

GAME NO. 627
SEPTEMBER 1978

MIDWAY'S ROTATION VIII ELECTRICAL OPERATING INSTRUCTIONS



MIDWAY MFG. CO.
A BALLY COMPANY
10750 WEST GRAND AVENUE
FRANKLIN PARK, ILLINOIS 60131
U.S.A.

PHONE: (312) 451-1360 CABLE ADDRESS: MIDCO TELEX NO.: 72-1596

ROTATION 8
Operating Instructions

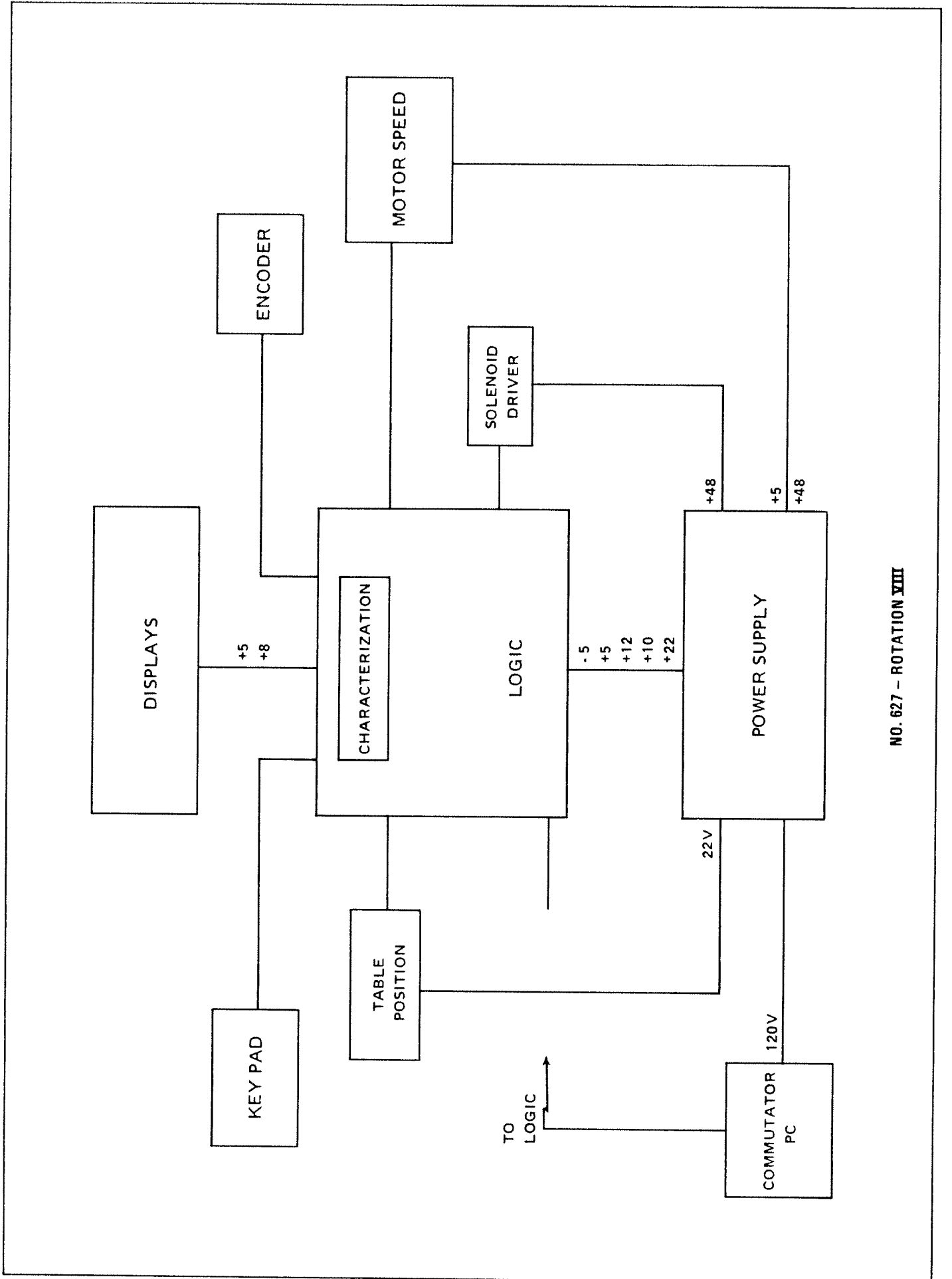
INDEX

COCKTAIL PIN BLOCK DIAGRAM	1
DO'S, DON'TS AND REMINDERS	2
WHAT SHOULD HAPPEN WHEN THE GAME IS FIRST TURNED ON	3
HOW TO START THE GAME	5
HOW TO GET TO THE KEYPAD	6
HOW TO RUN A TEST	6
TEST #1.	8
TEST #2.	8
TEST #3.	13
TEST #4.	14
TEST #5.	14
TEST #6.	14
TEST #8.	17
HOW TO SET THE GAME YOU WANT	17
IN CASE OF DIFFICULTY	17
Lamps; Test 1.	17
Switches; Test 2.	18
Solenoids; Test 3	18
Encoder; Test 4	19
Display; Test 5	21
Table Positioning; Test 6	22
Factory Preset; Test 8	22
GENERAL CONSIDERATIONS	22
Sounds	22
General Lamps	23
Motor Speed	23
Game Does Not Power Up Properly	23
FUSE LOCATIONS	25
HOW TO USE COCKTAIL PIN KEYPAD	26-33

ELECTRICAL

TABLE OF CONTENTS (Cont'd)

	Page No.
WIRING DIAGRAM (GAME LOGIC – “G” VERSION & POWER SUPPLY – “E” VERSION).....	35
GAME LOGIC COMPONENT LAYOUT (“E” VERSION).....	36
GAME LOGIC – LOGIC SECTION (“E” VERSION).....	37
GAME LOGIC – DRIVER SECTION (“E” VERSION).....	38
GAME LOGIC – DRIVER SECTION (“G” VERSION).....	39
GAME LOGIC COMPONENT LAYOUT (“G” VERSION).....	40
GAME LOGIC – LOGIC SECTION (“G” VERSION).....	41
MOTOR DRIVER COMPONENT LAYOUT (“B” VERSION).....	42
MOTOR DRIVER SCHEMATIC (“B” VERSION).....	42
MOTOR DRIVER COMPONENT LAYOUT (“C” VERSION).....	43
MOTOR DRIVER SCHEMATIC (“C” VERSION).....	43
POWER SUPPLY SCHEMATIC & COMPONENT LAYOUTS (“D” VERSION)....	44
POWER SUPPLY SCHEMATIC & COMPONENT LAYOUTS (“E” VERSION)....	45
DISPLAY COMPONENT LAYOUT.....	46
DISPLAY SCHEMATIC.....	47
CHARACTERIZATION SCHEMATIC & COMPONENT LAYOUTS.....	48
KEYBOARD SCHEMATIC & COMPONENT LAYOUTS.....	49
SOLENOID DRIVER SCHEMATIC & COMPONENT LAYOUTS.....	50
TABLE POSITION SCHEMATIC & COMPONENT LAYOUTS.....	51
SHAFT ENCODER SCHEMATIC & COMPONENT LAYOUTS.....	52



NO. 627 - ROTATION VIII

DO'S, DON'TS AND REMINDERS

DO Read the manual completely (cover to cover).

DO Call serviceman when needed.

DON'T. EVER turn table by hand with the ball in the shooter. It will fall into the bottom of the cabinet. At times it is difficult to remove the ball from the bottom of the cabinet.

DON'T. Turn the table if it is dragging or is jammed-up.

REMEMBER: The game will not turn if the ball is not in the outhole.

REMEMBER: Another player cannot "Punch In" when the table is turning.

REMEMBER: Once the game is beyond the first ball, the game in play must be finished before a new game can be started.

WHAT SHOULD HAPPEN WHEN THE GAME IS FIRST TURNED-ON

After the table has its legs mounted, shipping bracket removed, table leveled, and the ball is on the table, plug it in, and turn it on. The "On-Off" switch is under the flipper between the west and south players. The game should do the following, all at once:

1. The lights around the edge of the playfield should turn on and remain on.
2. A musical note or series of notes should be heard.
3. The #1 ball in the "rack" should light.
(The rack is a group of lamps arranged in the shape of a pool rack, see Fig. C).
4. The four-player displays (N,E,S,W) will light up with the "high score" value. If any of these conditions are not met, turn the game off IMMEDIATELY! Then see, "In Case Of Difficulty".

The next things to look for are:

1. The "Game Over" lamp will start flashing and remain flashing.
2. The #2 rack lamp should light along with the #1 rack lamp.
3. The four player displays will alternate between high score and last player score or "00" if just powered up.

The rack lamps should continue to light up the rack, in order, at an approximate 1 second rate.

On the 15th rack lamp, the display will recycle (start at #1).



RACK

FIG. C

At this time read:

“How To Get To The Keypad”, then

“How To Run A Test”, then

if your game has lost it's preset program in shipping, then Run “Test #8”.

If your game is OK, read

“How To Start Game”.

If you have trouble, see

“In Case Of Difficulty”.

HOW TO START GAME

To start the game THE BALL MUST BE IN THE OUT HOLE.

1. Open the coin door and flip the coin switch a few times. Make sure credits are adding up in the credit display. With each credit, a tone should be heard. Close the coin door.
2. Press a player call button. The credits will decrease and the number 1 will appear in the ball display. The playfield should turn to face you and then stop when it is exactly on target.
3. The ball will kick out of the out hole and land in the shooter.
4. The display of the location that you pressed should flash “00” in the 10's and 1's digits.
5. The shooter is located to the right of the call button and the flipper buttons are on each side.
6. PLAY THE GAME, Good Luck.

7. At the end of the game, the "Game Over" light should come on, your score and the high score are flashed alternately.

HOW TO GET TO THE KEYPAD (Coin Door Call Button)

On each coin door, there is a small red button mounted on the upper-right part of the coin door. With this button, the keypad can be called to the coin door of your choosing. This **MUST** be done with the game in "Game Over" and the BALL IN THE OUT HOLE.

HOW TO RUN A TEST

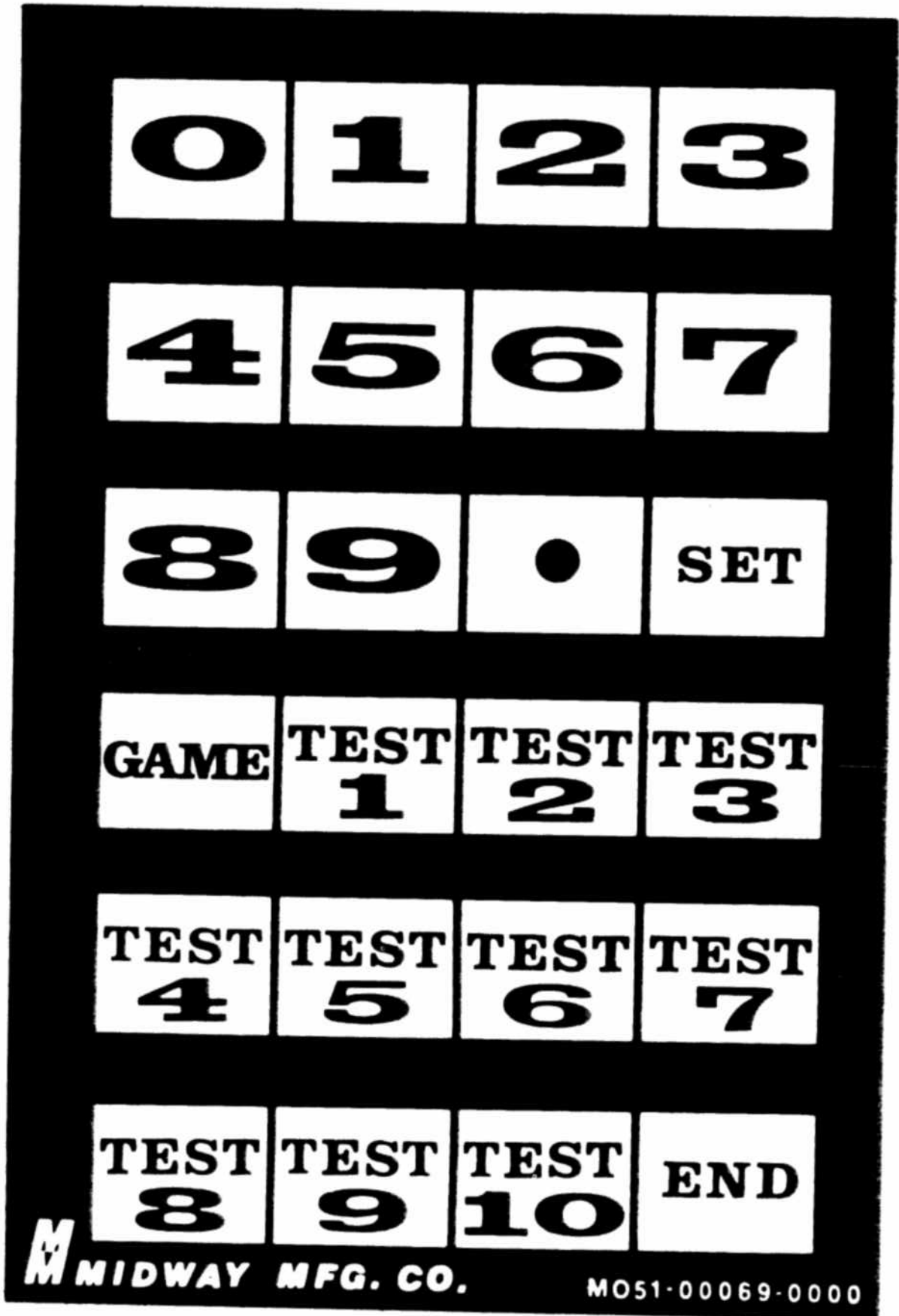
(see Fig. H)

All test MUST BE DONE IN "GAME OVER", WITH THE BALL IN THE "OUT HOLE".

Call the keypad to a coin door using the coin door call button. To use the test:

1. Press "Game".
2. Press "End".
3. Then press the desired test button, listed below.
4. When done testing, press "Game". If another test is to be run, repeat the above procedure.

(FIG. H)



TEST INDEX

Test #1	Lamp Test
Test #2	Switch Test
Test #3	Solenoid Test
Test #4	Encoder Switch Test
Test #5	Display Test
Test #6	Table Position Test
Test #7	Not Used
Test #8	Factory/Operator Memory Preset
Test #9	Not Used
Test #10	Not Used

TEST #1 (see Figs. 1 and 2)

To test all light bulbs or to show if a column or row is bad. When pressed, ALL playfield lamps should be on. The lamps that are out, should be replaced. If a bulb was replaced and still does not light, see "In Case Of Difficulty".

TEST #2 (see Figs. 1 and 3)

Shows any closed switches. Test #2 should be done without the ball being on the playfield. This test is used in finding stuck, intermittent or non-functioning switches. Each switch has a code number, and it will be displayed in all the player displays. It is a two-digit number. The 10's digit shows which column it is on and the 1's digit shows which switch row it is on. A listing of switches by code number is listed in Fig. 3.

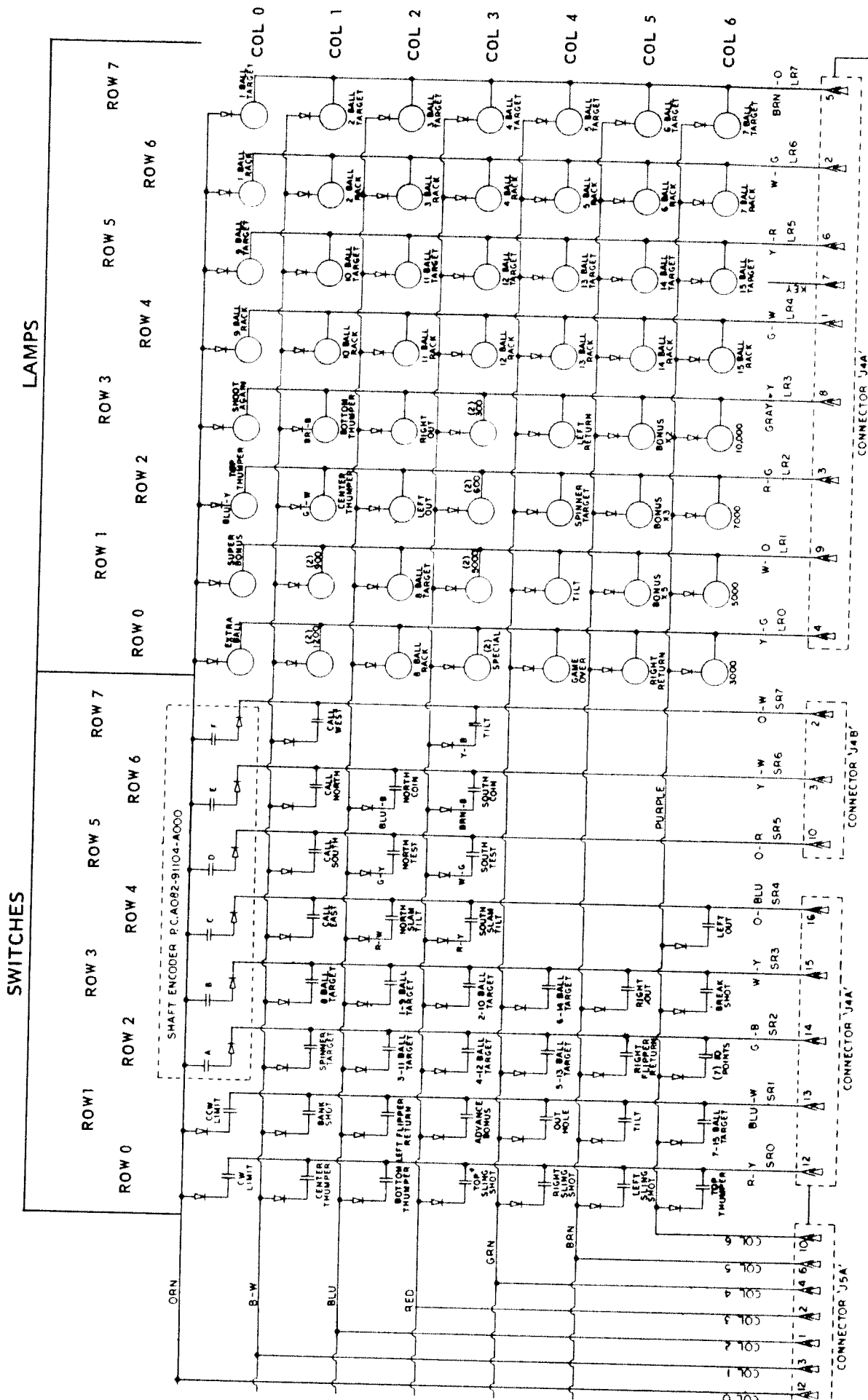
NOTE: The highest value switch will be displayed (Example: 30 will be displayed if 07 and 30 were on).

NOTE: If 41 is displayed, the ball was left in the out hole.

NOTE: If there are no stuck switches, then a number between 02 and 07 will be displayed. These numbers correspond to the angle encoder. To check out the encoder, use the encoder test and to check out the optical switch, use the table position test.

FIG. 1

(TESTS 1 & 2)



LOGIC BOARD

FIG 2

ROTATION 8

LAMP MATRIX

(TEST #1)

	C	O	L	U	M	N	S
	★ ★ 0 ★	★ ★ 1 ★	★ ★ 2 ★	★ ★ 3 ★	★ ★ 4 ★	★ ★ 5 ★	★ ★ 6 ★
7	★ ★ TARGET ★ 1	★ ★ TARGET ★ 2	★ ★ TARGET ★ 3	★ ★ TARGET ★ 4	★ ★ TARGET ★ 5	★ ★ TARGET ★ 6	★ ★ TARGET ★ 7
6	★ ★ RACK ★ 1	★ ★ RACK ★ 2	★ ★ RACK ★ 3	★ ★ RACK ★ 4	★ ★ RACK ★ 5	★ ★ RACK ★ 6	★ ★ RACK ★ 7
R 5	★ ★ TARGET ★ 9	★ ★ TARGET ★ 10	★ ★ TARGET ★ 11	★ ★ TARGET ★ 12	★ ★ TARGET ★ 13	★ ★ TARGET ★ 14	★ ★ TARGET ★ 15
O 4	★ ★ RACK ★ 9	★ ★ RACK ★ 10	★ ★ RACK ★ 11	★ ★ RACK ★ 12	★ ★ RACK ★ 13	★ ★ RACK ★ 14	★ ★ RACK ★ 15
W 3	★ ★ S.P.S.A ★	★ ★ BOTTOM ★ T.B.	★ ★ RIGHT ★ OUT ★ LANE	★ ★ BANK ★ SHOT ★ 300 (2)	★ ★ LEFT ★ FLIPPER ★ RETURN	★ ★ 2X	★ ★ BREAK ★ SHOT ★ 10K
2	★ ★ TOP ★ T.B.	★ ★ CENTER ★ T.B.	★ ★ LEFT ★ OUT ★ LANE	★ ★ BANK ★ SHOT ★ 600 (2)	★ ★ SPINNER	★ ★ 3X	★ ★ BREAK ★ SHOT ★ 7K
1	★ ★ SUPER ★ BONUS	★ ★ BANK ★ SHOT ★ 900 (2)	★ ★ TARGET ★ 8	★ ★ BANK ★ SHOT ★ 5000 (2)	★ ★ TILT	★ ★ 5X	★ ★ BREAK ★ SHOT ★ 5K
0	★ ★ BREAK ★ SHOT ★ EXTRA ★ BALL	★ ★ BANK ★ SHOT ★ 1200 (2)	★ ★ RACK ★ 8	★ ★ BANK ★ SHOT ★ SPOL (2)	★ ★ GAME ★ OVER	★ ★ RIGHT ★ FLIPPER ★ RETURN	★ ★ BREAK ★ SHOT ★ 3K

FIG. 3

TEST #2 LISTING:

Switch #	Description
00	CW SW OPTICAL ASSY. NOT SEEN, USUALLY
01	CCW SW OPTICAL ASSY. NOT SEEN, USUALLY

02	*
	*
03	*
	*
04	*
	*
05	*****
	*
06	*
	*
07	*

10	CENTER T.B.
11	BANK SHOT OUTLANE
12	SPINNER
13	8 BALL TARGET
14	CALL EAST
15	CALL SOUTH
16	CALL NORTH
17	CALL WEST
20	BOTTOM T.B.
21	LEFT FLIPPER RETURN
22	3/11 TARGET
23	1/9 TARGET
24	NORTH SLAM (IF USED)
25	NORTH TEST BUTTON
26	NORTH COIN
27	NORTH TILT (IF USED)

Fig. 3 (cont.)

Switch #	Description
30	TOP SLING SHOT
31	BANK SHOT ADVANCE
32	4/12 TARGET
33	2/10 TARGET
34	SOUTH SLAM (IF USED)
35	SOUTH TEST
36	SOUTH COIN
37	SOUTH TILT
40	RIGHT SLING SHOT
41	OUTHOLE
42	5/13 TARGET
43	6/14 TARGET
44	-----
45	-----
46	-----
47	-----
50	LEFT SLING SHOT
51	-----
52	RIGHT FLIPPER RETURN
53	RIGHT OUT LANE
54	-----
55	-----
56	-----
57	-----

Fig. 3 (cont.)

Switch #	Description
60	TOP T.B.
61	7/15 TARGET
62	10 POINTS
63	BREAK SHOT HOLE
64	LEFT OUT LANE
65	-----
66	-----
67	-----

TEST #3 (see Fig. 4)

This test checks all solenoids. It energizes all solenoids automatically except the flippers, which are done manually. If the flippers need to be tested, press the flipper buttons on either side of the display, during the test. The flippers will then be energized automatically at the proper time. The test shows a code for what solenoid should be energized at that time. The code is shown in the ball display. A listing of solenoid code numbers and energization order is shown below.

NOTE: If the ball was in the out hole, it will be ejected to the shooter. Do not turn the table as the ball will fall off the table and into the cabinet. Also remember the game will not start or turn without the ball in the out hole.

FIG 4

Solenoid #	Name
40	OUTHOLE
41	BANK SHOT
42	CENTER T.B.
43	BOTTOM T.B.
44	TOP T.B.
45	TOP SLING SHOT
46	RIGHT SLING SHOT
47	LEFT SLING SHOT
50	BREAK SHOT
53	3 FLIPPERS

TEST #4 (see Fig. 5)

This test shows the code number for the encoder switches. This number is displayed in the ball display.

At the center of each player's location, the encoder should have a certain code number:

NORTH	00
EAST	20
SOUTH	40
WEST	60

As the table is rotated, the count should go up when turned clockwise, and should go down when turned counterclockwise. Since the game is using an electronic system, it will count in octal arithmetic. An 8 or a 9 will never be displayed in the 1's digit.

TEST #5

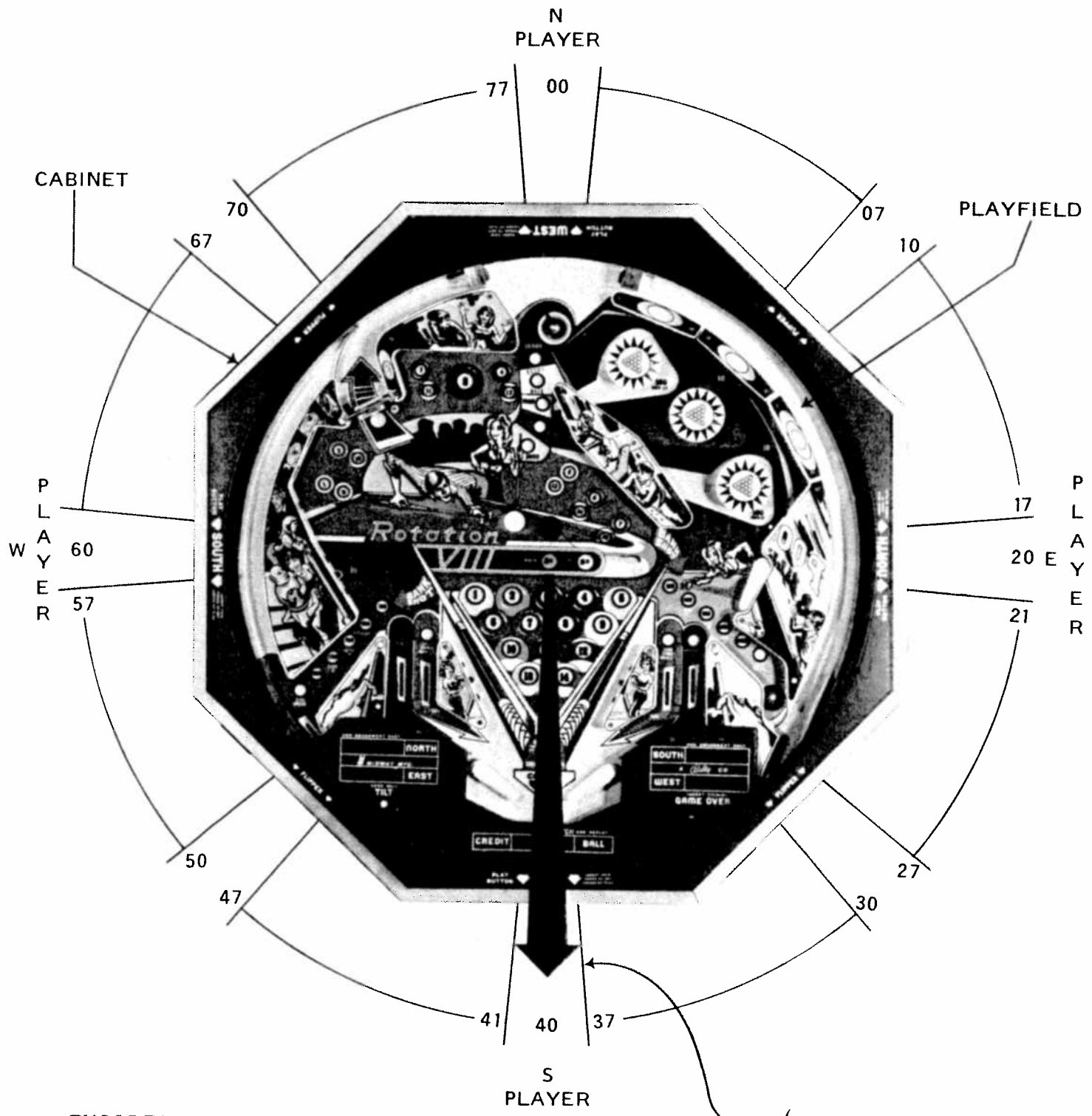
This test checks the display. It will run through the numbers 0 to 9 on each digit of all the displays except the middle two digits of the credit/ball display.

TEST #6 (see Fig. 6)

This tests the table position switch. This is not a mechanical switch, it uses the reflection of infrared light to sense it's location. The table should stop on location code 3. Area 3 is the exact place the table will stop. Areas 1 and 2 are indexes to find area 3. The area code will be displayed in the ball display.

Reading	Meaning
0	NEITHER SW ON
1	CW " "
2	CCW " "
3	BOTH " " (HOME POSITION)

FIG. 5



ENCODER — READINGS
 (OVER HEAD VIEW
 GAME IN CABINET)

EXAMPLE:
 THE CODE DISPLAY
 WOULD BE 40.

(TEST 4)

FIGURE 6

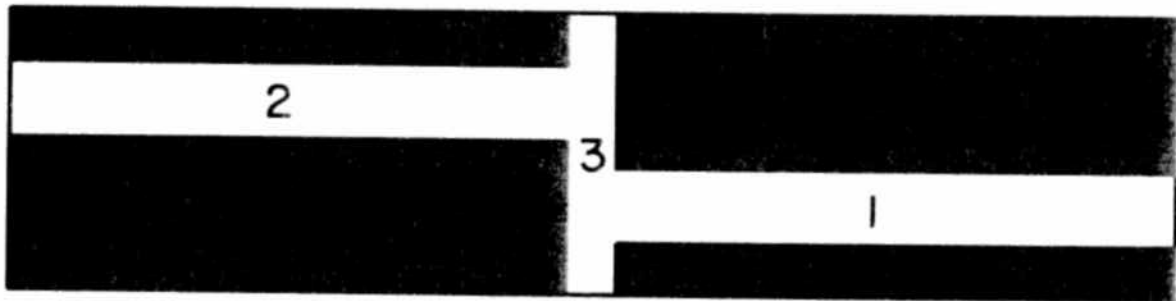
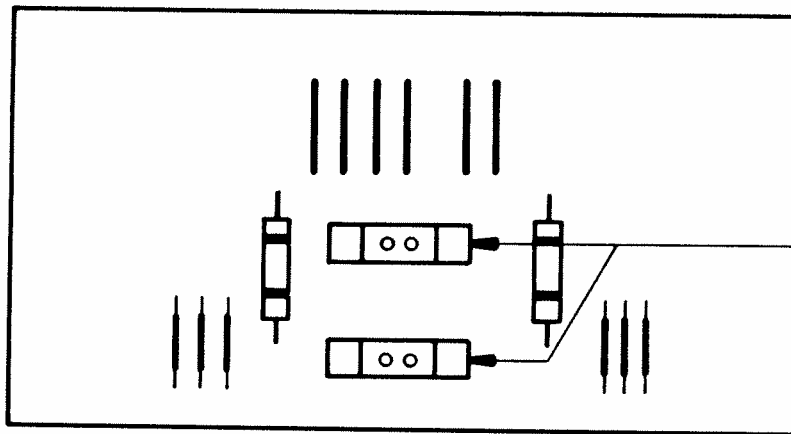


TABLE POSITION REFLECTOR

(WHITE SHOWS REFLECTIVE AREAS)



OPTIC TRANSDUCERS

TABLE POSITION BOARD

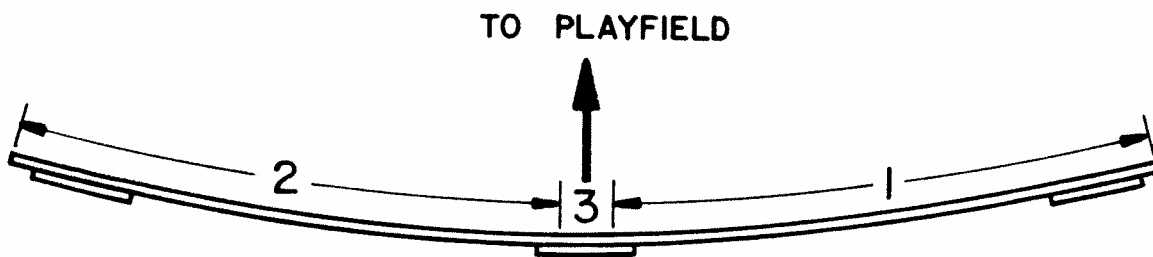


TABLE POSITION REFLECTIVE BRACKET

(TEST #6)

TEST #8

This is not really a test, it is a Factory/Operator Preset. It sets the game options to factory specifications. A listing of the setup can be found in the "How To Use The Cocktail Pin Keypad".

HOW TO SET THE GAME YOU WANT (Programming)

See "How To Use The Cocktail Pin Keypad".

IN CASE OF DIFFICULTY

FEATURE LAMPS; TEST 1.

Burnt Out Lamps.

Replace lamps that are out. If the lamps still do not light up, follow the procedure given below.

— Check to see if all the lamps that are out are on the same column or row. If exactly 7 lamps are out, chances are that a row driver will have to be replaced. If 8 lamps are out, a column drive is probably the cause. One way to verify this is to check the wiring diagram. On the upper-right hand corner of the diagram is a matrix which shows which lamps are on what column or row. If the lamps that are out correspond to a particular row or column, then changing that particular driver transistor may solve the problem.

Another way to check for bad columns or rows is to look at the color of the wire going to all the lamps that are out. If the same colored wire goes to all of them, then a row or column driver may be at fault.

VERY BRIGHT LAMPS OR LAMPS ON ALL THE TIME

This problem may arise because of column or row driver problems. Follow the procedure mentioned for BURNT OUT LAMPS in order to determine the malfunctioning row or column.

NOTE: See Fig. 7 to determine the location of column and row transistors.

NO LAMPS

Check feature lamp fuse.

Check logic fuse.

Check wiring and lamp jacks.

SWITCHES; TEST #2

Always Closed:

Adjust switch manually.

Intermittent:

Adjust switch.

Switch Does Not Work:

Check wiring.

SOLENOIDS; TEST #3

Solenoid Stuck On:

1. Check solenoid driver board and make sure that none of the transistors are shorting.
2. Check the wiring.
3. Check the UDN 2981 chips on the logic and driver board. (see Fig. 7)

If flippers are stuck on, check all of the above and then also check 7402 chip on logic board (see Fig. 7).

Solenoid Always off:

If all solenoids are always off, check the solenoid fuse.

If a single solenoid is always off, follow the test procedure for "SOLENOID STUCK ON".

Also, check the wiring and the pin-outs on the solenoid connectors.

ENCODER; TEST #4

Important: If the encoder is not properly adjusted and aligned, it may not be possible to operate the game. The encoder must read the numbers shown in Fig. 8 for the North, South, East and West positions.

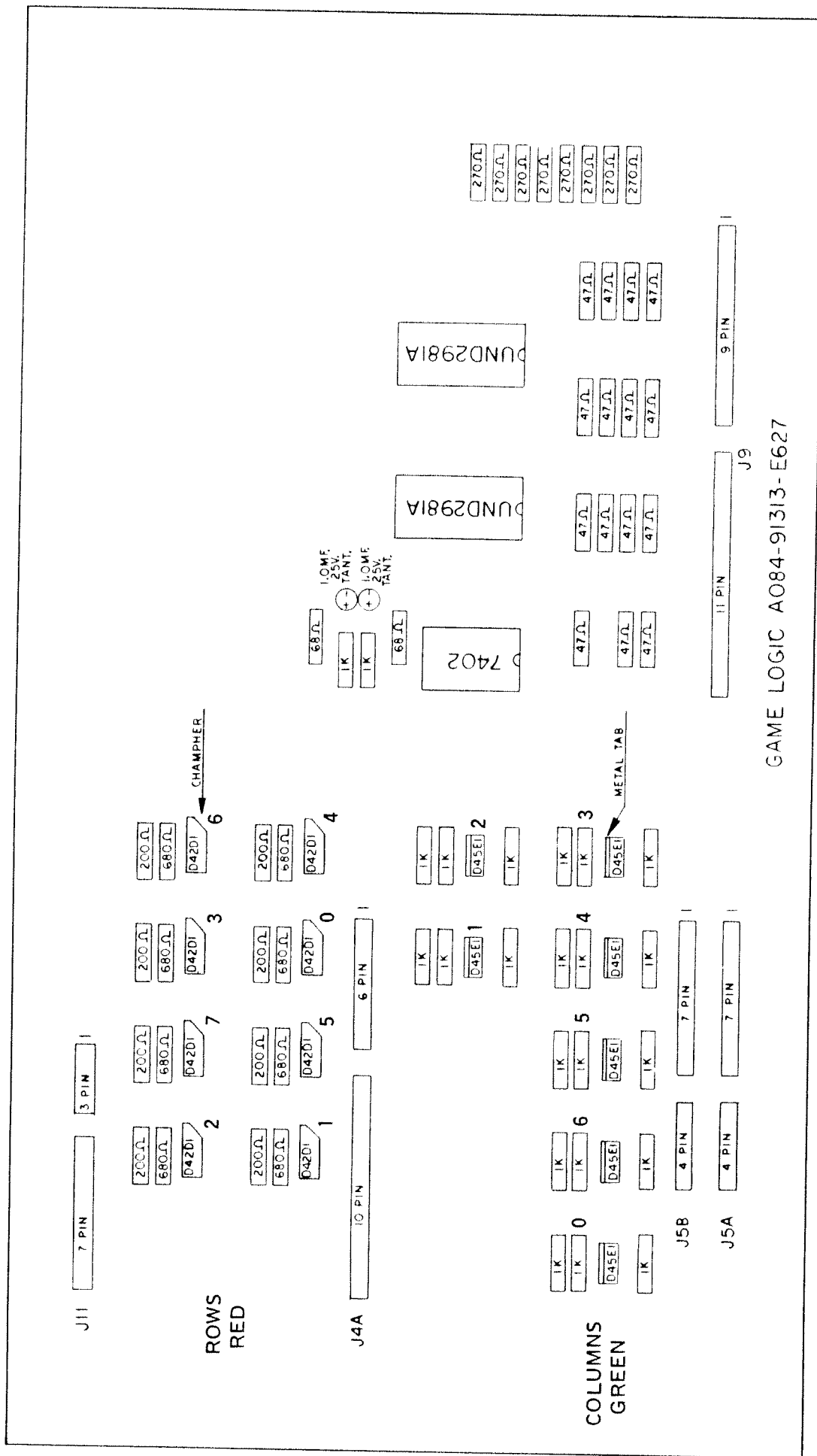
If the number is off and the optical switch sees blank space instead of the reflector, the game will go into a no-operation mode. In this mode, the game will not turn, nor will it eject the ball from the out hole.

To adjust the angle encoder, do the following:

1. There are set screws located below the angle encoder P.C., holding the shaft of the encoder in place. Loosen these set screws so that the shaft can be moved easily by hand.
2. Move the table to North, South, East or West position (see Note on next Page).
3. Put the game into the encoder test mode.
4. Adjust the encoder shaft by hand till you read the proper number in the display.

The numbers should be, depending upon your position, as shown in Fig. 8:

FIG. 7



GAME LOGIC A084-91313-E627

ALL CAPS ARE 50V AXIAL LEAD CERAMIC UNLESS OTHERWISE SPECIFIED

FIG. 8

NORTH	00
EAST	20
SOUTH	40
WEST	60

5. Carefully, retighten the set screws, using the encoder test. Make sure that you read the right number corresponding to the four positions. If you find you are still off, repeat the above procedure.

NOTE: To make sure that you are on NORTH, SOUTH, EAST or WEST position, use Test #6 (Table Positioning) which will indicate when you are exactly homed in.

DISPLAY; TEST #5

Bad Digit

If the same order digit on each of the five displays is malfunctioning, then run Test #1 and follow the procedure outlined to determine defective column driver. Check the TIP 140 transistors on the display board.

NOTE: Malfunction implies digit off or digit on very brightly. If a single digit is out or a segment from a digit, replace the L.E.D. block that the digit is on.

Missing Display

Check the display fuse on the power supply.

Check out the jacks corresponding to the displays.

TABLE POSITING; TEST #6

No Reading

1. Make sure that the jack going to the table positioning P.C. has not been yanked off. Also make sure that the encoder jack is on properly.
2. Check the reflector brackets which are mounted in the game cabinet near the bottom. There are four of these, one for each position. Make sure that these are placed perpendicular to the optical devices on the table positioning P.C.

FACTORY PRESET; TEST #8

This is not really a test but it sets all the game options and features to a predetermined value. The exact values are shown in the "How To Use The Cocktail Pin Keypad".

GENERAL CONSIDERATIONS

SOUNDS ("E" VERSION LOGIC BOARDS)

Loud Hum:

1. Make sure that the sound amplifier chip (LM 383) is properly grounded (pin 3).
2. Check to see if the chip is making good contact with the heat sink.
3. Make sure grounds are isolated. You can do this by unplugging all the jacks that go to the logic board. Using a VOM with ohms setting RX1, measure from the case (or pin 5) of the LM 383 to logic ground. You should read 100 ohms or more. If you read 100 ohms or less, check for shorts between power and logic grounds.

No Sound:

1. Make sure sound amplifier chip is getting power (Pin 5, 10V unregulated).
2. Check to see that the speaker jack is inserted properly.
3. Turn volume pot up.

SOUNDS ("G" VERSION LOGIC BOARDS.)

Loud Hum:

1. Make sure that the sound amplifier chip (LM 377) is properly grounded (Pin 3,4,5,10, 11, 12).
2. Check to see if the chip is making good contact with the heat sink.
3. Make sure grounds are isolated. You can do this by unplugging all the jacks that go to the logic board. Using a VOM with ohms setting RX1, measure from the case (Pin 3,4,5,) of the LM 377 to logic ground. You should read 100 ohms or more. If you read 100 ohms or less, check for shorts between power and logic grounds.

No Sound:

1. Make sure sound amplifier chip is getting power (Pin 14, 20V. unregulated).
2. Check to see that the speaker jack is inserted properly.
3. Turn volume pot up.

GENERAL LAMPS

No General Illumination:

Check fuse on power supply.

Check main line fuse.

MOTOR SPEED

Motor Will Not Turn

1. Check the fuse on motor speed board.
2. Check the solenoid fuse.

3. Make sure table is not jammed-up by loose cabling, etc.
4. Check wiring to motor speed board and to motor making sure that the female clips which are inserted on the motor, are making proper contact.

NOTE: Make sure that of the two clip on leads that go to the motor, the black one is on the outside and the red on the inside.

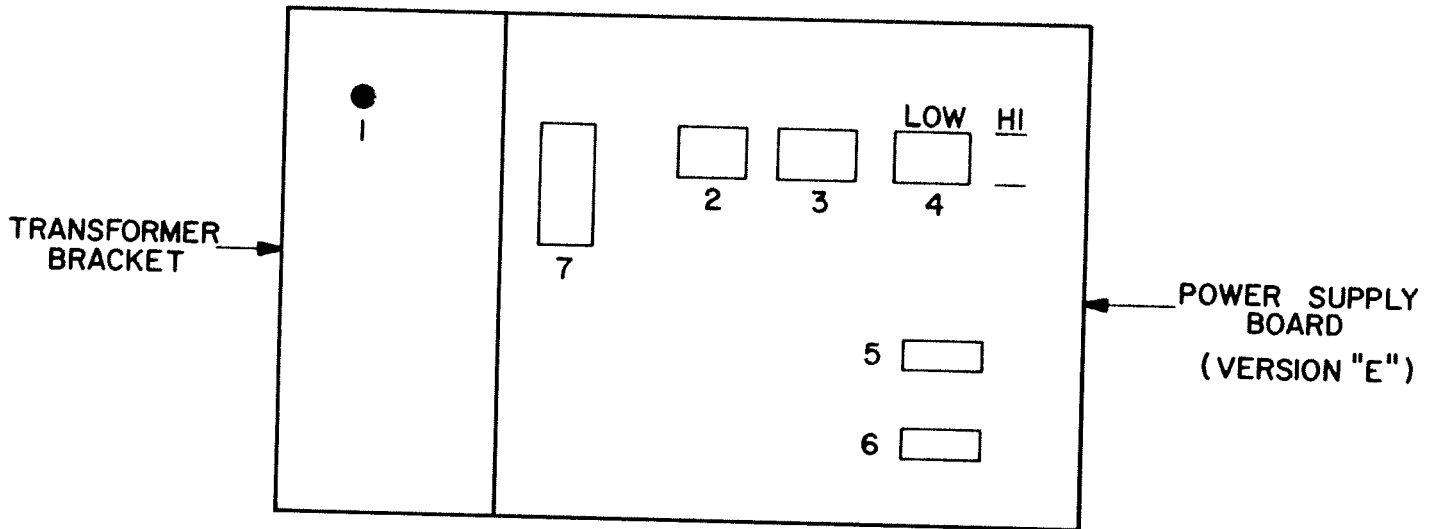
GAME DOES NOT POWER UP PROPERLY

1. Check line fuse.
2. Make sure that power supply is operational. Check the power supply voltage, especially those going to the logic board.
3. Remove the character board. Make sure that the ROMs are seated in their sockets properly and that no pins are bent.
4. Mount the characterization card back in the logic board connector, taking care to see that it is leveled firmly against the logic board.
5. Check the primary of the transformer to ensure that it is getting A.C. voltage from outside.

CAUTION:

In trouble shooting the game, if you find that solenoids energize and stay on, then it is advisable to disconnect the solenoid jack from the logic board.

FUSE LOCATIONS



1	Power Line Fuse	120/220 Primary	2 A Slo Blo
2	Display Fuse	+8 Vled.	4 A
3	Feature Lamp Fuse	+22, +12	6 A
4	Solenoid Fuse	+48 Sol. & Mot. (22)	4 A Slo-Blo
5	Logic Fuse	+5, -5, Unreg. +5 +10	2 A Slo-Blo
6	General Lighting Fuse	5.5 Vac.	8 A
7	Motor Speed Fuse	+48 V.	½ A Slo-Blo

NOTE: ½ A Slo-Blo, mounted on motor speed. (Version "D" only).

* 4 A Slo-Blo, can be mounted low or high voltage for solenoids.

HOW TO USE COCKTAIL PIN KEYPAD

1. To bring keyboard to either coin door, push "red" button mounted on coin door. This button is only active in the game/over condition.
2. THE "game computer" WILL NOT rotate the playfield if the ball is not in the outhole.
3. **WARNING:**

Do not move the playfield by hand with the ball in the shooter.

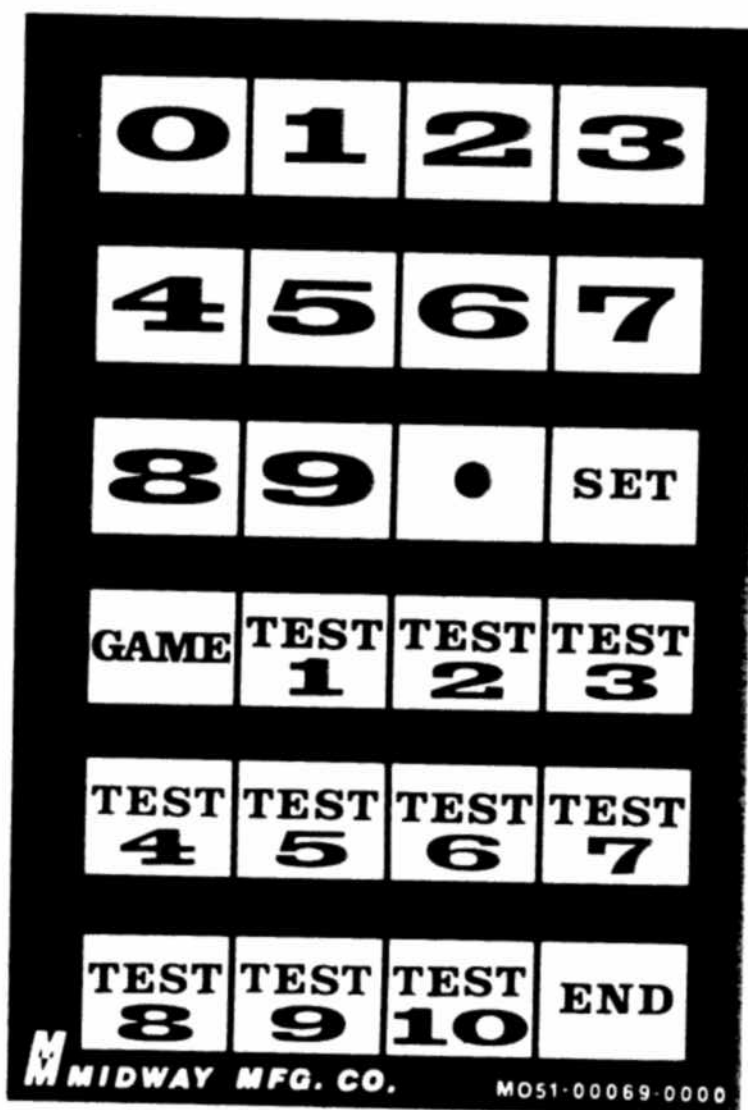


FIG. 1

The keyboard can only be used when the game is in "game over".

The keyboard is used to display and modify operator settable features.

See Figure 1.

TO DISPLAY a feature:

1. Press "end" key.
2. Press "set" key; player displays 1 to 4 should go blank.
3. Press "dot" key.
4. Press numbered keys (0 to 9) until desired feature number, see page 28, is displayed in "match/ball in play" window.
5. Press "dot"; current value of desired feature will appear in players 1 to 4 displays.

NOTE: If a feature number larger than the last number listed on page 29 is entered, game will return to the "game over" still state.

Example:

To display feature number "10":

Press: "end", "set", "dot", "1", "0", "dot"

If you do not wish to change value:

Press "game" key, if you are done.

Press "end" key, if you want to check another feature.

6. ***TO MODIFY*** feature value, press number keys until desired number appears in displays 1 to 4.
7. When number is correct:
Press "game" key, if you are done with keypad.
Press "end" key, if you want to go to another feature or do a test.

8. To do a test, press "end" and then press:

"Test 1": Lamp Test (all lamps will lite)
"Test 2": Stuck switch test (page 29)
"Test 3": Solenoid test (page 32)
"Test 4": Encoder readout (page 32)
"Test 5": Digit test (0 to 9)
"Test 6": Optical switch check (page 33)
"Test 8": Nonvolatile Ram setup (page 33)

NOTE: To do another test, do step 8.

9. You can return to the "game over" still state at any time by pressing the "game" key.

LIST OF GAME FEATURES

- 00 Total coins thru chute 1 (north door)
- 01 Total coins thru chute 2 (south door)
- 02 Total plays (payed and free)
- 03 High score to date

NOTE: Features 04, 05 & 06 can be disabled by setting value to 000000.

- 04 First level score award
- 05 Second level score award
- 06 Third level score award
- 07 Total replays (free)
- 08 Current credits
- 09 Credits per coin:

	Credits	Coins	
Enter 11 =	1	1	
Enter 21 =	2	1	
Enter 31 =	3	1	
Enter 41 =	4	1	
Enter 51 =	5	1	
Enter 61 =	6	1	
Enter 71 =	7	1	
Enter 81 =	8	1	
Enter 91 =	9	1	
Enter 52 =	5	2	(2 + 3)
Enter 12 =	1	2	(0 + 1)
Enter 13 =	1	3	
Enter 32 =	3	2	(1 + 2)

Enter any other number = 1 per 1 coin.

- 10 1 = Replay
0 = Extra ball; for beating each score level (04, 05, 06)
- 11 1 = Match feature on
0 = Match feature off

- 12 1 = Credits are displayed
0 - Credits are not displayed
- 13 1 = Game over table mover enabled
0 = Game over table mover disabled
- 14 1 = Plays tunes
0 = Plays single notes only
- 15 1 = Each target is spotted individually
0 = Targets 1/9 spotted with 4/12; Targets 2/10 spotted with 3/11
- 16 1 = 20,000 points for beating a score level and disables features "10"
0 = No points and enables feature "10"
- 17 1 = Bank shot starts at 600
0 = Bank shot starts at 300
- 18 1 = free play
0 = No free play
- 22 Number of balls per game: 01 to 05, any other number will give 5 balls.
- 23 Maximum credits that can be accumulated. Set by operator.
- 24 Number of replays awarded for beating "Hi-Score". Enter : 00 or 01 or 02 or 03.

TEST 2 — STUCK SWITCH

NOTE: The switch number will appear in player displays 1 to 4.

The ball cannot be in the outhole for this test to be able to check all the switches. Do "Test 3" first to put the ball in the shooter.

Switch #	Description
00	CW. Sw. Optical Assy. (Not Seen)
01	CWW. SW. Optical Assy.

Switch #	Description
02	
03	Gray Code
04	Shaft
05	Position
06	Encoder
07	
10	Center T. B.
11	Bank Shot Outlane
12	Spinner
13	8 Ball Target
14	Call East
15	Call South
16	Call North
17	Call West
20	Bottom T. B.
21	Left Flipper Return
22	3/11 Target
23	1/9 Target
24	North Slam
25	North Test Button
26	North Coin
27	North Tilt (If Used)
30	Top Sling Shot
31	Bank Shot Advance
32	4/12 Target
33	2/10 Target

Switch #	Description
34	South Slam
35	South Test
36	South Coin
37	South Tilt
40	Right Sling Shot
41	Outhole
42	5/13 Target
43	6/14 Target
44	-----
45	-----
46	-----
47	-----
50	-----
51	Left Sling Shot
52	-----
53	Right Flipper Return
54	Right Outlane
55	-----
56	-----
57	-----
60	Top T.B.
61	7/15 Target
62	10 Points
63	Break Shot Hole
64	Left Outlane
65	-----
66	-----
67	-----

TEST 3 — SOLENOID TEST

NOTE: Number appears in "Match" window

Solenoid #	Name
40	Outhole
41	Bank Shot
42	Center T.B.
43	Bottom T.B.
44	Top T.B.
45	Top Sling Shot
46	Right Sling Shot
47	Left Sling Shot
50	Break Shot
53	Flippers

TEST 4 — ENCODER READOUT

NOTE: Used to check encoder number for any playfield position. Number is displayed in "Match" window.

Playfield Position (Outhole)	Number
North	00
East	20
South	40
West	60

TEST 6 — OPTICAL SWITCH READOUT

NOTE: Used to check optical switch operation. Number is displayed in "Match" window.

Reading	Meaning
0	Neither Sw. on
1	CW Sw. on
2	CCW Sw. on
3	Both Sw. on (home position)

TEST 8 — NONVOLATILE RAM (NVR) SETUP

The NVR can be set to certain fixed settings by using this test button.

The purpose is to allow an operator to set certain game settings without doing each one separately.

The values are as follows:

North coin chute total:	010000
South coin chute total:	010000
Total plays:	010000
High score:	400000
First score level:	200000
Second score level:	300000
Third score level:	400000
Total replays:	010000
Credits:	00
Credits per coins:	11 (One credit per coin)
Balls per game:	3
Max. credits allowed:	10

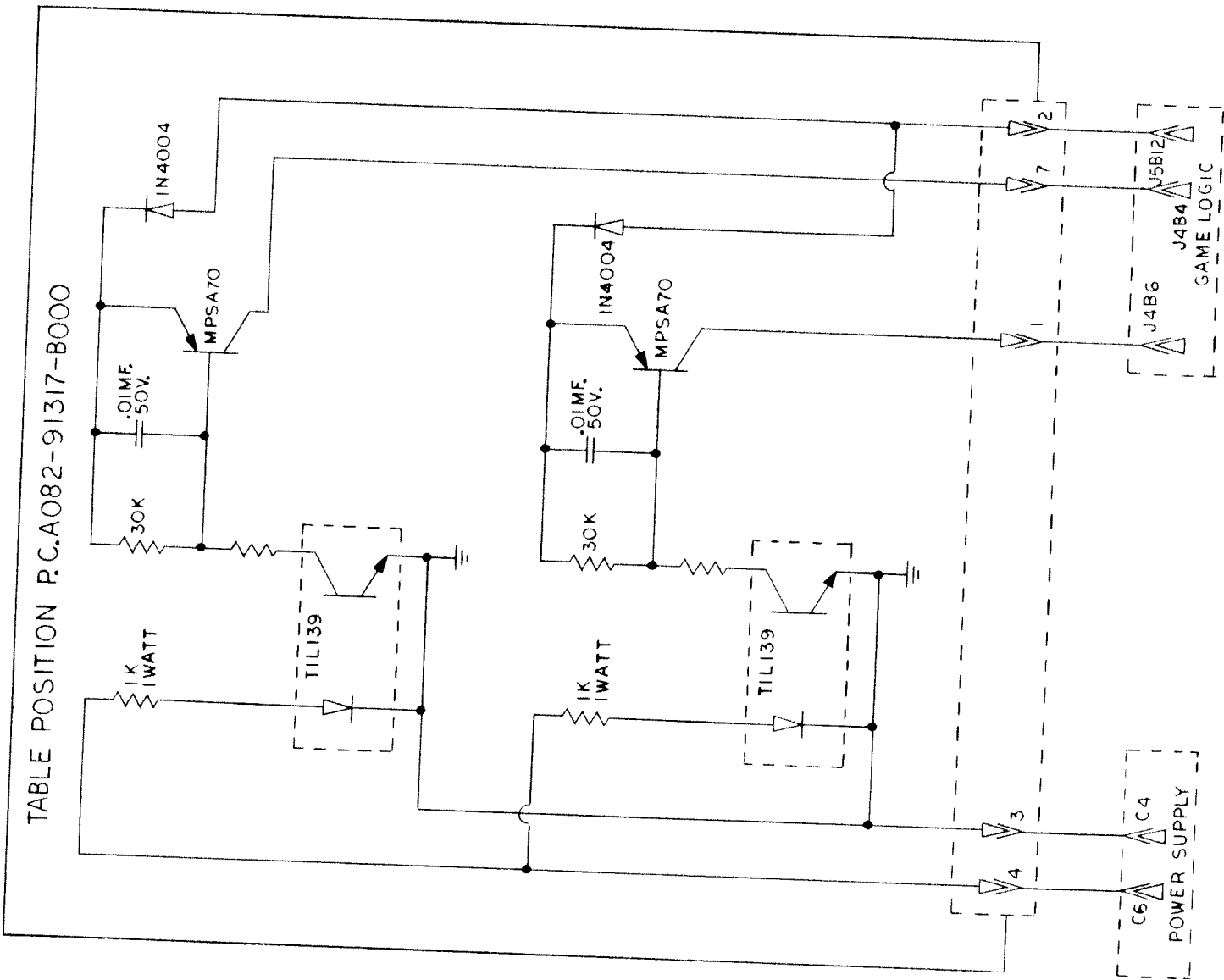
1 replay for beating each score level. 3 replays for beating high score to date.

"Free play" is off.

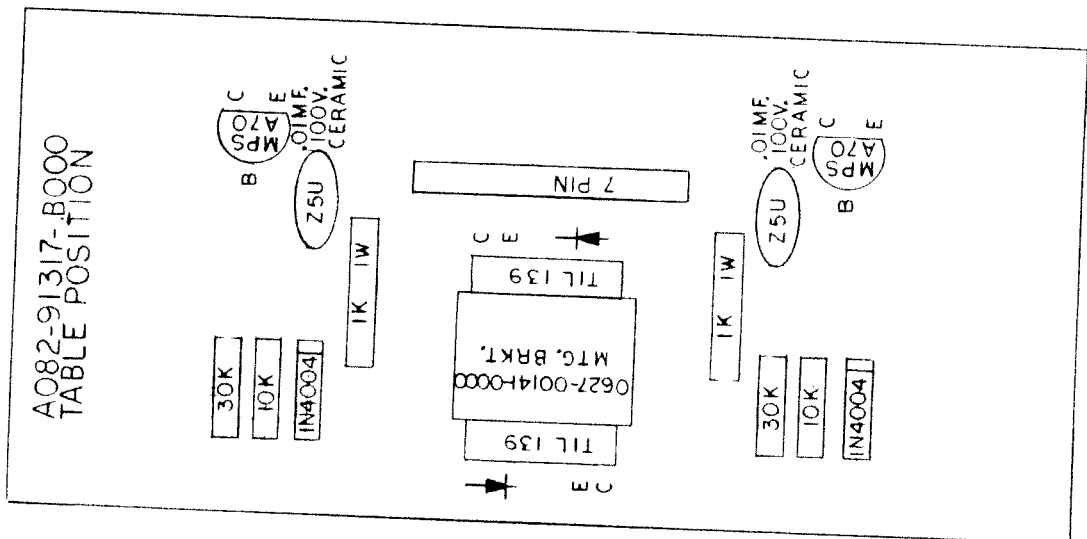
NOTES

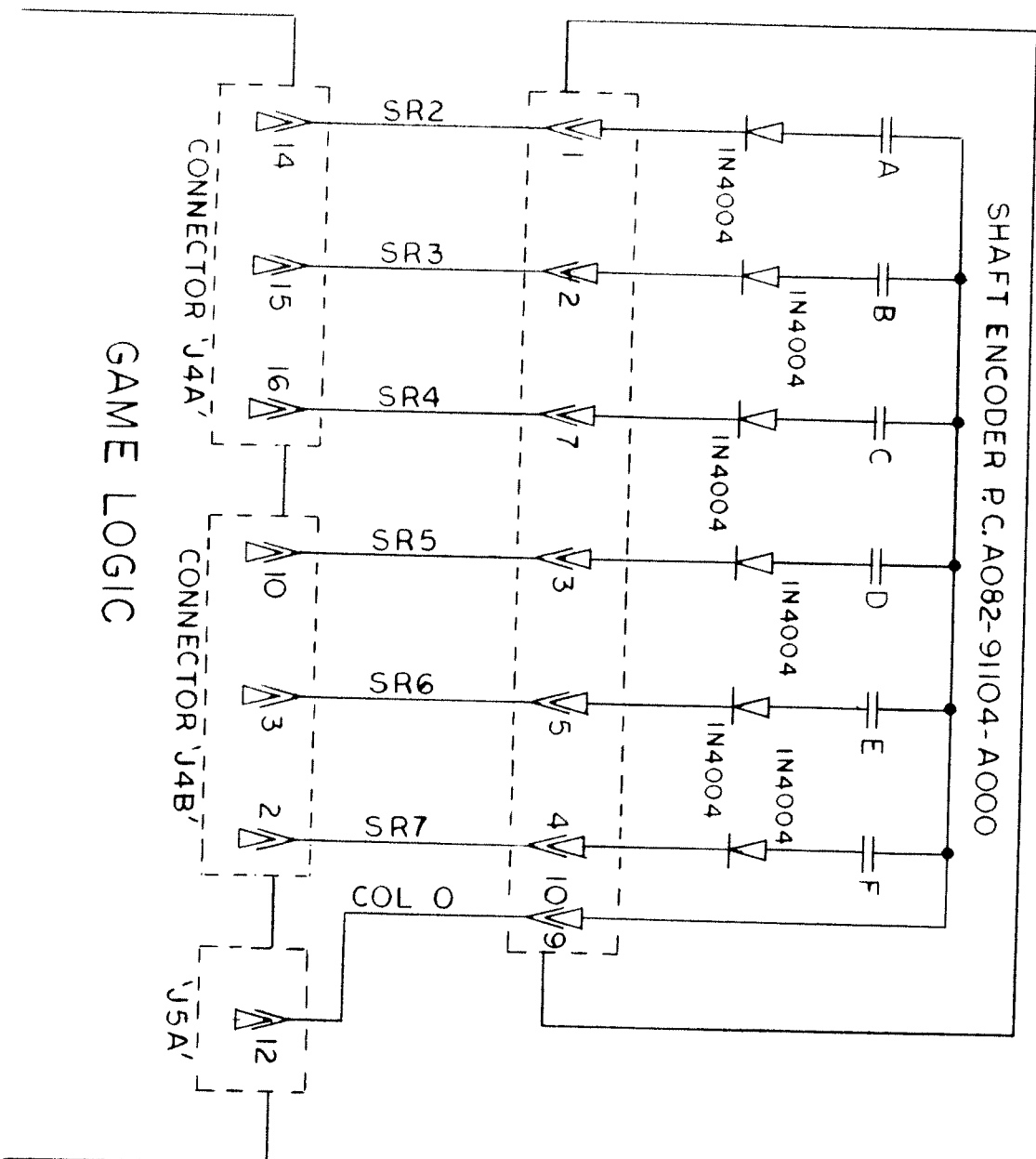
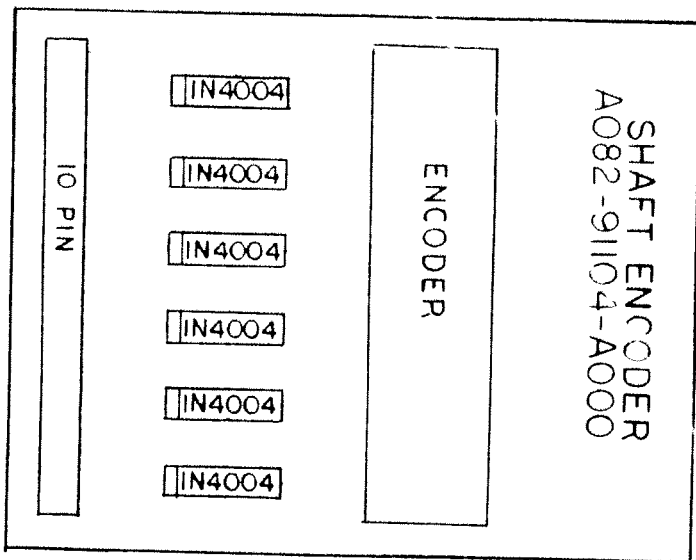
This space is provided for personal notes

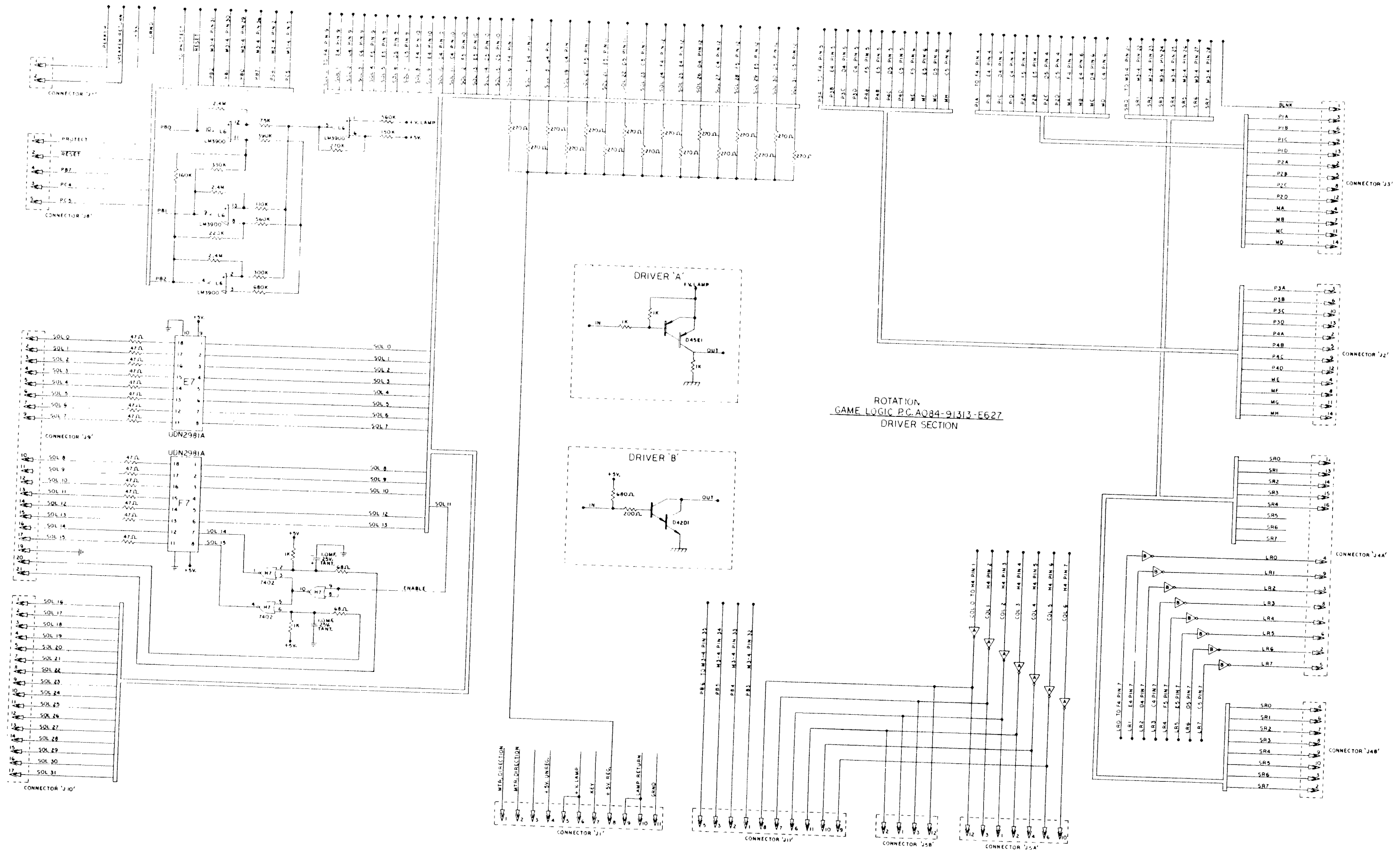
TABLE POSITION P.C.A082-91317-B000



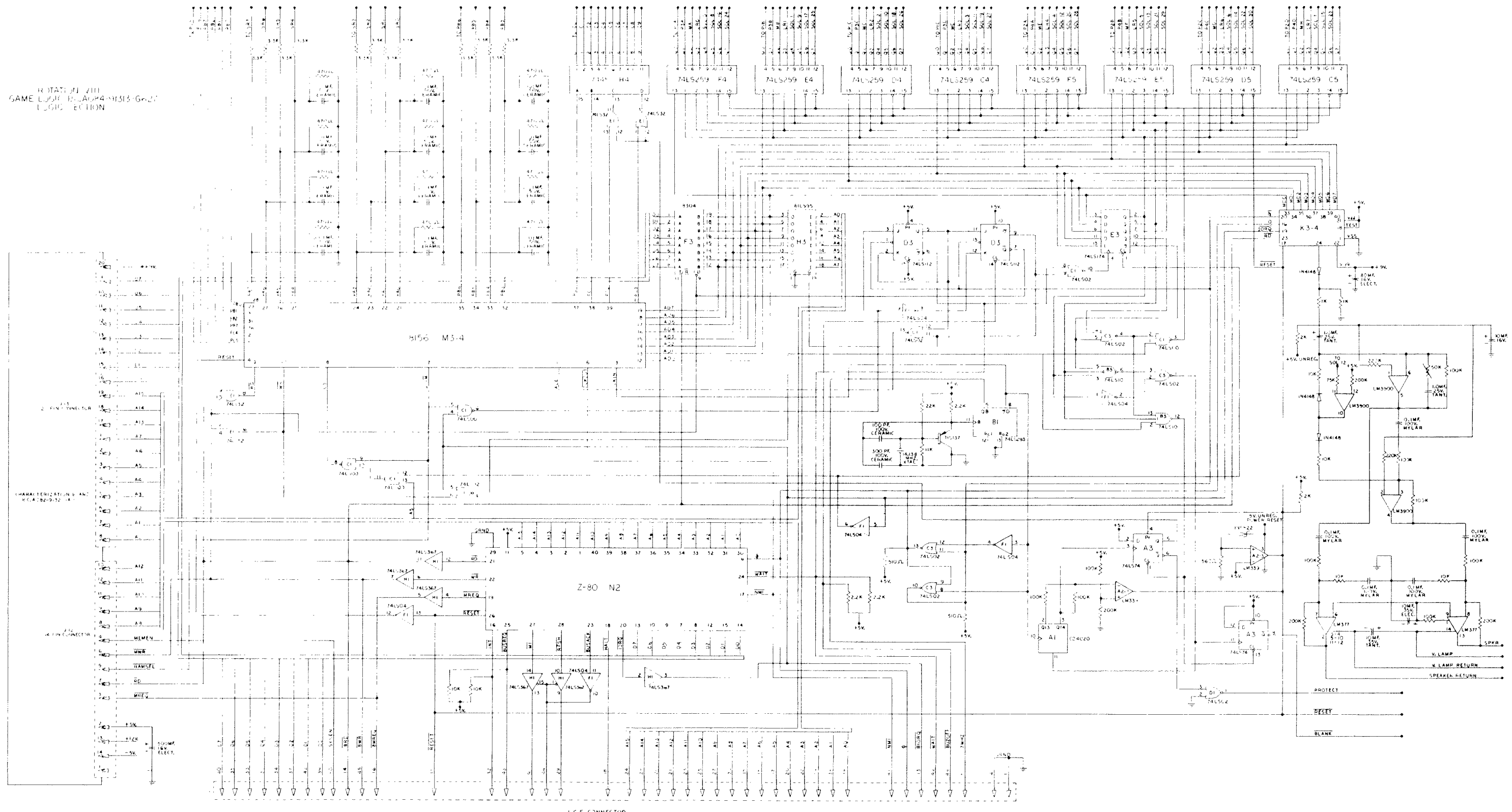
A082-91317-B000
TABLE POSITION

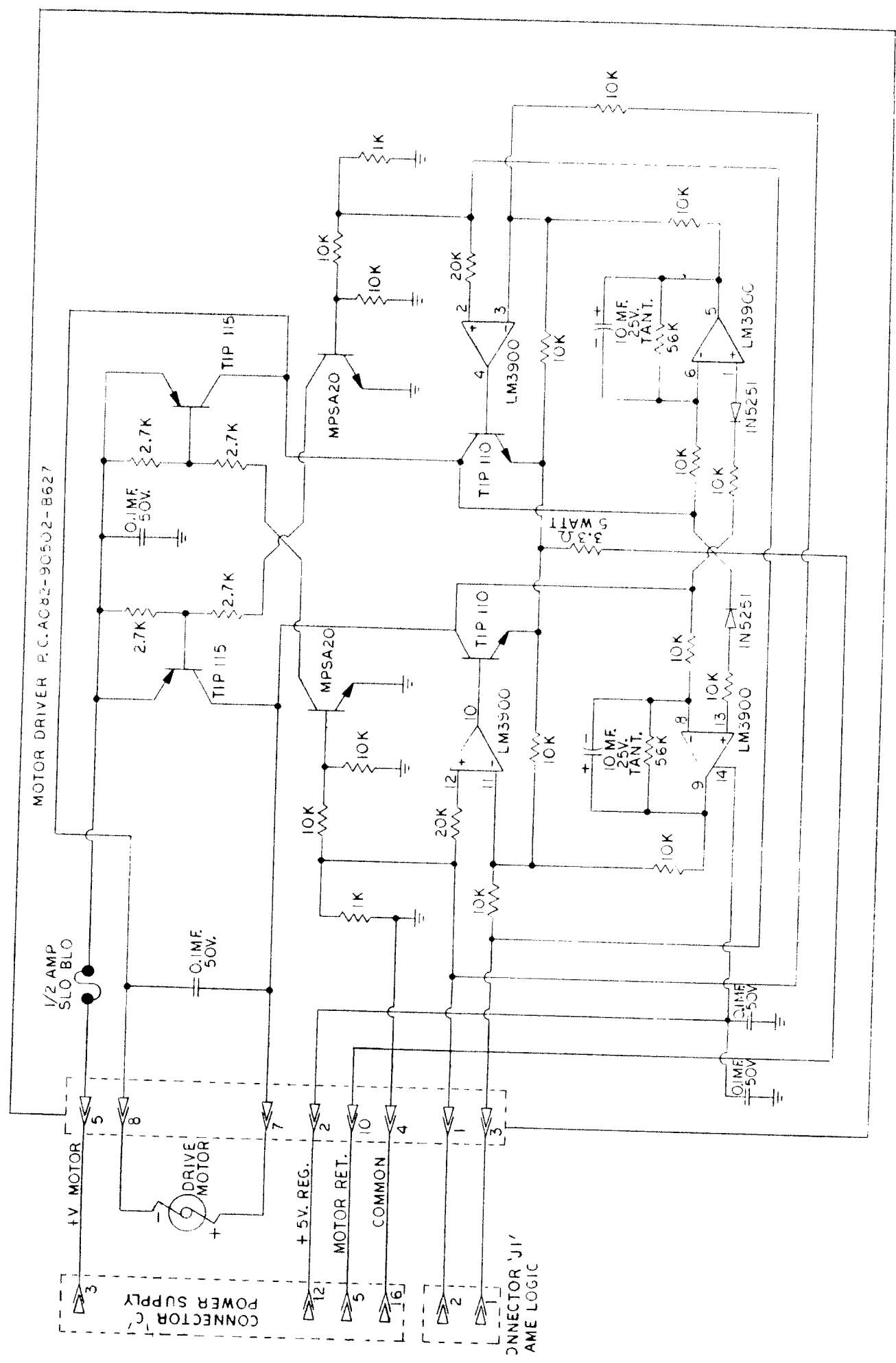
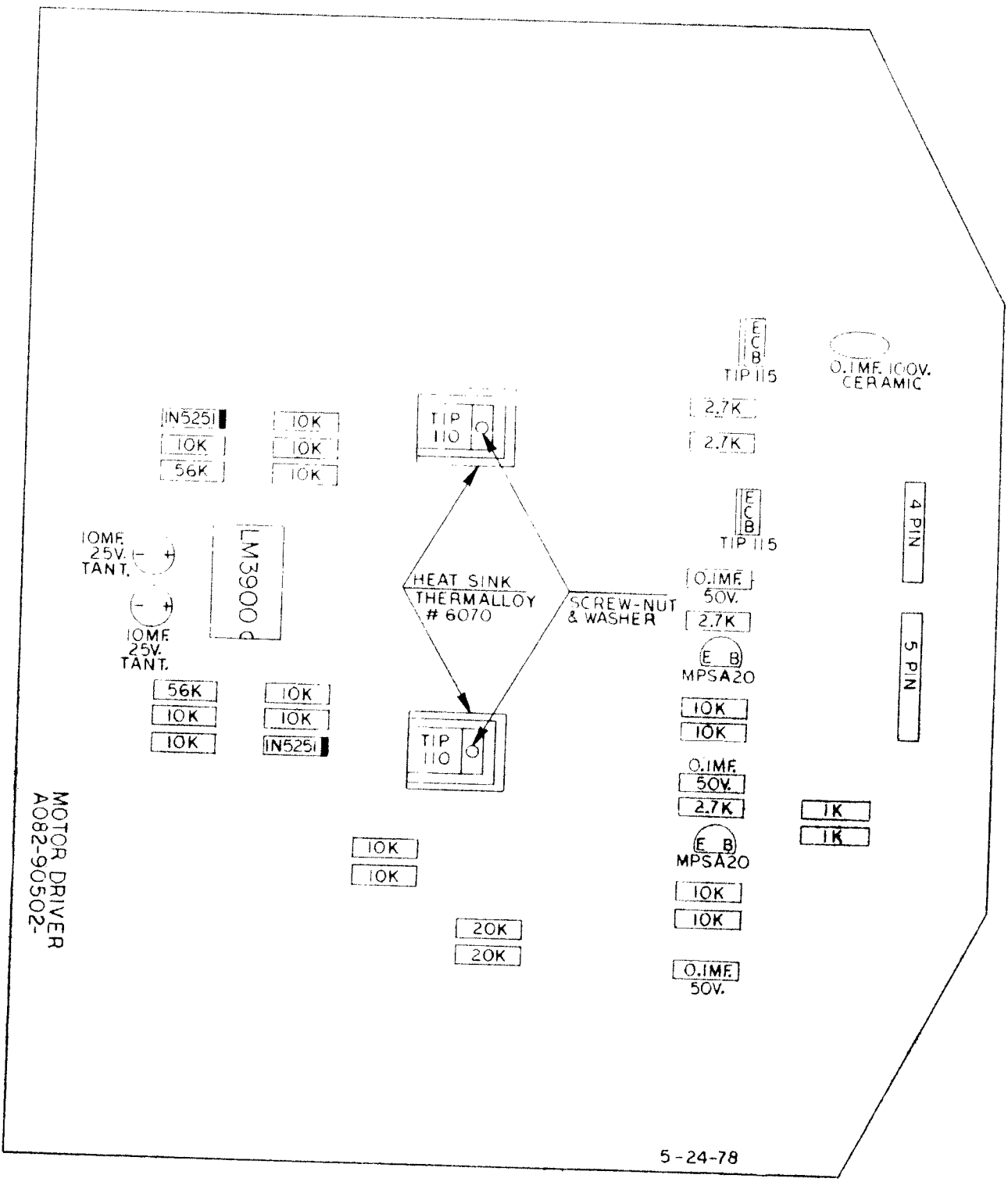


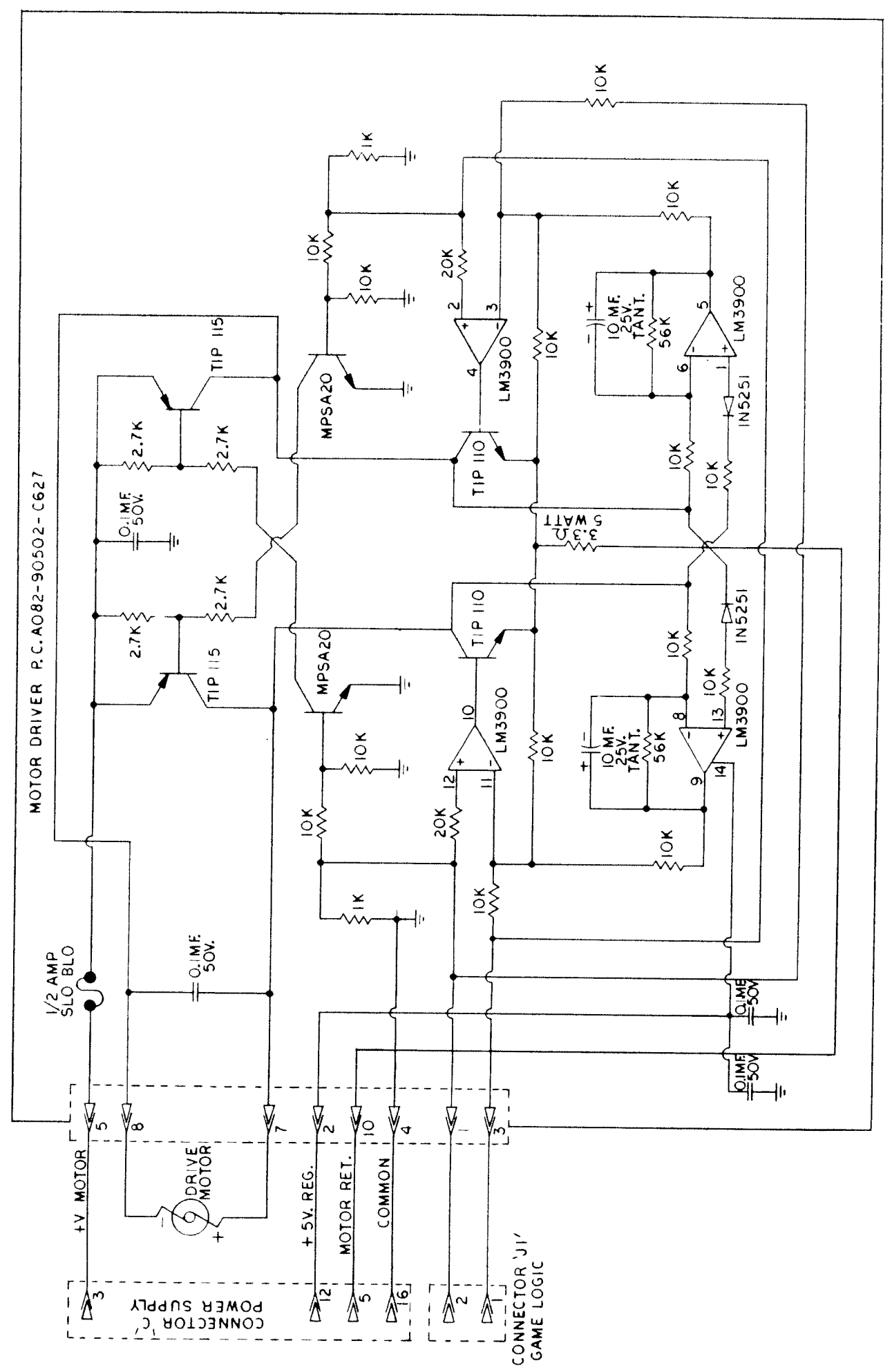
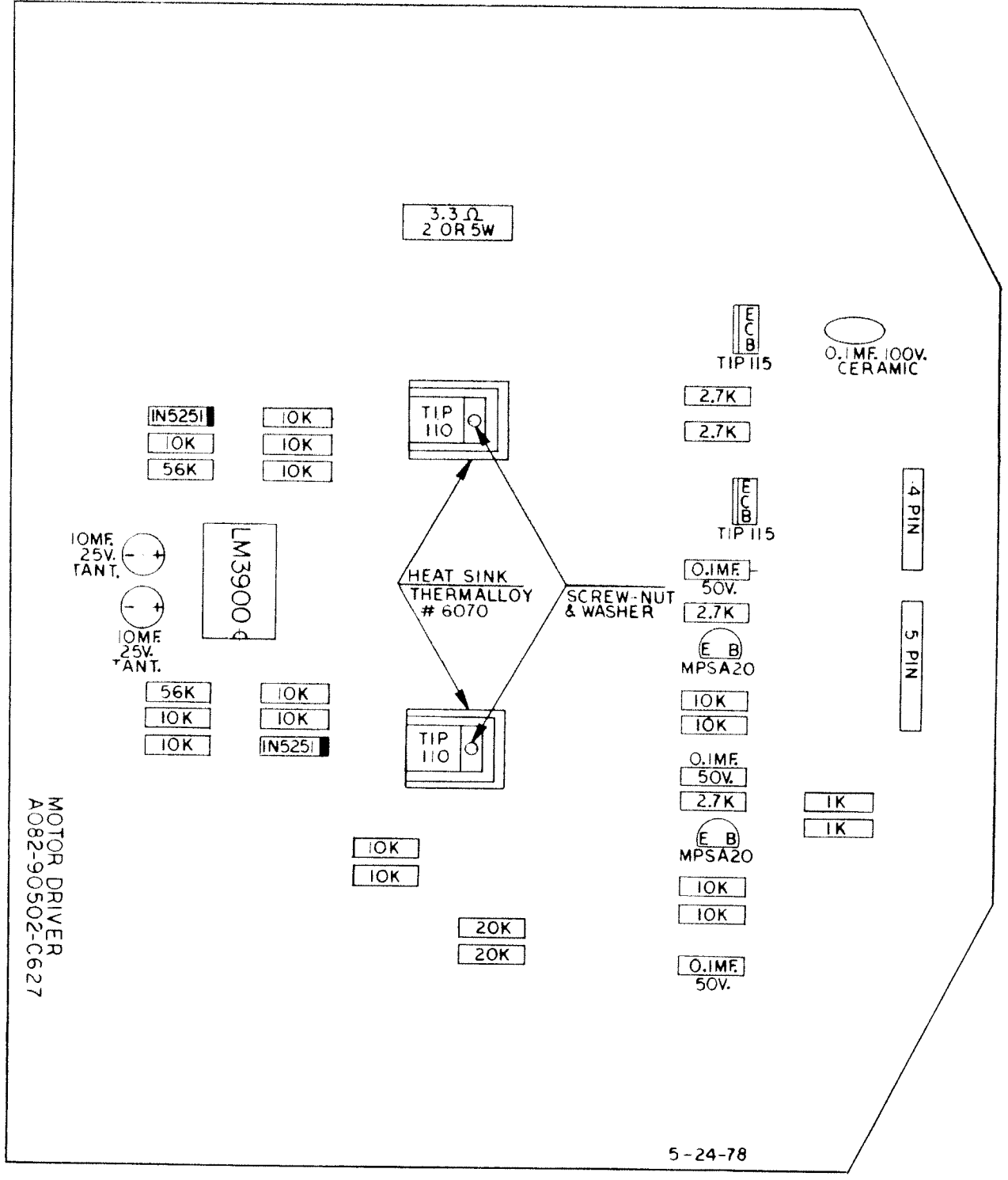


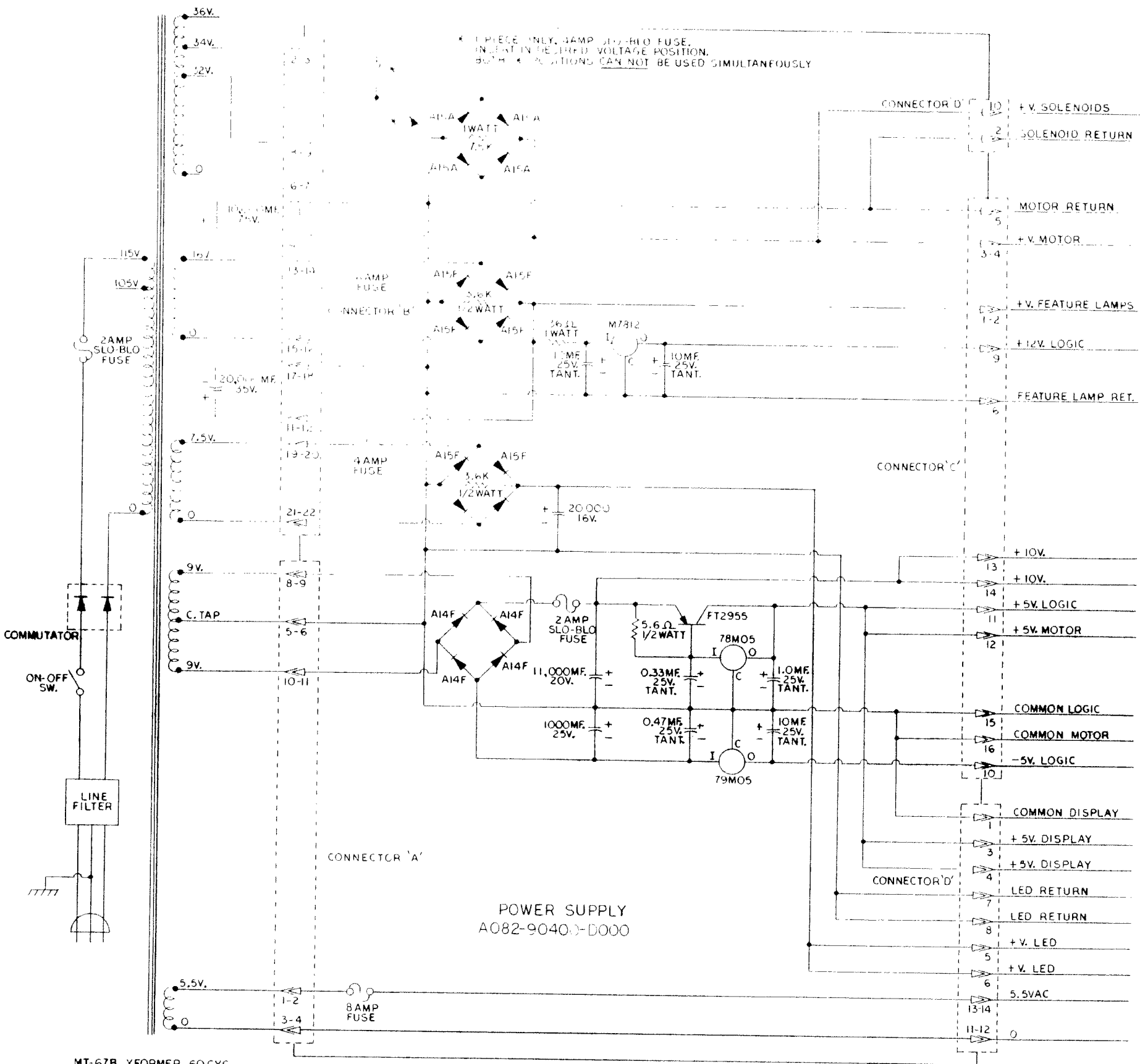


ROTARY SWITCH GAME LOGIC BOARD #1313-G-22
LOGIC SECTION







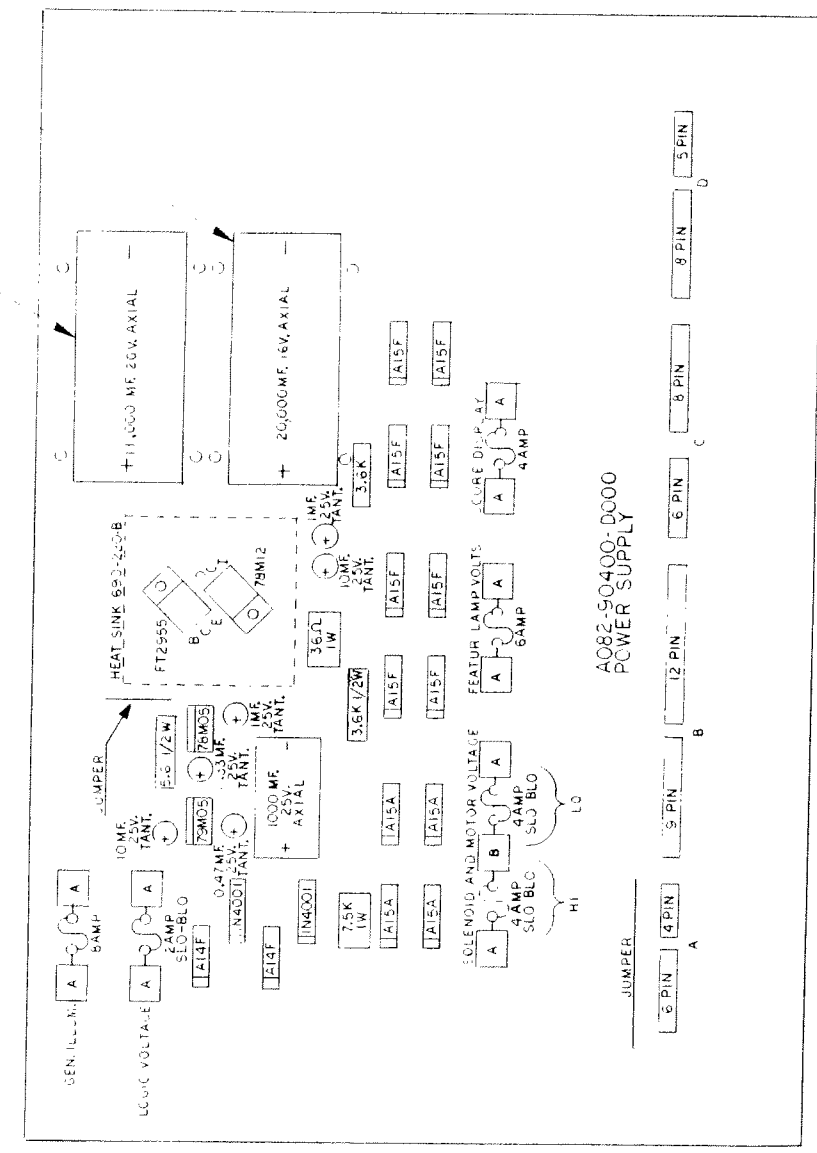


* 1 PIECE ONLY, 8AMP SLO-BLO FUSE.
 INSERT IN DESIRED VOLTAGE POSITION.
 BOTH * POSITIONS CAN NOT BE USED SIMULTANEOUSLY

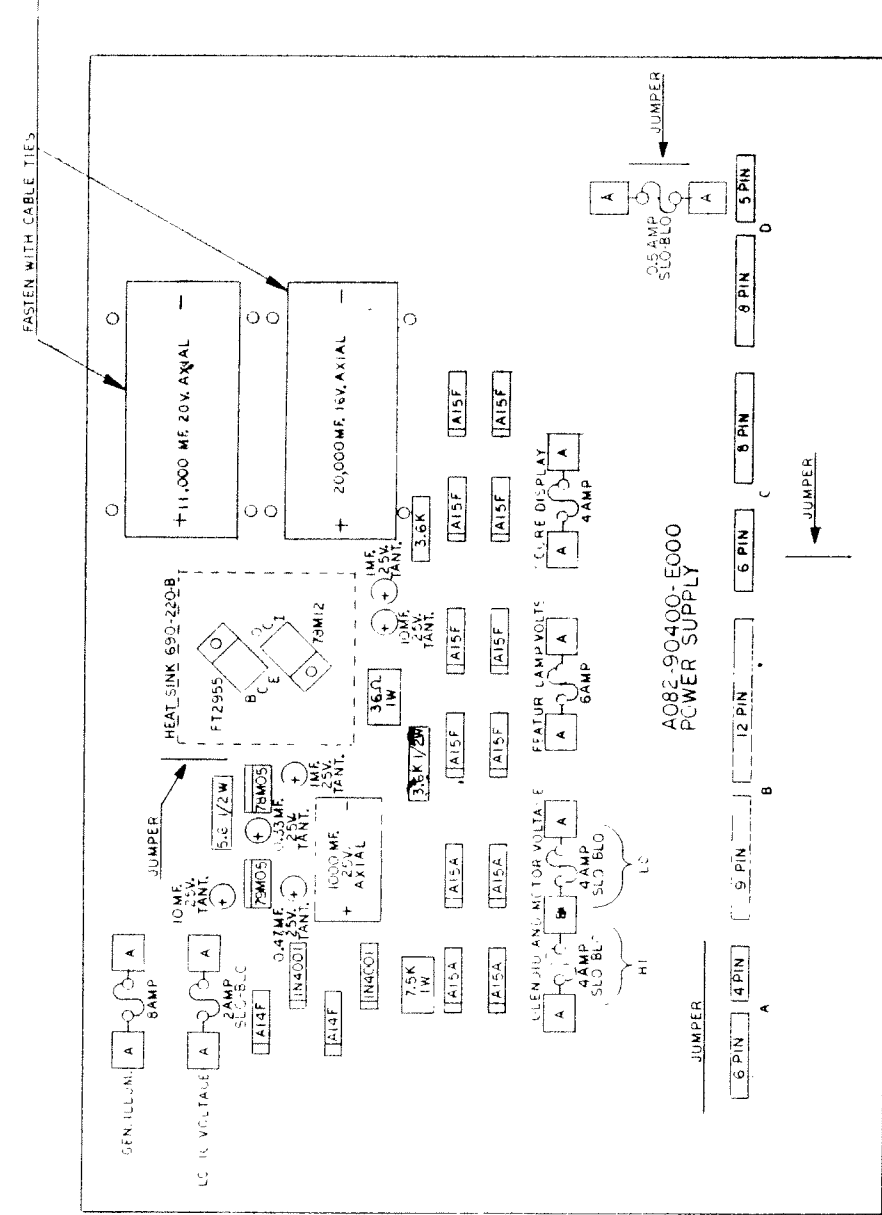
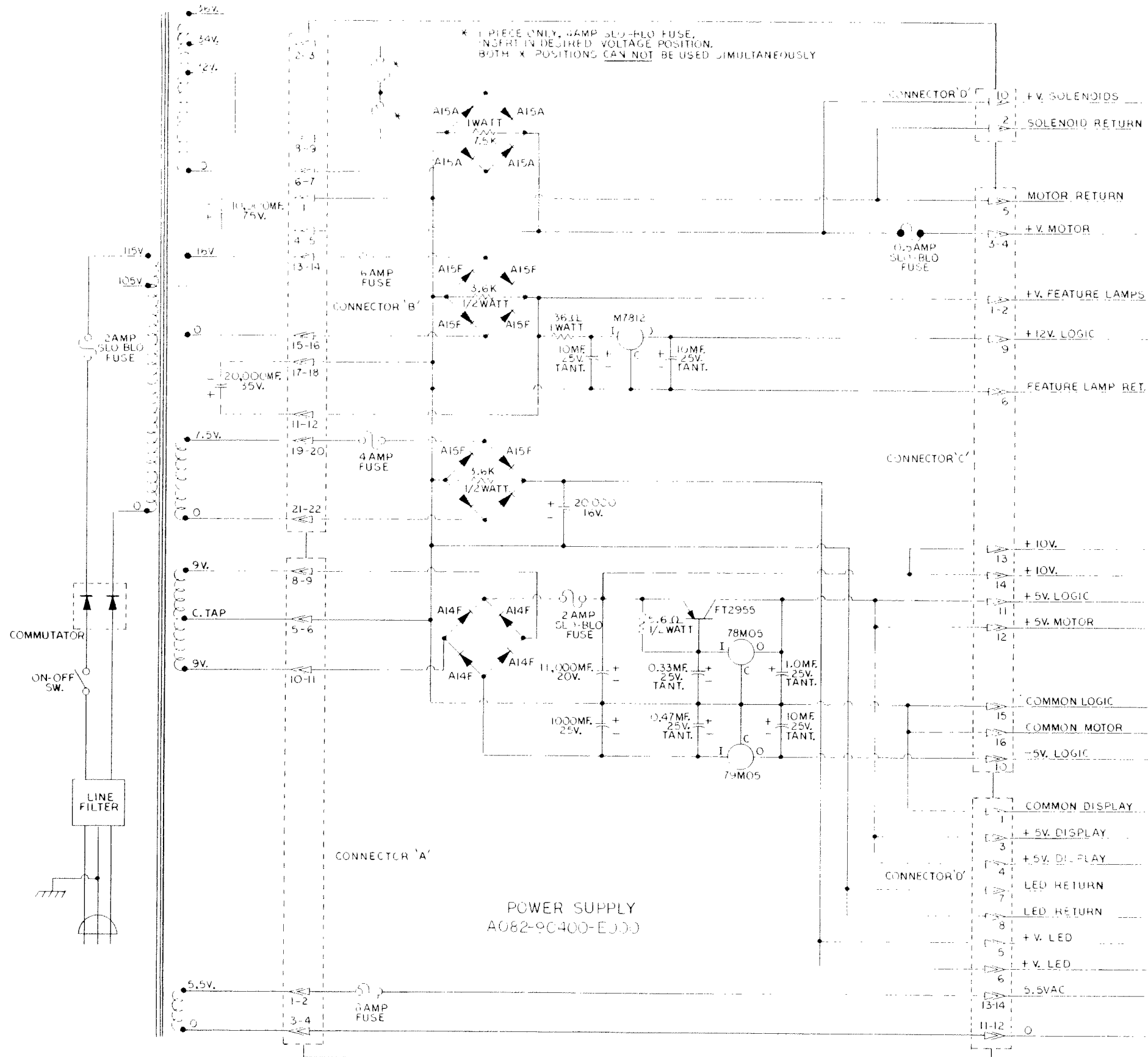
POWER SUPPLY
 A082-90400-D000

MT-67B XFORMER 60 CYC.
 MT-68B XFORMER 50 CYC.

FASTEN THESE CAPS WITH CABLE TIE

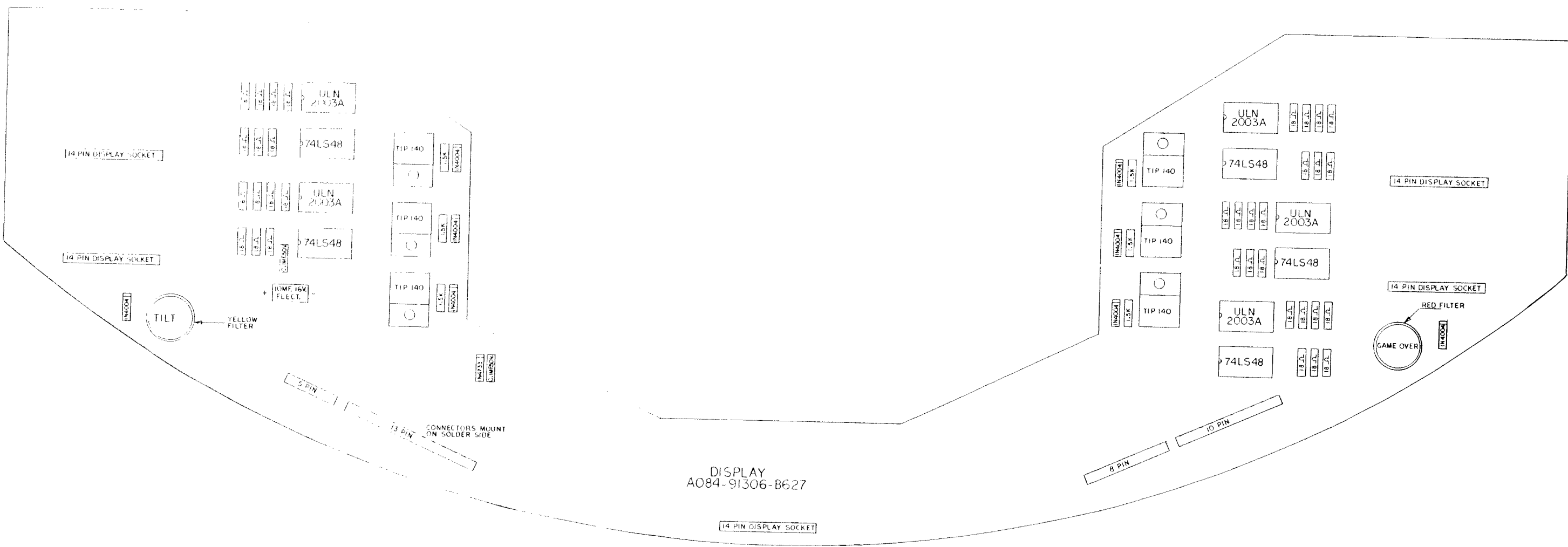


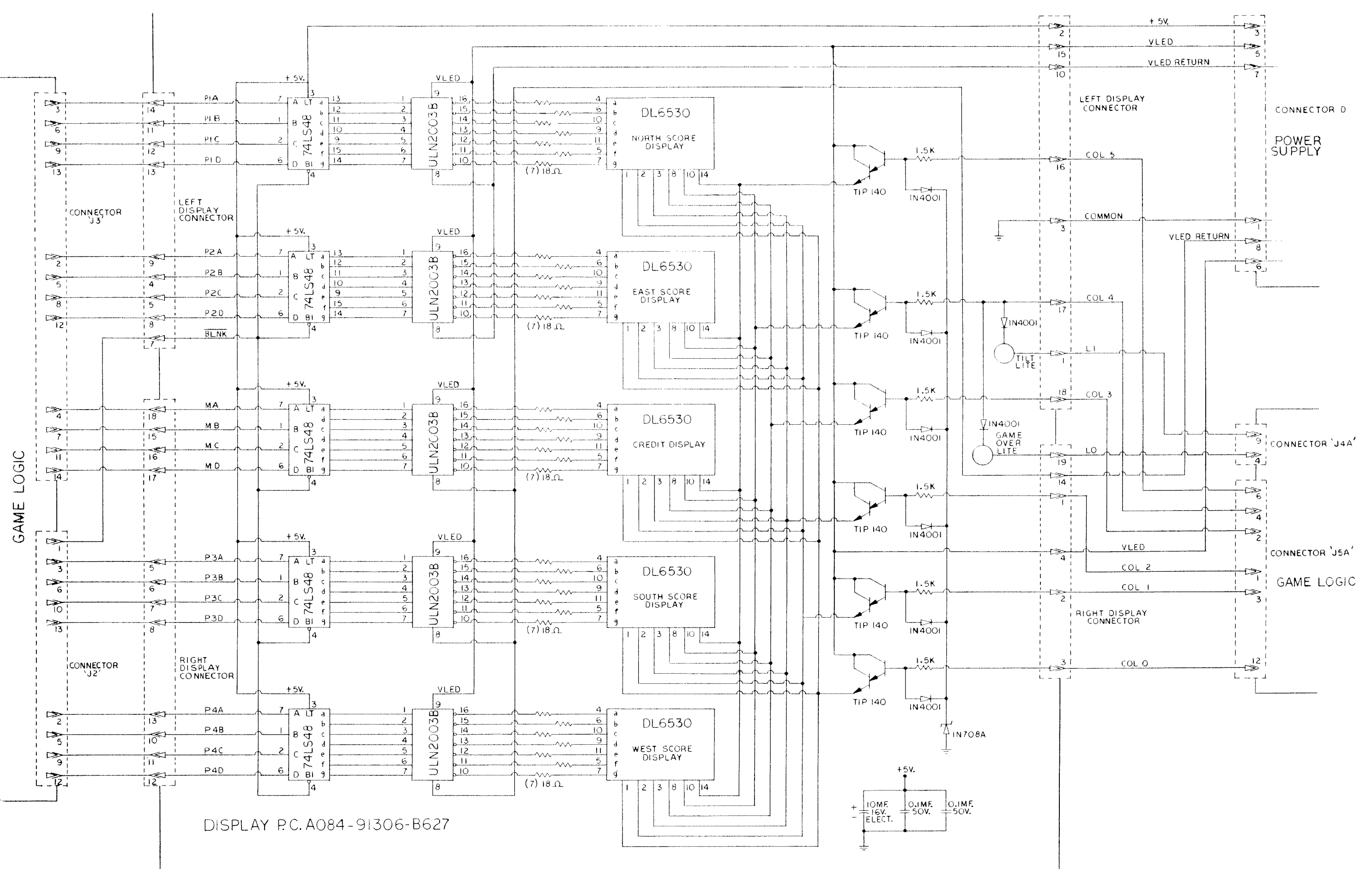
A DENOTES BEL FUSE CLIP TYPE 1
 B DENOTES BEL FUSE CLIP TYPE 2



MT-67B XFORMER 60CYC.
MT-68B XFORMER 50CYC.

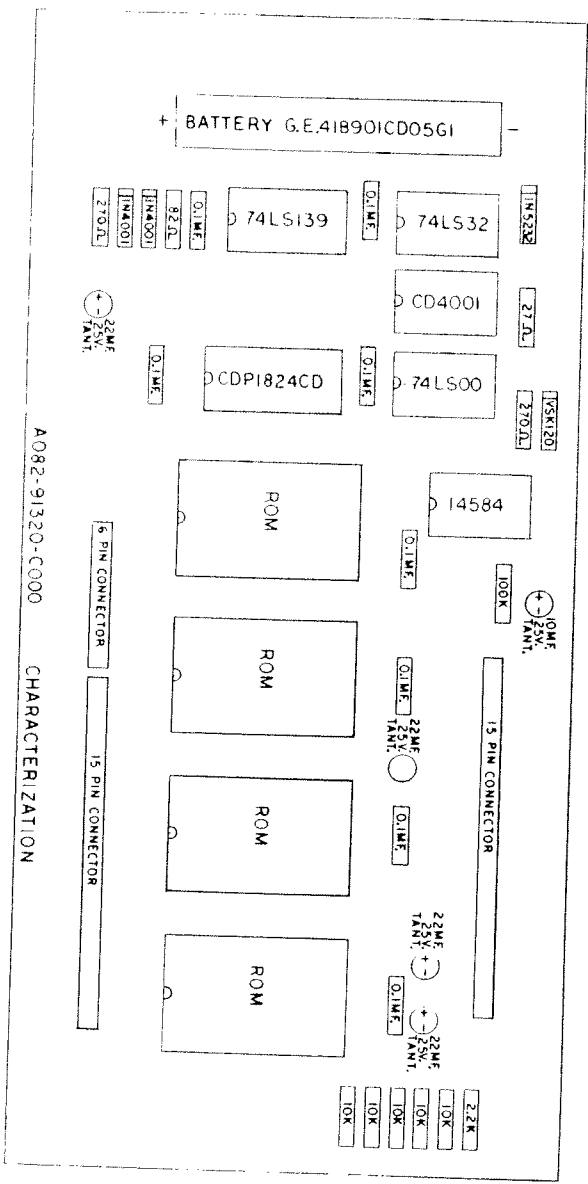
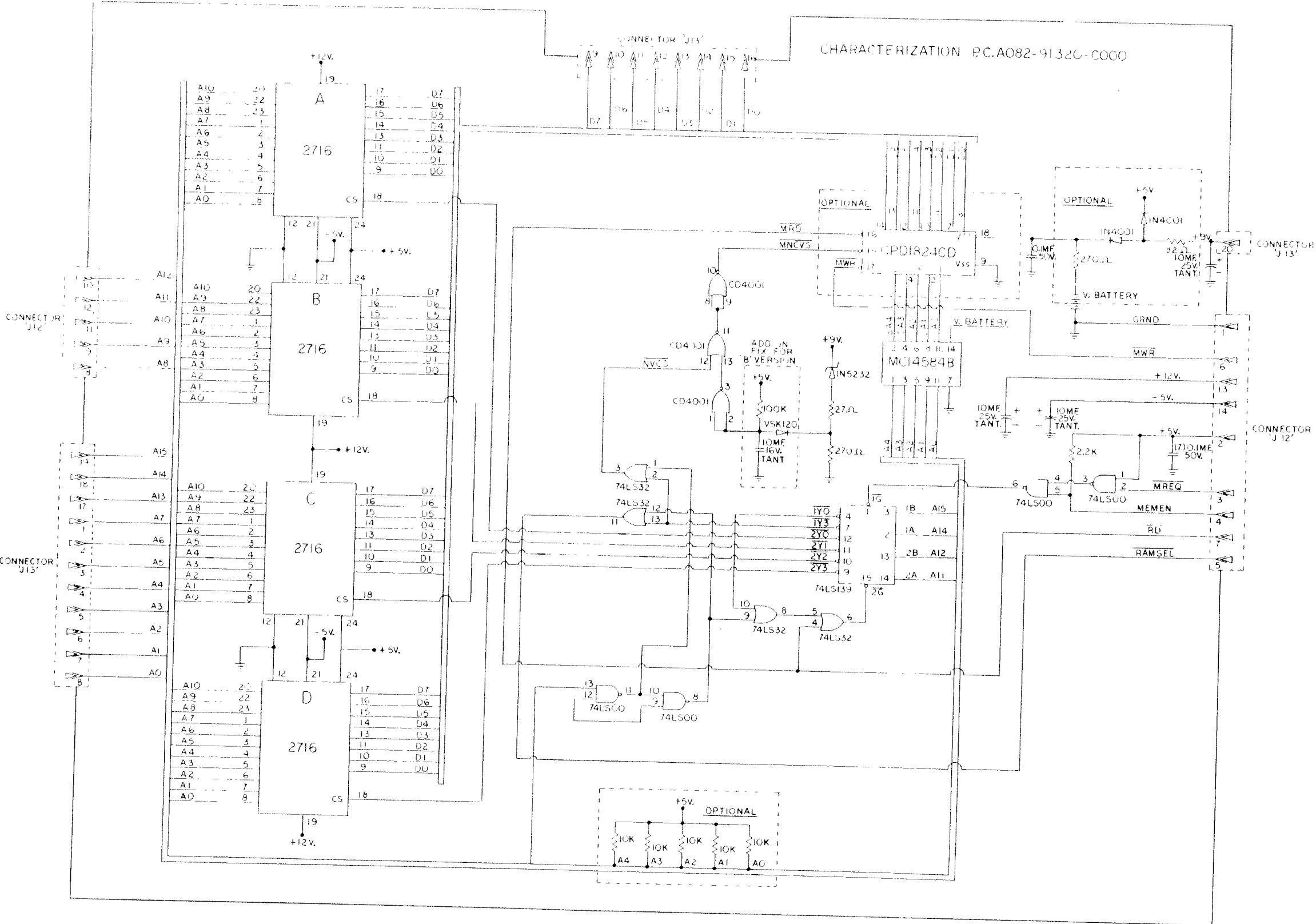
A DEMOTES BEL FUSE CLIP TYPE 1
B DEMOTES BEL FUSE CLIP TYPE 2

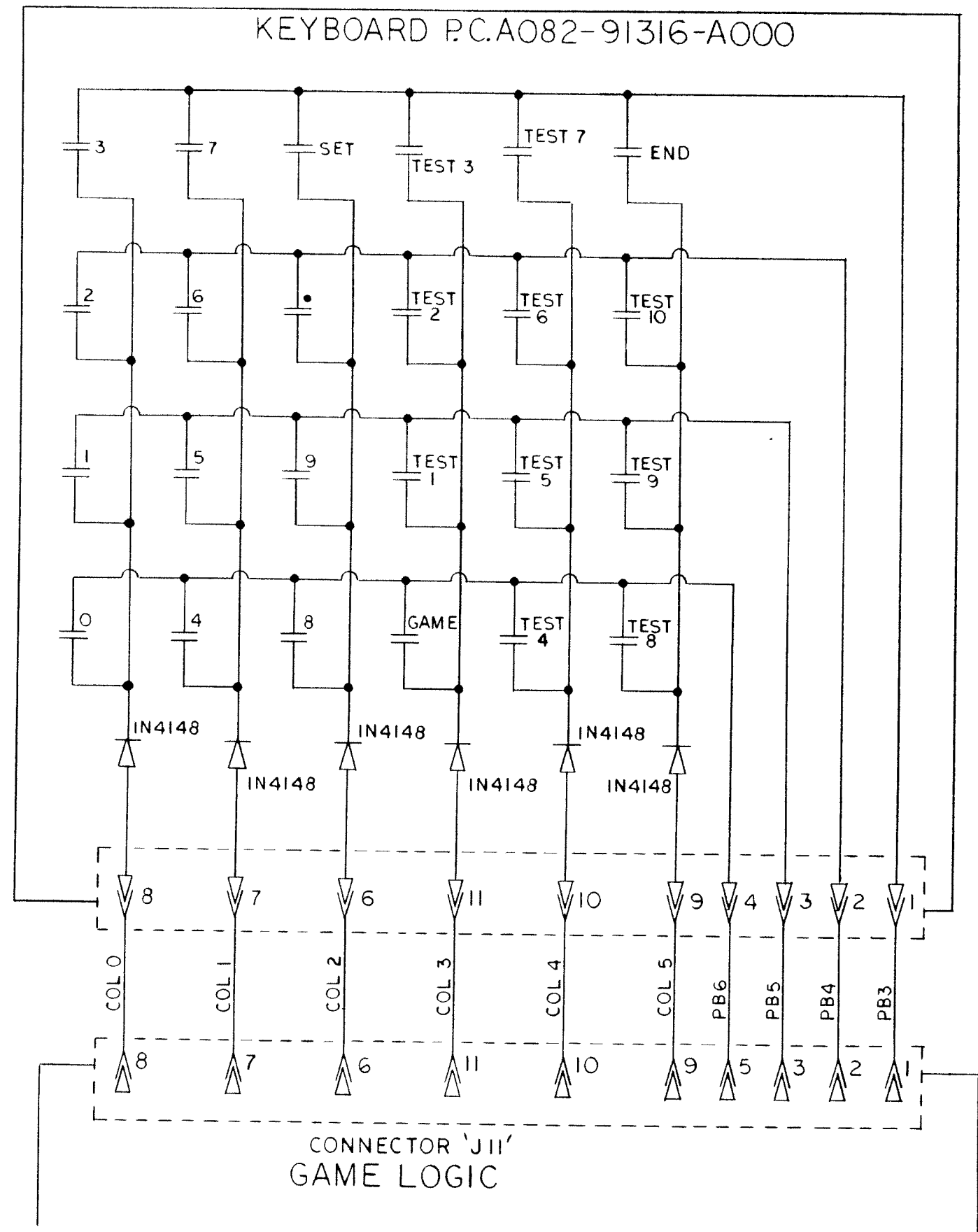
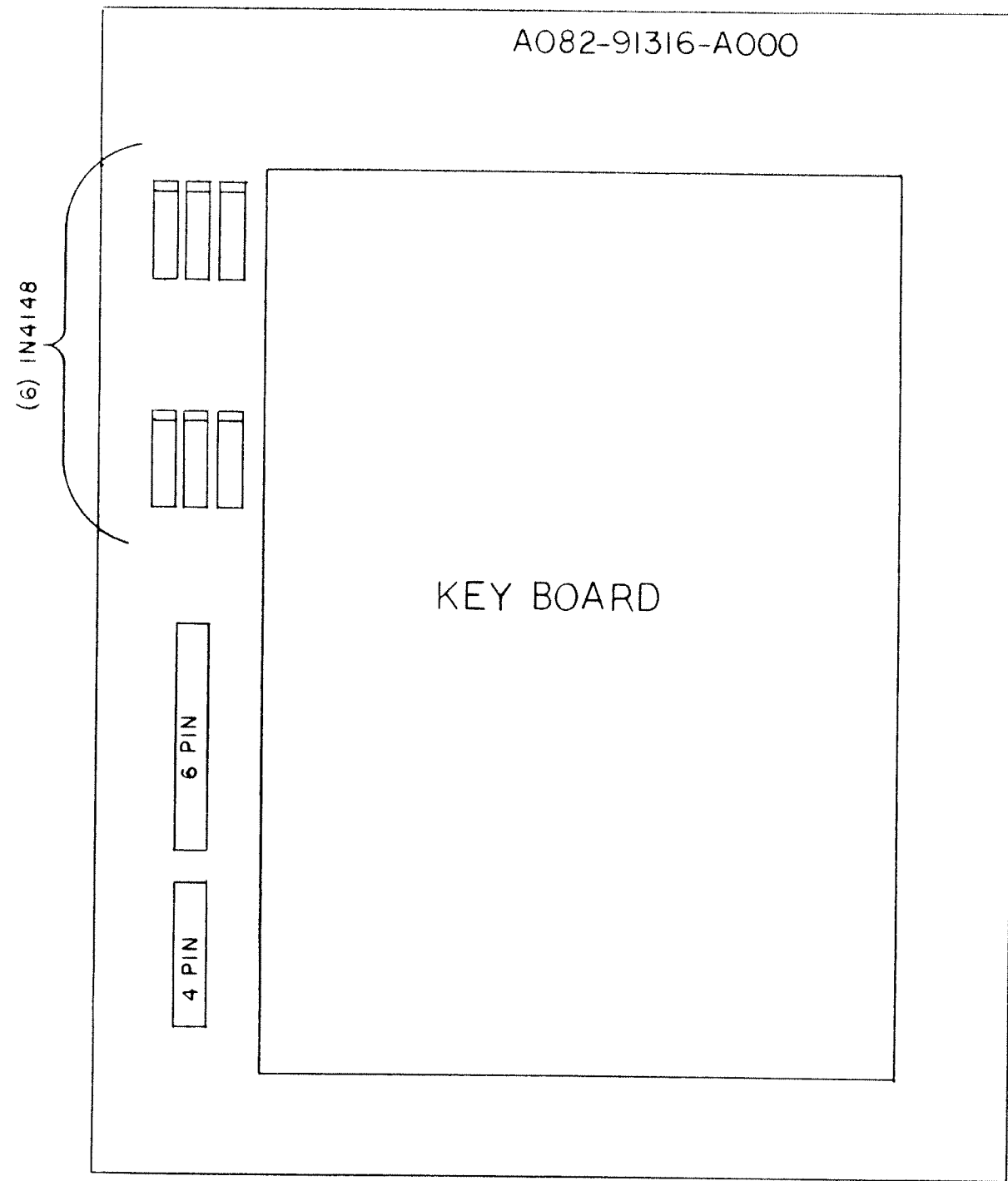




DISPLAY P.C. A084-91306-B627

CHARACTERIZATION PC.A082-91320-C000





A084-90501-C627
SOLENOID DRIVER

