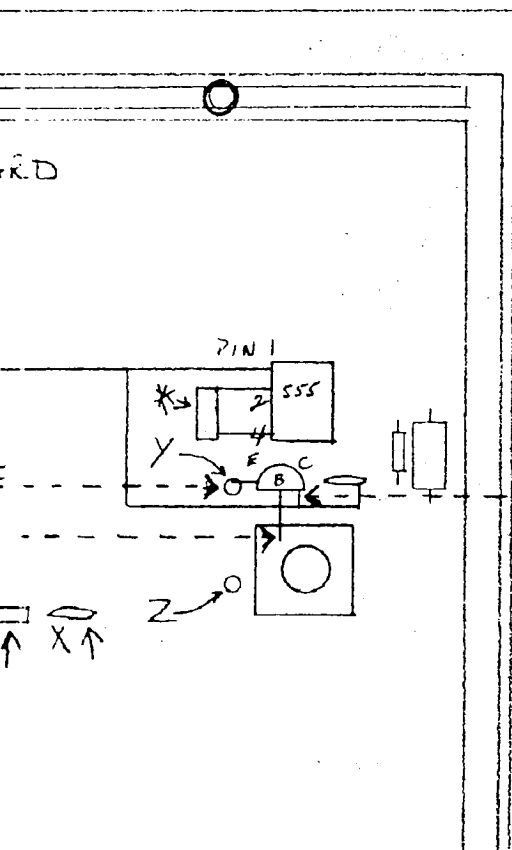
SOLDER EMITTER HERE -
SOLDER BASE HERE -

W↑

USE WITH DIOG #

W IS A 1 MEG OHM RESISTOR
 X IS A .01 UFD. CAP. CUT BOTH
 COMPONENTS OUT OF THE
 CIRCUIT.

BETWEEN SPOTS 'Y' AND 'Z' THERE ARE
 3 RESISTERS WIRED IN SERIES.
 CUT THEM COMPLETELY OUT OF
 THE CIRCUIT.



X IS 56K RESISTOR SOLDERED TO
 PINS 2 AND 4 OF 555 TIMER

SOLDER COLLECTOR HERE

TRANSISTOR IS: 2N4402

A. RACHNID INC.
 208 N. MADISON, ROCKFORD IL 61104

SCALE:

APPROVED BY:

DRAWN BY RC

DATE: 5-20

REVISED

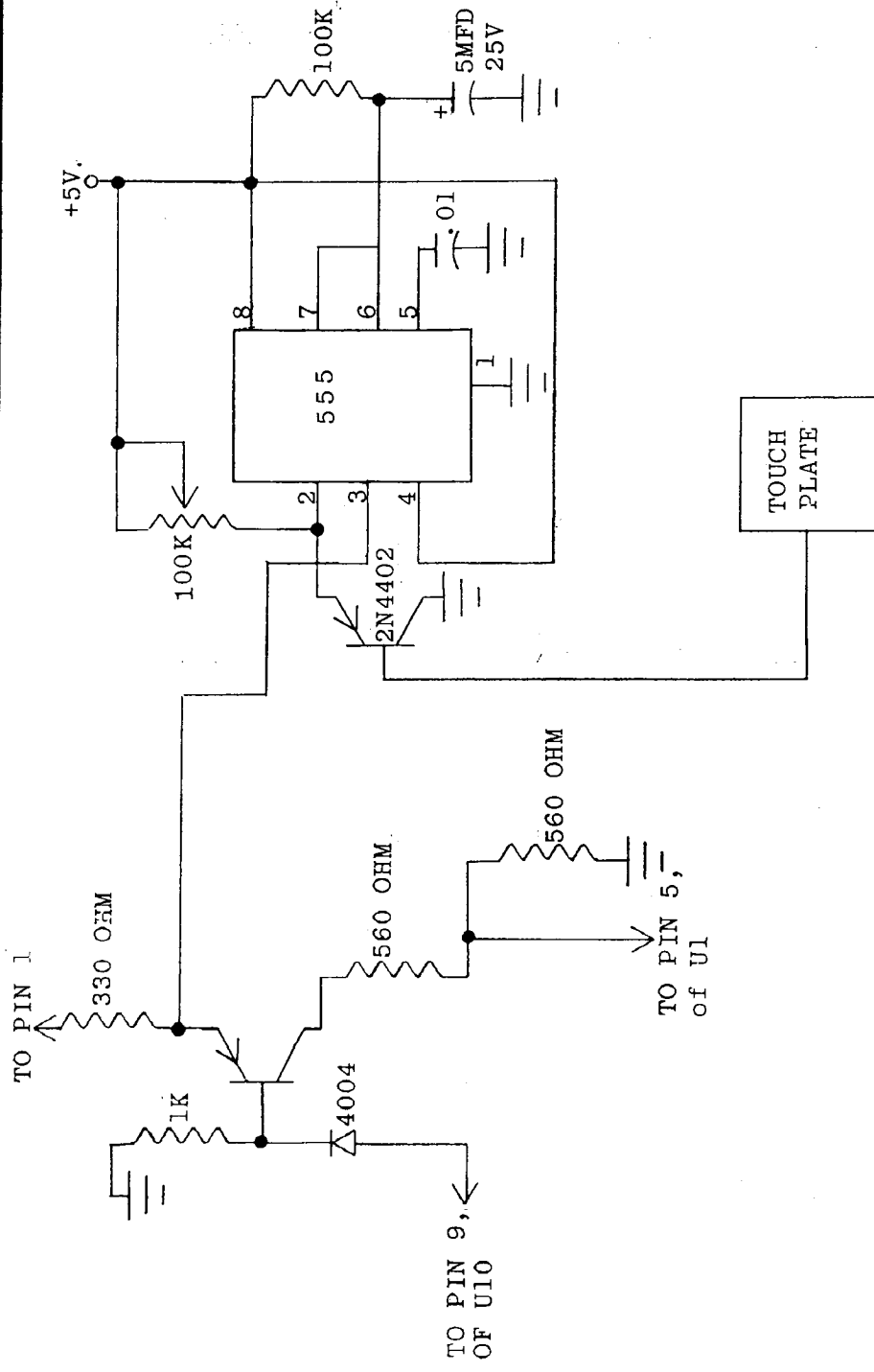
'TOUCH PLATE MODIFICATION'

1-815-962-3919

DRAWING NUMBER

38-9037

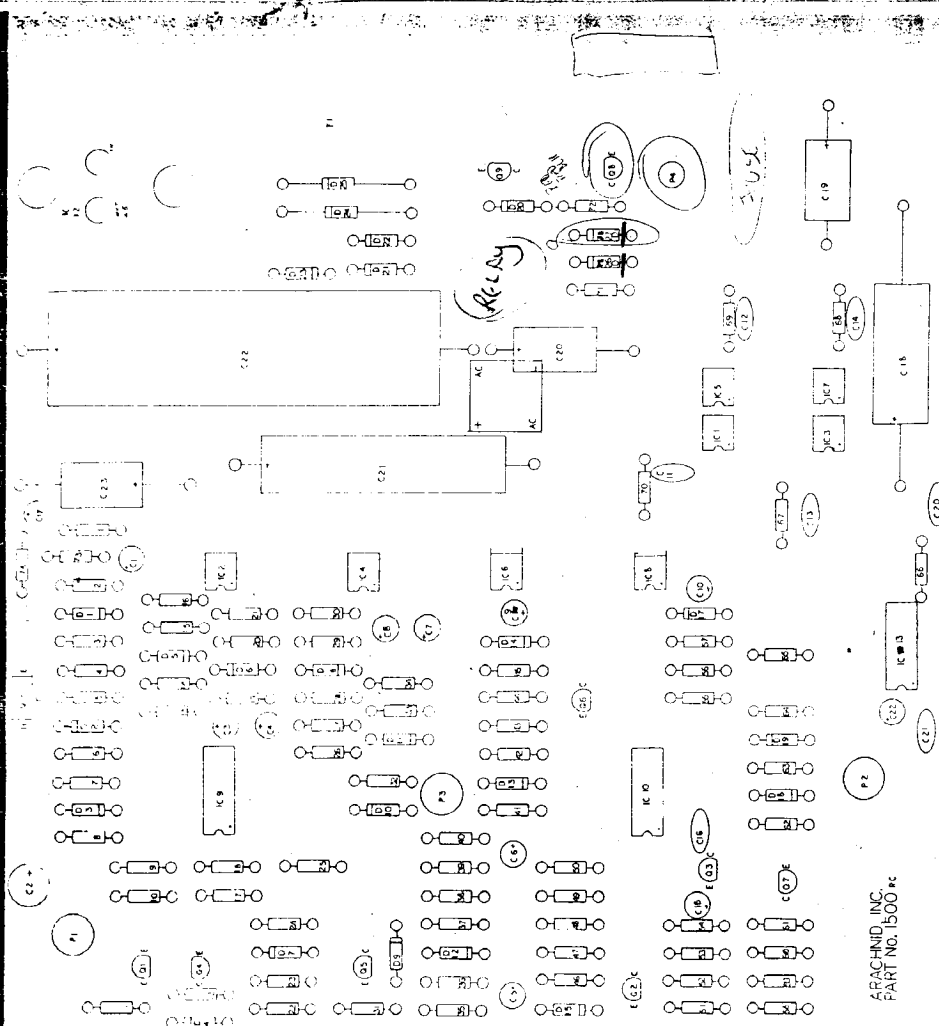
38-9038



WAS 922-23

OLD DART GAME REV.C			
SCALE: N/A	APPROVED BY:		DRAWN BY J. M.
	DATE: 6/16/81		REVISED
SCHEMATIC		PLAYER CHANGE TOUCH, 4000 SER.	
DRAWING NUMBER			38-9038

USE WITH DWG# 38-9037



0210914
D26 = 1N4148
D27 = 1N758A

4000 GAME

WARNING - 2 DIODES
 ARE IN BACKWARDS
 THIS IS RIGHT
 D26 & D27

THE PRINTING ON THE PCB
 IS WRONG
 (DIODES ARE DIRECTLY
 UNDER RELAY.)

**BAR END SHOULD BE
 AWAY FROM RELAY**
HUB PRINTING AND OFFICE SUPPLIES
 Highway 251 North • Rochelle, Illinois 61068 • 815/562-7057

ARACHNID, INC.
 PART NO. 1500-4c

Arachnid, Inc.

2500 North Main Street • Rockford, Illinois 61103 • 815 962-3919

74157 - IC 1, IC 2, IC 25, IC 35
7474 - IC 4, IC 9, IC 10, IC 16, IC 17, IC 18
74121 - IC 5, IC 22, IC 36, IC 38
555 - IC 6, IC 8
7405 - IC 7, IC 20, IC 23 IC 34, IC 43, IC 48, IC 49
7408 - IC 11, IC 14, IC 19, IC 26, IC 27, IC 50
7400 - IC 12
7475 - IC 13, IC 15, IC 21, IC 24, IC 39, IC 41, IC 42
7404 - IC 29, IC 30, IC 31, IC 32, IC 33
7490A - IC 37
7417A - IC 40
7426 - IC 44, IC 45, IC 46, IC 47
2N4402 - Q15 - Q29
2N4400 or A5T2222 - All Others

INSTRUCTIONS FOR HOOKING UP SOUND POWER.

CHANGES TO MOTHERBOARD:

FIRST STEP IS TO CUT PINS 1 THROUGH 6 ON I.C. 20
SHORT TOGETHER ETCH WORK ON BACK OF BOARD.

I.C. 20 Back Side

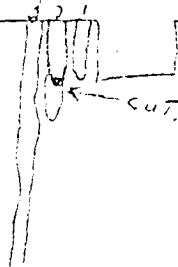
1
1
1
1
1
1

Short with solder
or small jumpers.

NEXT STEP.

COUNTED ON FRONT OF BOARD. FIND PIN 2 OF 15 PIN EDGE
BOARD CONNECTOR. THEN ON BACK OF BOARD CUT ETCH WORK
ON PIN 2 OF 15 PIN EDGE BOARD CONNECTOR AS BELOW.

BACK OF BOARD



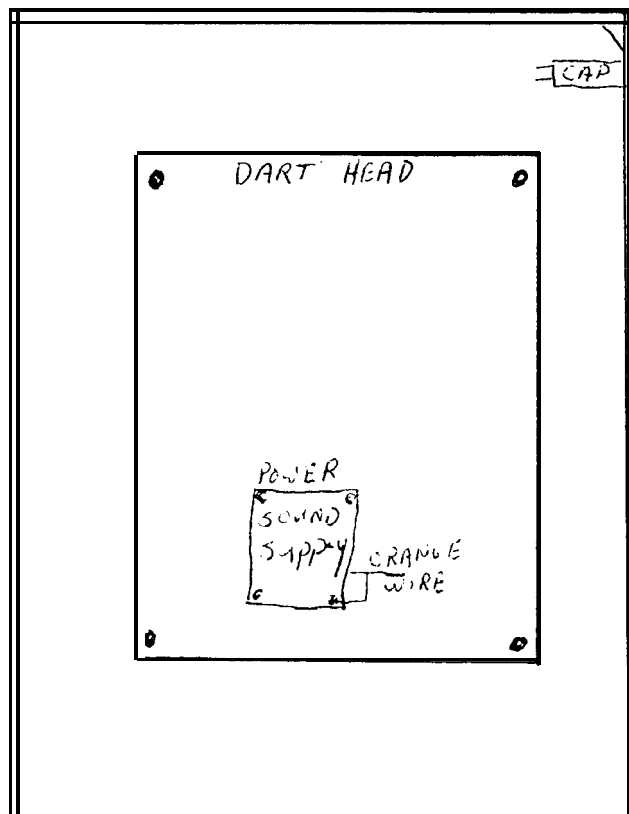
PLACE JUMPER WIRE FROM PIN 2 DOWN TO IC 4 PIN 9.

FRONT OF BOARD

10-22-80 4000 Series

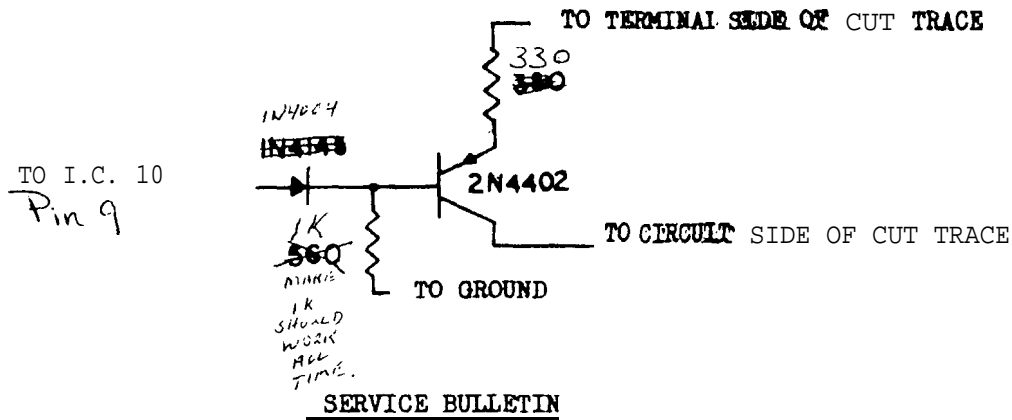
1. Remove old power supply, (save screws and spacers).
 2. Remove Bust relay, (buzzer).
 3. Remove door bell from back of Dart head.
 4. Remove three wires from plug that goes up to the top of **game**, (gray, blue, and brown). *CONNECT TWO BLACK TOGETHER.*
 5. Locate Power sound supply on back of Dart Board, leave about one inch to remove dart head. Connector is at bottom right. Use screws and spaces saved in.
 6. Install large 20,000 MFD cap near top of cabinet on side. Make sure you have clearance to remove dart head.
 7. Install new harness into game, making sure all plugs are right.
- (Black plug that goes onto power sound supply board goes with orange wire up.)

Top of game.



Arachnid, Inc.

2500 North Main Street • Rockford, Illinois 61103 • 815/962-3919



A problem having to do with the dart game using the touchplate rather than the push button for player change has come to our attention.

Sometimes, due to weather conditions, high humidity, etc. The touchplate becomes very sensitive. When this occurs, it is possible to lose up to three quarters in the machine. This happens in this way. Someone wishing to play four players on the dart game inserts quarters 1 at a time. Perhaps on inserting the third quarter his hand gets too close to the touchplate or someone walks by the machine, triggering the player change circuit. When this happens his first three quarters are wiped out and his fourth quarter will only give him one player. This is not a constant problem, and does depend on weather conditions as to whether it will come about or not. However, we have designed a very simple add on circuit that eliminates the problem should you choose to employ it.

The above schematic is the circuit in question and is very simple to build and install. One trace on the motherboard must be cut and you then have a four wire hook up to complete the modification.

Arachnid, Inc.

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

Once installed, the circuit will prevent the player change touchplate from operation until a game has been selected.

If after the circuit is installed, you forget to hit a game select button, player one will play, but you will not be able to change to player two. However, if you then hit game select, it will bring the touchplate back into the circuit.

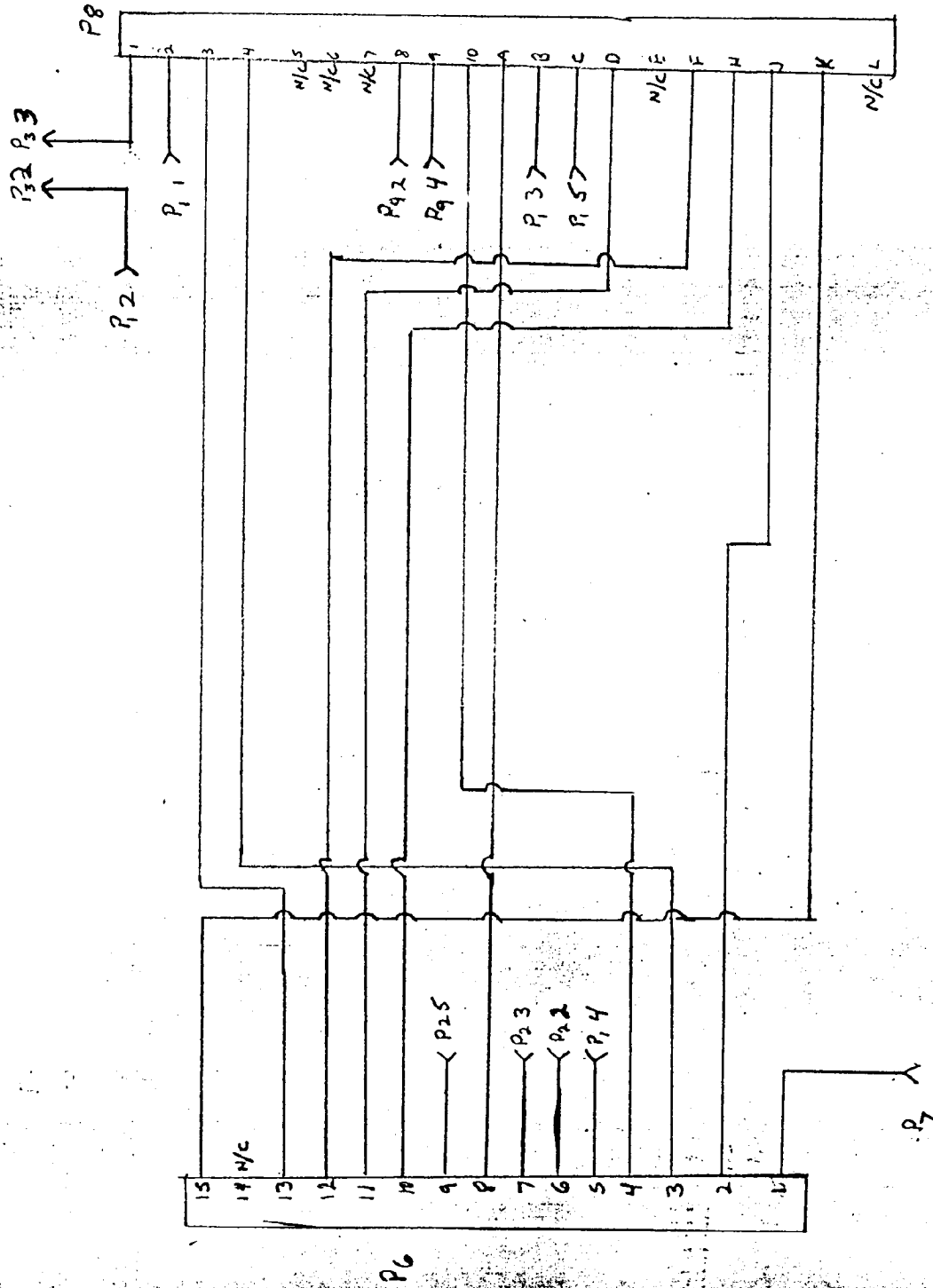
And it will automatically go to player two. From then on the touchplate will operate normally through the end of the game.

On the back of the motherboard, under the first terminal on the right of the large terminal, you will see a short trace, about a half an inch in length. Cut this trace. The wire you have going to the ⁵³⁰380 register will then be soldered to the terminal itself, on the very bottom. The wire going to the collector of the transistor will go to the opposite side of the trace, on the other side of the cut you made. The wire going to the diode will go to I.C. 10 Pin 9. And the wire going to the 560 resistor goes to ground. Installation is now complete and the player change will not work until after a game has been selected.

If you so desire, we will send the completed circuit-ready to install-for a nominal charge.

4K Power Sound HARNESS

4K Power Sound HARNESS



P1 + P2 + P9 SPIN MALE CONN MOLEX

P3 SPIN FEMALE CONN "

P6 15 PIN CONN EDGE BOARD

P7 20 PIN 2 SIDE EDGE BOARD CONN.

THE FOLLOWING IS A LIST OF PROBLEMS AND SUGGESTED MEANS
OF SOLVING THOSE PROBLEMS FOR THE 4000 SERIES ENGLISH
MARK DART GAME.

2-12-81

SYMPTOM	CHECK
1.) L.E.D. displays are not lit.	<p>Transistors Q15 thru Q29, these are 2N4402 PNP's, I.C.'s 44 thru 47 with scope. These are 5~7426 I.C.'s.</p> <p>EXAMPLE: Units led missing in player two score display. Check Q22, if OK, go to I.C.46, pins 8-10-9, if OK, replace LED.</p>
2.) L.E.D. on at wrong time.	<p>Transistors Q15 thru Q29 these are 2N4402's. Check I.C. 44 thru 47.</p> <p>EXAMPLE: Units led partly or all the way on in player 1 display. Check 920, if good, go to I.C. 45 pins 8-10-9. Replace I.C. if gate is found to be bad.</p>
3.) Missing segment on all scoring displays.	<p>Check transistors Q8 thru Q14. These are 2N4400's. Check I.C. 48 and I.C. 34 pins 5 & 6. These are 7405's.</p> <p>EXAMPLE: G segment missing, check Q14, if OK, check I.C. 48 pins 1 & 2. Replace if bad.</p>
4.) Segment out all LED's in temporary score.	<p>Check transistors Q1 thru Q7, these are 2N4400's. Check I.C. 43 and I.C. 7 pins 12 & 13.</p> <p>EXAMPLE: "A" segment out on all temporary score digits. Check Q1, if OK, check I.C. 43 pins 1 & 2. If OK, check I.C. 42, pin 16. Replace bad I.C.'s when found.</p>
5.) Coin up problems.	<p>Check I.C. 5, pins 3 & 6, check I.C. 4, pins 9 & 11. Check I.C. 25, pins 12 & 13. Check I.C. 2, pins 12 & 13. Check I.C. 35, pins 12 & 13. If all these were OK, replace microprocessor.</p>

SYMPTOM

CHECK

6.) No score when target segments are hit.

Check connector from target head to motherboard. If OK, check IC's 16, 17, 18, 26, 27, 25, 2, 35. If no problems are found, replace processor.

EXAMPLE: "1" segment will not score, check pin one on the connector. If it looks OK, check I.C. 18, pins 4 & 5. If this is OK, check I.C. 27, pins 1,2 & 3. If OK, check I.C. 25, pins 2 & 4. If OK, check I.C. 35, pins 3 & 4. If OK, check micro.

7.) Right after coin up, temporary score flashes 3 scores and games goes to player change.

Observe the score in temporary score and divide by 3. This will tell you which segment to check. You will be looking for a stuck segment, may be held in by a dart tip. If this doesn't cure the automatic scoring, check the following: C8-14-I.C.'s 16-17-18-26-27.

EXAMPLE: Scoring a 16 with dart board disconnected, check C-12 and check I.C. 16, pins 4 & 5. If OK, check I.C. 26, pins 1,2, and 3. Replace any chip suspected of being bad.

8.) Won't select game.

Check pins on connector. Check I.C.'s 1 & 2 & 35. Check micro.

EXAMPLE: No cut-throat. Check pin 5 on connector. If OK, check I.C. 2, pins 9 & 11. If OK, check I.C. 35, pins 9 & 10. If OK, check micro.

9.) Game goes to player change by itself.

Check output I.C. 9, pins 3 & 11. Check Q50.

EXAMPLE: Game goes to player change without scoring. Check output I.C. 9, pins 3 & 11. If they have pulse train, check the collector of 450, it should be low. Replace any component that looks suspicious under test.

IF THERE ARE ANY QUESTIONS ON A PROBLEM WITH A DART GAME, FEEL FREE TO CALL ARACHNID, AT 1-815-962-3919 AND ASK FOR RANDY.