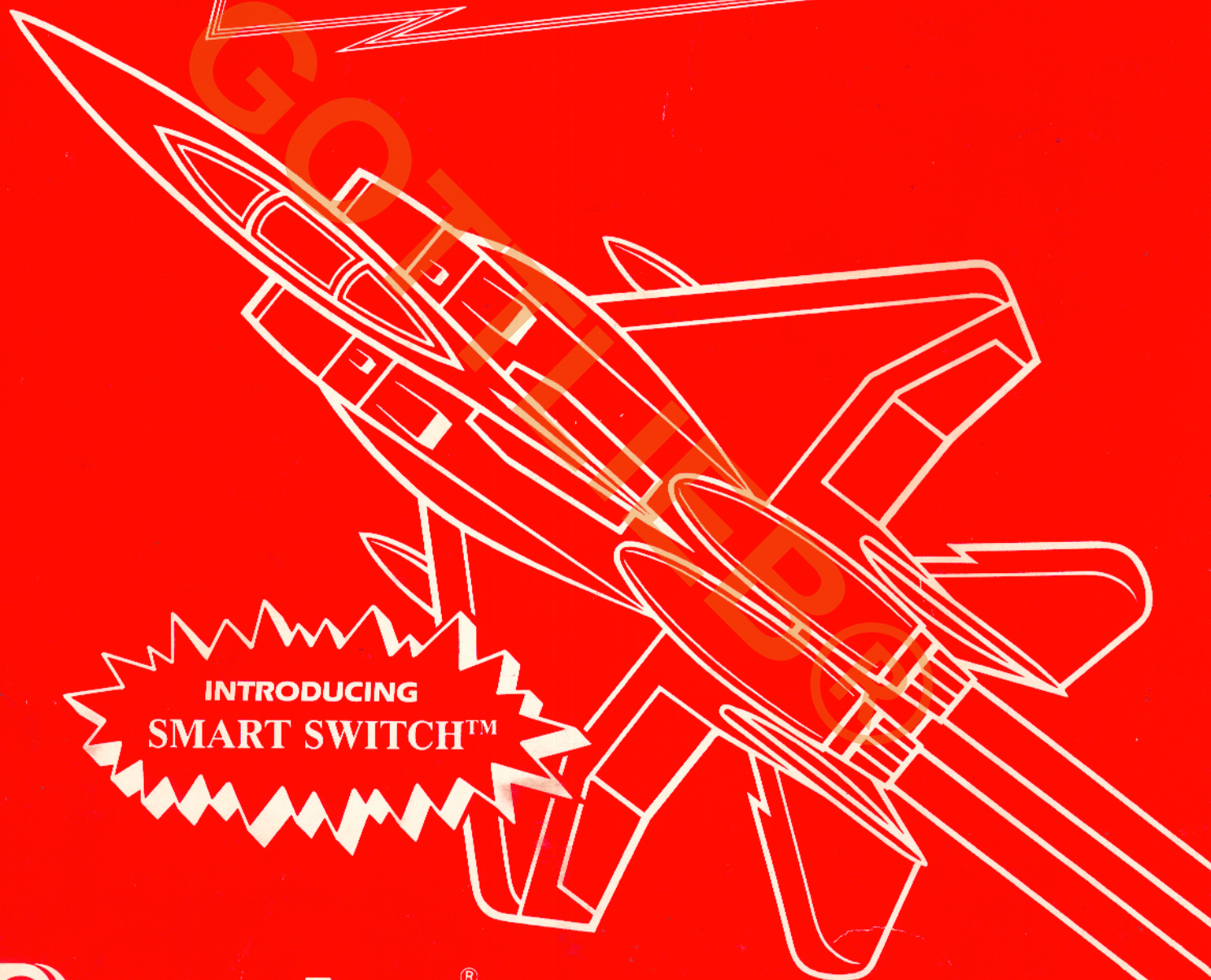


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THE PREMIER NAME IN PINBALL

OPERATION:

THUNDER™



**INTRODUCING
SMART SWITCH™**

 **Premier**®
Technology

INSTRUCTION MANUAL

OPERATION:

THUNDER™

GAME #732

(3 BALL GAME)

INSTRUCTION MANUAL

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GAME PROM:	SOUND PROMS:	
(TYPE 27C512)	(TYPE 27C256)	(TYPE 27C020-25)
732/GPROM	732/DROM1	732/AROM1
	732/YROM1	732/AROM2

NOTE: ANY PROM CHANGES DURING PRODUCTION WILL BE INDICATED BY A REVISION NUMBER FOLLOWING THE GAME NUMBER. CONSULT YOUR DISTRIBUTOR FOR ANY PROM CHANGE UPDATE.

Premier®
Technology

759 INDUSTRIAL DRIVE
BENSENVILLE, IL 60106
1-708-350-0400
TELEX 215009 PRMR
FAX: 1-708-350-1097

THE PREMIER HOTLINE
1-800-444-0761

SYSTEM 3 OVERVIEW

System 3 contains many new features which improve game play and reliability. Some of these features are as follows:

- 1) New lithium battery provides data retention for a minimum of 5 years under normal operation and virtually eliminates battery leakage. Also a low battery warning is given in the displays when the voltage drops to the critical level.
- 2) New interlocking connector system for improved reliability.
- 3) Use of High Speed CMOS technology for low power consumption and cooler operation.
- 4) Improved solenoid driver reliability due to simplified circuitry and the use of Rugged Power MOSFETS.
- 5) Lamp short protection.
- 6) Switch matrix input protection.
- 7) Easy line voltage adjustment on location.
- 8) Improved bookkeeping functions.
- 9) Improved display control.
- 10) Capability for operators to enter their own messages in the attract mode.
- 11) Use of new SMART SWITCH™ technology which eliminates the use of contact points on switches. Therefore the need for cleaning dirty contact points is eliminated.

This equipment has been found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

I. INSTALLATION

A. SET-UP

1. Bolt the legs to the cabinet.
2. Lift lightbox into an upright position. Be sure none of the cables are crimped in between the lightbox and cabinet.
3. Engage the snap in the rear of the lightbox to the cabinet.
4. To remove the lightbox backglass and gain servicing access to the electronics panel and the insert lamp assembly, proceed as follows:

Unlock the lightbox by turning the key a quarter turn counter-clockwise, the hinged speaker panel grille will swing out toward you.

The backglass is held in place in the retaining groove at the bottom ledge of the lightbox and the wood retaining tabs on each side. Lift the backglass up about an inch, pull the bottom of the backglass toward you and slide it down past the two wood retaining tabs, carefully set aside.

Unloosen the two wing nuts on the left side and push the lock slide upwards, this allows the lightbox lamp insert to swing out and for gaining access to service the back side and access to the electronics panel.

5. Secure the lightbox to the cabinet with the bolts and washers provided.

To replace the backglass, slide the backglass up behind the wood retaining tabs and set down into the bottom retaining groove.

To secure the backglass, pivot the speaker panel grille towards the backglass and turn the key clockwise a quarter turn, the lightbox is now locked.

6. Open the cabinet door and loosen the front moulding locking arm.
7. Remove the front moulding from the cabinet.
8. Slide the playfield glass toward you and remove it, carefully set aside.
9. Raise the playboard and pivot it upwards and back towards the lightbox,

hold in place and insert the prop stick into the countersunk hole on the underside of the playfield.

CAUTION!

Use prop stick when servicing under the playfield.

10. Unravel and straighten out the power line cord located at the rear of the cabinet.
11. Proceed to "B. CHECK-OUT".

B. CHECK-OUT

1. Check that all cables are clear of moving parts.
2. Check for any loose wires.
3. Check switches for loose solder or other foreign matter.
4. Be certain all fuses are firmly seated.
5. Check transformer for any foreign matter across terminals.
6. Be sure that the Transformer Panel power input connector A12J5, corresponds to the supply voltage.
7. Check the setting of the normally open tilt switch on the underside of the playfield. One blade should be free-floating with a weight on the end.
8. The plumb-bob tilt can be adjusted by loosening the clip and raising the plumb-bob to increase its sensitivity, or lowering it to decrease its sensitivity.
9. Lower the playfield into the cabinet. Using the leg adjusters, level the playfield and set the pitch. Recommended pitch is 6°.
10. Plug the line-cord into a properly grounded 3-wire receptacle ONLY!
11. Refer to Section III to make all necessary game adjustments.
12. Re-install the playfield glass, front moulding and lock the cabinet door.
13. CAUTION! If this game has been subjected to extreme cold, allow to warm up to room temperature.

I. INSTALLATION

C. COIN METER (OPTIONAL)

A +12vdc mechanical coin meter may be installed by the operator to count total coins accepted by the machine. The coin meter leads should be soldered to the lugs on the terminal strip mounted inside the front door on the right side (see Figure 1). If the coin meter is polarized, the positive lead (red) should be attached to the lug that has the cathode (banded) side of the diode attached to it otherwise the leads may be attached in any order. The COIN METER adjustment must be set to on and the following four adjustments should be set to the number of pulses (counts) required for each coin denomination used.

NOTE: Make sure that the GAME MODE adjustment is not set to either REPLAY + TICKETS or TICKETS ONLY (see Game Adjustments section).

D. TICKET DISPENSER (OPTIONAL)

This machine is equipped to easily interface to the Deltronic Labs #DL-4-S-S ticket dispenser with the outside mounting option. To install the dispenser, first locate the five partially drilled holes on the inside of the cabinet on the right side (see Figure 1). The four "A" holes are for mounting the cabinet with #10 X 1-1/4" carriage bolts. The "B" hole is for

cable access to the unit. Drill the "A" holes out from the inside of the cabinet using a 13/64" drill bit. Drill the "B" hole out from the inside of the cabinet using a 1" drill bit. The GAME MODE adjustment is used to set whether to dispense a number of tickets along with each replay awarded (REPLAY + TICKETS) or to dispense a number of tickets in place of each replay awarded (TICKETS ONLY). The TICKETS TO AWARD adjustment is used to set the number of tickets to dispense for each replay awarded (see Game Adjustments section).

NOTE: Make sure that the COIN METER adjustment is set to off when using a ticket dispenser.

E. BILL ACCEPTOR (OPTIONAL)

A bill acceptor can be easily interfaced electrically to this machine. The two unused 522 (green-red-red) and 622 (blue-red-red) center chute switch wires should be attached to the switch output of the bill acceptor (see Cabinet/Lightbox Schematic Diagram). The line voltage plug located inside the cabinet on the right side can be used for supplying power to the unit. The CENTER CHUTE SETTING adjustment can then be used to set the number of credits to be issued for each bill accepted.

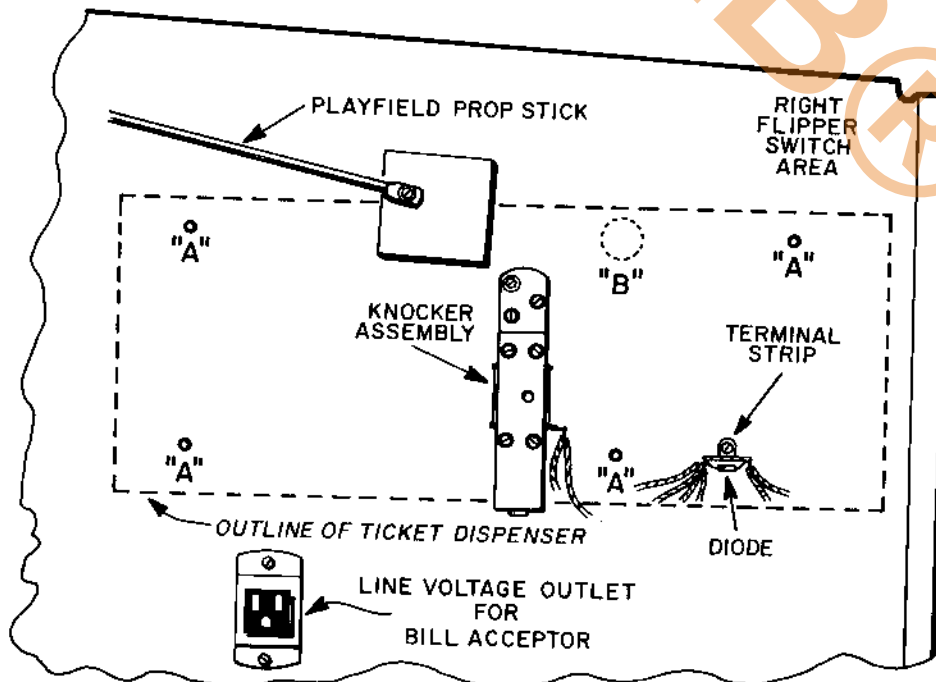


FIGURE 1.

II. GAME PLAY AND SCORING

OPERATION:



GENERAL GAME FEATURES

GAME THEME:

- * THE PLAYER IS A JET FIGHTER PILOT (CALLSIGN "EAGLE 3") WHO ATTEMPTS TO COMPLETE 12 MISSIONS TO BECOME A 5 STAR GENERAL. EACH SUCCESSFULLY COMPLETED MISSION EARNS A PROMOTION. EACH MISSION HAS SET PRIMARY OBJECTIVES AND SECONDARY OBJECTIVES.

MISSION 1:

- * PRIMARY OBJECTIVE IS TO LOCK THE BALL IN THE RAMP BY SHOOTING THE TRAIN, RADAR, OR SPINNER.
- * SECONDARY OBJECTIVES ARE TO SCORE THE STRAFE VALUE BY SHOOTING THE SPINNER AND ADVANCE MULTIPLIER BY HITTING THE VARI-TARGET. 3-BANK DROP TARGETS ARE ALSO LIT FOR HIGHER POINTS. THE MYSTERY LAMPS IS ALSO LIT.

MISSION 2:

- * PRIMARY OBJECTIVE IS TO LOCK THE 1ST OR 2ND BALL IN THE RAMP BY SHOOTING THE TRAIN, RADAR, OR SPINNER AND COLLECT ATTACK POINTS.
- * SECONDARY OBJECTIVES ARE THE MYSTERY HOLE AFTER THE ATTACK POINT VALUE HAS COUNTED DOWN TO MINIMUM AND ADVANCE MULTIPLIER BY SHOOTING THE VARI-TARGET AFTER THE LEFT RETURN LANE. 5-BANK DROP TARGETS ARE LIT FOR HIGHER POINTS.

MISSION 3 (DOGFIGHT)

- * PRIMARY OBJECTIVE IS TO COMPLETE ALL FLASHING AIRPLANES (ADJUSTABLE) TO SCORE BIG POINTS, AN EXTRA BALL, AND ADVANCE "SPECIAL". BALLS THAT WERE LOCKED IN MISSIONS 1 AND OR 2 ARE RELEASED FOR 2 OR 3 BALL MULTIBALL PLAY. COMPLETING ALL PLANES RESTARTS FLASHING FOR MORE BIG SCORING. MISSION 3 CONTINUES UNTIL ONLY 1 BALL REMAINS IN PLAY.

- * SECONDARY OBJECTIVE IS THE FLASHING LOWER LEFT SPOT TARGET FOR EXTRA BALL. ADVANCE MULTIPLIER BY SHOOTING VARI-TARGET AFTER LEFT RETURN LANE.

MISSION 4 (TANK ASSAULT):

- * PRIMARY IS TO SHOOT ALL THE DROP TARGETS NECESSARY (ADJUSTABLE) TO EARN A SPECIAL BEFORE FUEL EXPIRES.
- * SECONDARY IS TO SHOOT THE SPINNER AFTER THE RIGHT RETURN LANE IN ORDER TO ADD FUEL.

MISSION 5:

- * PRIMARY IS TO COMPLETE THE FLASHING ANTI-AIRCRAFT, AMMO, AND TRAIN (ADJUSTABLE).
- * SECONDARY ARE ADVANCE MULTIPLIER BY SHOOTING THE VARI-TARGET AFTER THE LEFT RETURN LANE, 3-BANK DROP TARGETS SCORE HIGHER, MILLION SPOT TARGETS ARE LIT, AND MYSTERY WHEN LIT.

MISSION 6 (SEEK & DESTROY):

- * PRIMARY OBJECTIVE IS TO FIND THE ENEMY HIDDEN AT ONE OF THE WINKING LAMPS BEFORE FUEL (ADJUSTABLE) EXPIRES.
- * SECONDARY IS TO ADD FUEL BY SHOOTING THE SPINNER AFTER THE RIGHT RETURN LANE.

MISSION 7

- * PRIMARY IS TO COMPLETE THE FLASHING ARTILLERY, ANTI-AIRCRAFT, BUNKER, AND RADAR.
- * SECONDARY IS TO ADVANCE MULTIPLIER BY SHOOTING THE VARI-TARGET. THE LOWER LEFT SPOT TARGET ALSO TIMES OUT FOR EXTRA BALL, AND MYSTERY LIGHTS AFTER ANTI-AIR HIT ONCE.

II. GAME PLAY AND SCORING

MISSION 8 (ATTACK COUNTDOWN):

- * PRIMARY IS TO SHOOT THE FLASHING PLANE AND ATTACK LAMPS AND COLLECT THE REMAINING "ATTACK" POINTS. THE FLASHING LAMPS MOVE AT SET VALUES IN THE COUNTDOWN (ADJUSTABLE) OF THE POINT VALUE. MISSION ENDS AT ZERO POINT VALUE OR SUCCESSFUL COLLECTION
- * SECONDARY MILLION SPOT TARGETS LIT.

MISSION 9:

- * PRIMARY OBJECTIVE IS TO SHOOT THE FLASHING ANTI-AIRCRAFT, ARTILLERY, AMMO, BUNKER, AND HELIPORT IN ORDER. THE HELIPORT LOCKS THE BALL.
- * SECONDARY ARE THE 3-BANK DROP TARGET HIGHER POINTS AND ADVANCE MULTIPLIER BY SHOOTING THE VARI-TARGET AFTER THE LEFT RETURN LANE. MYSTERY ALSO LIGHTS AFTER ANTI-AIRCRAFT HIT ONCE.

MISSION 10 (2 OR 3 BALL MULTIBALL):

- * PRIMARY IS TO SHOOT THE RAMP TO COLLECT JACKPOT, DOUBLE JACKPOT, OR SUPER JACKPOT. 1 BALL REMAINING STARTS NEXT MISSION.

MISSION 11:

- * PRIMARY OBJECTIVE IS TO SHOOT THE FLASHING ANTI-AIRCRAFT, ARTILLERY, BUNKER, TRAIN, HELIPORT, AND RADAR IN ORDER.
- * SECONDARY ARE BOTH DROP TARGET BANKS ARE LIT FOR EXTRA POINTS AND ADVANCE

MULTIPLIER BY SHOOTING THE VARI-TARGET AFTER THE LEFT RETURN LANE. SHOOT MYSTERY WHEN LIT.

MISSION 12 (FINAL ASSAULT):

- * PRIMARY OBJECTIVE IS TO COMPLETE ALL FLASHING LAMPS BEFORE FUEL (ADJUSTABLE) EXPIRES. SUCCESS MAKES PLAYER A 5 STAR GENERAL AND EITHER ENDS HIS GAME OR RESTARTS HIM AT MISSION 6 (ADJUSTABLE). FAILURE RETURNS PLAYER TO MISSION 11.

MULTIBALL:

- * THE GAME ALLOWS 2 OR 3 BALL MULTIBALL IN MISSIONS 3 AND 10.

CATCH-UP FEATURE (MYSTERY AWARD):

- * PLAYER UP IS IMMEDIATELY GIVEN THE SAME SCORE AS THE HIGHEST SCORE OF ALL OTHER PLAYERS (ADJUSTABLE).

HURRY-UP SPECIAL:

- * FLASHES OUT THE VARI-TARGET SPECIAL LAMP OVER A SHORT TIME.
- * STARTS FLASHING FROM A MYSTERY AWARD OR AT SET MULTIPLIER LEVELS (ADJUSTABLE).

RETURN TO POWER PLANT:

- * DURING CERTAIN MISSIONS, AFTER A NUMBER OF SWITCH CLOSURES, THE "RETURN TO POWER PLANT" LAMP WILL FLASH FOR A SHORT TIME. SHOOTING THE HELIPORT WILL DIRECT THE EJECTED BALL BACK TO THE SHOOTER LANE.

*** PLAYFIELD FEATURES ***

SPINNING DISK SPOT TARGETS:

- * UNLIT SCORE 20,000. LIT SCORE BELOW.
- * MISSION 1 ADDS 100,000 TO STRAFE VALUE. ALL DONE MAKES IT 1 MILLION.
- * MISSION 2 ADDS 1 MILLION TO ATTACK BONUS. ALL DONE MAKES IT 9,999,000.
- * MISSION 3 ADDS 1 TO EB TIME COUNTDOWN. ALL DONE MAKES IT 10.
- * MISSION 10 ADDS 100,000 TO JACKPOT VALUE. ALL DONE ADDS 3 MILLION MORE.
- * ALL OTHER MISSIONS ADDS 100,000 TO POWER PLANT BONUS. ALL DONE ADDS 3 MILLION MORE.

CENTER SPOT TARGET:

- * SCORE 3,000 UNLIT OR 1 MILLION LIT.

RIGHT SPOT TARGET:

- * SCORE 10 UNLIT OR 1 MILLION LIT.

LEFT SPOT TARGET:

- * SCORE 100,000.
- * AWARD AN EXTRA BALL IF 1-2-EB ARE ALL FLASHING IN MISSION 3.
- * WHEN THE "1" INSERT IS FLASHING OR LIT, TARGET IS ENABLED FOR EXTRA BALL. HITTING THE TARGET WILL PROGRESSIVELY LIGHT THE "1", "2", AND "EXTRA BALL" LAMPS FROM OFF TO FLASHING TO ON. LAMPS RETURN TO OFF

II. GAME PLAY AND SCORING

AFTER A TIMED INTERVAL. WHEN 1-2-EB SEQUENCE HAS BEEN COMPLETED, AN EXTRA BALL IS AWARDED.

- * SCORE A HIT IF "ARTILLERY" FLASHING

HOLE (POWER PLANT) :

- * COLLECT POWER PLANT BONUS IF DISPLAYED.
- * LOCK BALL IF NO BALL ALREADY CAPTURED WHEN STARTING MISSION 3 OR MISSION 10 AND RELEASE A BALL TO SHOOTER FOR MULTIBALL PLAY.

CENTER UPKICKER:

- * SCORE 20,000.
- * SCORE A HIT IF HELIPORT, ATTACK, OR AIRPLANE FLASHING.
- * IN MISSION 9, LOCK BALL AND RELEASE A BALL TO SHOOTER FOR MULTIBALL.
- * IF "RETURN TO POWER PLANT" IS FLASHING, EJECT BALL TO SHOOTER LANE AND RESTART THE SPINNING DISK.

LEFT UPKICKER:

- * SCORE 20,000.
- * SCORE A HIT IF TRAIN, ATTACK, OR AIRPLANE FLASHING.

RIGHT UPKICKER:

- * SCORE 20,000.
- * GIVE A RANDOM MYSTERY AWARD IF LIT.
- * SCORE A HIT IF ANTI-AIRCRAFT, ATTACK, OR AIRPLANE FLASHING.

UNDERGROUND ENTRANCE:

- * SCORE 20,000.
- * SCORE A HIT IF BUNKER, ATTACK, OR AIRPLANE FLASHING.
- * SCORE AMMO ANTI-AIRCRAFT HIT IN MISSION 5 IF ADJUSTED TO EASY OR MEDIUM.

TOP LEFT RAMP:

- * SCORE ATTACK BONUS IF ATTACK FLASHING OR SCORE 200,000.
- * SCORE A HIT IF RADAR, ATTACK OR AIRPLANE FLASHING.

- * LOCK THE BALL IF IN MISSION 1 OR 2 AND RELEASE ANOTHER BALL TO THE SHOOTER.

- * SCORE JACKPOT, DOUBLE JACKPOT OR SUPER JACKPOT IN MISSION 10 MULTIBALL. LOCK BALL IF RAMP SHOT MADE ON FIRST SHOT OF MULTIBALL.

SPINNER:

- * ADD FUEL IF LIT.
- * SCORE 10,000 UNLIT OR STRAFE VALUE IF FLASHING.

POP BUMPERS:

- * SCORE 3,000.

VARI-TARGET (FIRST 3 POSITIONS) : :

- * SCORE 1,000.
- * SCORE AMMO HIT IN MISSION 5 IF ADJUSTED TO EASY.

VARI-TARGET (LAST 3 POSITIONS) : :

- * SCORE 100,000.
- * AWARD SPECIAL IF FLASHING.
- * ADVANCE MULTIPLIER IF LIT.

- * SCORE AN AMMO HIT IF FLASHING.

LEFT 3-BANK DROP TARGETS:

- * SCORE 3,000 UNLIT.
- * SCORE 300,000 IF LIT.
- * SCORE 2 MILLION IF FLASHING OR LIT.
- * ALL DOWN UNLIT, RESET BANK AND SCORE 27,000 MORE.
- * ALL DOWN SCORES A SPECIAL IF LIT AND STARTS NEXT MISSION.

RIGHT 5-BANK DROP TARGETS:

- * SCORE 3,000 UNLIT.
- * SCORE 300,000 IF LIT.
- * SCORE 2 MILLION IF FLASHING OR LIT.
- * ALL DOWN UNLIT, RESET BANK AND SCORE 27,000 MORE.

KICKING RUBBERS:

- * SCORE 90.

II. GAME PLAY AND SCORING

LEFT & RIGHT OUTSIDE ROLLOVERS:

- * IN 1 BALL PLAY, SCORE MYSTERY POINTS
- * IN MISSION 2, RELEASE ANY LOCKED BALLS IN LEFT RAMP AND DRAIN.

LEFT RETURN ROLLOVER:

- * SCORE 1,000.
- * LIGHT VARI-TARGET ADVANCE MULTIPLIER IF LIT.

RIGHT RETURN ROLLOVER:

- * SCORE 1,000.
- * LIGHT SPINNER FUEL IF LIT.

OUTHOLE:

- * RELEASE AND DRAIN ANY LOCKED BALLS IN LEFT RAMP.
- * COLLECT BONUS OF 100,000 FOR EACH LIT MISSION TIMES MULTIPLIER.
- * ON LAST BALL, COLLECT EXTRA BONUS BASED UPON FINAL RANK.

LEFT AND RIGHT FLIPPERS:

- * CHANGE LIT SPOT TARGET LAMPS WHILE BALL IS IN THE POWER PLANT.

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III. TEST MODE

There are several functions accessible to the operator while in the test mode. These functions are Self-Test, Bookkeeping, Game Adjustments, and Burn-In. Each of these functions will be explained in detail later in this section. To enter the test mode, the game must be in the attract mode (game over). Then depress the Test button located just inside the front door of the game. The operator will be given a choice as to which function he wants to access. Pressing the appropriate button will select that function.

NOTE: The Test button may be held in to fast forward through the steps of a particular function.

To exit the test mode or change functions the Slam switch (front door) must be activated or the power must be turned off.

I. SELF-TEST

This function will allow the operator to test all the hardware related devices in the game. Each test is described below.

A. MEMORY TEST

This function tests all memory devices on the Control Board (A1). If all the devices pass the test an "OK" will be displayed. If a failure occurs, a description of the faulty component will be displayed. Then after a short period of time the Game Prom check sum will be displayed. The Credit button can be used to restart this test.

B. LAMP CHECK

This function will flash all the controlled lamps and flasher lamps continuously. This will allow the operator to easily check for and replace any burned out light bulbs.

C. LAMP MATRIX TEST

This test will allow the operator to single step through and check the operation of each lamp in the game. The left flipper button will decrement the active lamp number by one while the right flipper button

will increment the active lamp number by one. The strobe number and the return number are combined to form the lamp number (strobe,return) which is shown in the lower display along with a description of the lamp. The Credit button can be used to restart this test. Only one lamp at a time should flash during this test.

D. RELAY AND SOLENOID TEST

This test will allow the operator to single step through and check the operation of each relay and solenoid driver in the game. The left and right flipper buttons are used to change the active driver number. The selected driver description and number will appear in the lower display. The Credit button is then used to activate the driver for a short time period. Solenoid #31 ("Q" relay) is always on during this test so as to provide power to devices such as the pop bumpers and kicking rubbers (see Playboard Schematic Diagram).

E. SWITCH MATRIX TEST

This test will allow the operator to test the operation of all the switches used in the game. If no switches are closed when this test is started, the message "ALL SWITCHES OPEN" will be displayed. If any switches are closed either before or after this test is started, the closed switch(s) name and number will be displayed. The strobe number and the return number are combined to form the switch number (strobe,return). The Credit button can be used to restart this test.

F. DISPLAY TEST

This test will allow the operator to check the operation of the individual digits and segments of the displays. Pressing the right flipper button will advance to the next step of the test. The displays will first step through all the individual segments followed by all the individual digits. The Credit button can be used to restart this test.

G. AUXILIARY DRIVER TEST

This test will allow the operator to single step through and check the

III. TEST MODE

operation of each driver transistor on the Auxiliary Driver Board (A11). The left and right flipper buttons are used to change the active driver number. The selected driver description and number will appear in the lower display. The Credit button is then used to activate the driver for a short time period.

H. SOUND TEST

This test allows the operator to test the interface lines from the Control Board (A1) to the Sound Board (A6). Every time the right flipper button is pressed, a different tone should be heard from the Sound Board. During each tone, the sound line connection which is being tested will be shown in the lower display. After the tone stops the sound line which is being tested will still be kept at a low level ($< .8v$) until the right flipper button is pressed again or the Credit button is used to restart the test.

I. FRONT DOOR TEST

This test allows the operator to check the operation of the coin chutes used in the game. Utilizing this function will not affect any bookkeeping values. Each coin chute closure is categorized and shown in the display. The Credit button can be used to restart this test.

II. BOOKKEEPING

The Test button is used to step through bookkeeping. The upper display will contain a description of each step while the lower display will contain the step number and two different bookkeeping values. The value in the leftmost column represents long term bookkeeping. The value in the rightmost column (in brackets) represents short term bookkeeping. These two values are provided so that the operator may compare recent performance with long term performance and then make any necessary game adjustments.

NOTE: The first four left steps (coin chute counts) will not be displayed unless the credit button is pressed during that active step number.

The left flipper button will allow the operator to reset all of the left (long term) and right (short term) bookkeeping values. The right flipper button will allow the operator to reset all of the right (short term) bookkeeping values only. If the R.BOOK AUTO-RESET adjustment is on, the right (short term) bookkeeping will automatically be reset after every 2000 plays (see Game Adjustments). Therefore, the operator does not need to reset the short term bookkeeping himself unless he prefers to follow his own procedure. Also, this feature will aid in adjusting the game payout percentage to the caliber of players in different locations. If there happens to be a major error in a long term bookkeeping value the letters ERR will appear to the right of that bookkeeping value. To correct this error the long term bookkeeping must be reset. A description of each bookkeeping step is given in the test mode flowchart.

III. GAME ADJUSTMENTS

This function allows the operator to make any adjustments to his game as necessary.

A. FACTORY SETTINGS

Upon entering the game adjustment section of bookkeeping, the operator is given a choice to load all factory settings or to single step through the game adjustments and adjust each section individually. If he chooses to enter the factory settings by depressing the Credit button, he will also be given a choice of what language to load. By using the right flipper button he may choose the appropriate language and then depress the Credit button again to enter the settings. After the settings are loaded the display should show the message "FACTORY SETTINGS LOADED" for a short time and then proceed to game adjustment step 1. At any time during the previous steps the operator may either exit the test mode or depress the Test button to proceed immediately to game adjustment step 1.

III. TEST MODE

WARNING

Loading the factory settings will affect all previous game adjustment settings. Therefore be careful when selecting this feature.

B. GAME ADJUSTMENT STEPS

Each time the Test button is pressed a description of the next step appears in the upper display while the lower display contains the step number and the current status of that step. Unless otherwise specified, the left and right flipper buttons are used to change the possible selections in each step.

- 1) SCORE REPLAY LEVEL 1
- 2) SCORE REPLAY LEVEL 2
- 3) SCORE REPLAY LEVEL 3

Each Score Replay Level may be set by using the left flipper button to decrement the score and the right flipper button to increment the score. The Credit button can be used to load the factory setting for each individual level if desired. If the Auto-Percentaging adjustment is on, Replay Levels 2 & 3 can only be set to on or off. If Replay Level 2 is on, the score level will be set to two times Replay Level 1. If Replay Level 3 is on, the score level will be set to three times Replay Level 1. This allows the operator several combinations of levels in the Auto-Percentaging mode (i.e. 1, 1 & 2, 1 & 3, or 1 & 2 & 3).

- 4) HIGH GAME TO DATE 1
- 5) HIGH GAME TO DATE 2
- 6) HIGH GAME TO DATE 3
- 7) HIGH GAME TO DATE 4
- 8) HIGH GAME TO DATE 5

Each High Game To Date may be set by using the left flipper button to decrement the score and the right flipper button to increment the score. The Credit button can be used to load the factory setting for the displayed level and all those below it.

9) GAME PRICING

This step provides a choice of loading a standard setting for a particular country or a custom setting. When a standard setting is selected, the following steps (10-17) are skipped.

- 10) CHUTE 1 UNITS (L)
- 11) CHUTE 2 UNITS (R)
- 12) CHUTE 3 UNITS (C)
- 13) CHUTE 4 UNITS
- 14) UNITS REQUIRED FOR CREDIT
- 15) UNITS REQUIRED FOR BONUS
- 16) BONUS CREDITS
- 17) MINIMUM UNITS REQUIRED FOR CREDIT

Steps 10-17 are used if a custom setting is selected in step 9 (GAME PRICING). Steps 10-13 select the number of units that each chute is worth when a coin is dropped into that particular chute. The value entered for step 14 determines how many units must be accumulated for a credit to be issued on the game. Steps 15 and 16 determine how many units must be accumulated for any bonus credits to be issued. A value of zero entered for step 15 will disable the bonus feature. Step 17 indicates the number of units required before any credits are issued (see Coin Chute Setting Table for examples).

18) COIN METER

If set to ON, the pulses to be given for each of the four coin chutes can be defined so that the number of pulses for a given chute are in relation to the currency denomination. If set to OFF, steps 19-22 will be skipped.

- 19) CHUTE 1 PULSES
- 20) CHUTE 2 PULSES
- 21) CHUTE 3 PULSES
- 22) CHUTE 4 PULSES

The four steps above are used to set the number of pulses to be issued for each of the four coin chutes.

23) 1 COIN BUY-IN BONUS

At the end of a game a 10-second timer is initialized allowing each player that participated in the previous game a chance to purchase 1 credit for each coin inserted.

24) GAME PERCENT PAYOUT

This step is used to set the game payout percentage used when the Auto-Percentaging adjustment is on. The value entered for this step is compared to the value calculated by dividing total replays by total plays (see Bookkeeping section). Total

III. TEST MODE

COIN CHUTE SETTING TABLE

COIN CHUTE SETTING TABLE														
Country		Coin Chutes				Plays/Coin(s)	Chute Adjustment Steps							
		Left 1	Right 2	Center 3	4		10	11	12	13	14	15	16	17
USA		.25	.25	\$1		1/.50, 2/.75, 3/\$1	03	03	12	00	04	00	00	00
USA (Custom)						1/.50, 3/\$1	01	01	04	00	02	04	01	00
						1/.25, 4/\$1	01	01	04	00	01	00	00	00
						1/.25, 5/\$1	01	01	04	00	01	04	01	00
Australia	1	.20	\$1	\$2	-	1/3x.20, 2/\$1, 5/\$2	02	10	20	00	05	20	01	00
	2	.20	\$1	\$2	-	1/5x.20, 1/\$1, 3/\$2	01	05	10	00	05	10	01	00
Belgium		5Fr	20Fr	50Fr	-	1/20Fr, 3/50 Francs	03	12	30	00	10	00	00	00
Canada		.25	\$1	-	-	1/.50, 2/.75, 3/\$1	03	12	00	00	04	00	00	00
Canary Islands		25P	100P	-	-	1/25P, 4/100 Pesetas	01	04	00	00	01	00	00	00
Denmark		1Kr	10Kr	-	-	1/3x1Kr, 4/10 Kroner	01	10	00	00	03	10	01	00
Finland		5Mka	1Mka	-	-	1/3x1 Markka, 2/5 Markkaa	10	02	00	00	05	00	00	00
France	1	1Fr	5Fr	10Fr	-	1/3x1Fr, 2/5Fr, 5/10Fr	02	10	20	00	05	20	01	00
	2	1Fr	5Fr	10Fr	-	2/5Fr, 4/10Fr, 9/2x10Fr	02	10	20	00	05	40	01	10
	3	1Fr	5Fr	10Fr	-	1/5Fr, 3/10Fr, 7/2x10Fr	03	15	30	00	10	60	01	15
Germany		2DM	1DM	5DM	-	1/1DM, 2/2DM, 6/5 D-Mark	02	01	05	00	01	05	01	00
Italy		500L	500L	-	-	1/500 Lire	01	01	00	00	01	00	00	00
Japan		100Y	100Y	-	-	1/100 Yen, 3/2x100 Yen	01	01	00	00	01	02	01	00
New Zealand		.20	.20	-	-	1/20 Cents	01	01	00	00	01	00	00	00
Norway		5Kr	10Kr	-	-	1/5Kr, 2/10 Kroner	01	02	00	00	01	00	00	00
Spain		500P	100P	-	-	1/100P, 6/500 Pesetas	05	01	00	00	01	05	01	00
Sweden		10Kr	5Kr	-	1Kr	1/5x1Kr, 1/5Kr, 2/10Kr	10	05	00	01	05	00	00	00
Switzerland		1Fr	5Fr	2Fr	-	1/1Fr, 3/2Fr, 7/5 Francs	01	07	03	00	01	00	00	00
United Kingdom	1	1£	50P	20P	10P	1/3x10P, 2/50P, 4/1 Pound	20	10	04	02	05	00	00	00
	2	1£	50P	20P	10P	1/2x10P, 3/50P, 7/1 Pound	30	15	06	03	05	30	01	00
Universal		-	-	-	-	1/1 Coin	01	01	00	00	01	00	00	00

III. TEST MODE

replays include all replays won from beating the score replay level, achieving a new high game to date, winning a playfield special, and all match replays.

When the GAME MODE adjustment is set to Add a Ball this setting refers to extra ball percentage rather than replay percentage. The value entered in this case will be compared to the value calculated by dividing total extra balls won by total plays (see Bookkeeping section).

25) MATCH PERCENT PAYOUT

This step is used to set the match payout percentage. If this step is set to zero, the match will be disabled.

NOTE: The resulting value from subtracting the value entered for this step from the value entered for the GAME PERCENT PAYOUT adjustment indicates what percentage is left for any other means of winning a replay during a game.

26) HIGH GAME REPLAYS

This step is used to set the number of replays to award when the highest game to date has been beaten.

27) MAXIMUM CREDITS

This step sets the maximum number of credits allowed on the game.

28) TILT WARNINGS

This step sets the number of tilts allowed before the current player's ball in play is terminated.

29) BALLS PER GAME

This step sets the game to 3-ball play or 5-ball play.

30) GAME MODE

This step allows the game to be played in Replay, Replay + Tickets, Tickets Only, Add a Ball, or Novelty mode. In Replay mode all Specials and replays are allowed. Replay + Tickets mode is the same as Replay mode with the addition of one or more tickets to be issued (TICKETS TO AWARD) along with each replay. In Tickets Only mode one or more tickets will be issued in place of each replay won.

In Add a Ball mode all Score Level Replays and Playfield Specials award an extra ball in place of a replay. Also the Match and High Game To Date awards are disabled. However, after the Add a Ball mode is selected, the PLAYFIELD SPECIAL, MATCH PERCENT PAYOUT, and HIGH GAME REPLAYS adjustments may be individually set to whatever setting may be desired. In Novelty mode all Specials award 10,000,000 points and the Score Replay Levels, Match, and High Game to Date awards are disabled.

NOTE: If either the Replay + Tickets or Tickets Only setting is selected do not set the COIN METER setting to on.

31) TICKETS TO AWARD

This step allows the operator to set the number of tickets to award when a replay has been won. This setting will only apply when the GAME MODE is set to either Replay + Tickets, or Tickets Only.

32) LANGUAGE

This step allows the Test Mode steps to be displayed in English, German, or French.

33) AUTO-PERCENTAGING

If this step is set to on, the Score Replay Levels will be adjusted periodically so that the Game Percent Payout setting will match the actual Replay Percentage displayed in Bookkeeping.

NOTE: If the GAME MODE is set to Add a Ball, the Extra Ball Percentage in bookkeeping is used in place of the Replay Percentage.

34) REPLAY LIMIT

This step may be set to no limit or one per player per game.

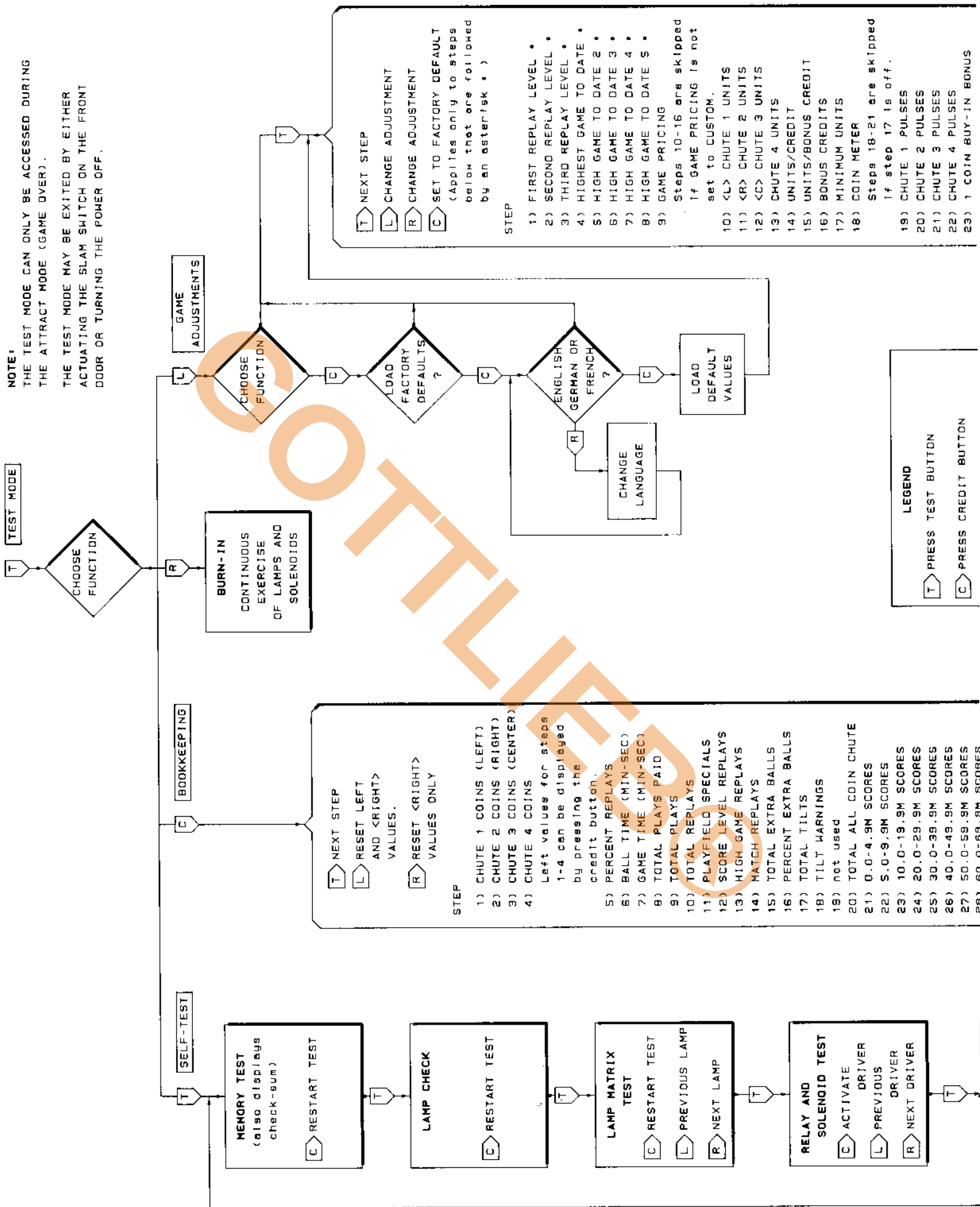
35) HIGH GAMES 2-5

This step will determine if High Games to Date (2-5) will be saved or erased when power is turned off.

36) ATTRACT SOUND

This step determines whether or not sounds are enabled during the attract mode (game over).

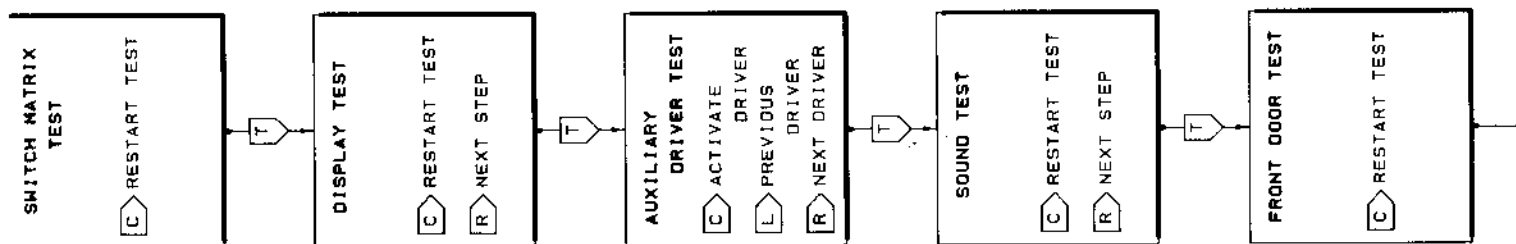
NOTE:
THE TEST MODE CAN ONLY BE ACCESSED DURING
THE ATTRACT MODE (GAME OVER).
THE TEST MODE MAY BE EXITED BY EITHER
ACTUATING THE SLAM SWITCH ON THE FRONT
DOOR OR TURNING THE POWER OFF.



[L] PRESS LEFT FLIPPER BUTTON
[R] PRESS RIGHT FLIPPER BUTTON

- 29) 70.0-79.9M SCORES
- 30) 80.0-89.9M SCORES
- 31) 90.0-99.9M SCORES
- 32) 100.0-149.9M SCORES
- 33) 150.0-199.9M SCORES
- 34) 200.0M+ SCORES
- 35) HURRY-UP SPECIALS
- 36) CARRYOVER SPECIALS
- 37) TANK ASSAULT SPECIALS
- 38) MYSTERY EXTRA BALLS
- 39) SPOT TARGET EX BALLS
- 40) MISSION 3 EX BALLS
- 41) MISSION 1+2 COMPLETE
- 42) MISSION 3 COMPLETE
- 43) MISSION 4 COMPLETE
- 44) MISSION 5 COMPLETE
- 45) MISSION 6 COMPLETE
- 46) MISSION 7+8 COMPLETE
- 47) MISSION 9+10 COMPLETE
- 48) MISSION 11 COMPLETE
- 49) MISSION 12 COMPLETE

- 24) GAME PERCENT PAYOUT
 - 25) MATCH PERCENT PAYOUT
 - 26) HIGH GAME REPLAYS
 - 27) MAXIMUM CREDITS
 - 28) TILT WARNINGS
 - 29) BALLS PER GAME
 - 30) GAME MODE
 - 31) TICKETS TO ANARD
 - 32) LANGUAGE
 - 33) AUTO PERCENTAGING
 - 34) REPLAY LIMIT
 - 35) HIGH GAMES 2-5
 - 36) ATTRACT SOUND
 - 37) ATTRACT MESSAGE
- Use the credit button to enter a message.
- 38) FREE PLAY
 - 39) RIGHT BOOK AUTO-RESET
 - 40) PLAYFIELD SPECIAL
 - 41) GAME DIFFICULTY
 - 42) TIMED MISSIONS
 - 43) EXTRA BALL TARGET
 - 44) MYSTERY EXTRA BALL
 - 45) TANK ASSAULT SPECIAL
 - 46) HURRY-UP SPECIAL
 - 47) MYSTERY SPECIAL ADV
 - 48) MISSION 3
 - 49) MISSION 5
 - 50) MISSION 6
 - 51) MISSION 8
 - 52) MISSION 12
 - 53) CATCH UP FEATURE
 - 54) GAME INTERVENTION
 - 55) TOURNAMENT PLAY
 - 56) AUTO SKILL ADJUST



III. TEST MODE

37) ATTRACT MESSAGE

This step is used to enable or disable an operator message during the attract mode (game over). This step is also used to enter a user message into memory. To enter a message press the Credit button. The current message will be displayed and the cursor position will be indicated by the flashing character. If the current position is blank, a flashing directional arrow will appear. This type of arrow will indicate which direction the cursor will move if the Credit button is pressed. The Credit button is also used to select characters after they have been chosen using the left and right flipper buttons.

38) FREE PLAY

If this step is set to on, a game may be started without any credits posted on the machine.

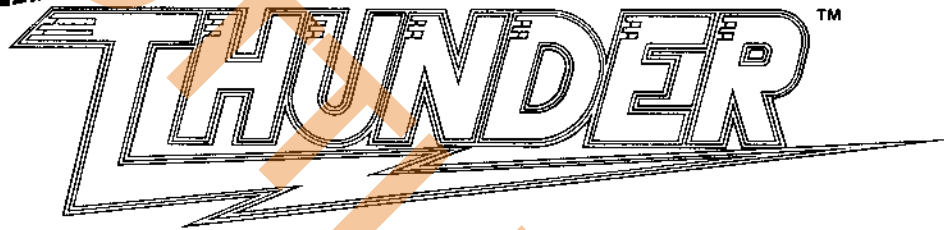
39) RIGHT BOOKKEEPING AUTO-RESET

If this step is set to on, all the short term bookkeeping steps (in brackets) will reset after 2000 plays. Otherwise they will not reset until 10,000 games have been played on the machine.

40) PLAYFIELD SPECIAL

When a playfield special is won, either a replay or an extra ball is awarded to the player based on the setting of this step.

OPERATION:



ADJUSTMENTS

OPERATOR ADJUSTMENT SETTINGS
(*** = FACTORY DEFAULT SETTING)

41) GAME DIFFICULTY

AUTOMATICALLY SETS VARIOUS
ADJUSTMENTS LISTED BELOW IN STEPS
42 - 52. THE FINE-TUNE SETTING
ALLOWS THE OPERATOR TO
INDIVIDUALLY SELECT EACH
ADJUSTMENT.

STEP		RECOMMENDED				
		3-BALL		5-BALL		
41	GAME DIFFICULTY	VERY EASY	EASY	MEDIUM	HARD	VERY HARD
42	TIMED MISSIONS	VERY EASY	EASY	MEDIUM	HARD	VERY HARD
43	EXTRA BALL TARGET	EASY	MEDIUM	MEDIUM	HARD	HARD
44	MYSTERY EXTRA BALL	VERY EASY	EASY	MEDIUM	HARD	VERY HARD
45	TANK ASSAULT SPECIAL	EASY	EASY	MEDIUM	MEDIUM	HARD
46	HURRY-UP SPECIAL	EASY	EASY	MEDIUM	MEDIUM	HARD
47	MYSTERY SPECIAL ADVANCE	ON	ON	ON	OFF	OFF
48	MISSION 3	EASY	EASY	HARD	HARD	HARD
49	MISSION 5	EASY	MEDIUM	MEDIUM	HARD	HARD
50	MISSION 6	EASY	EASY	MEDIUM	HARD	HARD
51	MISSION 8	EASY	MEDIUM	MEDIUM	MEDIUM	HARD
52	MISSION 12	EASY	MEDIUM	MEDIUM	MEDIUM	HARD

III. TEST MODE

- 42) TIMED MISSIONS
Rate at which the FUEL counts down in timed missions 4, 6, and 12.
VERY EASY = Slowest
EASY
*** MEDIUM
HARD
VERY HARD = Fastest
- 43) EXTRA BALL TARGET
Selects the amount of time allowed to earn an EB from the lower left spot target during mission 7.
EASY = Maximum time
*** MEDIUM
HARD = Minimum time
- 44) MYSTERY EXTRA BALL
Filters out EB from the random mystery table.
VERY EASY
EASY
*** MEDIUM
HARD
VERY HARD
- 45) TANK ASSAULT SPECIAL
Selects the number of drop target hits needed for a special during mission 4.
EASY = 8
*** MEDIUM = 11 (both banks up)
HARD = 11 (one bank at a time)
- 46) HURRY-UP SPECIAL
Enables vari-target special at selected multiplier values.
EASY = 5X, 10X, & 15X
*** MEDIUM = 10X & 15X
HARD = 15X
- 47) MYSTERY SPECIAL ADVANCE
Include advance "SPECIAL" as an available mystery award.
OFF = No
*** ON = Yes
- 48) MISSION 3
Selects the number of flashing airplane objectives need to complete mission 3.
EASY = 4
*** HARD = 5
- 49) MISSION 5
Chooses the difficulty of completing the 3 flashing objectives in mission 5.
EASY = Vari-target sensitive & Bunker scores Anti-Air
*** MEDIUM = Bunker scores Anti-Air
HARD = No help
- 50) MISSION 6
Selects the amount of FUEL (time) at the start of mission.
EASY = Most
*** MEDIUM
HARD = Least
- 51) MISSION 8
Sets the Attack Countdown rate.
EASY = Slowest
*** MEDIUM
HARD = Fastest
- 52) MISSION 12
Selects the amount of FUEL (time) at the start of mission.
EASY = Most
*** MEDIUM
HARD = Least
- 53) CATCH UP FEATURE
Include "CATCH-UP" as an available mystery award.
OFF = No
*** ON = Yes
- 54) GAME INTERVENTION
Selects if successfully completing mission 12 ends the player's game immediately.
*** OFF = Continues game at mission 6
ON = Ends player's game
- 55) TOURNAMENT PLAY
Controls various carry over and spotting features.
*** OFF = Normal play
ON = (1) Jackpot is set to 3 million
(2) Carry over is set to SPECI
(3) AUTO SKILL disabled
(4) CATCH-UP disabled
- 56) AUTO SKILL ADJUST
Automatically speeds FUEL (time) consumption as a player scores replays and specials.
OFF = No
*** ON = Yes

III. TEST MODE

SOUND ADJUSTMENTS

The speaker(s) output is controlled by the potentiometer mounted on a bracket located inside the cabinet next to the front door hinge.

Turning the potentiometer counter-clockwise will decrease the volume. Turning it clockwise will increase the volume.

POST ADJUSTMENTS

There are no post adjustments on this game.

IV. BURN-IN

This function can be used to continuously exercise all the lamps and solenoids in the game.

GOTTLEB®

IV. THEORY OF OPERATION

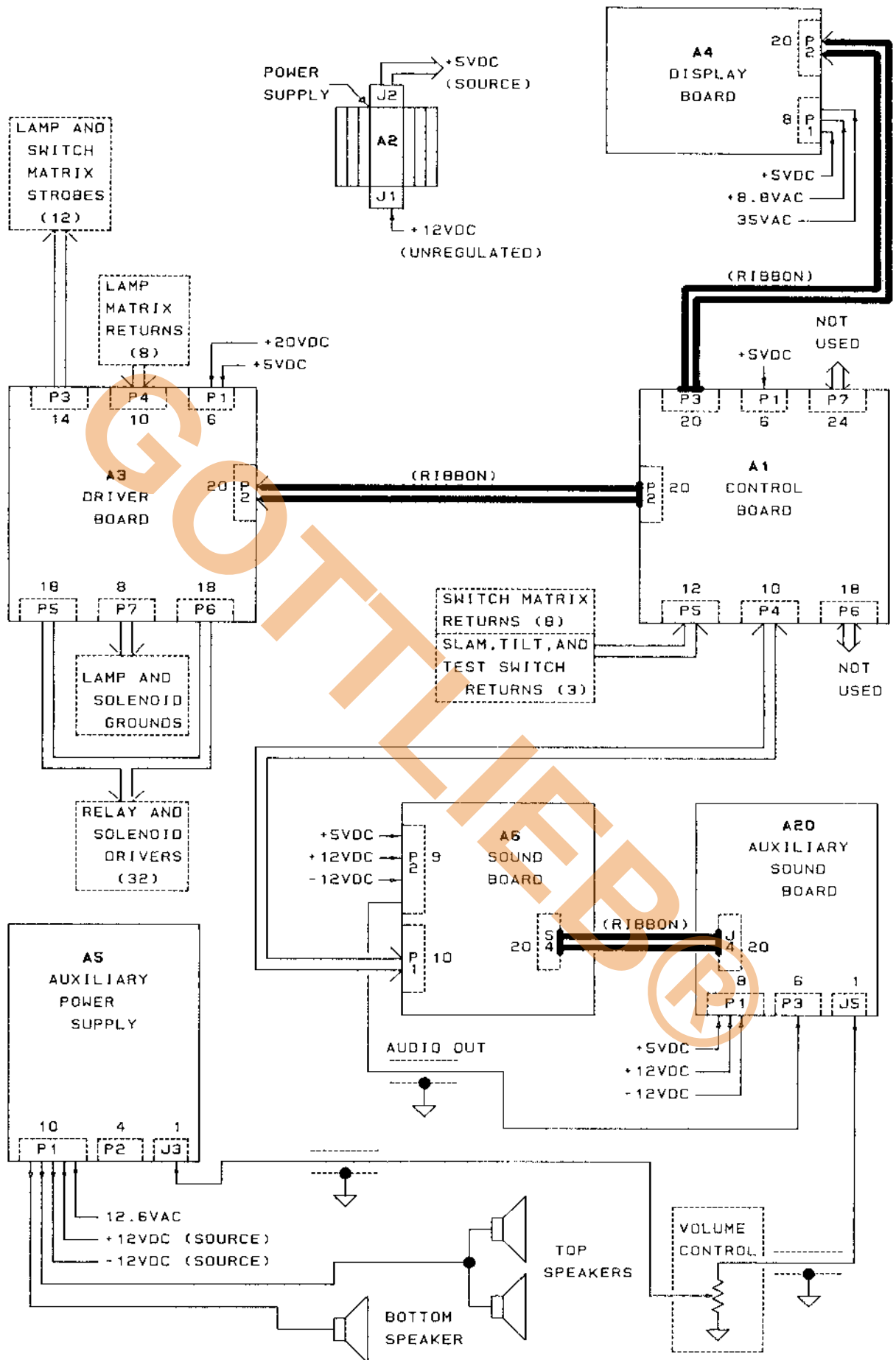


FIGURE 1, SYSTEM 3 BLOCK DIAGRAM

IV. THEORY OF OPERATION

A. CONTROL BOARD (A1)

The Control Board is supplied with 5vdc (A1P1) from the Power Supply (A2P2). The data contained in ram (U3) is kept valid when power is turned off by the lithium battery (BAT1) and controller (U6).

NOTE: When replacing either the battery, ram, or the controller there may be a message that appears in the display on power up the first time that indicates a low battery condition. If this occurs, turn the power off and back on again. The board should power up normally this time. If not, there is another problem on the board.

The Control Board can accommodate either a 27512 or a 27256 Eprom. JP1 must be installed for a 27512 or JP2 for a 27256 Game Prom. A 4 Mhz oscillator is configured using U17, R1, R2, C22, C23, and XTAL1. The oscillator output is then divided by 2 to a 2Mhz clock by U18 which is used as the input clock to the 65C02 (U1) microprocessor. The clock output of U1 (pin 39) is used as a sync signal for reading from or writing to the peripheral devices.

Two versatile interface adapters (U4, U5) are used to develop the necessary control signals for the system. The waveform generated on the CB2 output of U4 triggers the NMI input of the microprocessor. This signal controls the display refresh rate. The display connector (A1P3) is comprised of several signals. The display blanking (DBLKN), digit strobe (DSTB), and digit data (DDATA) are generated by U4-17, U4-16, and U4-15 respectively. The display segment data is output by U7 and latched into the appropriate device on the Display Board by the display segment strobes (DS0-DS3).

The Driver Board connector (A1P2) contains all the signals necessary to operate the lamp and switch matrix strobes, the lamp matrix returns, and the solenoids. The

lamp clear (LCLR), lamp strobe (LSTB), and lamp strobe data (LDATA) are generated by U4-12, U4-11, and U4-10 respectively. The appropriate lamp return data during each active lamp strobe is output by U7 and latched into U5 on the Driver Board by the lamp return data strobe (LDS). The solenoid data is output by U7 and latched into the appropriate Driver Board device (U1-U4) by the solenoid strobes (SS0-SS3).

The switch matrix returns are input at A1P5, buffered by U19 and U20 and then input to U4. Discrete inputs are provided at A1P5 for the slam, tilt, and test switches.

The connection to the Sound Board (A1P4) is made up of eight sound data lines (SD0-SD7), a return line (SRET), and a reset line (MR).

A reset circuit is configured using U13, U14, R3, and C24. When power is applied to the system, the microprocessor reset pin (U1-40) is held low for approximately 10 milliseconds. The system can also be reset by pressing the switch (SW1) on the board. Whenever a reset occurs the master reset signal (MR) (U18-9) is held low until the display strobe (DSTB) becomes active. At this point the master reset goes high which enables the peripheral IC's on the Display Board and Driver Board to accept data.

A watchdog circuit is employed to monitor both the display digit strobe and the lamp strobe. This circuit is made up of U11, U12, U13, U16, R5, R6, R29, R32, R33, C20, C21, C28, and C29. If either the display strobe or the lamp strobe is missing for 330 milliseconds the system will be reset. The system will also be reset if the supply voltage drops below 4vdc. This voltage monitor is configured using U21, VR1, D1, D2, R34, and R35.

IV. THEORY OF OPERATION

B. POWER SUPPLY (A2)

The transformer panel delivers 12vdc to the input of the power supply. The regulated output voltage should be set to 5vdc by using potentiometer R3. This voltage is then supplied to the Control Board (A1), Driver Board (A3), Display Board (A4), Sound Board (A6), and any other auxiliary board which may require it. (A1P3) to the Display Board (A4P2).

C. DRIVER BOARD (A3)

Two voltages are supplied to this board at A3P1. The 5vdc is supplied from the Power Supply (A2) and the 20vdc is supplied from the transformer panel. The 20vdc is used to source the controlled lamps and the switch matrix. The Driver Board receives its data at A3P2 from the Control Board (A1P2). Solenoid data is latched into U1-U4. Lamp return data is latched into U5. Lamp and switch strobe data is shifted through U6 and U7. The comparators (U10,U11) are used to protect the MOSFETS (Q33-Q49). If a sensed input voltage exceeds the reference voltage (V_{ref}), the corresponding MOSFET is turned off immediately following the lamp clear pulse (LCLR) supplied by U12 thus limiting the duty cycle. If the master reset signal (MR) is held low all lamps and solenoids will be disabled.

D. DISPLAY BOARD (A4)

Several voltages are input to this board at A4P1. The power supply (A2) supplies 5vdc (V_{cc}). The board develops V_{gg} from the 35vac supplied from the transformer panel. The transformer panel also sources 8.8vac to the display filaments. The display filaments are biased 9.1vdc above ground by the zener diode VR1.

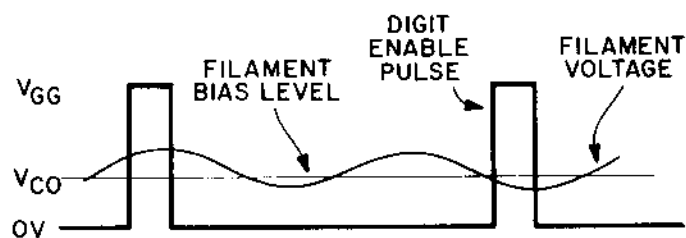


Figure 2. Display Waveform

The Display Board incorporates two vacuum fluorescent display tubes (DSP1,DSP2). The tube's digits are driven by U9. The segments (a-n) of the upper display are driven by U3,U4,U7, and U8. The segments of the lower display are driven by U1,U2,U5, and U6. Figure 1 shows the basic display waveform. Data is sent from the Control Board (A1P3) to the Display Board (A4P2).

E. SOUND BOARD (A6)

The Sound Board consists of two 6502 microprocessor systems, a dual DAC, an input port to receive commands from the system Control Board, and a low level audio output at A6P2-9 which is sent to the summing amplifier located on the Auxiliary Sound Board (A20) for amplification.

The Sound Board requires three supply voltages +5vdc, +12vdc, and -12vdc. In addition, a power-up reset signal is required from the Control Board. If a manual reset is desired, pressing SW2 will reset both processors.

A 4MHz oscillator is configured with R11, R12, C14, C15, C22, XTAL1, and T1. This clock is then divided down by S1 into either a 2MHz or 1MHz clock signal for the processors N1 and T3. A 250 KHz clock signal from S1-11 is used by the programmable timer section consisting of N5, H5, T5, and K5.

Eight lines from the Control Board are input at A6P1 on the Sound Board and sent to the two input code latches A3 and B2. When any of these inputs goes low (except for A6P1-9 when JP7 is not installed) A2-8 goes high which causes the input code data to be latched into A3 and B2. Also at the same time the flip-flops contained in A4 are clocked which cause the IRQ input of each microprocessor to go low. The outputs of A4 will remain in the low state until each flip-flop is cleared by a signal from its associated microprocessor after each IRQ is processed.

The Sound Board is designed to accommodate different types of Eproms. Jumpers JP1, JP2, JP3, and JP4 should be set to their proper positions based on the density of the Eproms being used.

IV. THEORY OF OPERATION

F. AUXILIARY SOUND BOARD (A20)

The Auxiliary Sound Board contains a sound generator YM2151 (U9) and a speech generator MSM6295 (U1). Both of these IC's operate under the control of the T3 microprocessor on the master Sound Board (A6). The sound generator YM2151 responds to its commands by sending serial data to the YM3014 DAC (U10). The DAC then converts this data into an analog signal which is filtered through a series of op-amps and then sent to the main summing amplifier (U11).

When the speech generator MSM6295 receives a command, it then retrieves its data from the Eproms (U4, U5). The analog output at pin 36 (DAO) is then sent through an active filter network and then to the main summing amplifier (U11). A 1MHz crystal resonator (XTAL1) is used to generate the proper clock signal for U1.

The output of the main summing amplifier is sent off the board to a potentiometer (volume control) located just inside the front door of the game. A portion of this output signal is then sent to the power amplifier inputs on the Auxiliary Power Supply Board (A5).

G. SENSOR BOARD (A15)

This board is used to detect if any flipper is energized and then inputs the data to the Control Board to be processed. This board therefore eliminates the need for a second switch to be used on the flipper assembly itself. U1 is an optocoupler device which converts the input signal from the flipper circuit when energized to a signal which can be recognized by the Control Board as a valid switch closure.

H. OPTICAL INTERFACE (A25)

The optical interface assembly generates and receives the infrared light pulses needed to optically detect the ball breaking an infrared light beam. It also provides a visual indication that the interface assembly is functioning properly.

This method of detection transmits

infrared light pulses from an opto LED to an opto phototransistor receiver. The LED light pulses are generated from a switch strobe that is buffered and current amplified by 2 sections of the LM-339 voltage comparator (output pins 1 & 2) and transistor Q2.

When no ball is present, the light pulses reach the opto receiver which passes the pulses 180 degrees out of phase with the switch strobe on to 2 additional sections of the comparator (pins 9 & 10). Because the strobe pulses and receive pulses are out of phase, they cancel at resistors R1 & R3 and keep comparator output pin 13 high preventing Q1 from passing strobes on to the switch return line.

As a ball passes between the opto transmitter and receiver, the light beam is broken. Now, with no out of phase pulses coming from the receiver, the strobe appears at comparator inputs 9 & 10. Comparator output pin 13 begins pulsing low and passes the strobes through Q1 to the return line to signal a closed switch. Also, positive strobe pulses at output pin 14 of the comparator turn Q3 on and light LED D2. D2 lit indicates a broken light beam and a closed optical switch.

J. SMART SWITCH™ (Piezo Film Sensor)

This device takes the place of the momentary rollover type switches. The main advantage of this device is that the need for switch contact points is eliminated. Therefore this eliminates the possibility of contamination by such elements as moisture, dust or smoke. A direct contact force on the wide cantilever beam induces a strain on the laminated piezo film sensor element. As the beam is returning to its rest position it generates an output voltage which triggers the on board circuit. This circuit then generates a momentary output which resembles that of contact points. This switch does not require any adjustment. DO NOT ATTEMPT TO ADJUST THE WIDE CANTILEVER BEAM. This could cause permanent damage to the device. The lifetime of this switch has been determined to be over 10 million cycles.

V. GENERAL INFORMATION

A. PRINTED CIRCUIT BOARDS ARE DESIGNATED AS FOLLOWS:

A1 - Control Board
A2 - Power Supply
A3 - Driver Board
A4 - Display Board
A5 - Auxiliary Power Supply
A6 - Sound Board
A11 - Auxiliary Driver Board
A13 - Resistor Board
A15 - Sensor Board
A17 - Diode Board
A20 - Auxiliary Sound Board
A22 - LED Board
A25 - Optical Interface Board

Printed circuit board connectors will be labeled AX-JX. For example, A3-J4 is the connector J4 to the driver board (A3).

B. WIRE COLORS ARE SHOWN AS NUMBERS:

0 Black
1 Brown
2 Red
3 Orange
4 Yellow
5 Green
6 Blue
7 Violet
8 Gray
9 White

For example, 688 is a BLUE-GRAY-GRAY striped wire.

C. FUSE AND COIL INFORMATION

TRANSFORMER PANEL

F1	Line Input.....	110V AC....	8 Amp	SLO-BLO
		220V AC....	4 Amp	SLO-BLO
F2	Primary Power.....	110V AC....	5 Amp	SLO-BLO
		220V AC....	2.5 Amp	SLO-BLO
F3	Display Filament.....		1/2 Amp	
F4	Display Filament.....		1/2 Amp	
F5	Displays.....		1/4 Amp	SLO-BLO
F6	Power Supply.....		2-1/2 Amp	SLO-BLO
F7	Controlled Lamps.....		10 Amp	SLO-BLO
F8	Solenoids.....		8 Amp	SLO-BLO
F9	Playfield Illumination.....		4 Amp	SLO-BLO
F10	Lightbox Illumination.....		15 Amp	
F11	Auxiliary Power Supply.....		3 Amp	SLO-BLO
F12	Auxiliary Power Supply.....		3 Amp	SLO-BLO

NOTE:

FUSE DESIGNATIONS F13 AND F14 NOT USED.

V. GENERAL INFORMATION

PLAYBOARD FUSES, COILS/COLORS/SLEEVES

FUSE	RATING	PART NO.	USAGE	COIL/COLOR	SLEEVE
F15	1-1/2 AMP SLO-BLO	EL-24	LEFT POP BUMPER	16570 (GREEN)	5064
F16	1-1/2 AMP SLO-BLO	EL-24	RIGHT POP BUMPER	16570 (GREEN)	5064
F17	1-1/2 AMP SLO-BLO	EL-24	LEFT KICKING RUBBER	5195 (WHITE)	5064
F18	1-1/2 AMP SLO-BLO	EL-24	RIGHT KICKING RUBBER	5195 (WHITE)	5064
F19	2-1/2 AMP SLO-BLO	EL-21	BOTTOM LEFT FLIPPER	25959 (RED)	5065
F20	2-1/2 AMP SLO-BLO	EL-21	BOTTOM RIGHT FLIPPER	25959 (RED)	5065
F21	1-1/2 AMP SLO-BLO	EL-24	TOP RIGHT FLIPPER	28740 (TAN)	5065
F22	1/2 AMP SLO-BLO	EL-20	BALL RELEASE	26451 (YELLOW)	5065
			OUTHOLE	26451 (YELLOW)	5065
			BALL HOLE KICKER	26451 (YELLOW)	5065
F23	1/2 AMP SLO-BLO	EL-20	LEFT PLUNGER GATE	26451 (YELLOW)	5065
			RIGHT PLUNGER GATE	26451 (YELLOW)	5065
F24	1 AMP SLO-BLO	EL-6	3 BANK RESET	26926 (BLUE)	5172
			#1 TRIP	26452 (PINK)	---
			#2 TRIP	26452 (PINK)	---
			#3 TRIP	26452 (PINK)	---
F25	2 AMP SLO-BLO	EL-7	5 BANK RESET	19300 (ORANGE)	5172
F26	2 AMP SLO-BLO	EL-7	CENTER UPKICKER	16570 (GREEN)	5064
F27	1 AMP SLO-BLO	EL-6	LEFT UPKICKER	26450 (PINK)	5064
			RIGHT UPKICKER	26450 (PINK)	5064

V. GENERAL INFORMATION

D. COIL CHART

SOLENOID COILS

PART NUMBER	WHERE USED	RESISTANCE (OHMS)	NUMBER OF TURNS	WIRE GAUGE	WRAPPER COLOR
A-19300	GENERAL PURPOSE	7.8	1075	#25	ORANGE
A-5195	GENERAL PURPOSE	12.3	1305	#26	WHITE
A-16570	GENERAL PURPOSE	15.5	1450	#27	GREEN
A-17876	GENERAL PURPOSE	24	1750	#28	TAN
A-26450	GENERAL PURPOSE	42	2400	#29	PINK
A-26451	GENERAL PURPOSE	65.8	3000	#30	YELLOW
A-26926	3-BANK RESET	32.8	2650	#27	BLUE
A-25959	FLIPPER (NEW UNIT)	3.85/202	445/1225	#22/#30	RED
A-26646	FLIPPER (NEW UNIT)	4.57/201	725/3470	#25/#33	BLUE
A-28740	FLIPPER (NEW UNIT)	6.02/207	790/3600	#26/#33	TAN
A-27642	FLIPPER (NEW UNIT)	9.1/203	950/3700	#27/#33	YELLOW
A-27643	FLIPPER (OLD UNIT)	11.4/202	960/3670	#28/#33	GREEN
A-27926	GENERAL PURPOSE	64.7	3475	#29	BLUE

RELAY COILS

PART NUMBER	WHERE USED	RESISTANCE (OHMS)	NUMBER OF TURNS	WIRE GAUGE	WRAPPER COLOR
A-26452	DROP TAR. TRIP	137	2450	#35	PINK
A-16890	GENERAL PURPOSE	231	4000	#35	ORANGE

VI. WIRING AND SCHEMATIC DIAGRAMS, PARTS LISTS

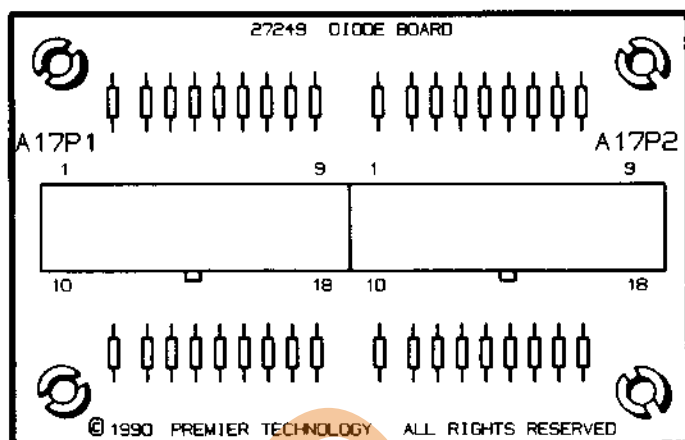
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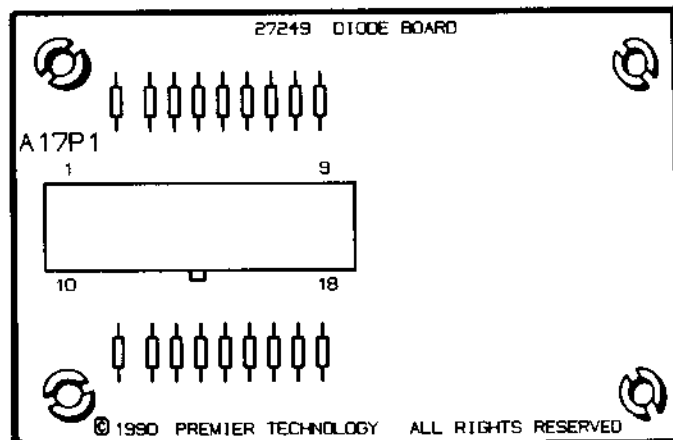
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DIODE BOARD (2A17)	
COMPONENT LOCATION AND PARTS LIST.....	23A
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VI. WIRING AND SCHEMATIC DIAGRAMS, PARTS LISTS

DIODE BOARD (A17) COMPONENT LOCATION



DIODE BOARD (A17) COMPONENT LOCATION



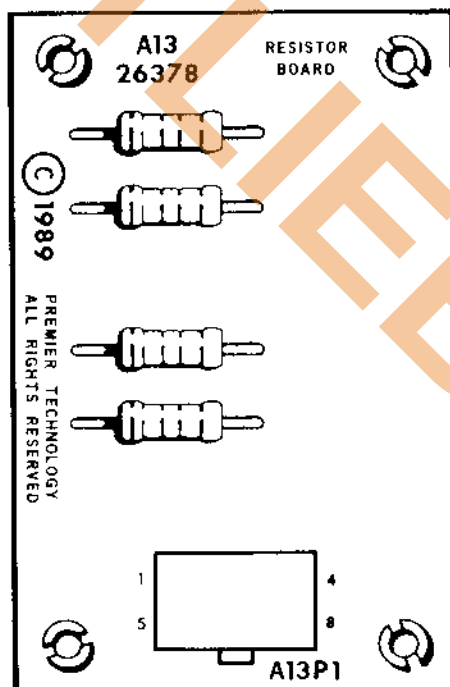
DIODE BOARD (A17) PARTS LIST

REFERENCE	DESCRIPTION	PART NUMBER
1A17	Diode Matrix Assembly	MA-1448
D1-D32	Diode, 1N4148	X0-261
P1,P2	Header, 18 Position	X0-916
R1-R4	Resistor, 220 OHM, 5%, 1/4W	X0-21
	Circuit Board Support (4)	23984

DIODE BOARD (A17) PARTS LIST

REFERENCE	DESCRIPTION	PART NUMBER
2A17	Diode Matrix Assembly	MA-1449
D1-D16	Diode 1N4148	X0-261
P1	Header, 18 Position	X0-916
R1,R2	Resistor, 220 OHM, 5%, 1/4W	X0-21
	Circuit Board Support (4)	23984

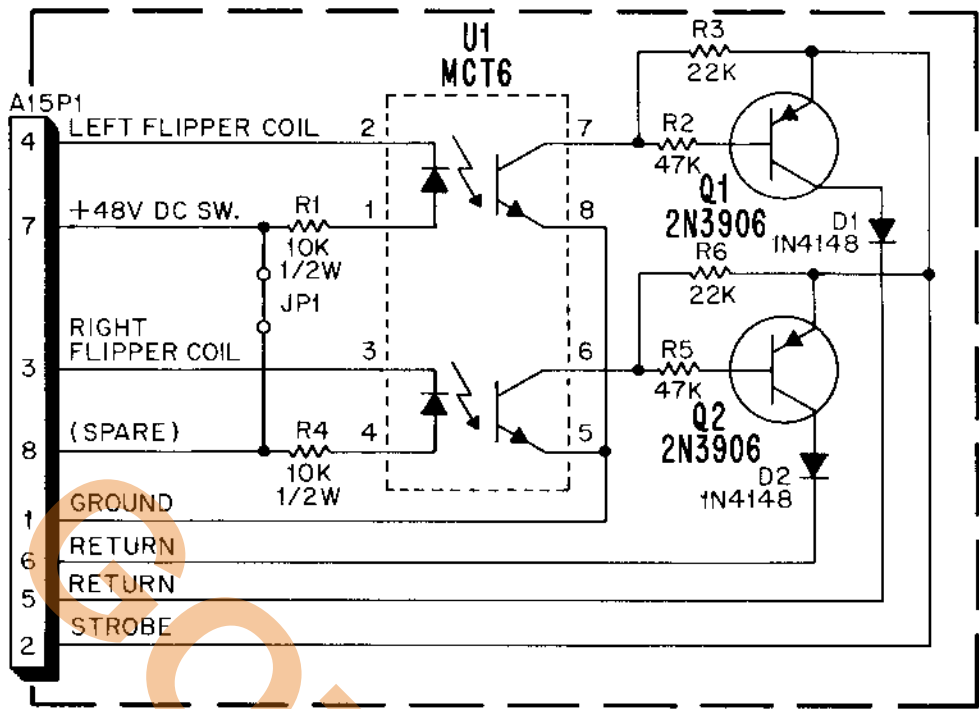
RESISTOR BOARD (A13) COMPONENT LOCATION



RESISTOR BOARD (A13) PARTS LIST

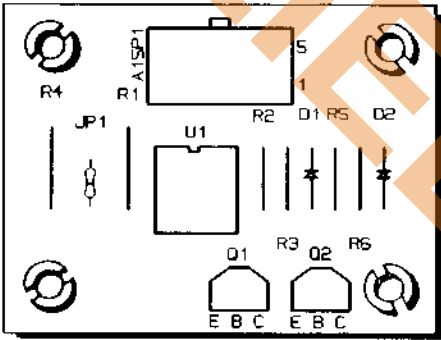
REFERENCE	DESCRIPTION	PART NUMBER
1A13	Resistor Board Assembly	MA-1435
R1,R2, R4,R5	Resistor 33 OHM, 5%, 5W	X0-1009
P1	Header, 8 Position	X0-911
	Circuit Board Support (4)	23984

VI. WIRING AND SCHEMATIC DIAGRAMS, PARTS LISTS



Premier® Technology			
TITLE			
SENSOR BOARD (A15)			
SCHEMATIC DIAGRAM			
DRAWN J.P.S.	APPROVED R.H.M.	DATE 10-12-89	E-27041

SENSOR BOARD (A15)
COMPONENT LOCATION

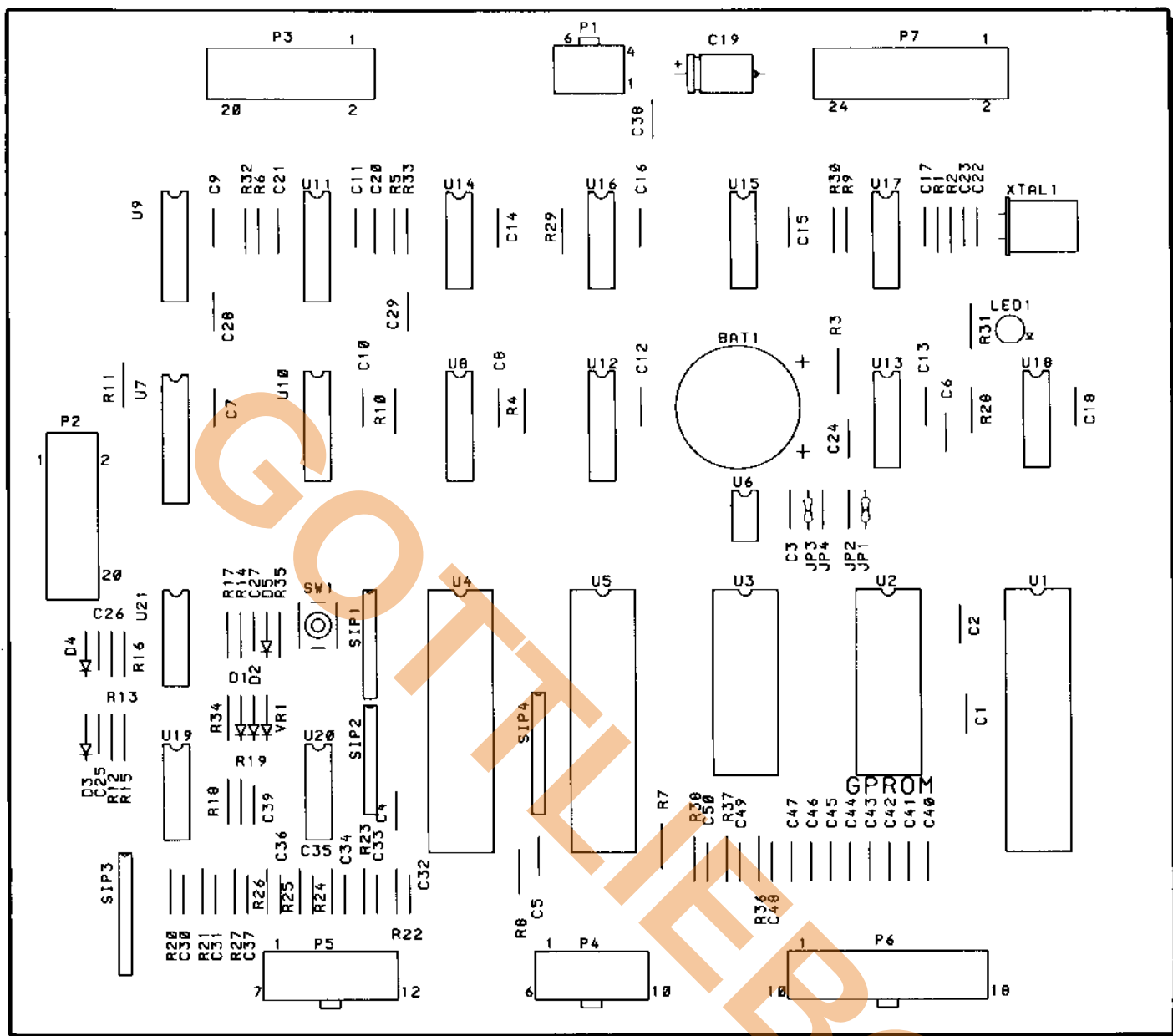


SENSOR BOARD (A15)
PARTS LIST

REFERENCE	DESCRIPTION	PART NUMBER
	Sensor Board Assembly (A15)	MA-1334
D1,D2	Diode, 1N4148	XO-261
JP1	Jumper, Resistor, 0 OHM	XO-469
Q1,Q2	Transistor, 2N3906 (PNP)	XO-588
R1,R4	Resistor, 10K Ohm, 5%, 1/2W	XO-62
R2,R5	Resistor, 47K Ohm, 5%, 1/4W	XO-30
R3,R6	Resistor, 22K Ohm, 5%, 1/4W	XO-42
U1	IC, Optocoupler, MCT6	XO-1000
A15P1	Header, 8 Position	XO-911
	Spacer (4)	23984

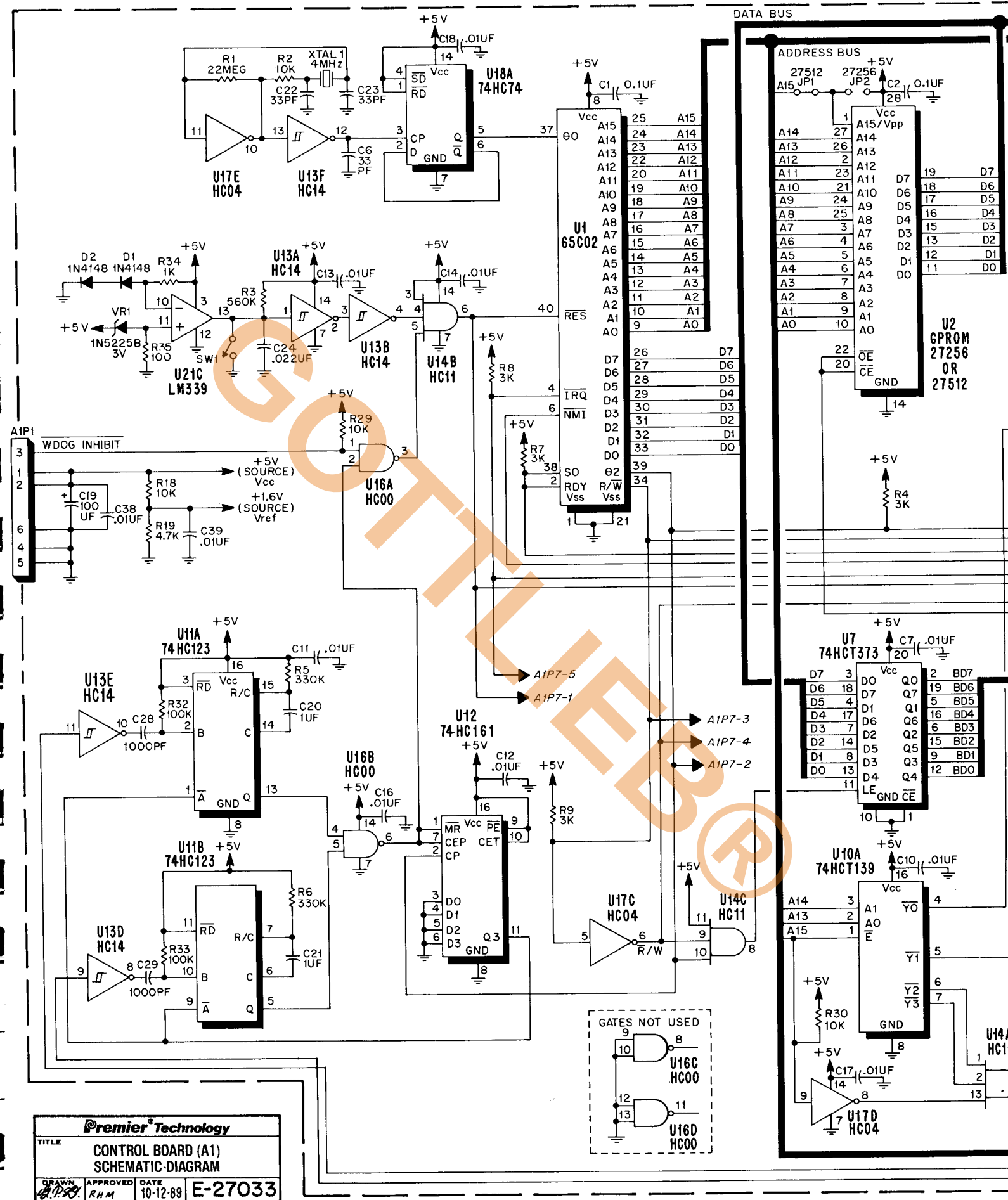
VI. WIRING AND SCHEMATIC DIAGRAMS, PARTS LISTS

CONTROL BOARD (A1) COMPONENT LOCATION

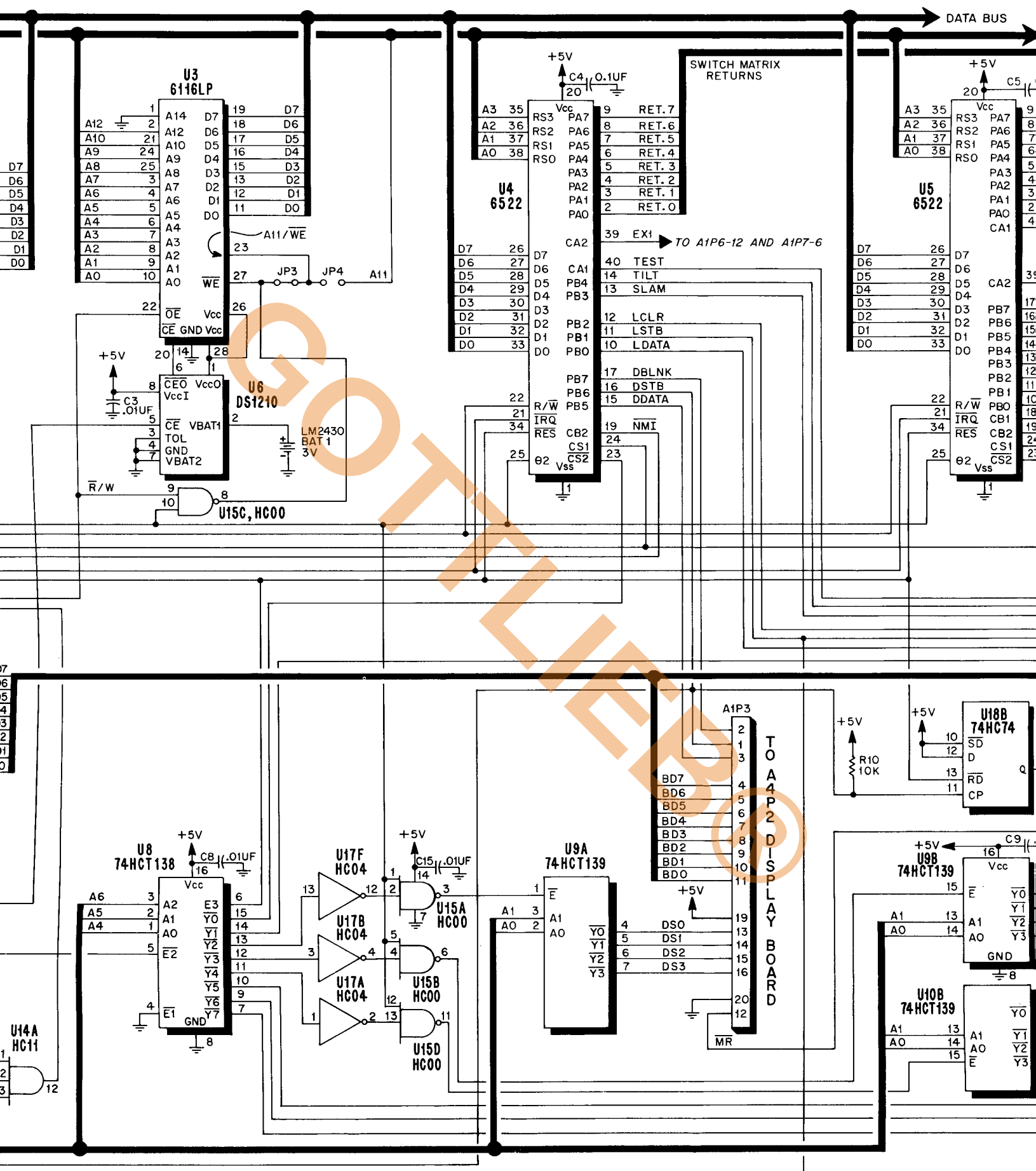


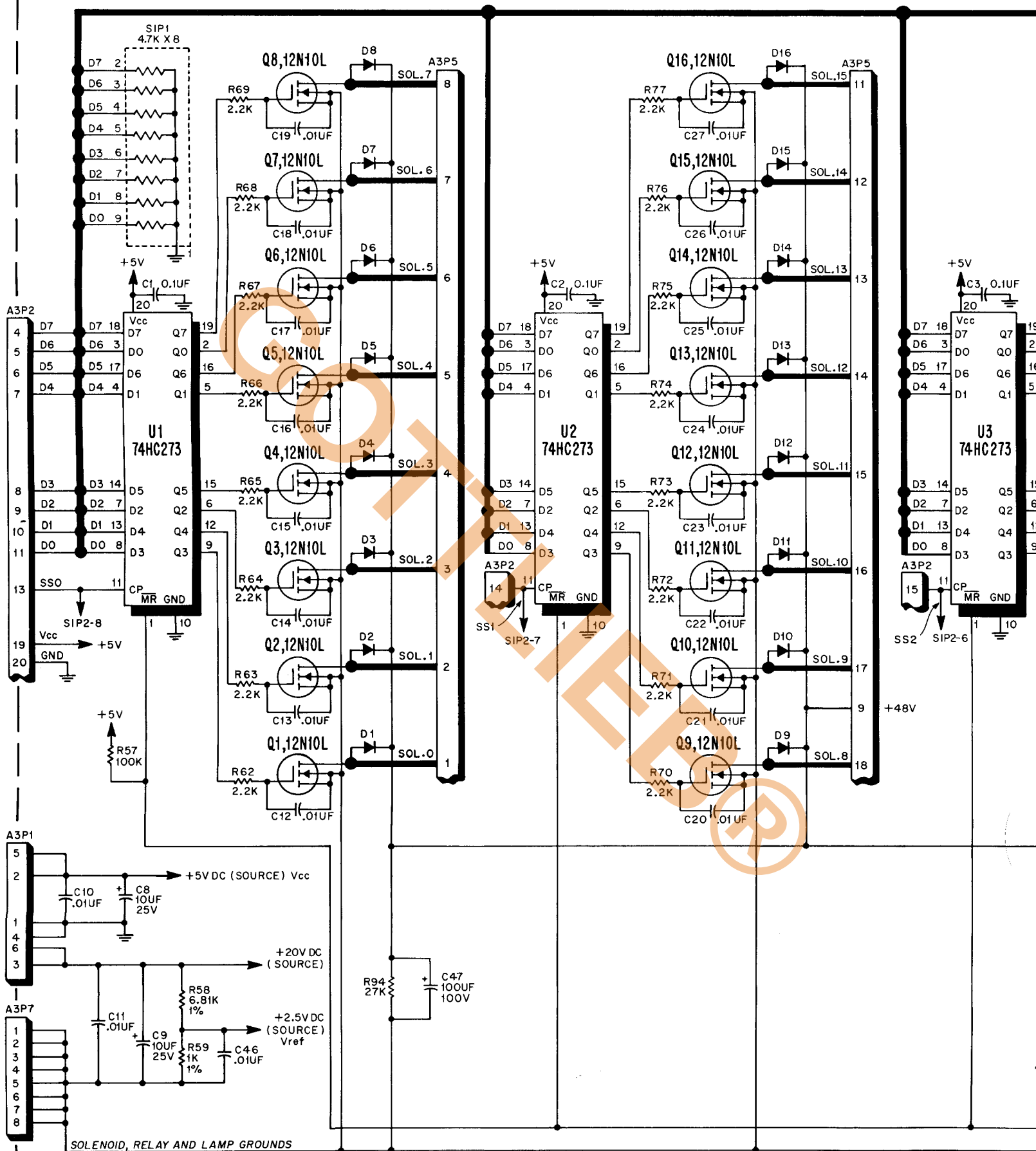
CONTROL BOARD (A1) PARTS LIST

REFERENCE	DESCRIPTION	PART NUMBER	REFERENCE	DESCRIPTION	PART NUMBER
	Control Board Assembly (A1)	MA-1423	SIP3,SIP4	Resistor Pack, 4.7K OHM X 8	X0-161
BAT 1	Lithium Battery, LM2430, 3V	X0-925	SW1	Switch, N.O.	X0-897
C3, C7-C18, C30-C50	Capacitor, .01UF, +80% -20%, 50V	X0-229	U1	IC, 65C02P2, CPU, 2MHZ	X0-927
C1,C2,C4	Capacitor, 0.1UF, +80% -20%, 50V	X0-230	U3	IC, 6116LP, 2K X 8, Static Ram	X0-928
C5,C25,C27	Capacitor, 33PF, 10%, 50V	X0-896	U4,U5	IC,6522AP, Versatile Interface Adaptor (VIA)	X0-929
C6,C22,C23	Capacitor, 100UF, +80% -20%, 10V	X0-211	U6	IC, DS1210, Non-Volatile Controller	X0-930
C19	Capacitor, 1UF, 20%, 50V	X0-746	U7	IC, 74HCT373, Octal Latch	X0-931
C20,C21	Capacitor, .022UF, 10%, 50V	X0-873	U8	IC, 74HCT138, Decoder	X0-932
C24	Capacitor, 1000PF, 10%, 100V	X0-296	U9,U10	IC, 74HCT139, Dual Decoder	X0-933
C28,C29	Diode, 1N4148	X0-261	U11	IC, 74HC123, Dual Multivibrator	X0-934
D1-D5	LED, MV5752 (Red)	X0-270	U12	IC, 74HC161, Binary Counter	X0-935
R1	Resistor, 22 MEGOHM, 5%, 1/4W	X0-74	U13	IC, 74HC14, Schmitt Hex Inverters	X0-936
R2,R10,R11	Resistor, 10K OHM, 5%, 1/4W	X0-18	U14	IC, 74HC11, Triple "And" Gates	X0-937
R18,R28,R30	Resistor, 560K OHM, 5%, 1/4W	X0-169	U15,U16	IC, 74HC00, Quad "Nand" Gates	X0-782
R3	Resistor, 330K OHM, 5%, 1/4W	X0-47	U17	IC, 74HC04, Hex Inverters	X0-888
R5,R6	Resistor, 3K OHM, 5%, 1/4W	X0-23	U18	IC, 74HC74, Dual "D" Flip-Flop	X0-939
R4,R7-R9	Resistor, 2.2K OHM, 5%, 1/4W	X0-27	U19,U20,U21	IC, LM339, Quad Comparators	X0-583
R12-R14	Resistor, 3.3K OHM, 5%, 1/4W	X0-38	VR1	Zener Diode, 1N5225B, 3V, 5%	X0-269
R15-R17	Resistor, 4.7K OHM, 5%, 1/4W	X0-7	XTAL1	Crystal, 4MHz	X0-366
R19-R27, R36-R38	Resistor, 1K OHM, 5%, 1/4W	X0-5	ALP1	Header, 6 Position	X0-910
R31	Resistor, 100 OHM, 5%, 1/4W	X0-28	ALP2,ALP3	Header, 20 Position (Ribbon)	X0-940
R32-R33	Resistor, 100 OHM, 5%, 1/4W	X0-28	ALP4	Header, 10 Position	X0-912
R34	Resistor, 100 OHM, 5%, 1/4W	X0-28	ALP5	Header, 12 Position	X0-913
R35	Resistor, 100 OHM, 5%, 1/4W	X0-28	ALP6	Header, 18 Position	X0-916
SIP1,SIP2	Resistor Pack, 10K OHM X 7, 5%, 1/4W	X0-926		Jumper, Resistor, 0 OHM (2)	X0-469
				Socket, 28 Pin Dip	X0-536

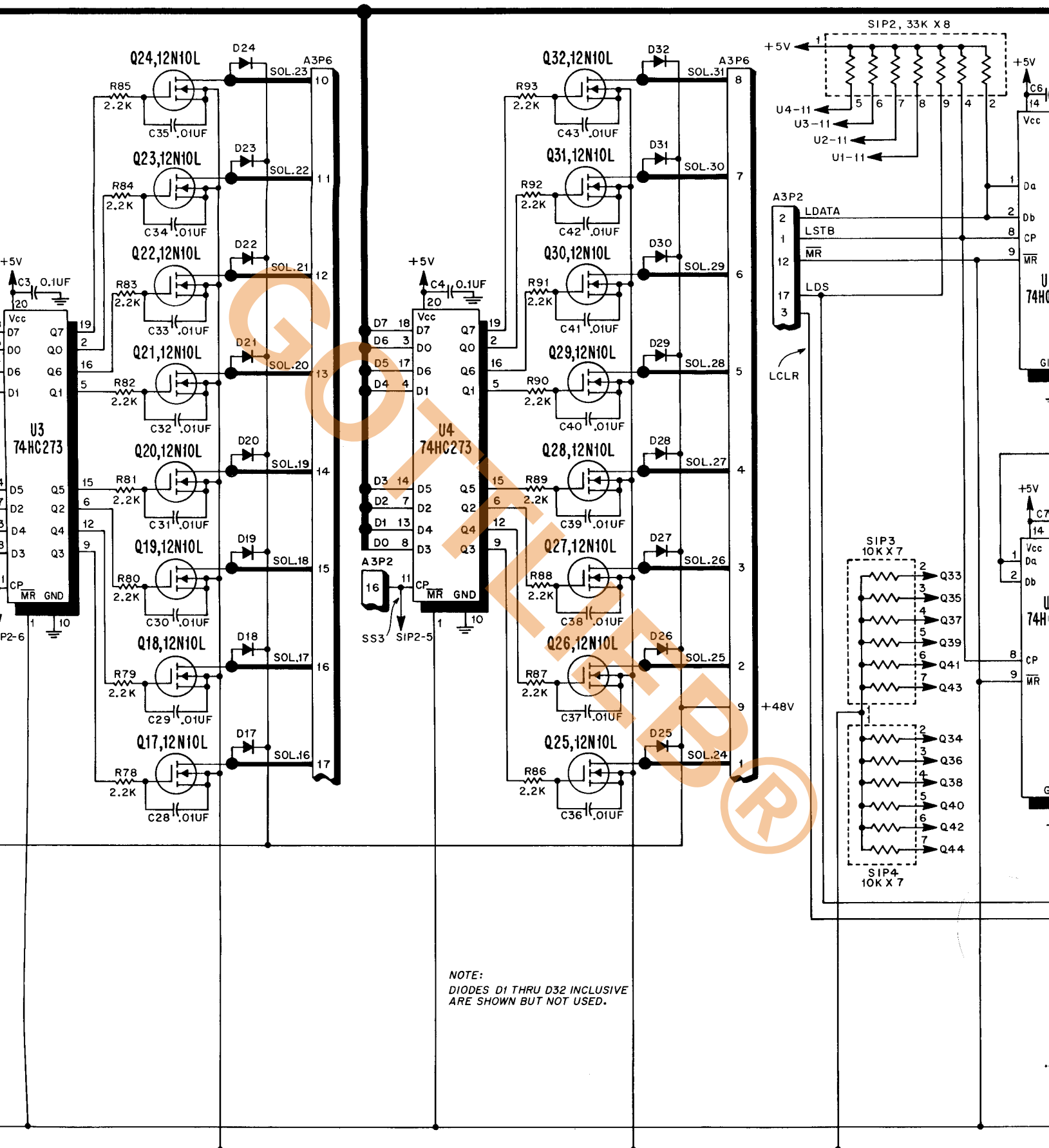


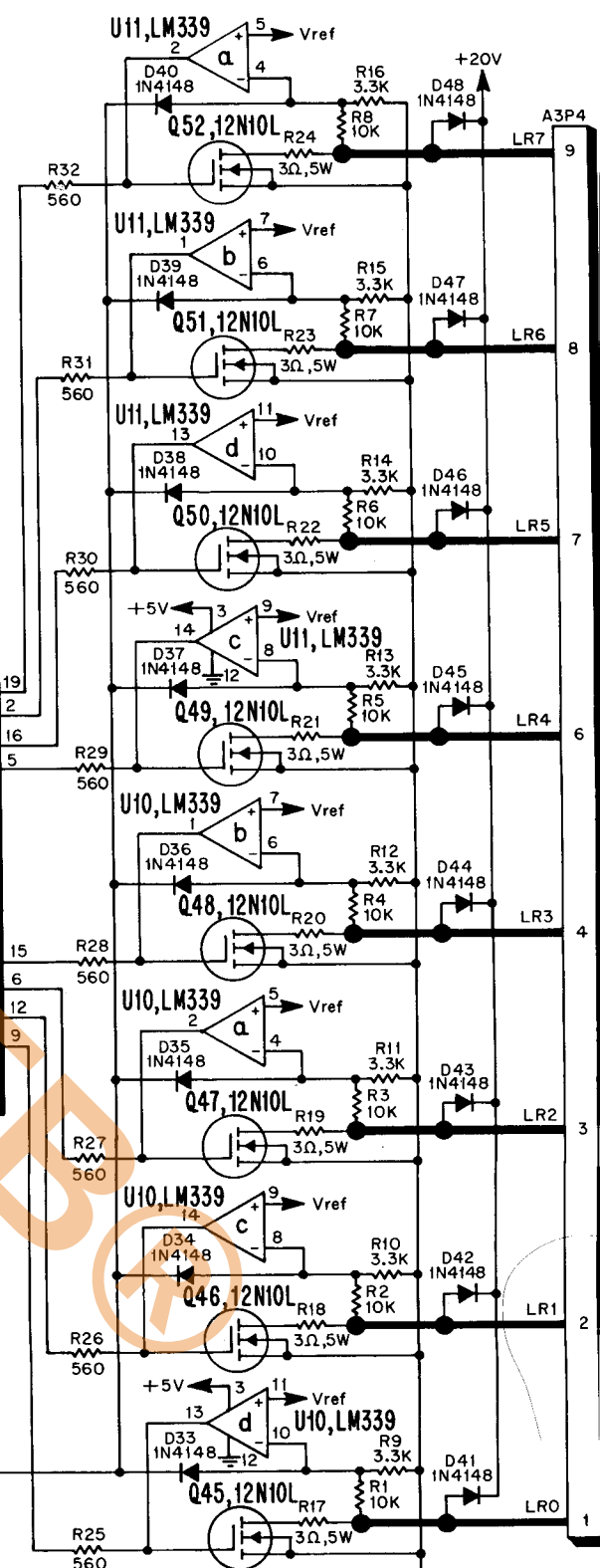
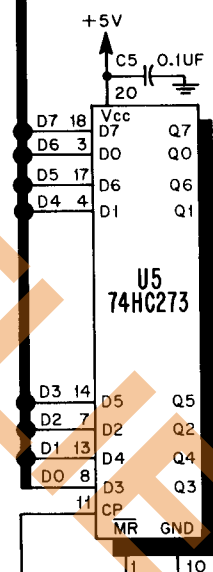
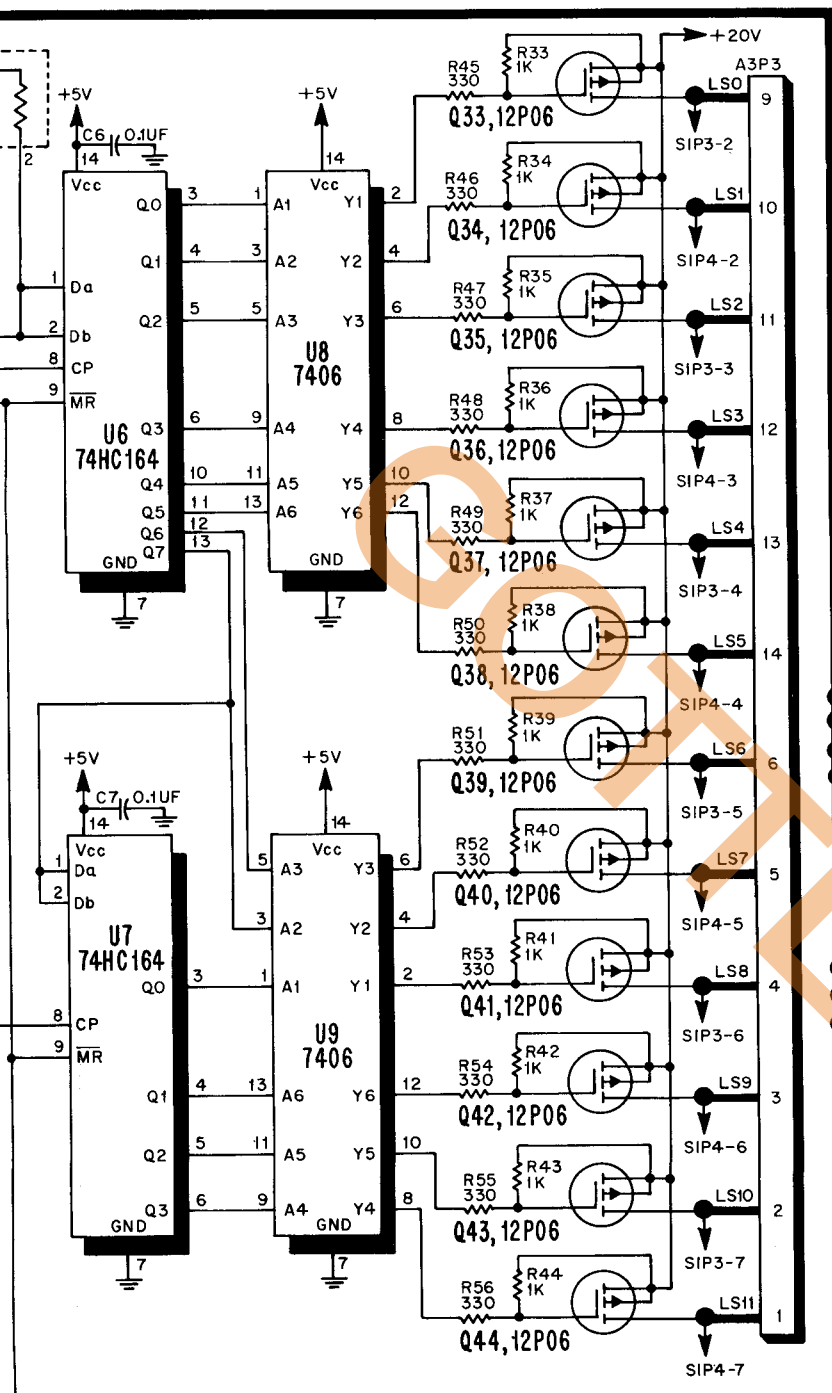
VI. WIRING AND SCHEMATIC DIAGRAMS, PARTS LISTS





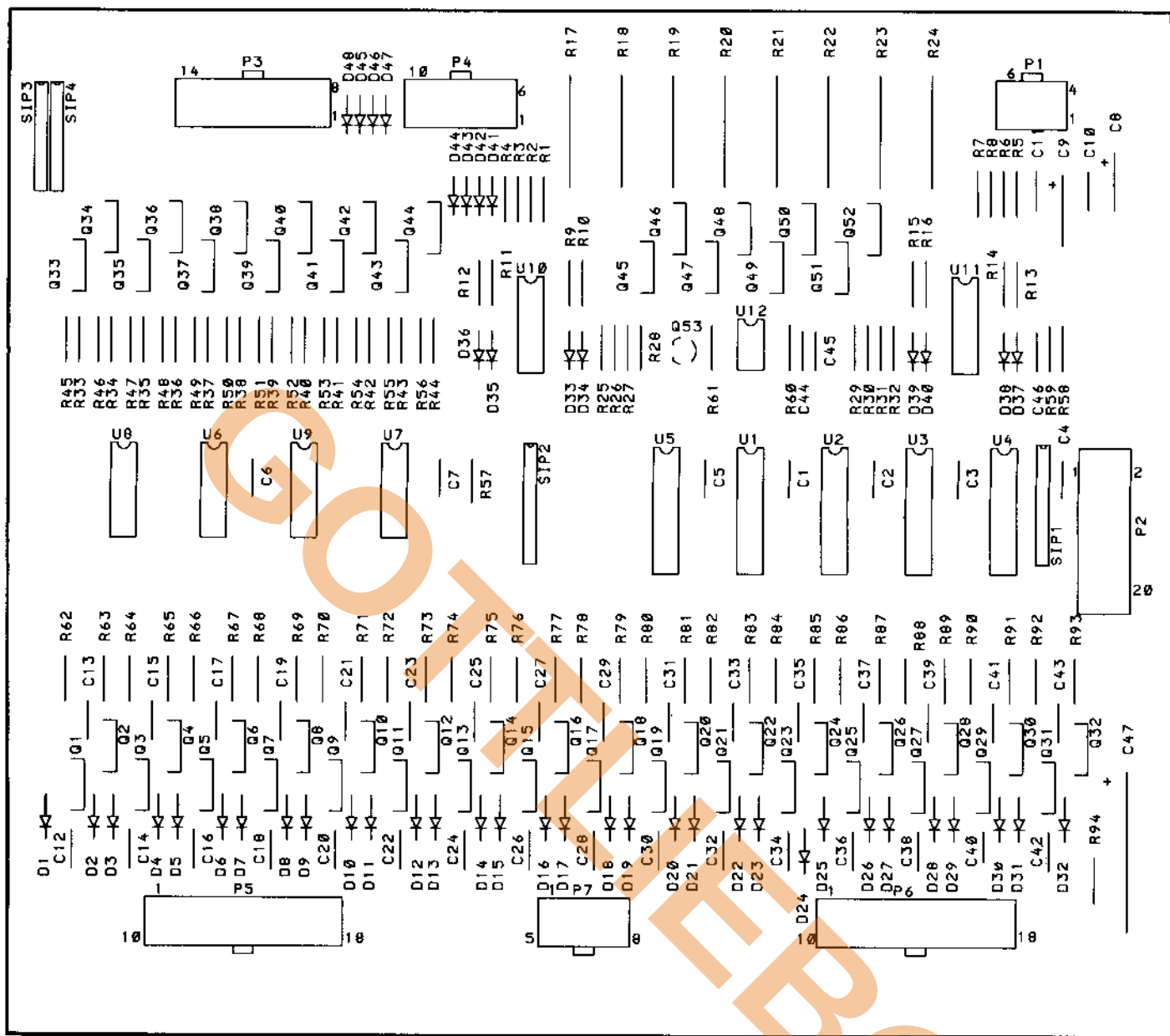
VI. WIRING AND SCHEMATIC DIAGRAMS, PARTS LISTS





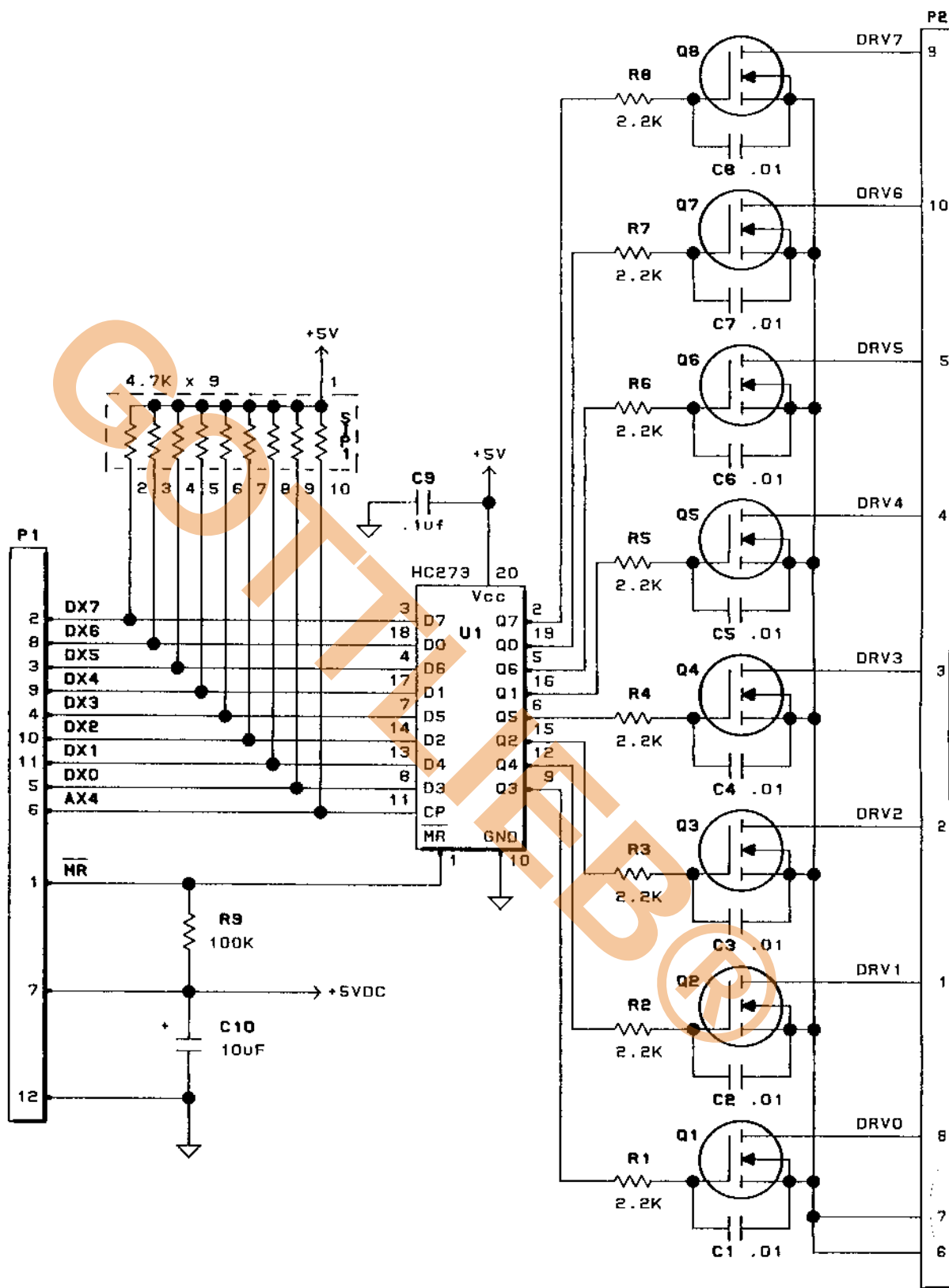
VI. WIRING AND SCHEMATIC DIAGRAMS, PARTS LISTS

DRIVER BOARD (A3) COMPONENT LOCATION



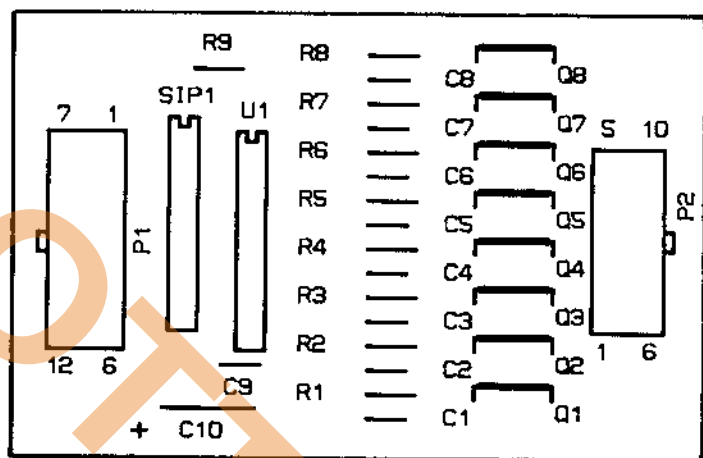
DRIVER BOARD (A3) PARTS LIST

REFERENCE	DESCRIPTION	PART NUMBER	REFERENCE	DESCRIPTION	PART NUMBER
	Driver Board Assembly (A3)	MA-1358	R58	Resistor, 6.81K Ohm, 1%, 1/4W	XO-943
C1-C7	Capacitor, 0.1 uF, +80% -20%, 50V	XO-230	R59	Resistor, 1K Ohm, 1%, 1/4W	XO-944
C8	Capacitor, 10uF, 20%, 25V	XO-127	R60	Resistor, 4.7K Ohm, 5%, 1/4W	XO-7
C9	Capacitor, 10uF, +80% -20%, 25V	XO-225	R61-R93	Resistor, 2.2K Ohm, 5%, 1/4W	XO-27
C10,C11	Capacitor, .01uF, +80% -20%, 50V	XO-229	R94	Resistor, 27K Ohm, 5%, 1/4W	XO-11
C45,C46			SIP1	Resistor Pack, 4.7K Ohm X 8.5%, 1/4W	XO-161
C12-C44	Capacitor, .01uF, 10%, 50V	XO-696	SIP2	Resistor Pack, 33K Ohm X 8.5%, 1/4W	XO-945
C47	Capacitor, 100uF, 20%, 100V	XO-958	SIP3	Resistor Pack, 10K Ohm X 7.5%, 1/4W	XO-926
D33-D48	Diode, 1N4148	XO-261	SIP4		
Q1-Q32,	Transistor, RFP12N10L, OR IRL530,	XO-947	U1-U5	IC, Octal "D" Flip-Flops, 74HC273	XO-949
Q45-Q52,Q54	N-Channel MOSFET		U6-U7	IC, Shift Register, 74HC164	XO-950
Q33-Q44	Transistor, RFP12P06, OR IRF9531,	XO-948	U8-U9	IC, Buffer, 7406	XO-85
	P-Channel MOSFET		U10-U11	IC, Quad Comparator, LM339	XO-583
Q53	Transistor, MPSA13, Darlington	XO-304	U12	IC, Timer, NE555	XO-631
R1-R8	Resistor, 10K Ohm, 5%, 1/4W	XO-18	A3P1	Header, 6 Position	XO-910
R9-R16	Resistor, 3.3K Ohm, 5%, 1/4W	XO-38	A3P2	Header, 20 Position (Ribbon)	XO-940
R17-R24	Resistor, 3 Ohm, 5%, 5W	XO-942	A3P3	Header, 14 Position	XO-914
R25-R32	Resistor, 560 Ohm, 5%, 1/4W	XO-36	A3P4	Header, 10 Position	XO-912
R33-R44	Resistor, 1K Ohm, 5%, 1/4W	XO-5	A3P5	Header, 18 Position	XO-916
R45-R56	Resistor, 330 Ohm, 5%, 1/4W	XO-34	A3P6		
R57	Resistor, 100K Ohm, 5%, 1/4W	XO-45	A3P7	Header, 8 Position	XO-911



Premier Technology			
TITLE			
AUXILIARY DRIVER BOARD (A11)			
SCHEMATIC DIAGRAM			
DRAWN	APPROVED	DATE	MA-1722
J.B.	R.H.M.	12-2-91	

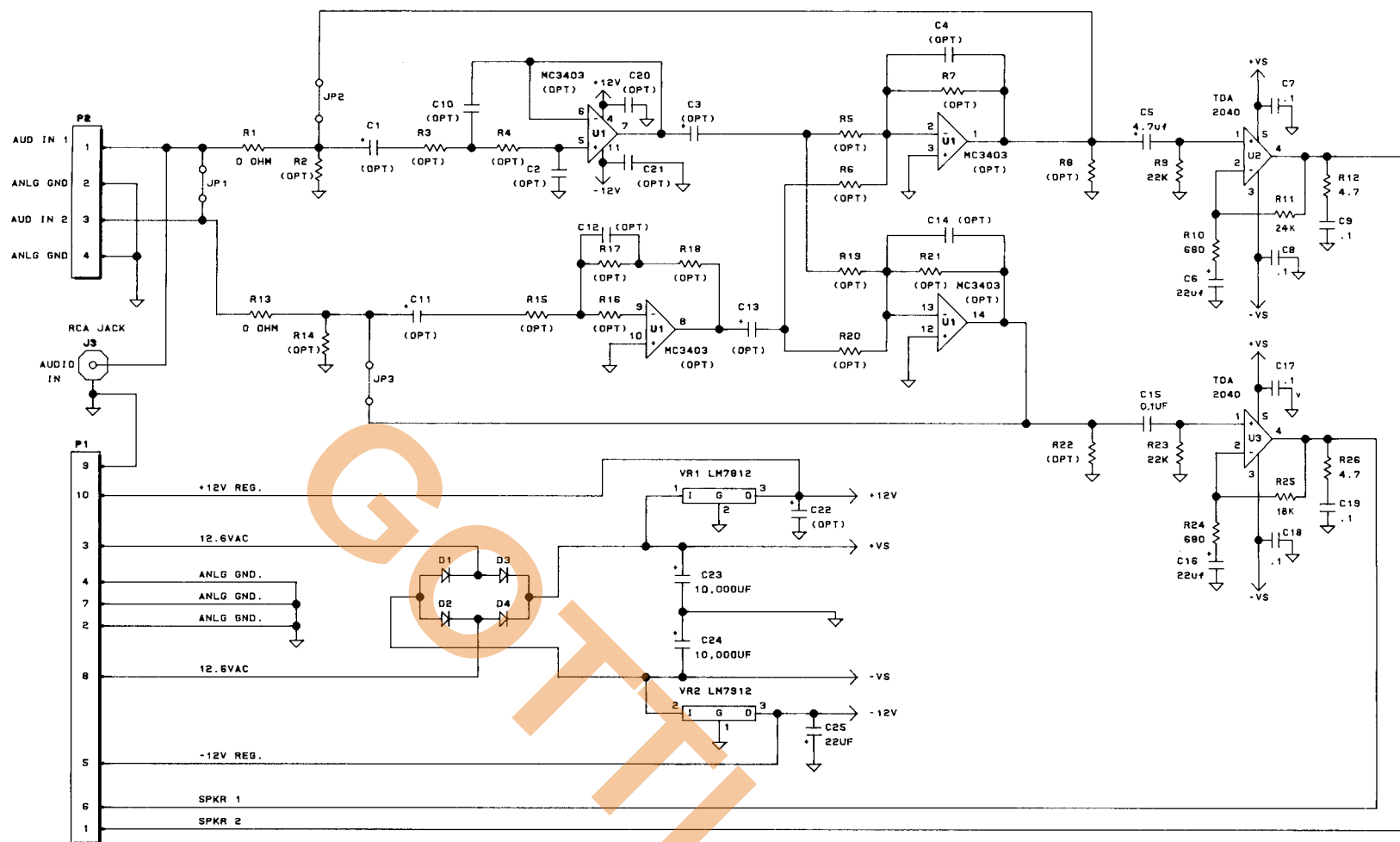
AUXILIARY DRIVER BOARD (A11) COMPONENT LOCATION



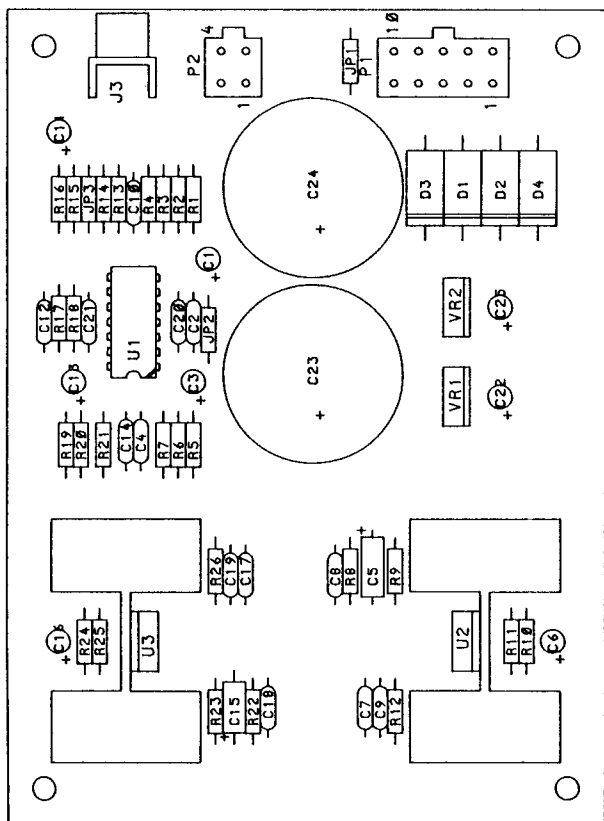
AUXILIARY DRIVER BOARD (A11) PARTS LIST

REFERENCE	DESCRIPTION	PART NUMBER
	Auxiliary, Driver Board, (A11)	MA-1722
C1-C9	Capacitor, .01UF, 10%, 50V	XO-696
C10	Capacitor, 10UF, +80%-20%, 25V	XO-225
Q1-Q8	Transistor, MOSFET, 12N10L	XO-947
R1-R8	Resistor, 2.2K, OHM, 5%, 1/4W	XO-27
R9	Resistor, 100K OHM, 5%, 1/4W	XO-45
S1P1	Resistor Pack, 4.7 OHM X 9	XO-906
U1	IC, Octal "D" Flip-Flop, 74HC273	XO-949
P1	Header, 12 Position	XO-913
P2	Header, 10 Position	XO-912

VI. WIRING AND SCHEMATIC DIAGRAMS, PARTS LISTS



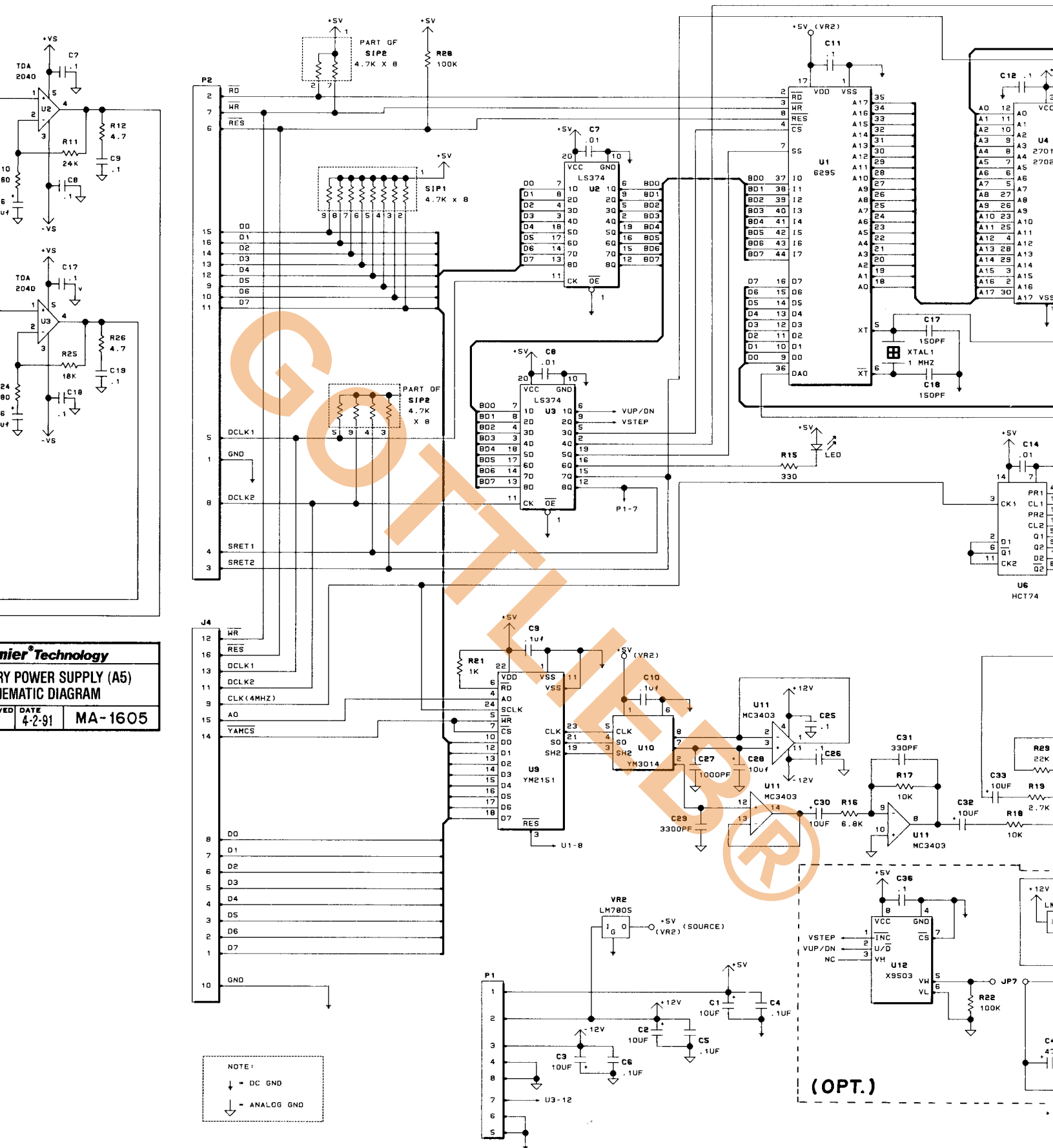
AUXILIARY POWER SUPPLY (A5) COMPONENT LOCATION



Premier® Technology			
TITLE AUXILIARY POWER SUPPLY (A5) SCHEMATIC DIAGRAM			
DRAWN C.B.	APPROVED RHM	DATE 4-2-91	MA-1605

AUXILIARY POWER SUPPLY (A5) PARTS LIST

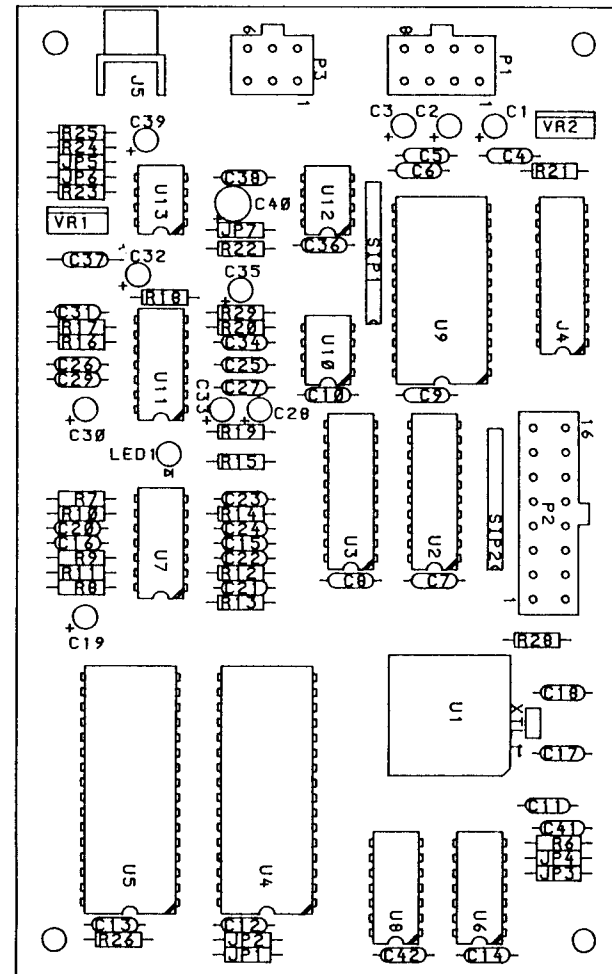
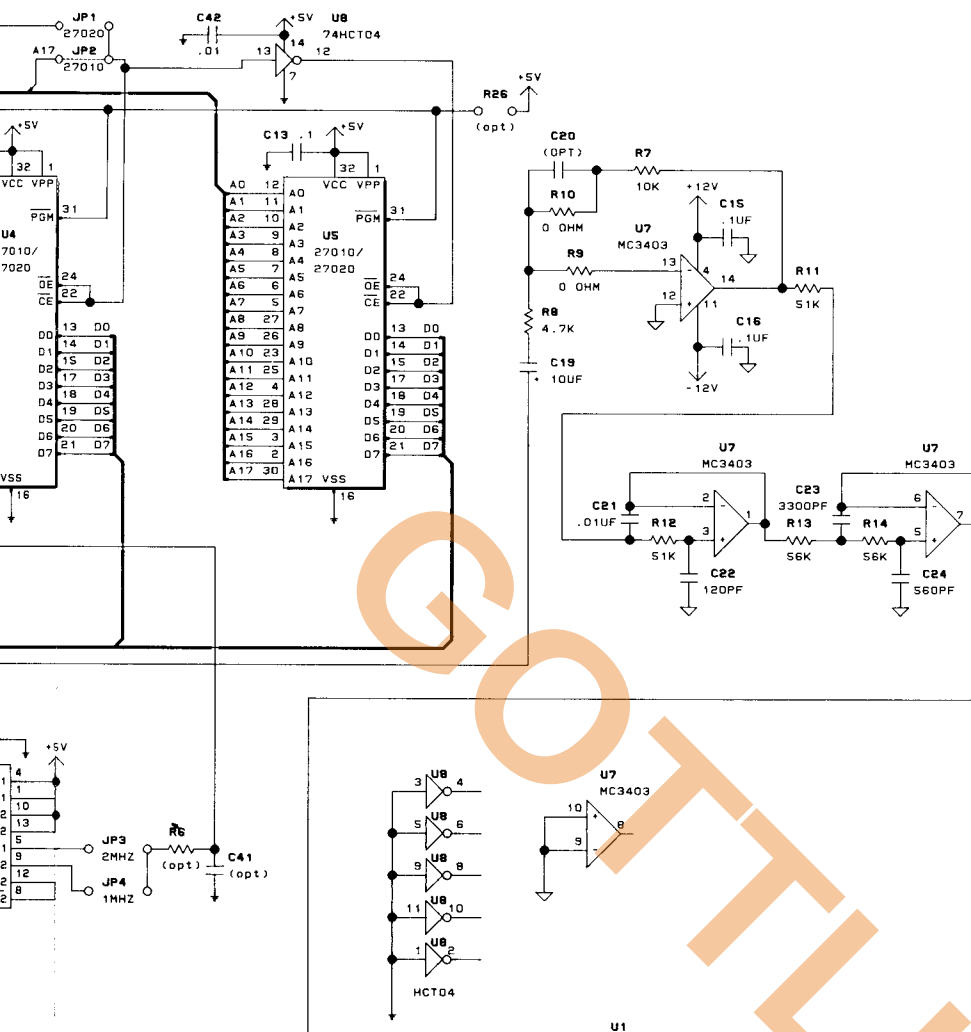
REFERENCE	DESCRIPTION	PART NUMBER
A5	Auxiliary Power Supply	MA-1605
C5	Capacitor, 4.7UF, 10%, 10V	XO-226
C6, C16, C25	Capacitor, 22UF, +80% -20%, 16V	XO-293
C7, C8, C9, C17, C18, C19	Capacitor, 0.1UF, +80% -20%, 50V	XO-230
C15	Capacitor, 0.1UF, 10%, 100V	XO-784
C23, C24	Capacitor, 10,000UF, +80% -20%, 25V	XO-830
D1-D4	Diode, 1N5401	XO-263
R1, R13, JP1, JP2, JP3	Resistor, 0 OHM, Jumper	XO-469
R8	Resistor, 2.2K OHM, 5%, 1/4W	XO-27
R9, R23	Resistor, 22K OHM, 5%, 1/4W	XO-42
R10, R24	Resistor, 680 OHM, 5%, 1/4W	XO-139
R11	Resistor, 24K OHM, 5%, 1/4W	XO-10
R12, R26	Resistor, 4.7 OHM, 5%, 1/4W	XO-800
R25	Resistor, 18K OHM, 5%, 1/4W	XO-762
U2, U3	IC, Audio Amplifier, TDA2040	XO-1038
VR1	Regulator, +12V, LM7812CT	XO-1039
VR2	Regulator, -12V, LM7912CT	XO-130
J3	Connector, RCA	XO-1035
P1	Header, 10 Position	XO-912
	Heat Sink	XO-1040



Premier Technology
PRIMARY POWER SUPPLY (A5)
SCHEMATIC DIAGRAM
 DATE 4-2-91 MA-1605

NOTE:
 ↓ = DC GND
 ↘ = ANALOG GND

Premier Technology
AUXILIARY SOUND BOARD (A20)
SCHEMATIC DIAGRAM
 DRAWN C.B. APPROVED RHM DATE 4-2-91 MA-1712

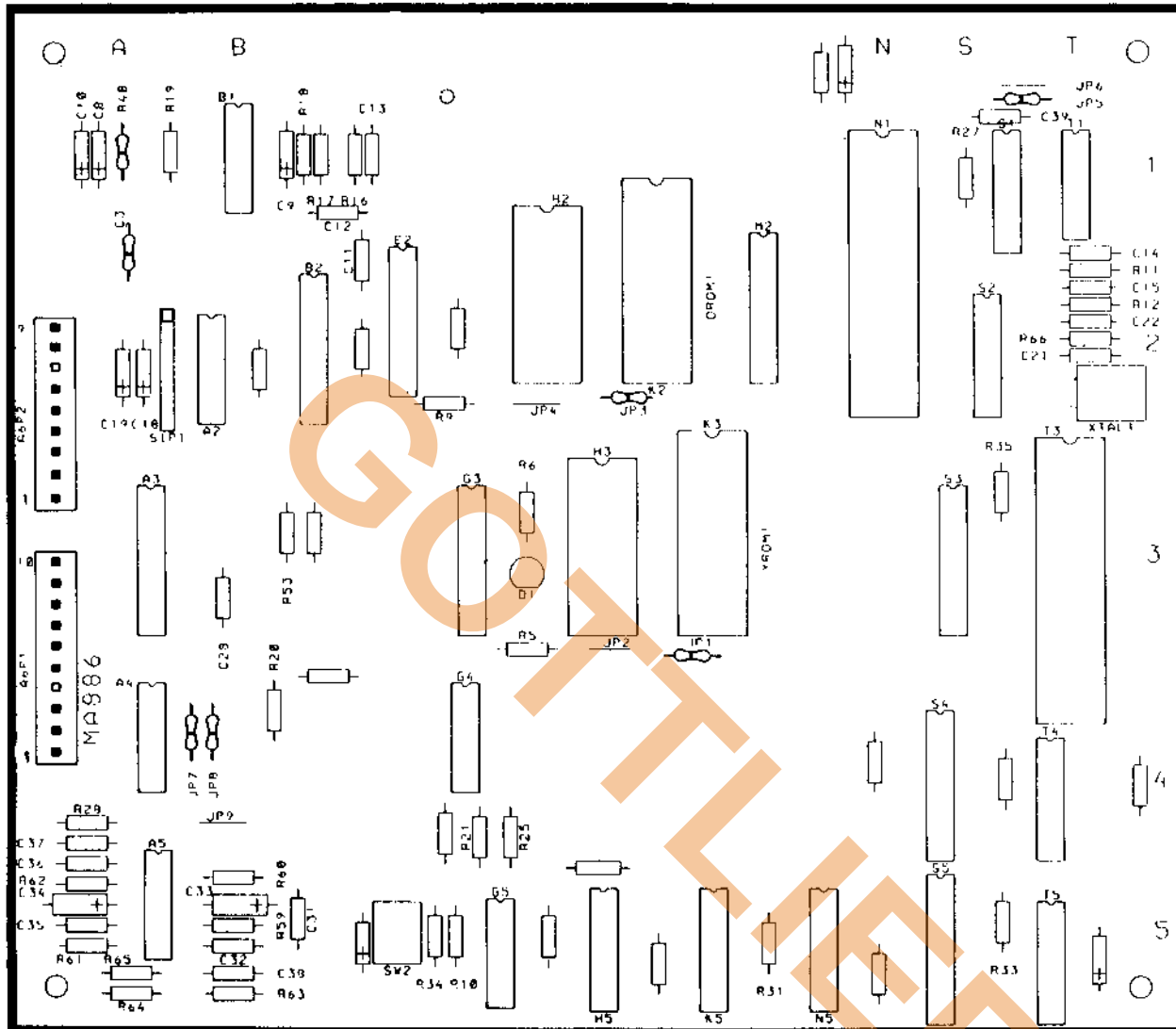


AUXILIARY SOUND BOARD (A20) PARTS LIST

REFERENCE	DESCRIPTION	PART NUMBER
A20	Auxiliary Sound Board	MA-1712
C1, C2, C3, C19, C28, C30, C32, C33, C35	Capacitor, 10UF, +80% -20%, 16V	XO-1030
C4-C6, C9-C13, C15, C16, C25, C26, C36	Capacitor, 0.1UF, +80% -20%, 50V	XO-230
C7, C8, C42	Capacitor, .01UF, +80% -20%, 50V	XO-229
C17, C18	Capacitor, 150PF, 5%, 100V	XO-803
C21	Capacitor, .01UF, 10%, 50V	XO-696
C22	Capacitor, 120PF, 10%, 50V	XO-1032
C23, C29	Capacitor, 3300PF, 10%, 100V	XO-600
C24	Capacitor, 560PF, 10%, 50V	XO-681
C31, C34	Capacitor, 330PF, 10%, 50V	XO-133
LED	Diode, MV5752, Red	XO-270
R7, R17, R18, R20	Resistor, 10K OHM, 5%, 1/4W	XO-18
R8, R26	Resistor, 4.7K, 5%, 1/4W	XO-7
R9, R10, JP1, JP6	Resistor, 0 OHM, Jumper	XO-469
R11, R12	Resistor, 51K OHM, 5%, 1/4W	XO-44
R13, R14	Resistor, 56K OHM, 5%, 1/4W	XO-771
R15	Resistor, 330 OHM, 5%, 1/4W	XO-34
R16	Resistor, 6.8K OHM, 5%, 1/4W	XO-8
R19	Resistor, 2.7K OHM, 5%, 1/4W	XO-6
R21, R25	Resistor, 1K OHM, 5%, 1/4W	XO-5
R28	Resistor, 100K OHM, 5%, 1/4W	XO-45
R29	Resistor, 22K OHM, 5%, 1/4W	XO-42
U1	IC, MSM6295, Speech Chip	*XO-1023
U2, U3	IC, 74LS374, Octal "D" Flip Flop	XO-96
U4, U5	IC, 27C010 (Specified Per Game)	
U7, U11	IC, MC3403P, Quad Amp	XO-953
U8	IC, 74HCT04, Hex Inverter	XO-1026
U9	IC, YM2151, Sound Chip	XO-882
U10	IC, YM3014, Serial DAC	XO-883
XTAL1	Resonator, 1MHZ	XO-1034
J4	Socket, 20 Pin	XO-491
J5	Jack, RCA	XO-1035
P1	Header, 8 Position	XO-911
P3	Header, 6 Position	XO-910
U4, U5	Socket, 32 Pin	XO-1036
U9	Socket, 24 Pin	XO-529
VR2	PCB Assembly, P/O *XO-1023	27922
	IC, 5V Regulator	XO-663

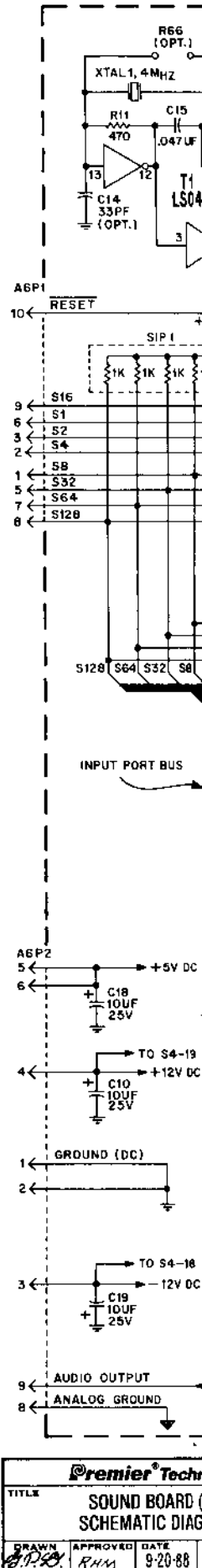
VI. WIRING AND SCHEMATIC DIAGRAMS, PARTS LISTS

SOUND BOARD (A6) COMPONENT LOCATION

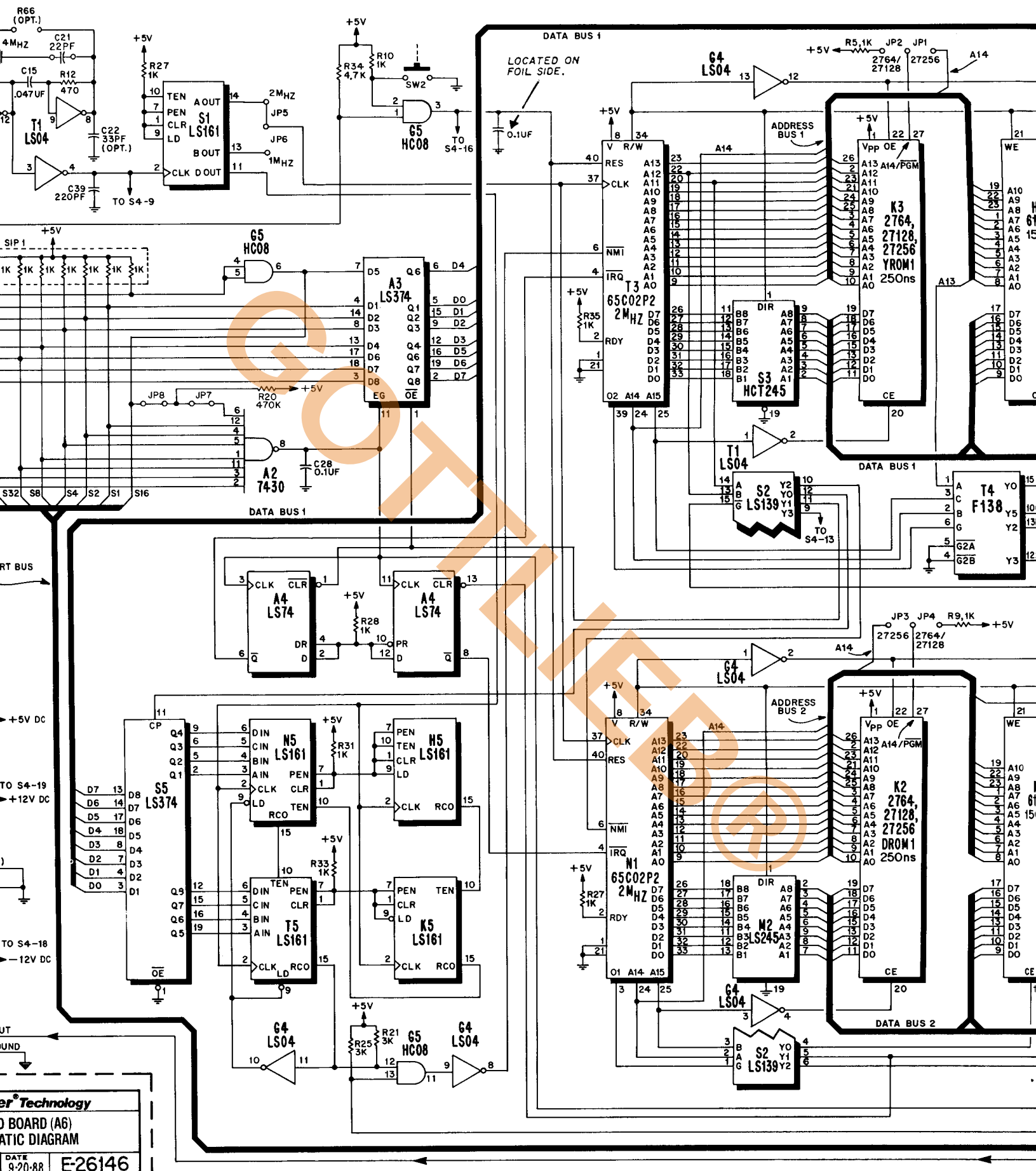


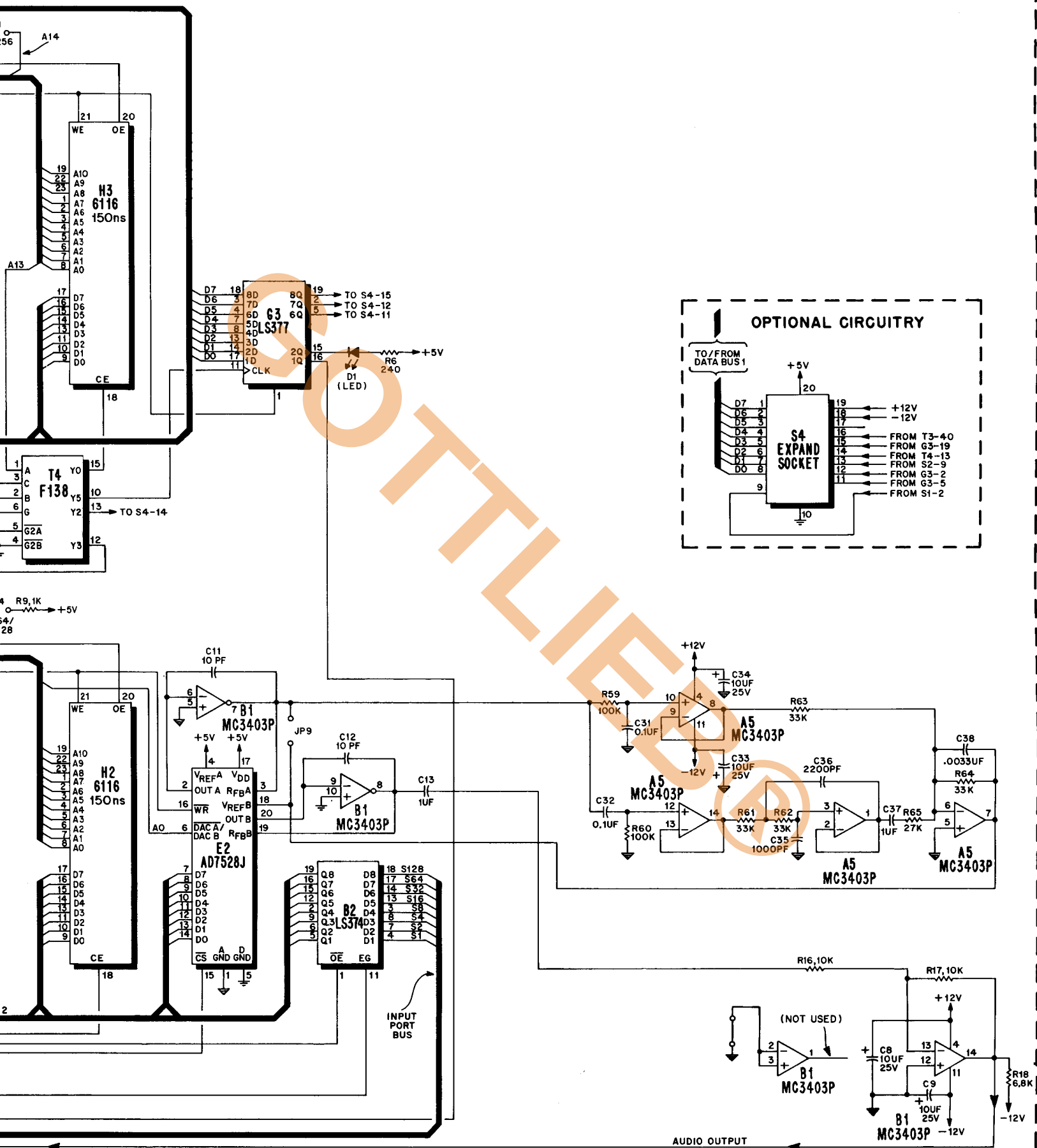
SOUND BOARD (A6) PARTS LIST

REFERENCE	DESCRIPTION	PART NUMBER	REFERENCE	DESCRIPTION	PART NUMBER
	Sound Board Assembly (1A6)	MA-1629			
C13, C37	Capacitor, 1UF, 20%, 50V (Non-polar)	XO-746	R20, R34	Resistor, 4.7K Ohm, 5%, 1/4W	XO-7
C8, C9, C10,	Capacitor, 10UF, 20%, 25V (Tantalum)	XO-127	R61-R64	Resistor, 33K Ohm, 5%, 1/4W	XO-43
C18, C19,			R59, R60	Resistor, 100K Ohm, 5%, 1/4W	XO-45
C33, C34			R65	Resistor, 27K Ohm, 5%, 1/4W	XO-11
AND THREE			A2	IC, 7430, 8 Input NAND Gate	XO-643
UNMARKED			A3, B2, S5	IC, 74LS374, Octal "D" Flip Flop	XO-96
CAPACITORS			A4	IC, 74LS74, Dual "D" Flip Flop	XO-434
C11, C12	Capacitor, 10PF, +80%-20%, 50V	XO-635	A5	IC, MC3403P, Quad Op-Amp	XO-953
C14, C22	Capacitor, 33PF, 10%, 100V	XO-896	B1	IC, MC3403P, Quad Op-Amp	XO-953
C15	Capacitor, .047UF, 20%, 50V	XO-638	E2	IC, AD7528J, Multiplier DAC	XO-647
C21	Capacitor, 22PF, 10%, 50V	XO-633	G3	IC, 74LS377, Octal "D" Flip Flop	XO-97
C28 AND	Capacitor, 0.1UF, +80%-20%, 50V	XO-230	G4, T1	IC, 74LS04, Hex Inverter	XO-418
FIFTEEN			G5	IC, 74HC08, Quad 2 Input "AND" Gate	XO-872
UNMARKED			H2, H3	IC, 6116LP-15, 2K X 8 RAM	XO-928
CAPACITORS			H5, K5, N5	IC, 74LS161, Synchronous Presettable Binary Counter	XO-440
C31, C32	Capacitor, 0.1UF, 10%, 100V	XO-784	S1, T5	IC, Specified Per Game	
C35	Capacitor, 1000PF, 10%, 100V	XO-296	F2, K3	IC, 74LS245, Octal Bus Transceiver	XO-79
C36	Capacitor, 2200PF, 10%, 100V	XO-289	M2	IC, 65C02P2 or 6502A, CPU	XO-927 or XO-893
C38	Capacitor, .0033UF, 10%, 100V	XO-600	N1, T3	IC, 74LS139, Dual 1 of 4 Decoder	XO-419
C39	Capacitor, 220PF, 10%, 100V	XO-694	S3	IC, 74HCT245, Octal Bus Transceiver	XO-891
D1	Diode, MVS752, (LED, Red)	XO-270	T4	IC, 74F138, 1 of 8 Decoder	XO-1041
R5, R9, R10,	Resistor, 1K Ohm, 5%, 1/4W	XO-5	SIP 1	Resistor Pack 1K Ohm X 8	XO-493
R27, R28, R31,			SW2	Switch, Pushbutton	XO-897
R33, R35			XTAL 1	Crystal, 4 MHz	XO-366
R6	Resistor, 240 Ohm, 5%, 1/4W	XO-173	A6P1, A6P2	Connector (2)	XO-879
R11, R12	Resistor, 470 Ohm, 5%, 1/4W	XO-35			
R21, R25	Resistor, 3K Ohm, 5%, 1/4W	XO-23			
R16, R17	Resistor, 10K Ohm, 5%, 1/4W	XO-18			
R18	Resistor, 6.8K Ohm, 5%, 1/4W	XO-8			
				28 Pin Dip Socket (2)	XO-536
				Jumper, Resistor, 0 OHM (7)	XO-469
				20 Pin Dip Socket	XO-491



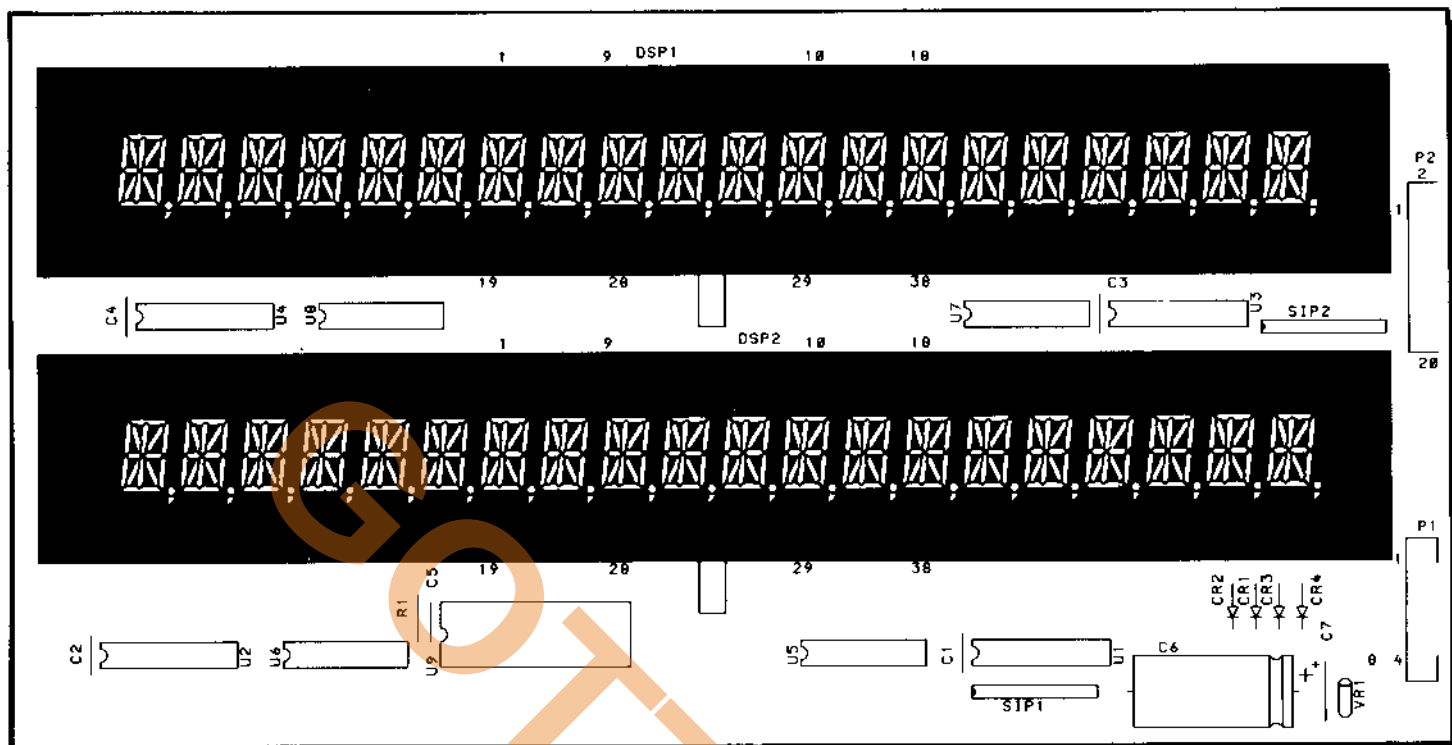
VI. WIRING AND SCHEMATIC





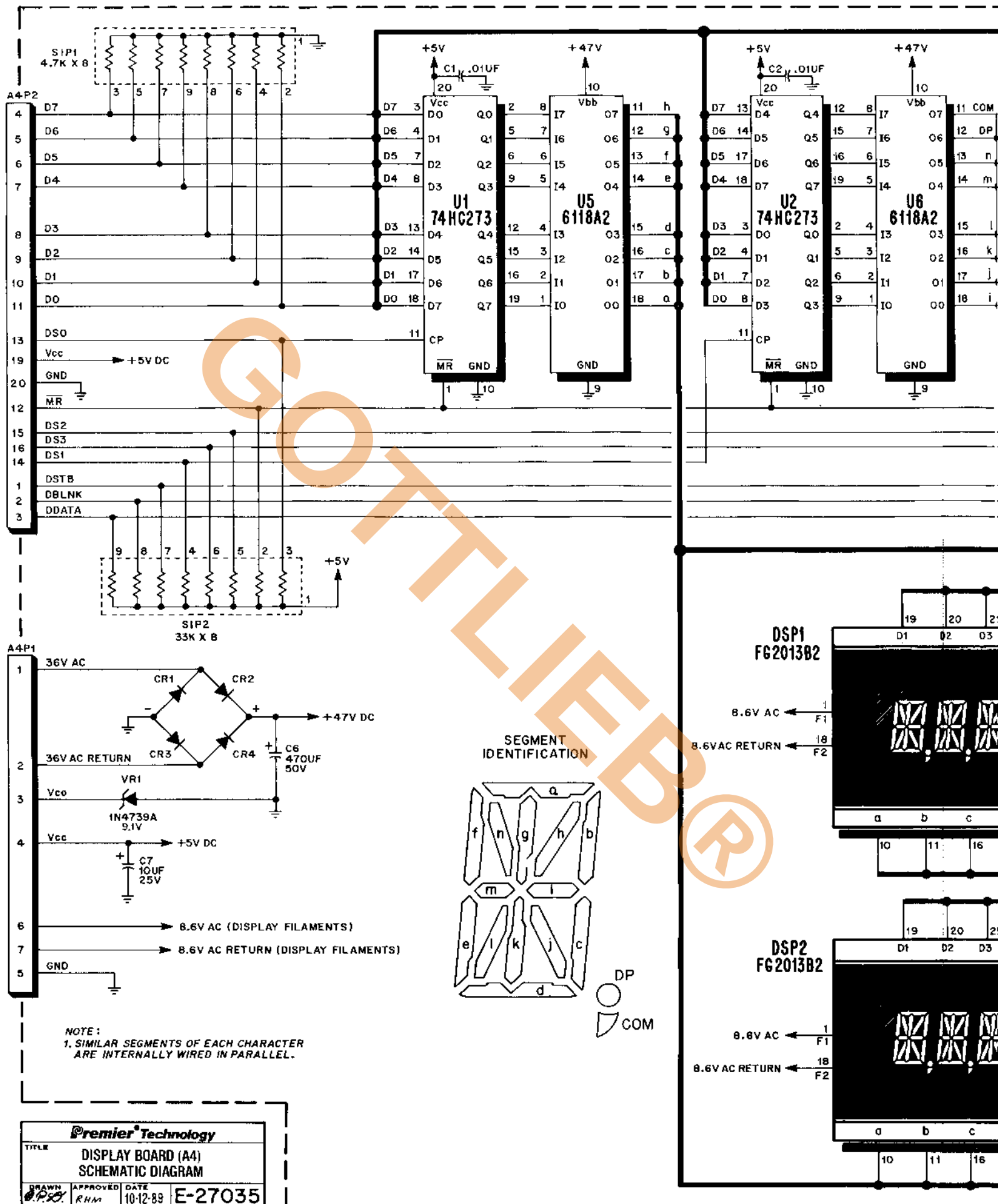
VI. WIRING AND SCHEMATIC DIAGRAMS, PARTS LISTS

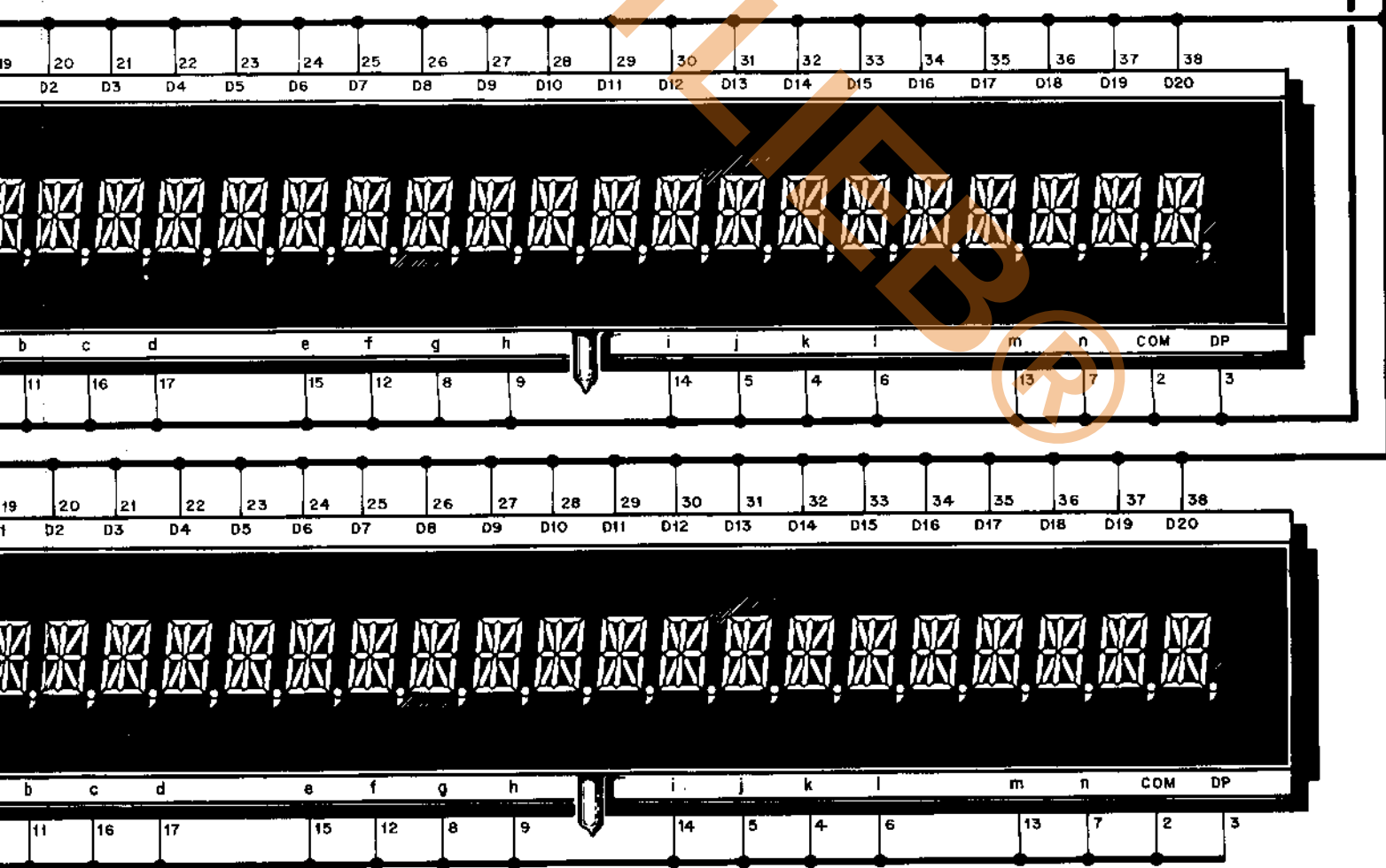
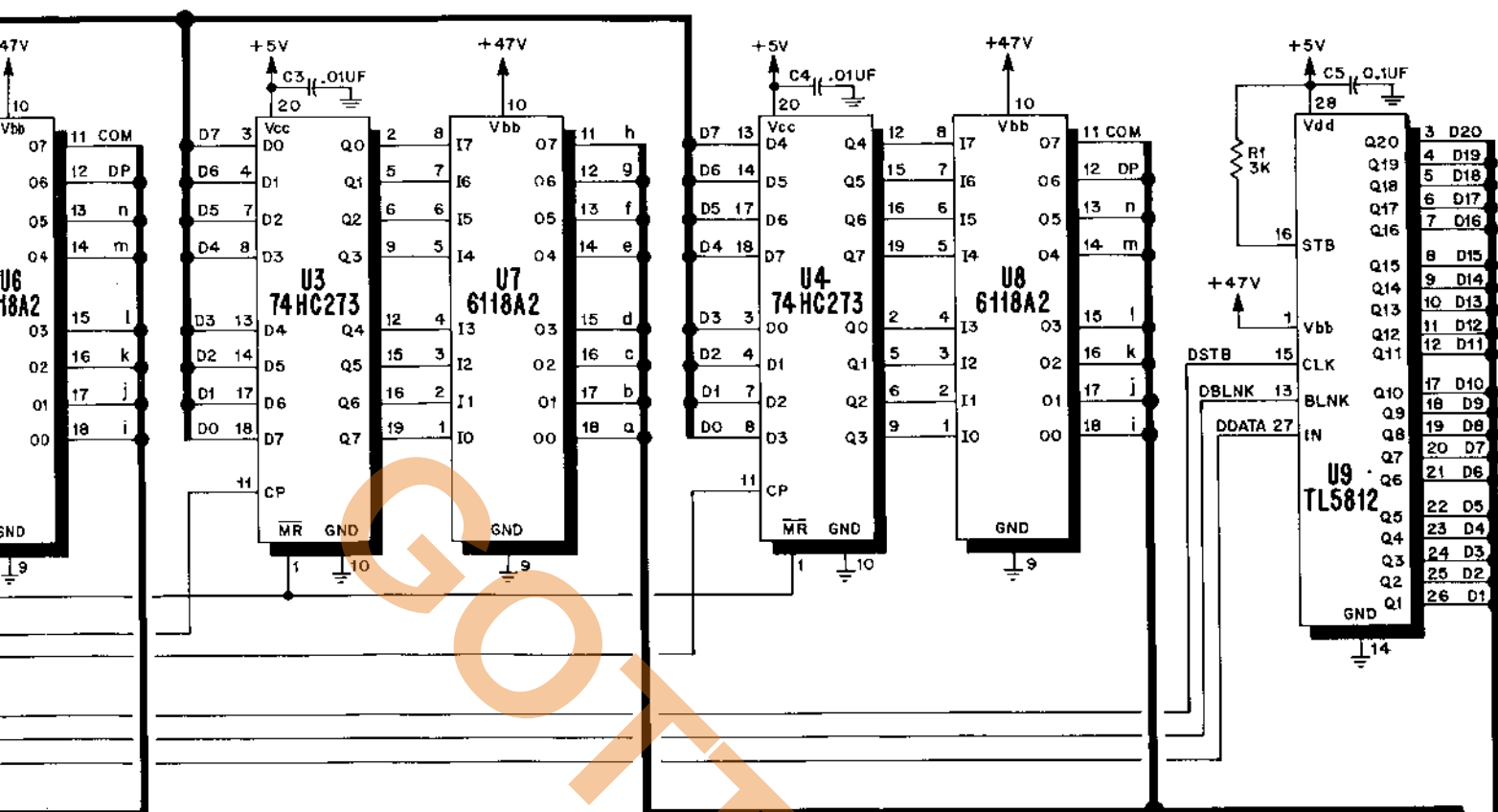
DISPLAY BOARD (A4) COMPONENT LOCATION



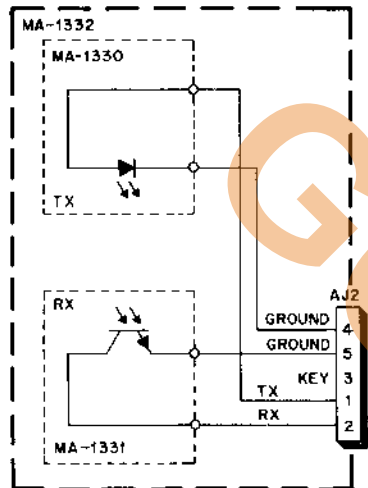
DISPLAY BOARD (A4) PARTS LIST

REFERENCE	DESCRIPTION	PART NUMBER
	Display Board Assembly (A4)	MA-1361
C1-C4	Capacitor, .01UF, +80%-20%, 50V	XO-229
C5	Capacitor, 0.1UF, +80%-20%, 50V	XO-230
C6	Capacitor 470UF, 50V	XO-847
C7	Capacitor, 10UF, 20%, 25V	XO-127
CR1-CR4	Diode, 1N4004	XO-254
DSP1, DSP2	Alphanumeric Display, FG2013B2	XO-901
R1	Resistor, 3K Ohm, 5%, 1/4W	XO-23
SIP1	Resistor Pack 4.7K Ohm X 8, 5%, 1/4W	XO-161
SIP2	Resistor Pack, 33K Ohm X 8, 5%, 1/4W	XO-945
U1-U4	IC, Octal "D" Flip-Flop, 74HC273	XO-949
U5-U8	IC, Display Drivers, 6118A2	XO-951
U9	IC, Latched Drivers, TL5812	XO-952
VR1	Diode 1N4739A, 9.1V Zener	XO-881
A4P1	Header, 8 Position	XO-920
A4P2	Header, 20 Position	XO-941
	Sponge Rubber, 1-1/4" (4)	24290A



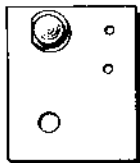


OPTO LED TRANSMITTER BOARD SCHEMATIC DIAGRAM



OPTO PHOTOTRANSISTOR RECEIVER BOARD SCHEMATIC DIAGRAM

OPTO LED TRANSMITTER BOARD COMPONENT LOCATION



OPTO LED TRANSMITTER BOARD PARTS LIST

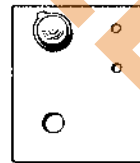
REFERENCE	DESCRIPTION	PART NUMBER
TX	Opto LED Transmitter Assembly	MA-1330
	Plastic Transmitter LED	XO-994

DESCRIPTION

DESCRIPTION	PART NUMBER
Bracket And Optic Boards Assembly	MA-1667
Optical Switch Bracket	28038

OPTICAL INTERFACE BOARD SCHEMATIC DIAGRAM

OPTO PHOTOTRANSISTOR RECEIVER BOARD COMPONENT LOCATION



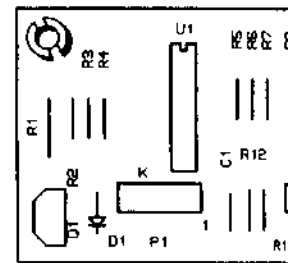
OPTO PHOTOTRANSISTOR RECEIVER BOARD PARTS LIST

REFERENCE	DESCRIPTION	PART NUMBER
	Opto Phototransistor Receiver Assembly	MA-1331
RX	Plastic Phototransistor	XO-993

PART NUMBER

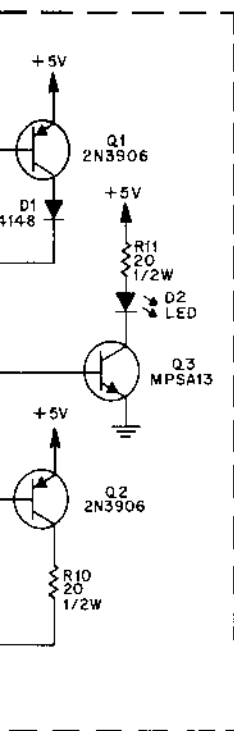
PART NUMBER
MA-1667
28038

OPTICAL INTERFACE COMPONENT LOCATION

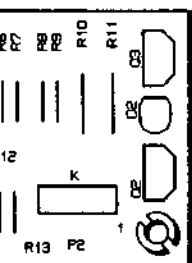


OPTICAL INTERFACE PARTS LIST

REFERENCE	DESCRIPTION
API, AP2	Optical Interface Board
C1	5 Pin Header
D1	Capacitor, 0.10UF, +80V
U1	Diode, 1N4148
Q1, Q2	Diode, MV5752 (LED, RX)
Q3	Transistor, PNP, 2N3904
R1	Transistor, NPN, MPSA
R2, R4, R7, R8	Resistor, 8.2K Ohm, 5%
R3	Resistor, 4.7K Ohm, 5%
R5, R12	Resistor, 1.5K Ohm, 5%
R6	Resistor, 1K Ohm, 5%
R9	Resistor, 10K Ohm, 5%
R10, R11	Resistor, 470 Ohm, 5%
R13	Resistor, 20 Ohm, 5%
U1	Resistor, 270 Ohm, 5%
	IC, Quad Comparators, SRS-B-6N, (2)

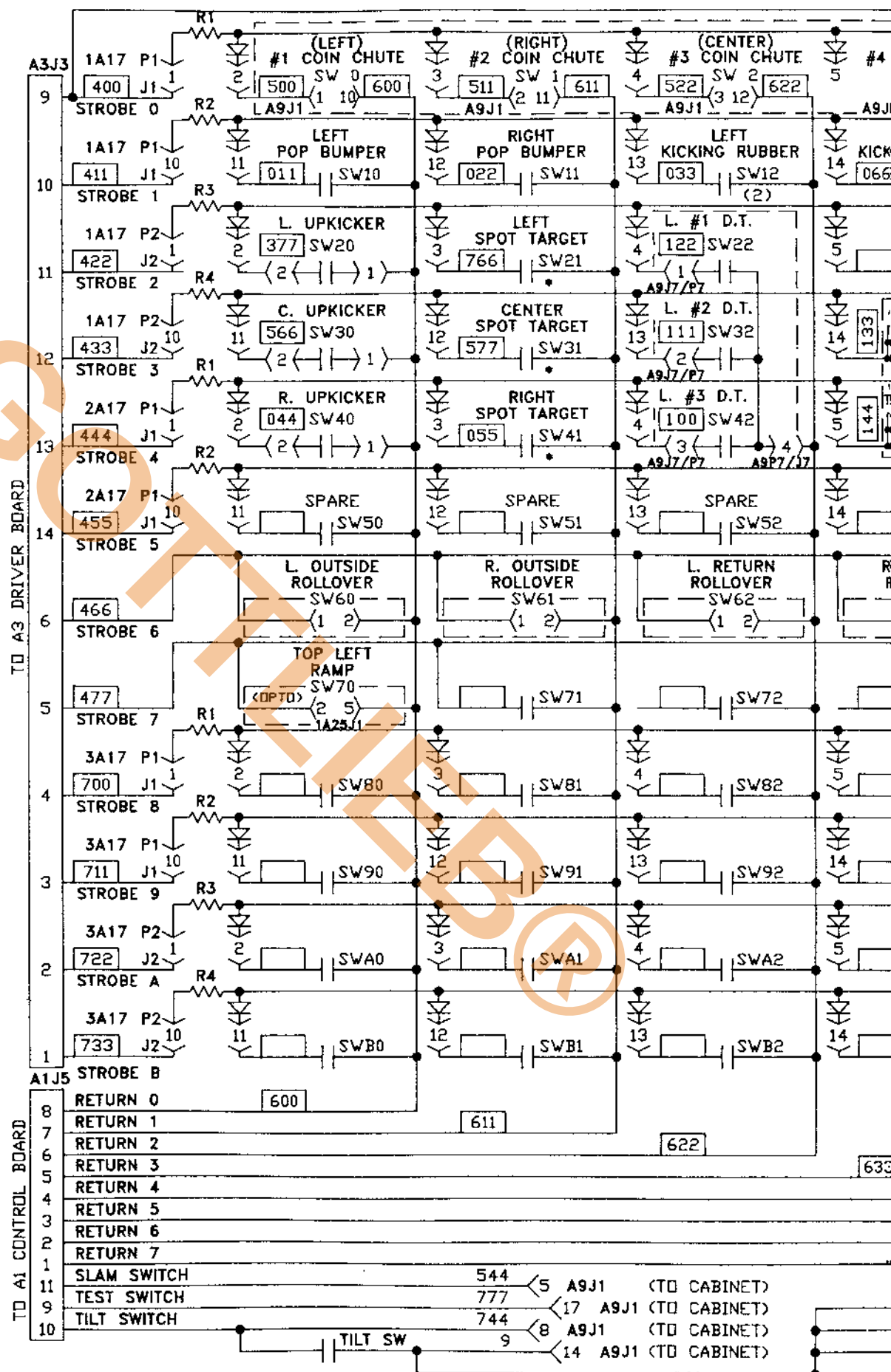


AGRAM

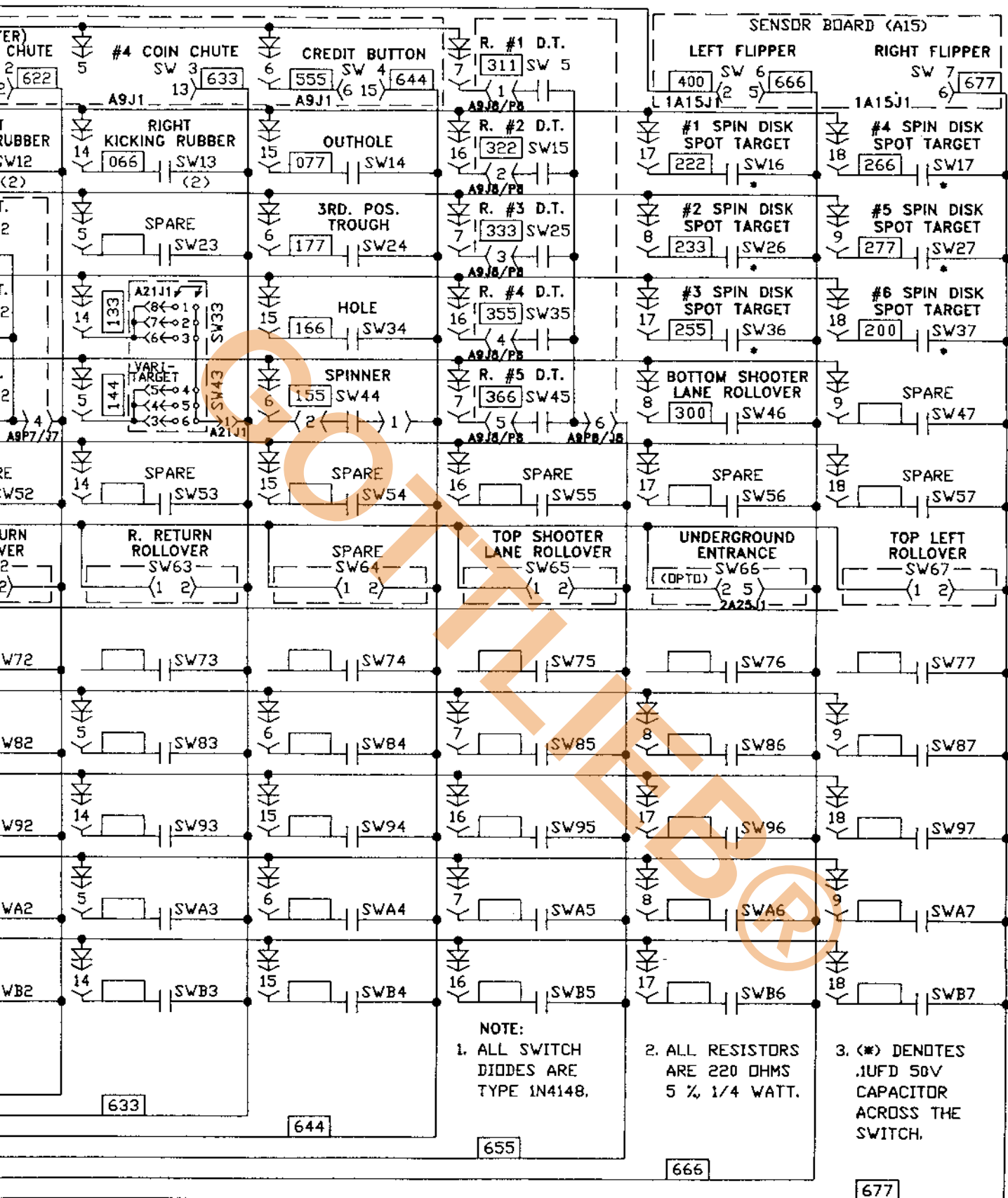
CE BOARD (A25)
LOCATIONCE BOARD (A25)
LIST

PART NUMBER

Board Assembly	MA-1558
+80% -20%, 50V	XO-1002
	XO-230
	XO-261
D, Red)	XO-270
2N3906	XO-588
MPSA13	XO-304
5%, 1/2W	XO-1022
5%, 1/4W	XO-7
5%, 1/4W	XO-20
5%, 1/4W	XO-5
5%, 1/4W	XO-18
5%, 1/4W	XO-35
5%, 1/2W	XO-65
5%, 1/4W	XO-68
ors, LM339	XO-583
, (2)	23984



ING AND SCHEMATIC DIAGRAMS, PARTS LISTS



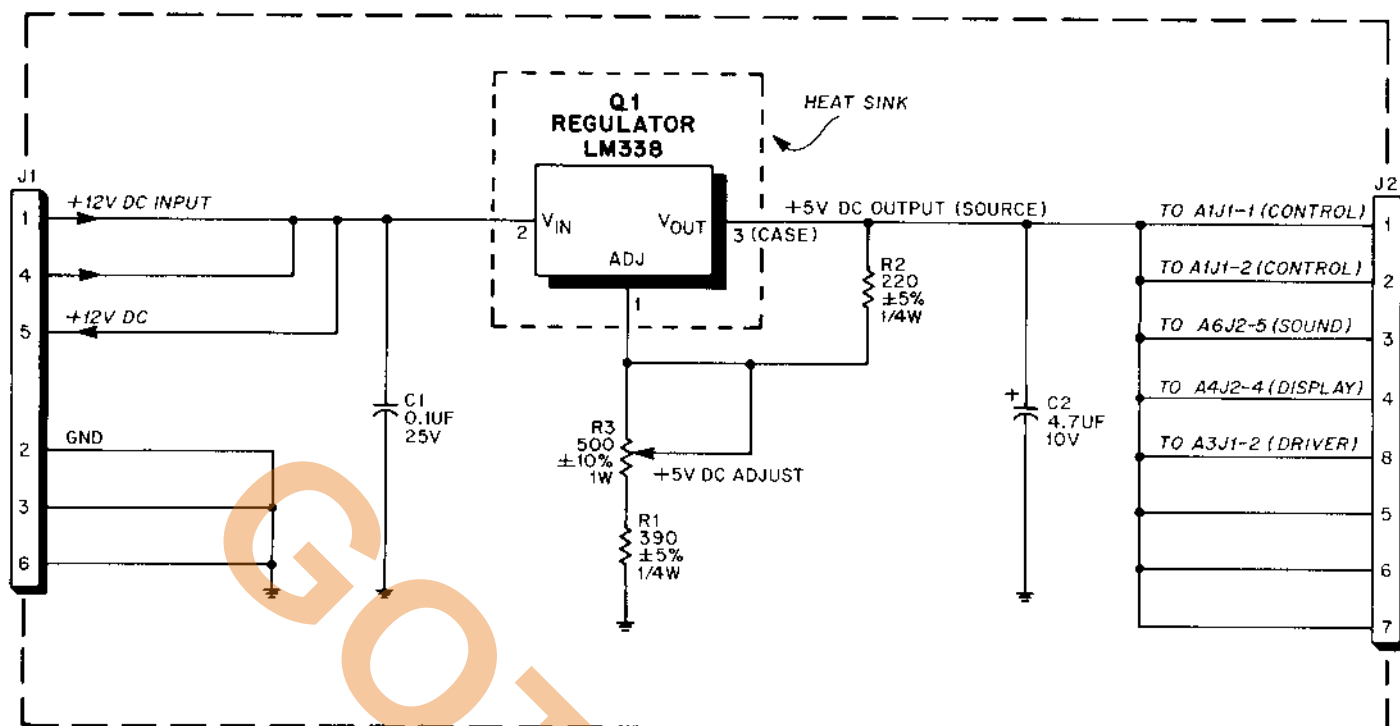
CT)
CT)
CT)
CT)

9 1 1A15J1 (SENSOR BOARD)
9 3 1A25J1 (OPTICAL BOARD)
9 3 2A25J1 (OPTICAL BOARD)
9 9 1A22J1 (LED BOARD)

COLOR CODE			
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1	BROWN	6	BLUE
2	RED	7	VIOLET
3	ORANGE	8	GRAY
4	YELLOW	9	WHITE

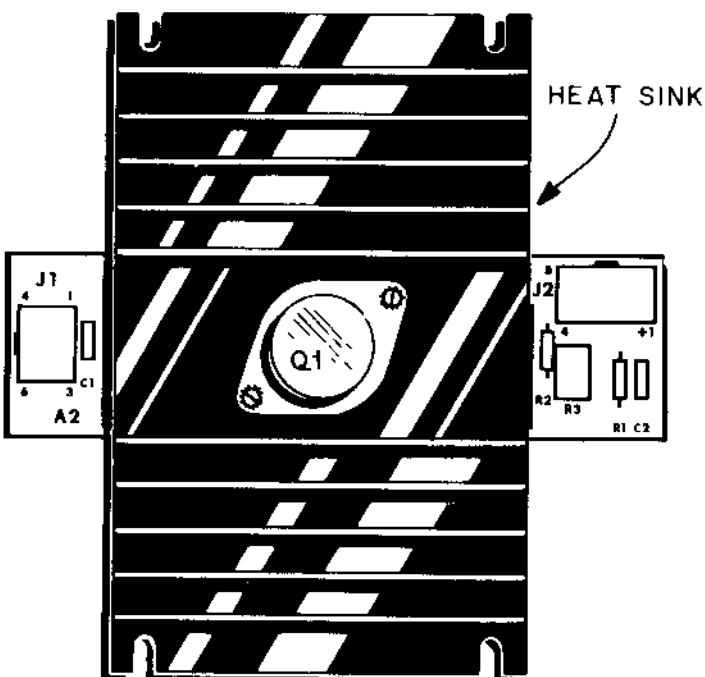
Premier Technology			
TITLE SWITCH MATRIX SCHEMATIC DIAGRAM			
WORK ON #732	DRAWN RLM	DATE 12-18-91	28635

VI. WIRING AND SCHEMATIC DIAGRAMS, PARTS LISTS



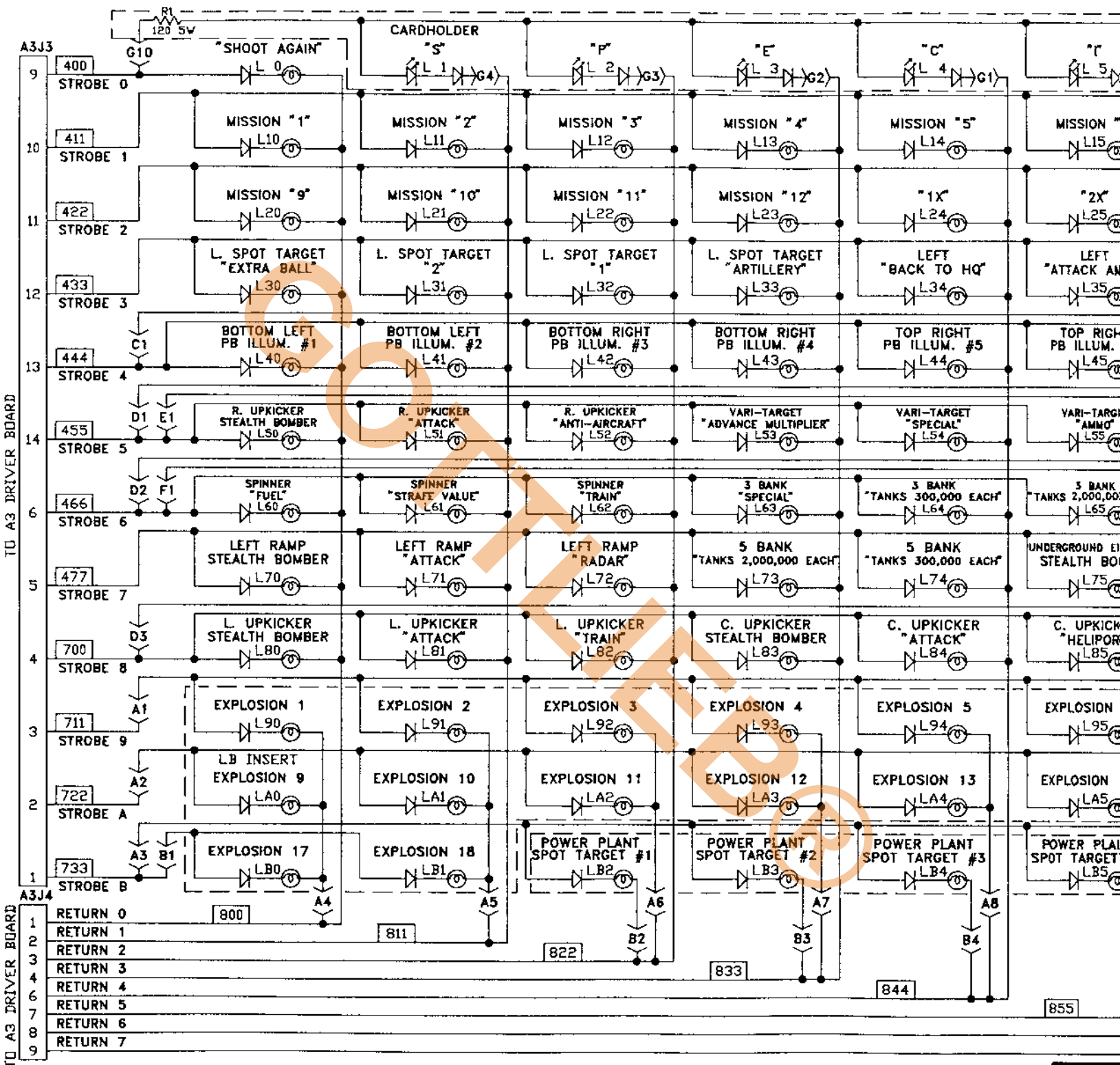
Premier Technology			
TITLE			
POWER SUPPLY (A2)			
SCHEMATIC DIAGRAM			
DRAWN	APPROVED	DATE	E-24441
APD	RHM	12 FEB 85	

POWER SUPPLY (A2) COMPONENT LOCATION



POWER SUPPLY (A2) PARTS LIST

REFERENCE	DESCRIPTION	PART NUMBER
	Power Supply (A2)	MA-1359
C1	Capacitor, 0.1uF, +80% -20%, 50V	XO-230
C2	Capacitor, 4.7uF, 10% 10V	XO-228
J1	Header, 6 Position	XO-910
J2	Header, 8 Position	XO-911
Q1	Regulator, LM338, (5 Amp)	XO-839
R1	Resistor, 390 Ohm, 5%, 1/4W	XO-845
R2	Resistor, 220 Ohm, 5%, 1/4W	XO-21
R3	Resistor, (Pot) 500 Ohm, 10%, 1W	XO-112
	Heat Sink	XO-534
	Insulator (Regulator)	XO-522
	Insulator (Regulator)	XO-523



NOTE:

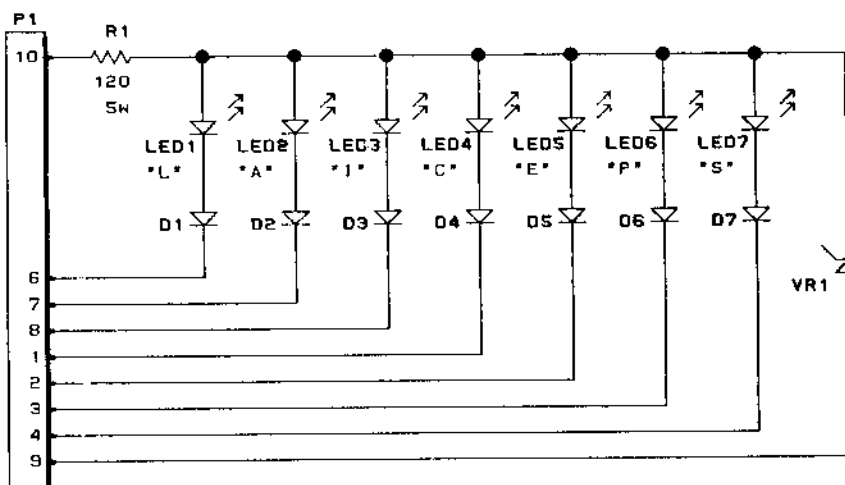
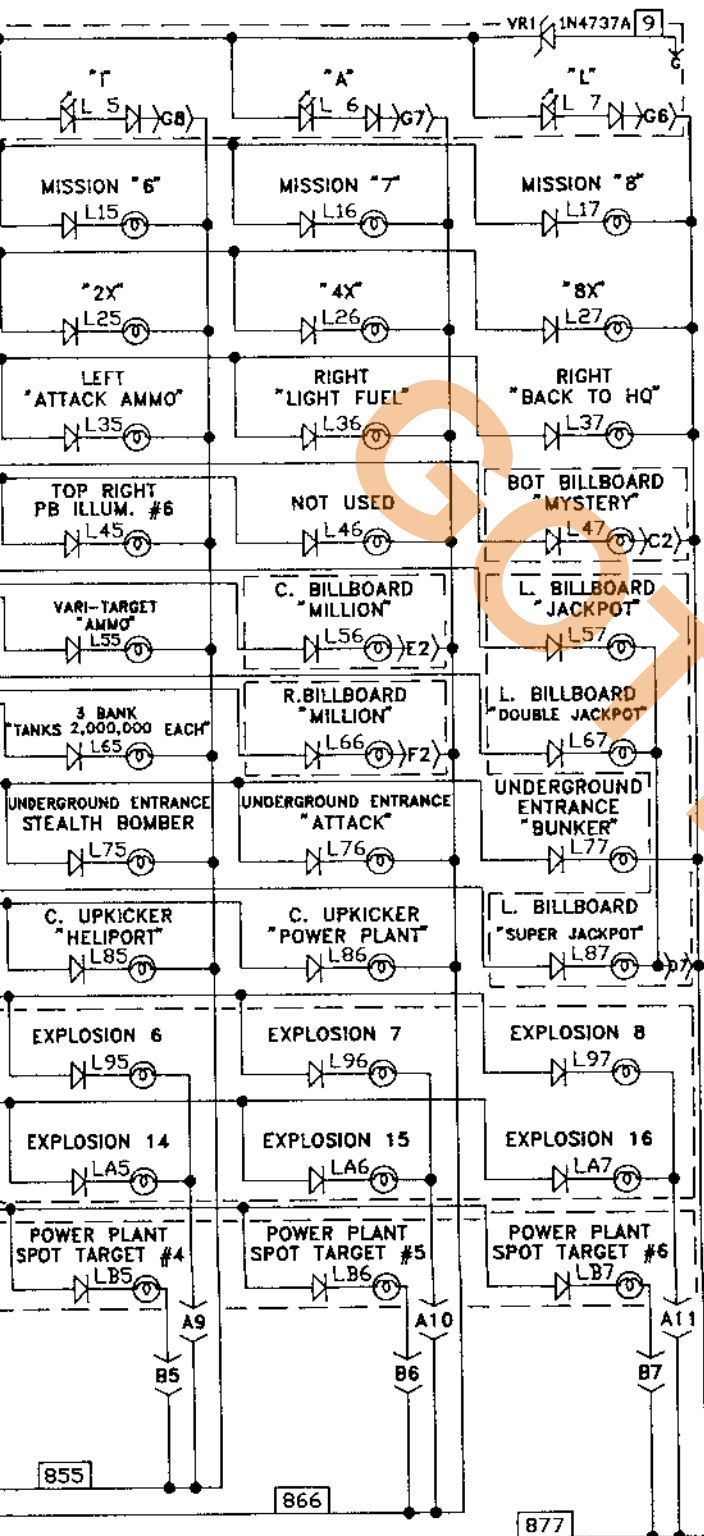
1. ALL LAMP
DIODES ARE
TYPE 1N4004.

2. ALL LAMPS
ARE TYPE #44.

3. A=A9J4/P4
B=A9J9/P9
C=A9J10/P10
D=A9J11/P11

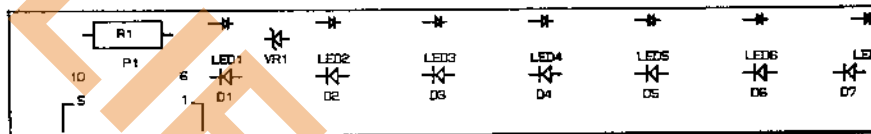
E=A9J12/P12
F=A9J13/P13
G=A9J14/P14

COLOR	
0	BLACK
1	BROWN
2	RED
3	ORANGE
4	YELLOW



Premier Technology			
TITLE LED BOARD (A22) SCHEMATIC DIAGRAM			
DRAWN J.B.	APPROVED RLM	DATE 12-7-91	MA-1721

LED BOARD (A22) COMPONENT LOCATION



LED BOARD (A22) PARTS LIST

REFERENCE	DESCRIPTION	PART NUMBER
D1-D7	LED Board Assembly (A22)	MA-1721
LED 1-LED 7	Diode, 1N4004	XO-254
R1	Diode, LED, Red	XO-865
VR1	Resistor, 120 OHM, 10%, 5W	XO-1042
P1	Diode, Zener, 1N4737A, 7.5V	XO-844
	Header, 10 Position	XO-998

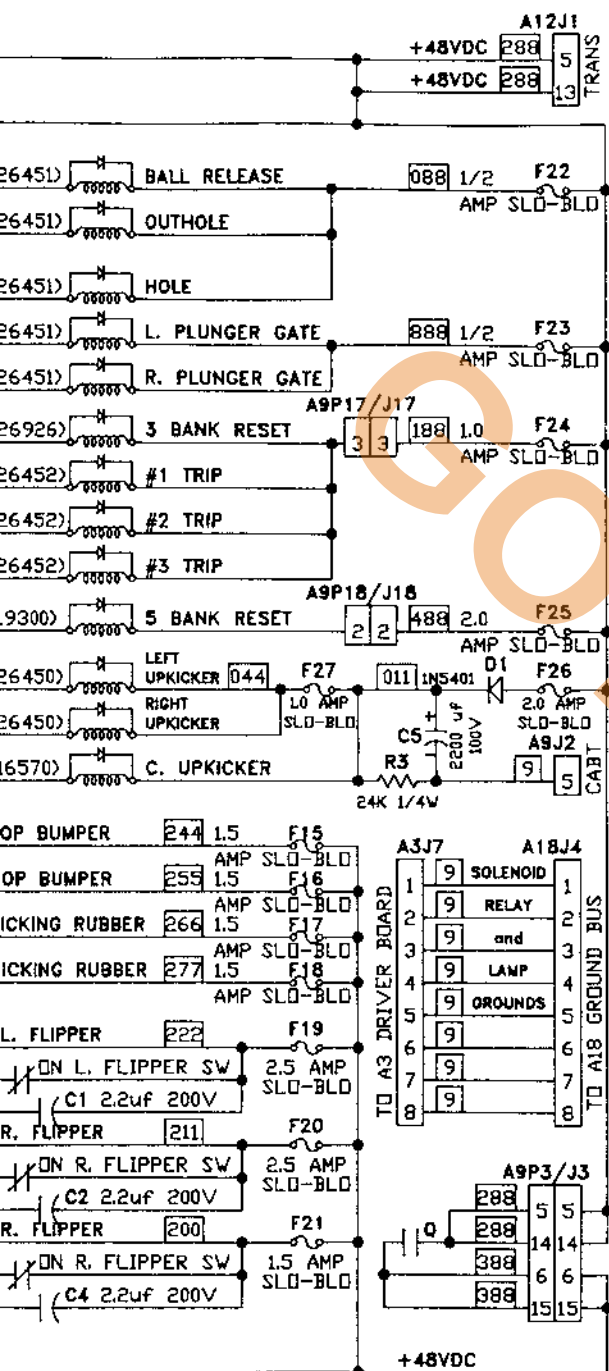
COLOR CODE			
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1	BROWN	6	BLUE
2	RED	7	VIOLET
3	ORANGE	8	GRAY
4	YELLOW	9	WHITE

Premier Technology			
TITLE LAMP MATRIX SCHEMATIC DIAGRAM			
USED ON #732	DRAWN RLM	DATE 01-03-92	28636

VI. WIRING AND SCHEMATIC

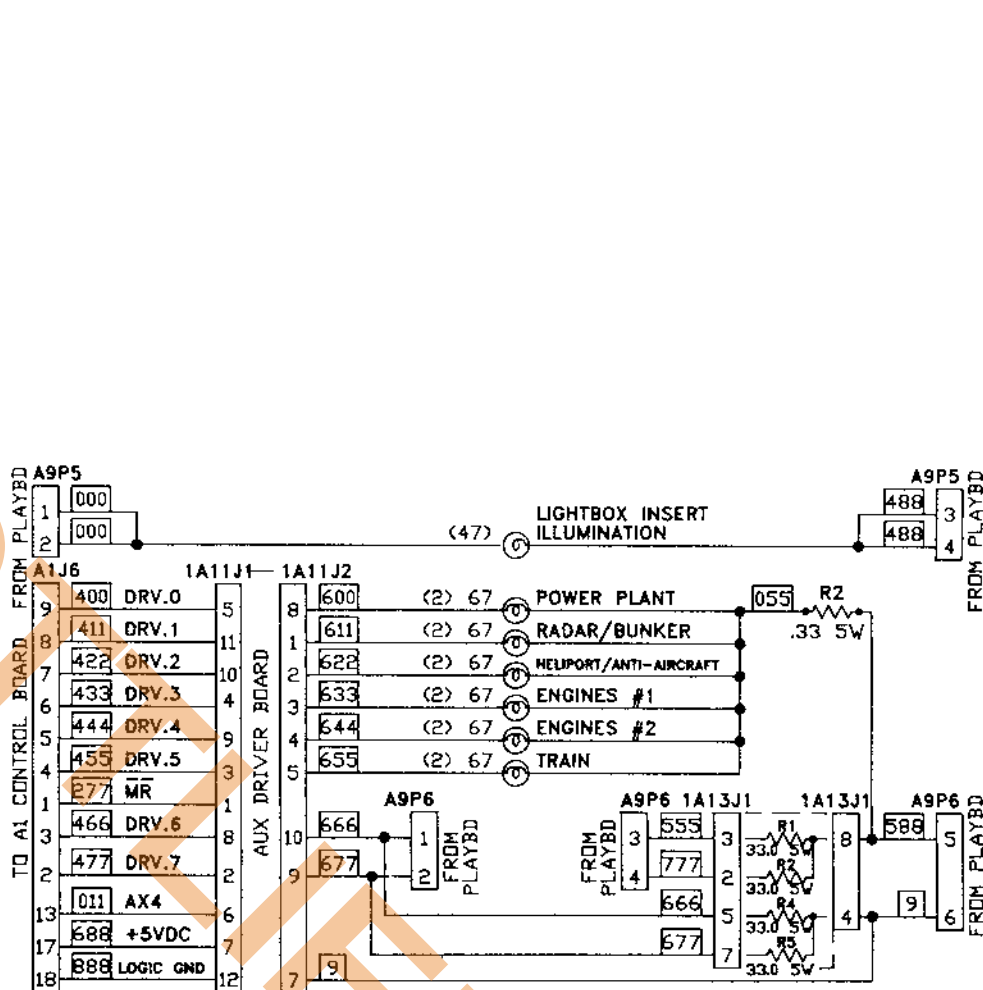


LOGIC DIAGRAMS, PARTS LISTS



COLOR CODE		
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BROWN	6	BLUE
RED	7	VIOLET
ORANGE	8	GRAY
YELLOW	9	WHITE

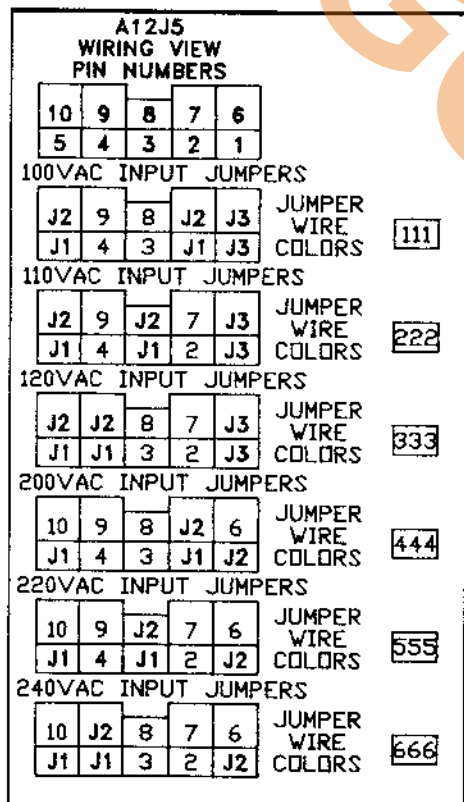
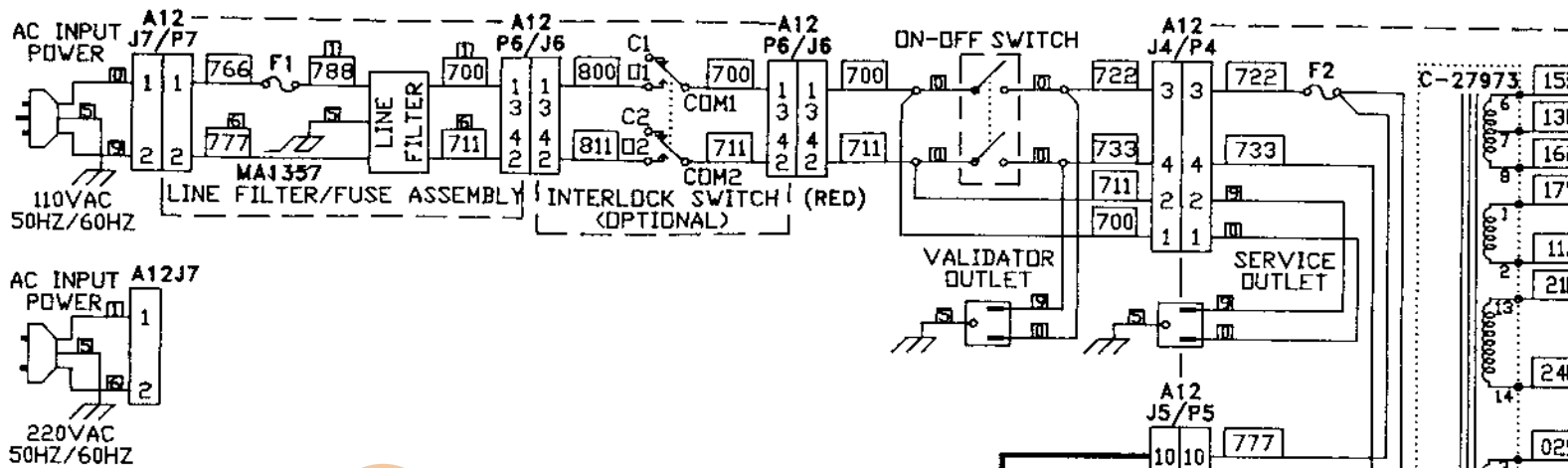
Premier Technology		
TITLE: PLAYBOARD SCHEMATIC DIAGRAM		
USED ON: #732	DRAWN: RLM	DATE: 12-17-91
28637		



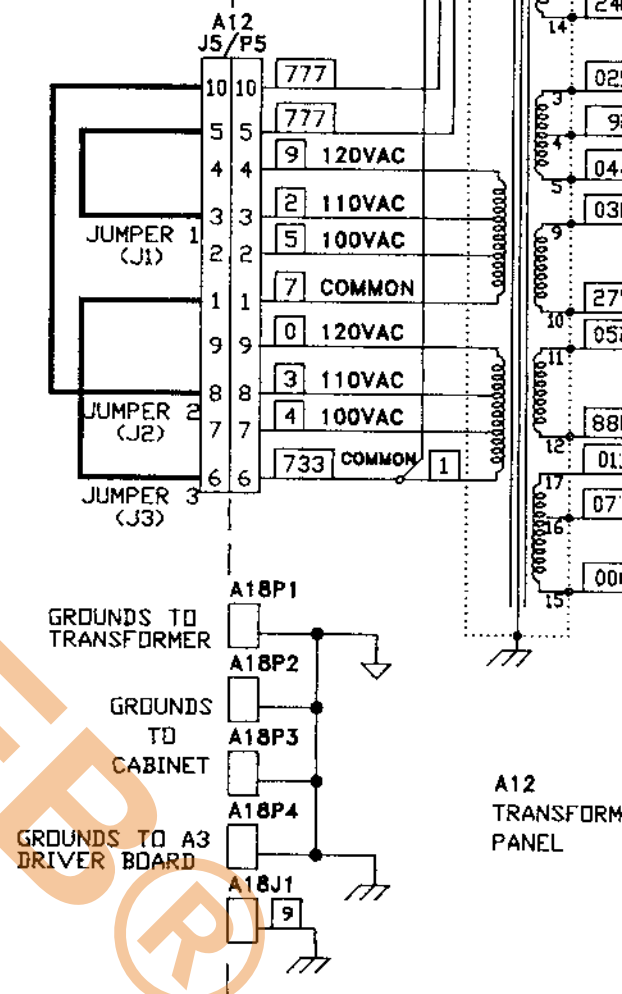
COLOR CODE		
0 BLACK	5 GREEN	
1 BROWN	6 BLUE	
2 RED	7 VIOLET	
3 ORANGE	8 GRAY	
4 YELLOW	9 WHITE	

Premier Technology		
TITLE: LIGHTBOX INSERT SCHEMATIC DIAGRAM		
USED ON: RLM	DRAWN: RLM	DATE: 12-03-91
28707		

VI. WIRING AND SCHEMATIC DIAGRAMS, I



COLOR CODE			
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1	BROWN	6	BLUE
2	RED	7	VIOLET
3	ORANGE	8	GRAY
4	YELLOW	9	WHITE

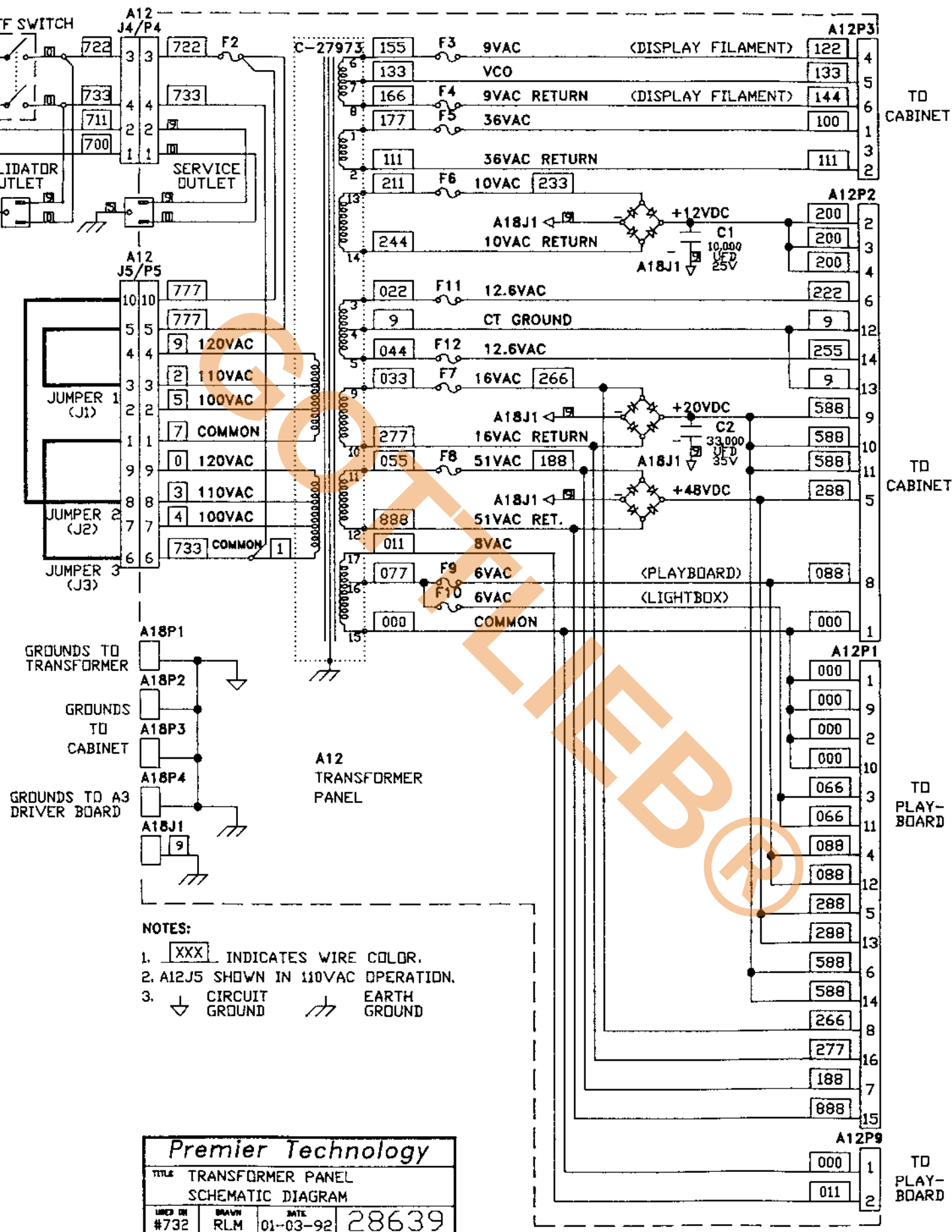


FUSE	RATING	PART NO.	USAGE
F1	8.0A SLO-BLO	EL26	LINE INPUT
	4.0A SLO-BLO	EL33	LINE INPUT
F2	5.0A SLO-BLO	EL8	PRIMARY POWER
	2.5A SLO-BLO	EL21	PRIMARY POWER
F3	1/2A	EL28	DISPLAY FILAMENT
F4	1/2A	EL28	DISPLAY FILAMENT
F5	1/4A SLO-BLO	EL5	DISPLAYS
F6	2.5A SLO-BLO	EL21	POWER SUPPLY
F7	10.0 SLO-BLO	EL36	CONTROLLED LAMPS
F8	8.0A SLO-BLO	EL26	SOLENOIDS
F9	4.0A SLO-BLO	EL33	PLAYFIELD ILLUMINATION
F10	15.0	EL25	LIGHTBOX INSERT ILLUMINATION
F11	3.0A SLO-BLO	EL9	AUXILLIARY POWER SUPPLY
F12	3.0A SLO-BLO	EL9	AUXILLIARY POWER SUPPLY

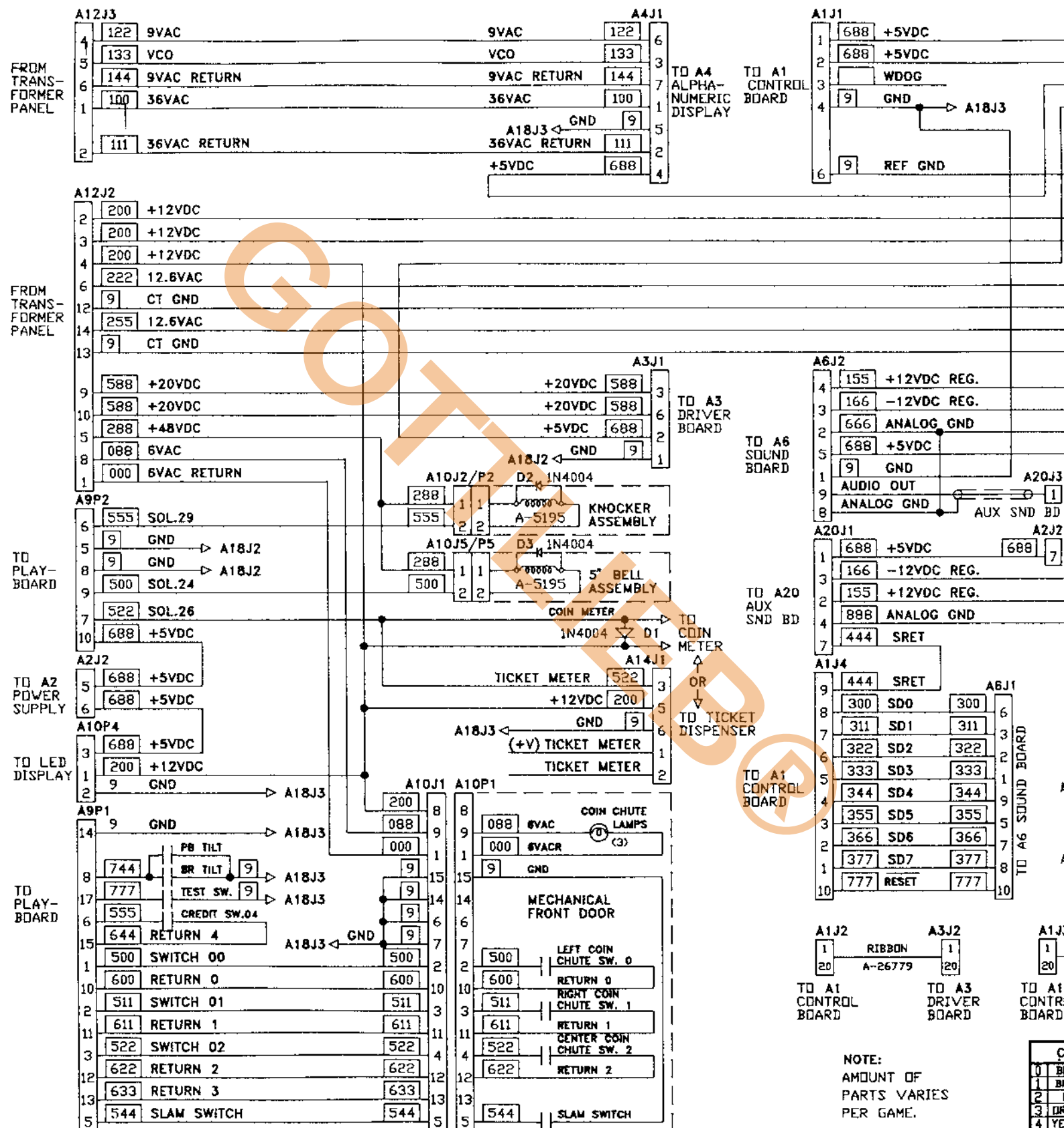
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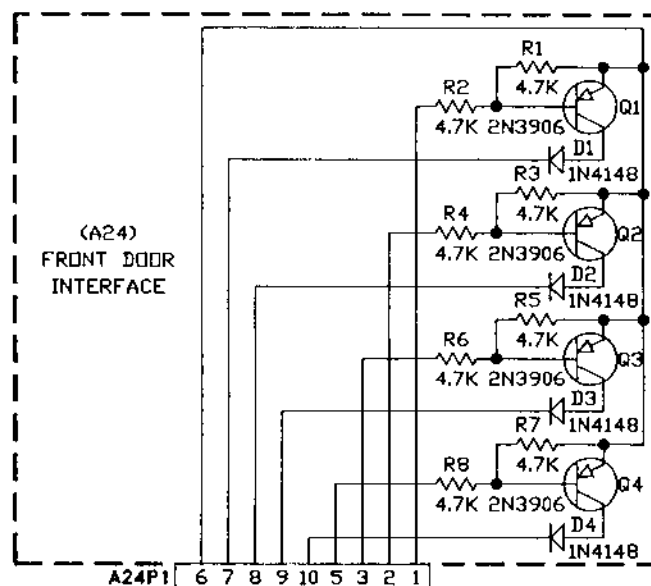
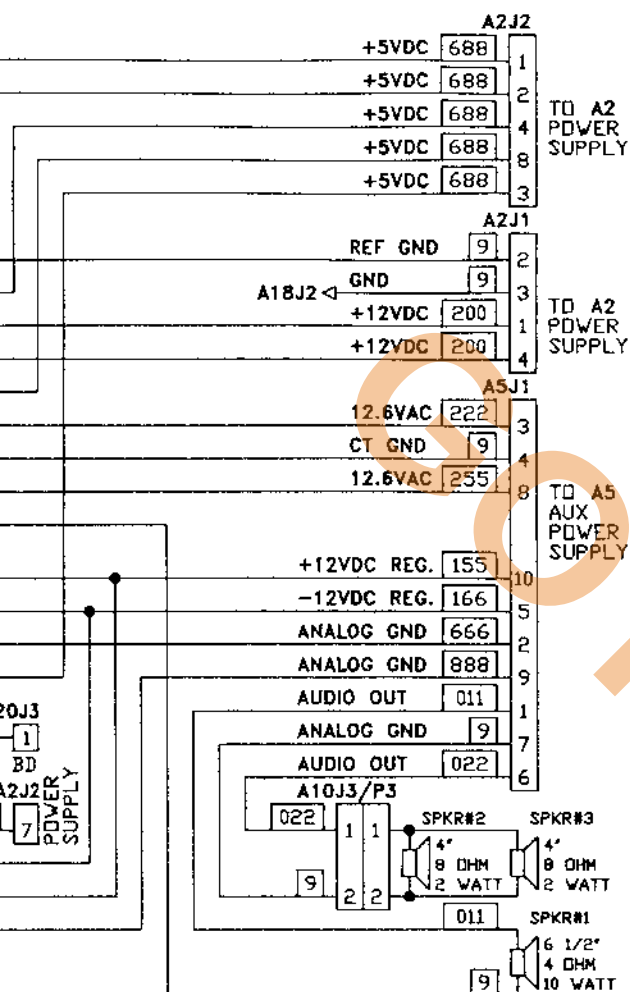
1. XXX INDICATES WIRE COLOR
2. A12J5 SHOWN IN 110VAC OPER
3.  CIRCUIT GROUND  EARTH GROUND

Premier Technology			
TITLE TRANSFORMER PANEL SCHEMATIC DIAGRAM			
USED ON #732	DRAWN RLM	DATE 01-03-92	286



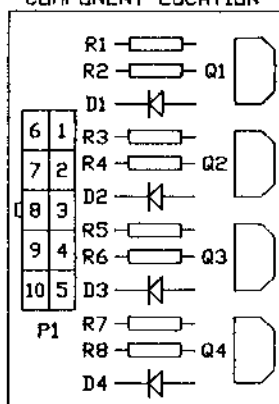
VI. WIRING AND SCHEMATIC





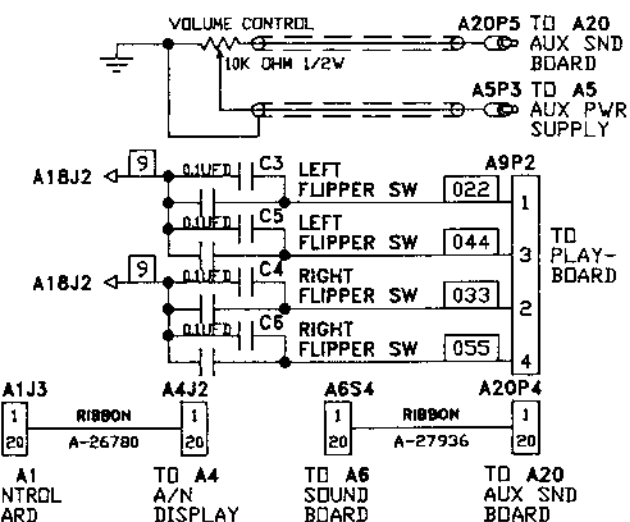
TO CABINET

(A24)
FRONT DOOR INTERFACE
COMPONENT LOCATION



(A24)
FRONT DOOR INTERFACE
PARTS LIST

REFERENCE	DESCRIPTION	PART NO.
	FRONT DOOR INTERFACE ASSEMBLY	MA1645
D1-D4	DIODE, 1N4148	X0-261
Q1-Q4	TRANSISTOR, PNP, 2N3906	X0-588
R1-R8	RESISTOR, 4.7K OHM, 1/4W, 5%	X0-7
A24P1	HEADER, 10 POSITION	X0-912
	SPACER (4)	23984



COLOR CODE			
0 BLACK	5 GREEN	1 BROWN	6 BLUE
2 RED	7 VIOLET	3 ORANGE	8 GRAY
4 YELLOW	9 WHITE		

Premier Technology

TITLE	CABINET/LIGHTBOX
SCHEMATIC DIAGRAM	
USED ON	#732
DATE	11-01-91
28638	

COLOR CODE			
0 BLACK	5 GREEN	1 BROWN	6 BLUE
2 RED	7 VIOLET	3 ORANGE	8 GRAY
4 YELLOW	9 WHITE		

Premier Technology

TITLE	SCHEMATIC DIAGRAM
ELECTRONIC FRONT DOOR-4 OUTPUT	
USED ON	#732
DATE	09-20-91
28541	

VII. PARTS INFORMATION

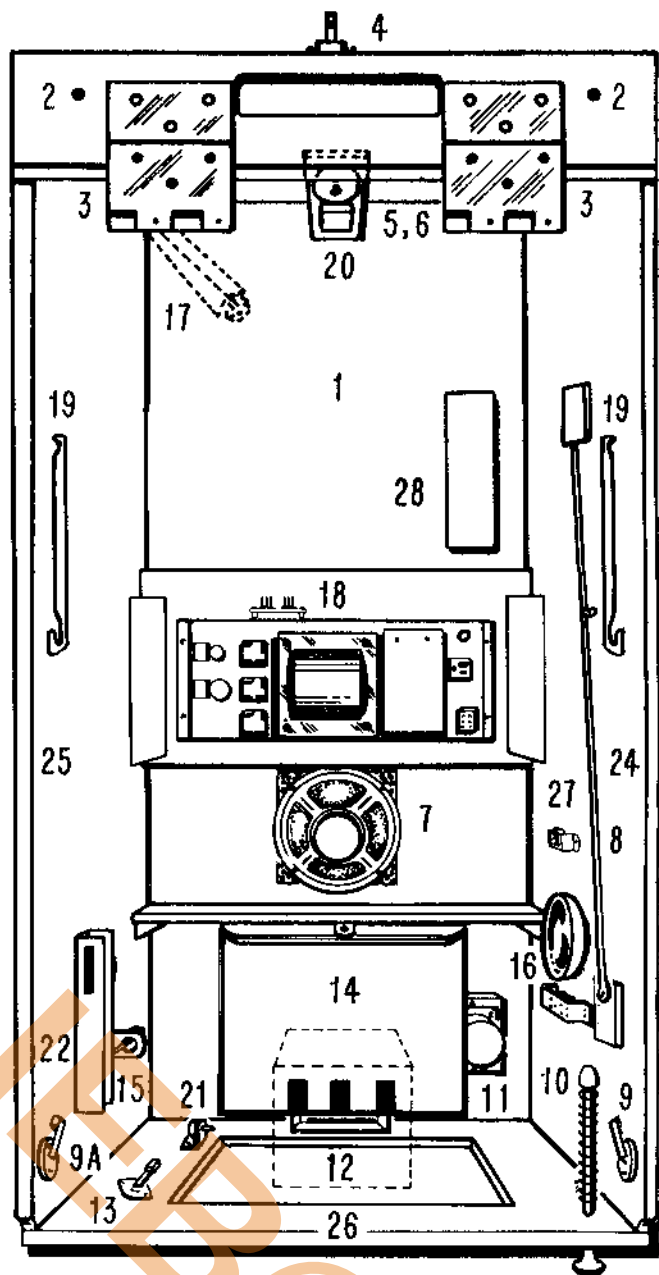
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LIGHTBOX INSERT LAMP IDENTIFICATION.....	66
BALL HOLE KICKER PARTS EXPLODED VIEW.....	67
UNIQUE PARTS.....	68

VII. PARTS INFORMATION

CABINET PARTS

ITEM	DESCRIPTION	PART NO.
1	Cabinet	28697-732
2	Lightbox Mounting Thumb Screw (2) (Not Shown, For Reference Only, Part of Lightbox Assembly)	FA-162
3	Butt Hinge (2) (Attached to Lightbox)	26449
4	"U" Bolt (P/O Lightbox)	24659
	Latch Assembly (P/O Cabinet)	21969
5	Cable Assembly, Domestic (High Voltage)	MA-1616
6	Line Cord (Domestic)	23365
	Line Cord Cover Plate	23364
7	Speaker, 4 Ohm, 10W, 6-1/2"	EL-83
	Speaker Guard	20931
8	Prop Stick, Playfield	23940
9	Right Flipper Switch	28693
9A	Left Flipper Switch	28691
10	Ball Shooter Assembly	26314
11	Switch, On/Off	13799
	Switch Plate (2)	18769
	Switch Housing	15163
12	Front Door Assembly (Universal)	24159
	Cable Assembly	MA-1709
	Slam Switch (N/O)	26130
	6V DC Lamp, Wedge Base	FD-2
	Lampholder	FD-24
13	Replay Switch Assembly	18092
14	Cashbox	28032
	Cover	28062
15	Plumb Bob Tilt Switch Assembly	
	Strike Plate	358
	Carbon, Tilt Bob	MH-30
	Rod, Tilt	357
	Bracket	22043
	Clip	14653
16	Knocker Assembly	MA-12
	5" Bell Assembly (When Used)	27591
17	Cabinet Leg (4)	4337
	Leg Bolt (8)	3775
	3" Leg Adjuster (4)	MH-21
	3/8-16", Jam Nut (8)	FA-665
18	Transformer Panel Assembly	MA-1727
	Bridge Rectifier (3)	EL-42
	Cable Assembly (Secondary)	MA-1618
	Capacitor, (10,000UF), 25V	XO-830
	Capacitor, (33,000UF), 35V	XO-957
	Fuse Block (8 Pos.)	EL-10
	Fuse Cover	23805
	Fuse Holder and Cap (F2)	EL-78
	Fuse Holder (1 Pos.)	EL-17
	F2, 5 Amp, SLO-BLO (110V AC)	EL-8
	F2, 2.5 Amp, SLO-BLO (220V AC)	EL-21
	F3, 1/2 Amp	EL-28
	F4, 1/2 Amp	EL-28
	F5, 1/4 Amp, SLO-BLO	EL-5
	F6, 2-1/2 Amp, SLO-BLO	EL-21
	F7, 10 AMP, SLO-BLO	EL-36
	F8, 8 AMP, SLO-BLO	EL-26
	F9, 4 AMP, SLO-BLO	EL-33
	F10, 15 AMP	EL-25
	F11, 3 Amp, SLO-BLO	EL-9
	F12, 3 Amp, SLO-BLO	EL-9
	Ground Bus Assembly	27153
	Outlet, Service	18133
	Transformer	27973
19	Cabinet Pivot Bracket (Right)	25658
	Cabinet Pivot Bracket (Left)	25657
20	Line Filter Assembly	MA-1386
	Fuse Holder	EL-78
	F1, 8 Amp, SLO-BLO (110V AC)	EL-26
	F1, 4 Amp, SLO-BLO (220V AC)	EL-33
	Line Filter	EL-50
	Line Filter (Germany)	EL-51
21	Mounting Bracket	24149
	Control, Volume, 10K Ohm, 1/2W	27944
	Switch, PLAY/TEST	EL-57
22	Ball Roll Tilt	
	Housing and Switch Assembly	24394
	Switch	24393
23	(Not Used)	
24	Right Moulding (Not Shown)	28700
25	Left Moulding (Not Shown)	28701
26	Front Moulding (Not Shown)	16951
27	Bracket, Voltage Outlet (Bill Acceptor)	18104
28	Relay Strip Assembly	MA-1671
	"Q" Relay	MA-23
	"T" Relay	MA-25
	"A" Relay	MA-1021



VII. PARTS INFORMATION

PLAYBOARD SWITCH ASSIGNMENTS

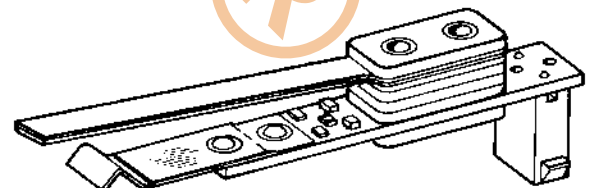
SWITCH MATRIX NUMBER

SWITCH ASSIGNMENT

PART NO.

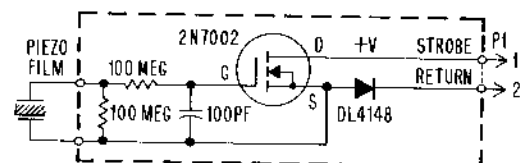
SW 0	LEFT COIN CHUTE (#1)	P/O FRONT DOOR
SW 1	RIGHT COIN CHUTE (#2)	P/O FRONT DOOR
SW 2	CENTER COIN CHUTE (#3)	P/O FRONT DOOR
SW 3	#4 COIN CHUTE	P/O ELECTRONIC DOOR
SW 4	START (CREDIT) BUTTON,	P/O CABINET 18092
SW 5	RIGHT DROP TARGET #1	25896
SW 6	LEFT FLIPPER (SENSOR BOARD (A15)	P/O MA-1334
SW 7	RIGHT FLIPPER (SENSOR BOARD (A15)	P/O MA-1334
SW 10	LEFT POP BUMPER	22705
SW 11	RIGHT POP BUMPER	22705
SW 12	LEFT KICKING RUBBER (2)	27702
SW 13	RIGHT KICKING RUBBER (2)	27702
SW 14	OUTHOLE	26927
SW 15	RIGHT DROP TARGET #2	25896
SW 16	#1 SPIN DISK SPOT TARGET, RED	28672U
SW 17	#4 SPIN DISK SPOT TARGET, RED	28671U
SW 20	LEFT UPKICKER	27667A
SW 21	LEFT SPOT TARGET, PURPLE	28730R
SW 22	LEFT #1 DROP TARGET	18094
SW 23	(NOT USED)	
SW 24	3RD POSITION TROUGH	26485
SW 25	RIGHT #3 DROP TARGET	25897
SW 26	#2 SPIN DISK SPOT TARGET, RED	28731U
SW 27	#5 SPIN DISK SPOT TARGET, RED	28731U
SW 30	CENTER UPKICKER	27667A
SW 31	CENTER SPOT TARGET, YELLOW	28730T
SW 32	LEFT #2 DROP TARGET	18095
SW 33	VARI-TARGET, POSITIONS 1,2,3	P/O MA-1163
SW 34	BALL HOLE KICKER, P/O MA-1736	18085
SW 35	RIGHT #4 DROP TARGET	25895
SW 36	#3 SPIN DISK SPOT TARGET, RED	28731U
SW 37	#6 SPIN DISK SPOT TARGET, RED	27667A
SW 40	RIGHT UPKICKER	28672T
SW 41	RIGHT SPOT TARGET, YELLOW	18093
SW 42	LEFT #3 DROP TARGET	P/O MA-1163
SW 43	VARI-TARGET, POSITIONS 4,5,6	27216
SW 44	SPINNER	25895
SW 45	RIGHT #5 DROP TARGET	25824
SW 46	BOTTOM SHOOTER LANE ROLLOVER	
SW 47	(NOT USED)	
SW 50	THRU	
SW 57	NOT USED	
*SW 60	LEFT OUTSIDE ROLLOVER	28265
*SW 61	RIGHT OUTSIDE ROLLOVER	28265
*SW 62	LEFT RETURN ROLLOVER	28265
*SW 63	RIGHT RETURN ROLLOVER	28265
SW 64	(NOT USED)	
*SW 65	TOP SHOOTER LANE ROLLOVER	28265
SW 66	UNDERGROUND ENTRANCE	
	TRANSMITTER	MA-1330
	RECEIVER	MA-1331
*SW 67	OPTICAL INTERFACE BOARD	MA-1558
SW 70	TOP LEFT ROLLOVER	28265
	TOP LEFT RAMP	
	TRANSMITTER	MA-1330
	RECEIVER	MA-1331
	OPTICAL INTERFACE BOARD	MA-1558

*SMART SWITCH™



SMART SWITCH™
DO NOT ADJUST WIDE BEAM

SEE PAGE 19



SCHEMATIC REPRESENTATION

VII. PARTS INFORMATION

PLAYBOARD LAMP ASSIGNMENTS

LAMP NUMBER LAMP ASSIGNMENT

L0	"SHOOT AGAIN"
L1	Cardholder "S"
L2	Cardholder "P"
L3	Cardholder "E"
L4	Cardholder "C"
L5	Cardholder "I"
L6	Cardholder "A"
L7	Cardholder "L"
L10	Mission "1"
L11	Mission "2"
L12	Mission "3"
L13	Mission "4"
L14	Mission "5"
L15	Mission "6"
L16	Mission "7"
L17	Mission "8"
L20	Mission "9"
L21	Mission "10"
L22	Mission "11"
L23	Mission "12"
L24	"1X"
L25	"2X"
L26	"4X"
L27	"8X"
L30	Left Spot Target "EXTRA BALL"
L31	Left Spot Target "2"
L32	Left Spot Target "1"
L33	Left Spot Target "ARTILLERY"
L34	Left "BACK TO HQ"
L35	Left "ATTACK AMMO"
L36	Right "LIGHT FUEL"
L37	Right "BACK TO HQ"
L40	Bottom Left Playfield Illum. #1
L41	Bottom Left Playfield Illum. #2
L42	Bottom Right Playfield Illum. #3
L43	Bottom Right Playfield Illum. #4
L44	Top Right Playfield Illum. #5
L45	Top Right Playfield Illum. #6
L46	(Not used)
L47	Bottom Billboard "MYSTERY"
L50	Right Upkicker Stealth Bomber
L51	Right Upkicker "ATTACK"
L52	Right Upkicker "ANTI AIRCRAFT"
L53	Vari-Target "ADVANCE MULTIPLIER"
L54	Vari-Target "SPECIAL"
L55	Vari-Target "AMMO"
L56	Center Billboard "MILLION"
L57	Left Billboard "JACKPOT"
L60	Spinner "FUEL"
L61	Spinner "STRAFE VALUE"
L62	Spinner "TRAIN"
L63	3 Bank "SPECIAL"
L64	3 Bank "TANKS 300,000 EACH"
L65	3 Bank "TANKS 2,000,000 EACH"
L66	Right Billboard "MILLION"
L67	Left Billboard "DOUBLE JACKPOT"
L70	Left Ramp Stealth Bomber
L71	Left Ramp "ATTACK"
L72	Left Ramp "RADAR"
L73	5 Bank "TANKS 2,000,000 EACH"
L74	5 Bank "TANKS 300,000 EACH"
L75	Underground Entrance Stealth Bomber
L76	Underground Entrance "ATTACK"
L77	Underground Entrance "BUNKER"
L80	Left Upkicker Stealth Bomber
L81	Left Upkicker "ATTACK"
L82	Left Upkicker "TRAIN"
L83	Center Upkicker Stealth Bomber
L84	Center Upkicker "ATTACK"
L85	Center Upkicker "HELIPORT"
L86	Center Upkicker "POWER PLANT"
L87	Left Billboard "SUPER JACKPOT"
*L90	Explosion 1
*L91	Explosion 2
*L92	Explosion 3
*L93	Explosion 4
*L94	Explosion 5
*L95	Explosion 6
*L96	Explosion 7
*L97	Explosion 8
*LA0	Explosion 9
*LA1	Explosion 10
*LA2	Explosion 11
*LA3	Explosion 12
*LA4	Explosion 13
*LA5	Explosion 14
*LA6	Explosion 15
*LA7	Explosion 16
*LB0	Explosion 17
*LB1	Explosion 18
LB2	Power Plant Spot Target #1
LB3	Power Plant Spot Target #2
LB4	Power Plant Spot Target #3
LB5	Power Plant Spot Target #4
LB6	Power Plant Spot Target #5
LB7	Power Plant Spot Target #6

NOTE:

* Lamps mounted on lightbox insert,
see page 66 for locations.

SOLENOID, DRIVER FUNCTIONS/LOCATIONS

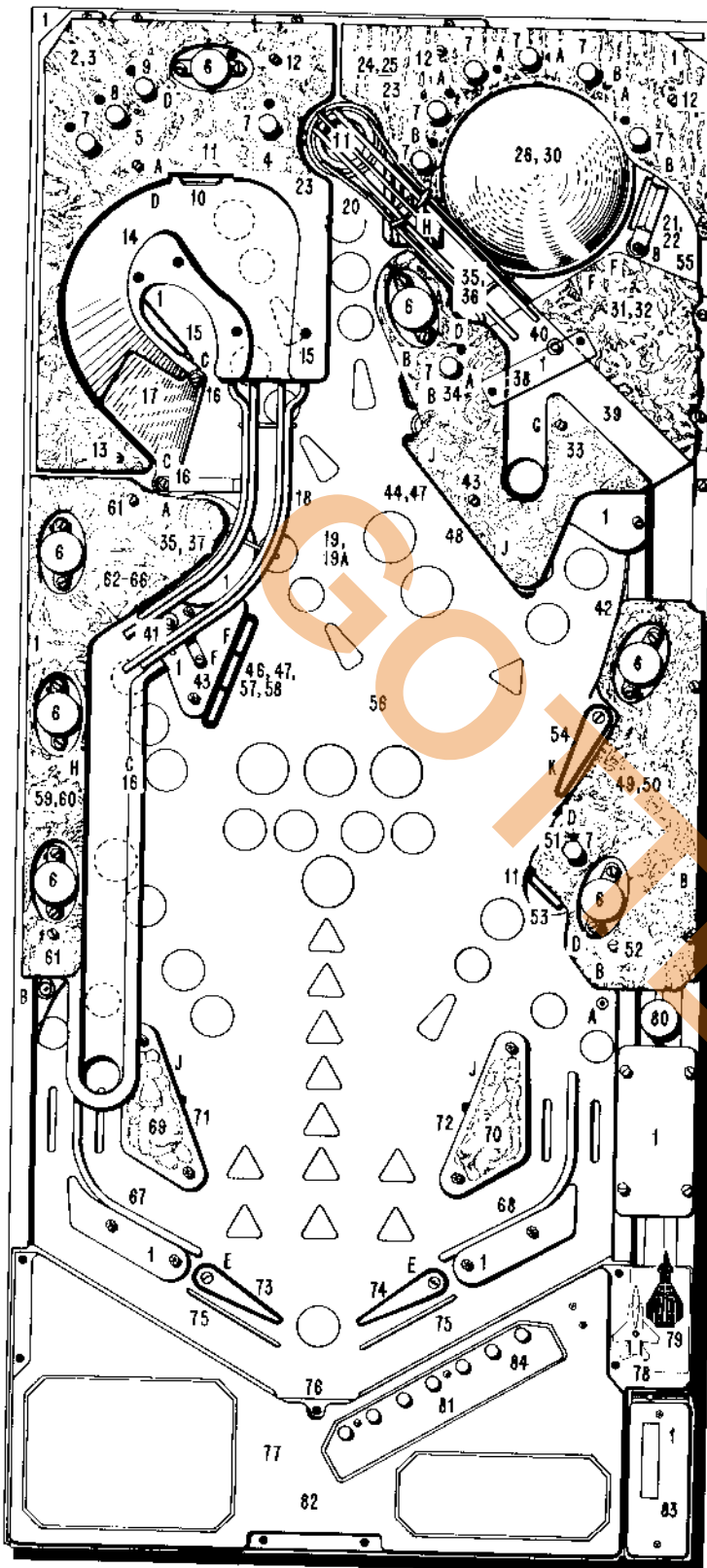
Sol.0	Left Pop Bumper	Sol.20	Top Right Mountain, #67
Sol.1	Right Pop Bumper	Sol.21	Bottom Right Mountain, #67
Sol.2	Left Kicking Rubber	Sol.22	Bottom Right Mountain, #67
Sol.3	Right Kicking Rubber	Sol.23	Vari-Target Reset
Sol.4	Hole	Sol.24	Spinning Disk Relay (B)
Sol.5	3 Bank Reset	Sol.25	Lightbox Insert Illum. Relay (A)
Sol.6	#1 Trip, #2 Trip, #3 Trip	Sol.26	Ticket/Coin Meter Enable
Sol.7	5 Bank Reset	Sol.27	Ball Release
Sol.8	Left Upkicker	Sol.28	Outhole
Sol.9	Center Upkicker	Sol.29	Knocker
Sol.10	Right Upkicker	Sol.30	Tilt Relay (T)
Sol.11	Left Plunger Gate	Sol.31	Game Over Relay
Sol.12	Right Plunger Gate	*Drv.0	Power Plant, #67 (2)
Sol.13	Bottom Right, #67	*Drv.1	Radar/Bunker, #67
Sol.14	Bottom Left, #67	*Drv.2	Heliport/Anti-Aircraft, #67 (2)
Sol.15	Top Left, #67	*Drv.3	Engines #1, #67 (2)
Sol.16	Top Left Mountain, #67	*Drv.4	Engines #2, #67 (2)
Sol.17	Bottom Left Mountain, #67	*Drv.5	Train, #67 (2)
Sol.18	Bottom Left Mountain, #67	Drv.6	Left Pop Bumper, #67
Sol.19	Bottom Left Mountain, #67	Drv.7	Right Pop Bumper, #67

VII. PARTS INFORMATION

PLAYBOARD PARTS INFORMATION

PARTS LIST

ITEM	DESCRIPTION	PART NO.
1	PLASTIC SHIELD SET	28682
2	UPPER LEFT RAMP ASSEMBLY	28674
3	MOLDED RAMP	28607
4	DECAL	28722
5	DECAL	28725
6	PLASTIC DOME, CLEAR (6)	25147P
7	BULB SHIELD, RED (10)	248750
8	BULB SHIELD, BLUE	24785W
9	BULB SHIELD, GREEN	24875S
10	SCOOP ASSEMBLY	28651
11	UPKICKER ASSEMBLY (3) (SEE EXPLODED VIEW ILLUSTRATION)	MA-1743
12	SPACER, 4-1/4" X 8-32 (3)	28745
13	SPACER, 3-5/8" X 8-32	28744
14	BALL SNUBBER	27256
15	OPTO SWITCH AND BRACKET ASSEMBLY (2)	MA-1667
16	HEX POST (3)	26531
17	RAMP FLAMP	28657
18	WIREFORM RAMP	28605
19	LOWER RAMP ASSEMBLY (UNDER PLAYBOARD)	28677
19A	MOLDED RAMP	28610
20	WIREFORM RAMP	28604
21	METAL SHIELD	17300
22	GATE WIREFORM	22112
23	SPACER, 1-7/16" X 6-32 AND 8-32 (3)	27981
24	UPPER RIGHT VACUUM FORM ASSEMBLY	28678
25	MOLDED VACUUM FORM	28622
26	VACUUM FORM DOME	28621
27	SPINNER AND MOTOR ASSEMBLY	26048
28	MOTOR, 51V AC	28629
29	SPINNER DISC AND HUB ASSEMBLY	26042
30	LEXAN MAT	28795
31	CENTER RIGHT RAMP ASSEMBLY	28675
32	MOLDED RAMP	28608
33	SPACER, 2-1/2" X 8-32	28526
34	DECAL	28722
35	POP BUMPER BRACKET ASSEMBLY, (2)	MA-1375
36	POP BUMPER BODY, YELLOW	10435T
37	POP BUMPER BODY, YELLOW	26860T
38	BALL HOLE KICKER ASSEMBLY (SEE EXPLODED VIEW ILLUSTRATION)	MA-1736
39	VARI-TARGET ASSEMBLY (SEE PICTORIAL ILLUSTRATION)	MA-1163
40	BALL STOP PLUNGER ASSEMBLY	MA-1723
41	BALL STOP PLUNGET ASSEMBLY	MA-1724
42	FLAT RAIL	28617
43	SPACER, 1-3/4" X 8-32 (2)	26942
44	5 POSITION TARGET BANK ASSEMBLY (SEE EXPLODED VIEW ILLUSTRATION)	MA-1735
45	DROP TARGET COIL	19300
46	DROP TARGET ARM, NYLON, YELLOW (8)	11905T
47	DROP TARGET DECAL (8)	28728
48	BALL SNUBBER	28656
49	LOWER RIGHT VACUUM FORM ASSEMBLY	28679
50	MOLDED VACUUM FORM	28624
51	DECAL	28723
52	SPACER, 2-5/16" X 8-32	28743
53	BALL SNUBBER	27256
54	FLIPPER ASSEMBLY FLIPPER COIL FLIPPER SWITCH ASSEMBLY (SEE EXPLODED VIEW ILLUSTRATION)	MA-1251D 28740 26438
55	FLAT RAIL	28615
56	MYLAR OVERLAY	28699
57	3 POSITION TARGET BANK ASSEMBLY (SEE EXPLODED VIEW ILLUSTRATION)	MA-1734
58	DROP TARGET TRIP COIL (3)	26452
59	LOWER LEFT RAMP ASSEMBLY	28676
60	MOLDED RAMP	28609
61	SPACER, 3-1/8" X 8-32 (3)	28115
62	SWINGING TARGET ASSEMBLY	24494
63	SWITCH ROD	27196
64	NYLON WASHER (2)	20407
65	MICROSWITCH, BRACKET AND ACTUATOR	27216
66	SPINNER SPACER (2)	27244
67	BALL GUIDE RAIL	27916
68	BALL GUIDE RAIL	27915
69	MOLDED COVER	28626
70	MOLDED COVER	28627
71	KICKER ASSEMBLY	MA-1373
72	KICKER ASSEMBLY	MA-1083
73	FLIPPER ASSEMBLY FLIPPER COIL FLIPPER SWITCH ASSEMBLY (SEE EXPLODED VIEW ILLUSTRATION)	MA-1250B 25959 26439
74	FLIPPER ASSEMBLY FLIPPER COIL FLIPPER SWITCH ASSEMBLY (SEE EXPLODED VIEW ILLUSTRATION)	MA-1251B 25959 26438
75	BALL SNUBBER (2)	13798
76	CARDHOLDER	28620-732
77	MOLDED CARDHOLDER COVER	28606
78	F-4 PHANTOM AIRPLANE	28747
79	STEALTH FIGHTER AIRPLANE	28748
80	STEEL BALL 1-1/16" DIAMETER (3)	28164
81	DECAL	28726
82	DECAL	28727
83	SHOOTER GAUGE AND PLASTIC	27992-732
84	LED BOARD ASSEMBLY	MA-1721



RUBBER RINGS

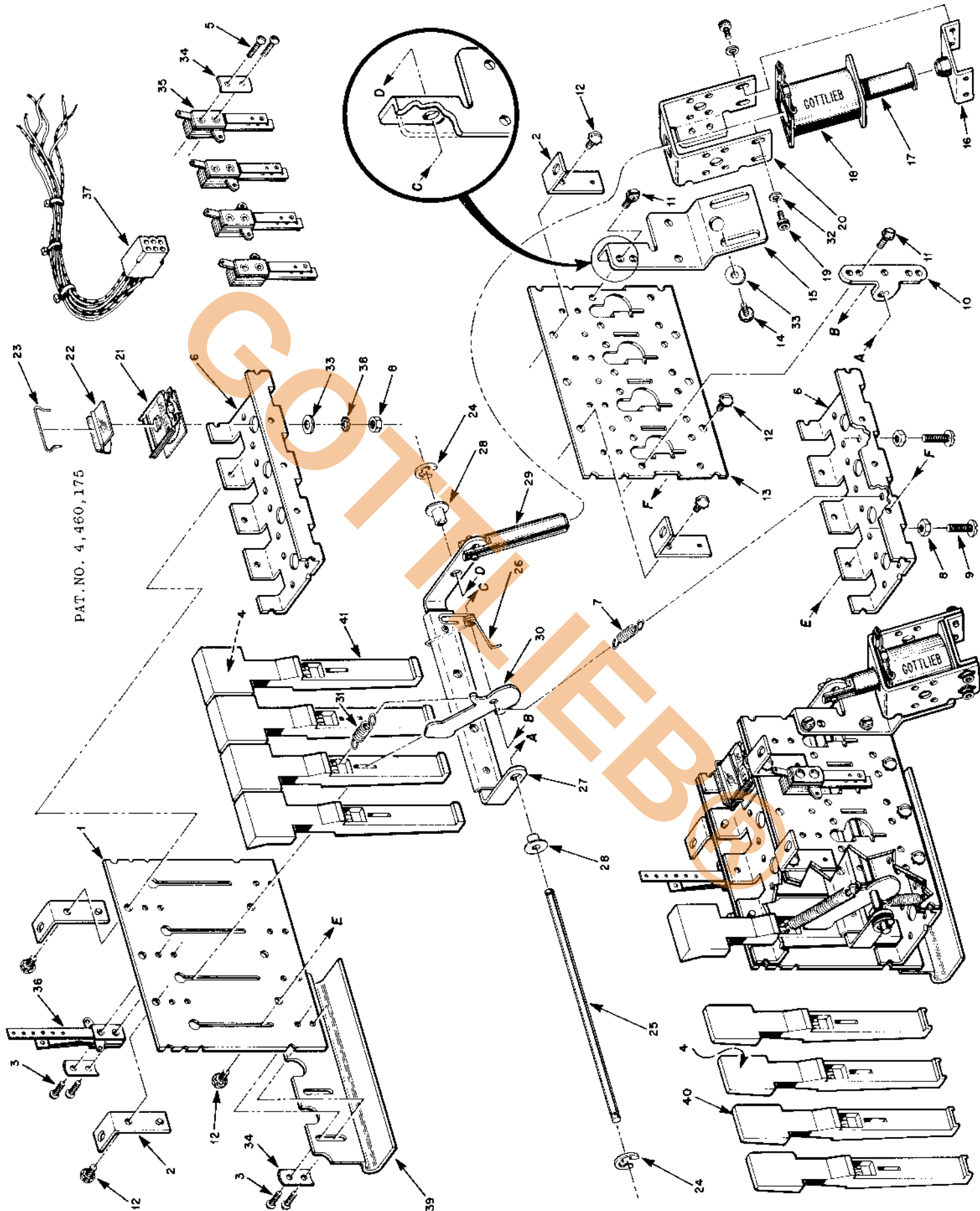
ITEM	DESCRIPTION	PART NO.
A	MINI-POST, LARGE (9)	15705
B	3/8" (8)	10217
C	BUMPER RUBBER, VEL (3)	26648
D	SIAMESE, 7/16" (5)	17493
E	FLIPPER, BLACK (3)	28546
F	1-1/2" (4)	10220
G	3"	10223
H	1" (2)	10219
J	2-1/2" (4)	10222

MISCELLANEOUS PARTS

DESCRIPTION	PART NO.
MINI-POST SCREW	14792
PLASTIC POST, 1", RED	11561U
PLASTIC POST, 1-3/16", RED	11562U
PLASTIC RIVET, BLACK	MP-10
SIAMESE POST, RED	174920
PLASTIC POST RED	20635U

VII. PARTS INFORMATION

DROP TARGET PARTS



VII. PARTS INFORMATION

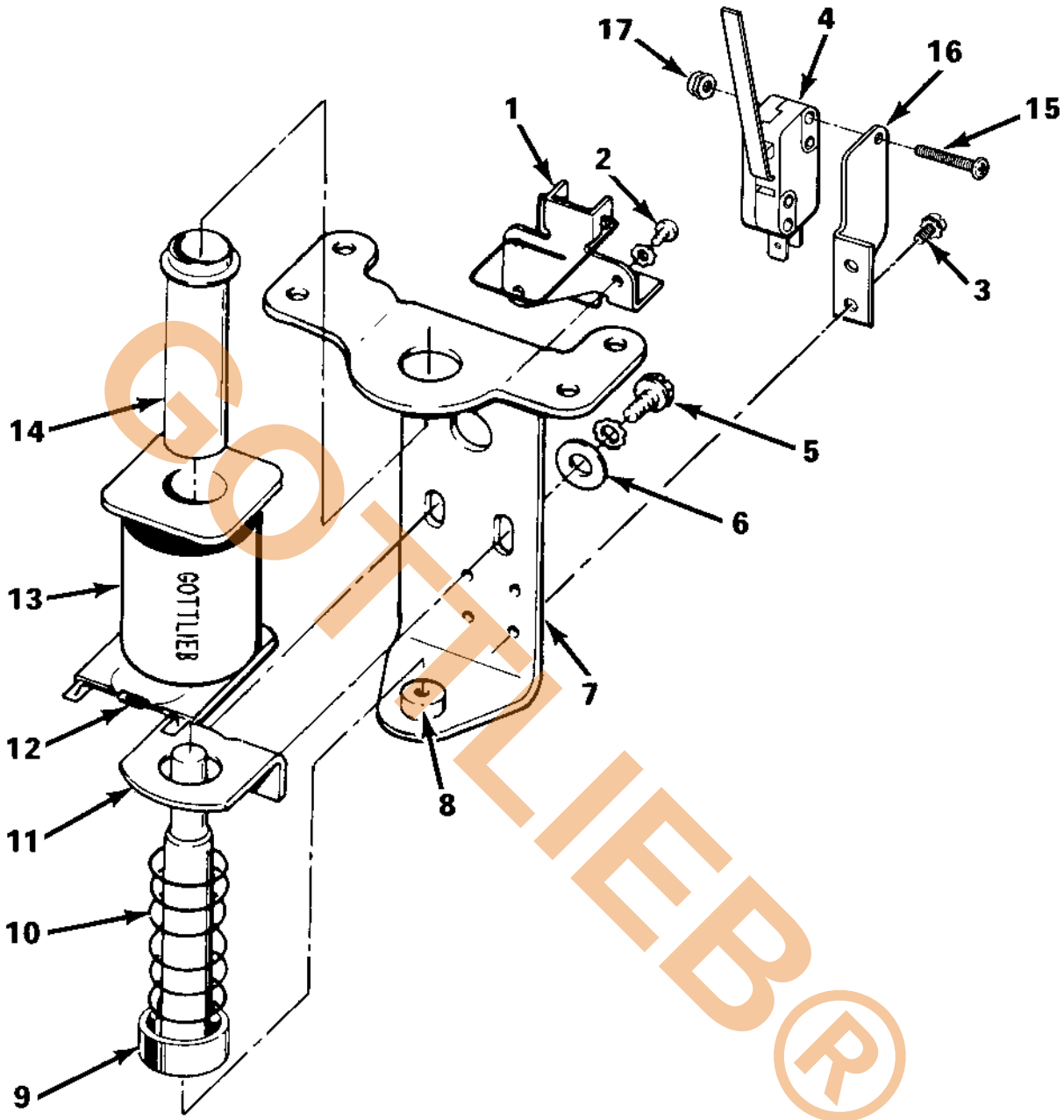
DROP TARGET PARTS

ITEM	DESCRIPTION	PART NO.
1	Switch Plate	Refer to Chart
2	Mounting Plate	12180
3	RHMS, #5-40 x 3/4	FA-3
4	Decals	Specify Game
5	RHMS, #5-40 x 5/8	FA-2
6	Guide Plate	Refer to Chart
7	Spring	517
8	Hex Nut, #8-32	FA-652
9	RHMS, #8-32 x 5/8	FA-75
10	Outboard Bearing Bracket	15696
11	HWSMS, #8-32 x 3/8	FA-69
12	RHMS, #8-32 x 1/4	FA-62
13	Pivot Plate	Refer to Chart
14	HWSMS, #8-32 x 5/16	FA-67
15	Coil Setup Bracket	15505 (Shown) 15504 (Opposite)
16	Coil Mount Bracket	17958
17	Plastic Slip in Core 2 1/2"	5172
18	Coil	Specify Game
19	Socket Head, #8-32 x 1/4	FA-65
20	Coil Housing	16194
21	Coil	19217
22	Armature	18643
23	Clip	18644
24	Retaining Ring	FA-681
25	Shaft	Refer to Chart
26	Reset Arm Return Spring	13455
27	Reset Arm	Refer to Chart
28	Reset Arm Bearing	15687
29	Drive Coil Plunger	262
30	Trigger	12181
31	Spring	18995
32	Internal Lockwasher, #8	FA-635
33	Washer, #8	FA-617
34	Switch Cover	465
35	Switch(s)	Specify Game
36	Switch(s), (10 Point)	18096
37	Cable Assembly	Specify Game
38	External Lockwasher, #8	FA-632
39	Stop Bracket	20937
40	Drop Target	Specify Game
41	Rollover Target	Specify Game

DROP TARGETS	ITEM 1	ITEM 6	ITEM 13	ITEM 25	ITEM 27
	SWITCH PLATE	GUIDE PLATE	PIVOT PLATE	SHAFT	RESET ARM
3	20936	20934	20935	20938	20941
4	13411	13413	13409	13402	15689
5	13412	13414	13410	13403	15691
5 (TRIP ARM)	13412	13414	13410	15878	15691
6	17938	17937	17939	17932	17936
7	14531	14532	14530	14527	15693
9	15621	15622	15620	15617	15619
9 (TRIP ARM)	15621	15622	15620	16406	15619
10	12187	12188	12186	12179	15503

VII. PARTS INFORMATION

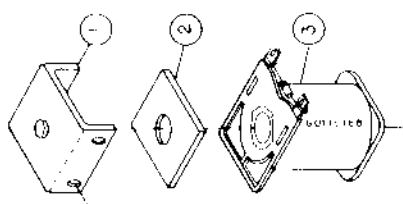
UPKICKER PARTS



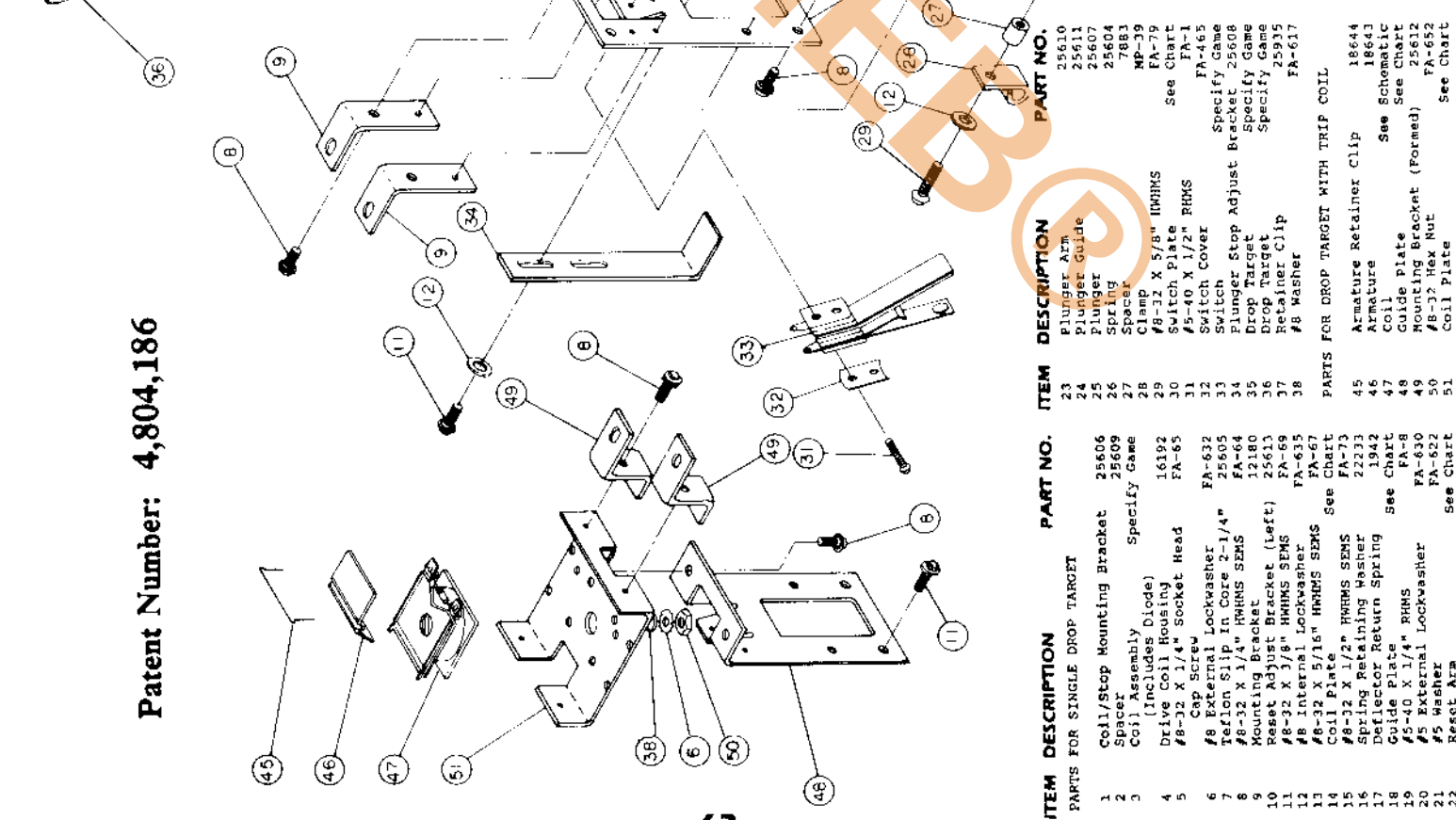
ITEM	DESCRIPTION	PART NO.
1	UPKICKER ASSEMBLY	MA-1743
2	WIREFORM AND BRACKET	21414
3	RHMS-SEMS 6-32 X 3/16" (3)	FA-30
4	RHMS 5-40 X 1/4" (2)	FA-8
5	MICROSWITCH WITH ACTUATOR	27667A
6	HWHMS-SEMS 8-32 X 5/16"(2)	FA-67
7	#8 WASHER (2)	FA-617
8	FRAME	21416
9	RUBBER GROMMET	5240
10	PLUNGER AND TIP ASSEMBLY	21412
11	SPRING	26739
12	COIL MOUNTING BRACKET	15409
13	DIODE, 1N4004	XO-254
14	COIL	(SEE SCHEMATIC)
15	SLIP-IN-CORE	21411
16	PAN HEAD 4-40 X 5/8"(2)	FA-107
17	MICROSWITCH MOUNTING BRACKET	27870
	ELASTIC STOP NUT, 4-40 (2)	FA-648

VII. PARTS INFORMATION DROP TARGET PARTS

Patent Number: 4,804,186

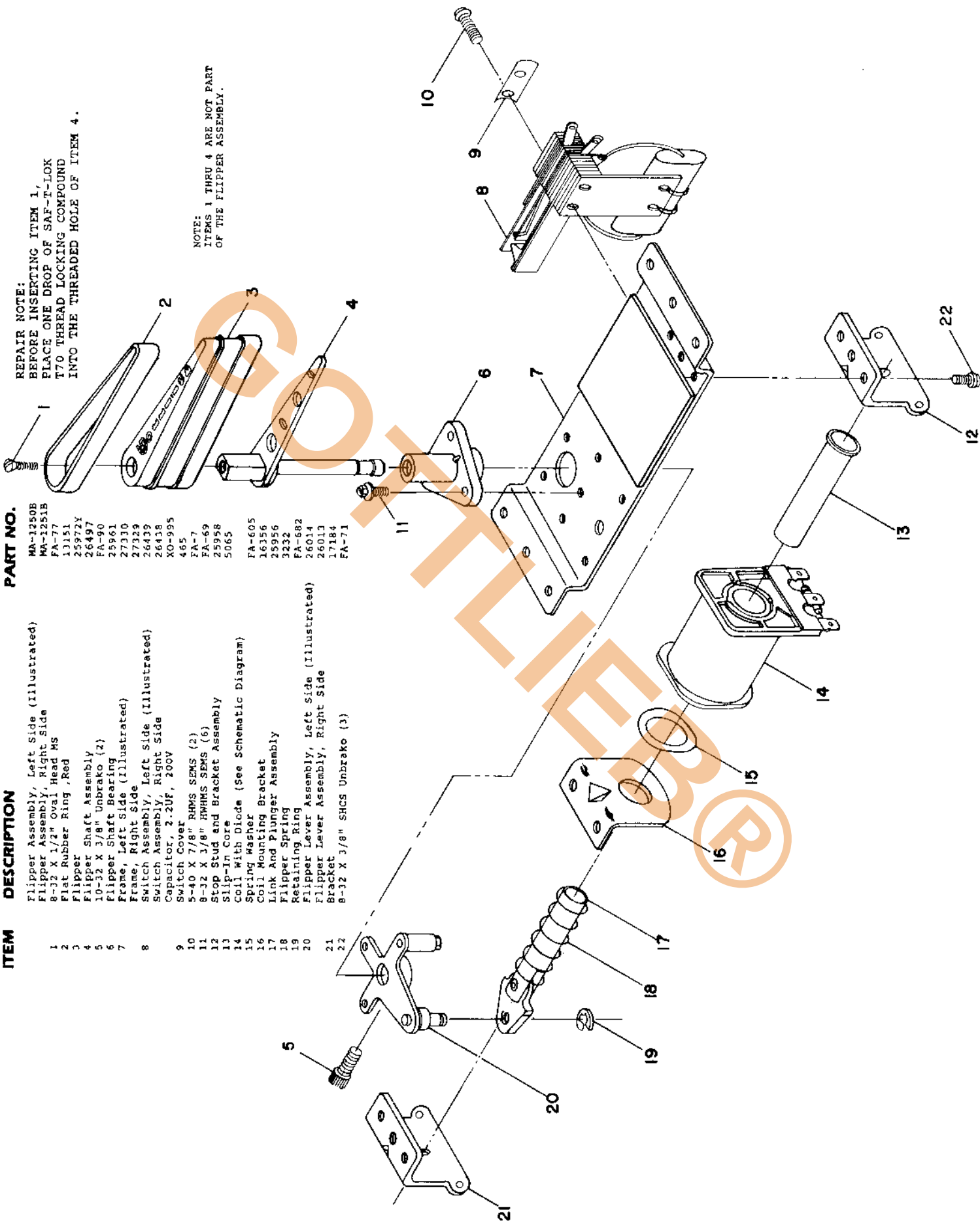


DROP TARGETS	WITHOUT TRIP COIL				WITH TRIP COIL			
	ITEM 14 COIL PLATE	ITEM 18 GUIDE PLATE	ITEM 22 RESET ARM	ITEM 30 SWITCH PLATE	ITEM 48 COIL PLATE	ITEM 51 GUIDE PLATE		
1 WITH TRIP COIL	25618-1	25621-1	25615-2	25617-1	25619-1	25623-1		
2 WITH TRIP COIL	25618-2	25621-2	25615-2	25617-2				
3 WITH TRIP COIL	25618-3	25621-3	25615-3	25617-3	25619-3	25623-3		
4 WITH TRIP COIL	25618-4	25621-4	25615-4	25617-4	25619-4	25623-4		
5 WITH TRIP COIL	25618-5	25621-5	25615-5	25617-5	25619-5	25623-5		
6 WITH TRIP COIL	25618-6	25621-6	25615-6	25617-6	25619-6	25623-6		
7 WITH TRIP COIL	25618-7	25621-7	25615-7	25617-7	25619-7	25623-7		
8 WITH TRIP COIL	25618-8	25621-8	25615-8	25617-8	25619-8	25623-8		



VII. PARTS INFORMATION

FLIPPER PARTS



REPAIR NOTE:
BEFORE INSERTING ITEM 1,
PLACE ONE DROP OF SAF-T-LOK
T70 THREAD LOCKING COMPOUND
INTO THE THREADED HOLE OF ITEM 4.

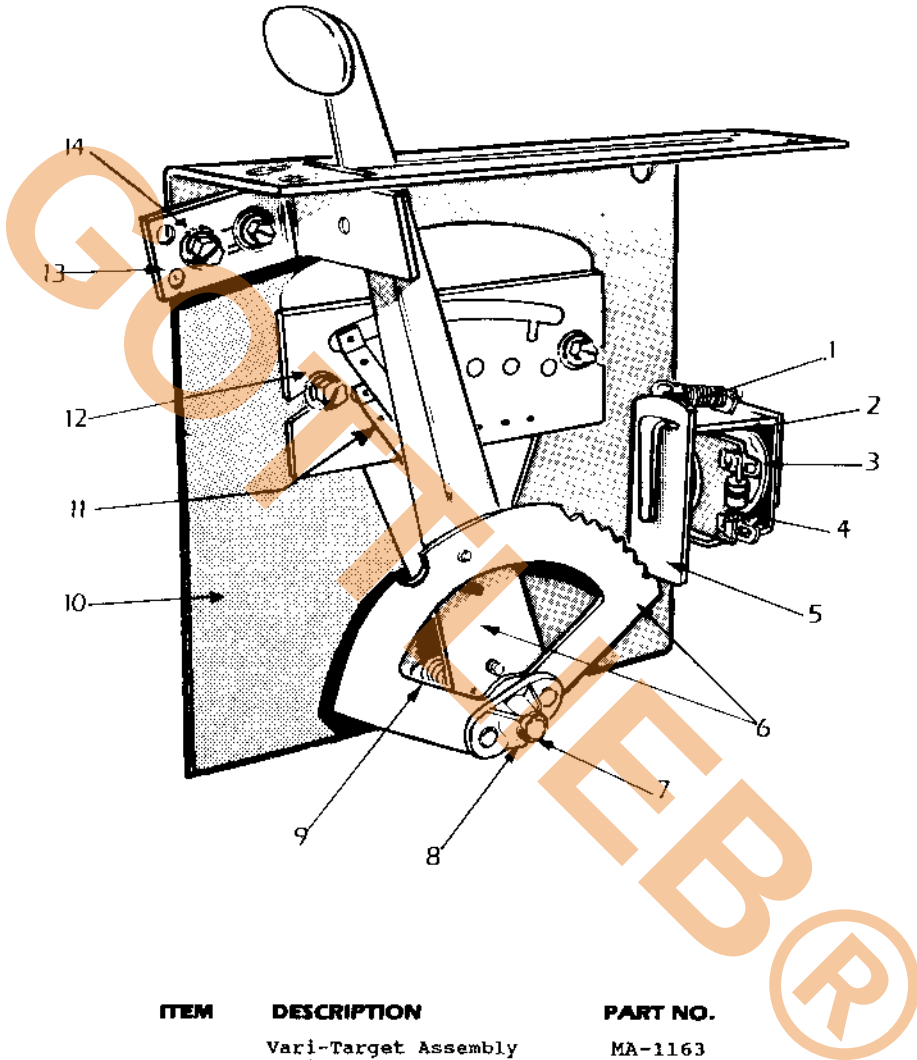
NOTE:
ITEMS 1 THRU 4 ARE NOT PART
OF THE FLIPPER ASSEMBLY.

ITEM	DESCRIPTION	PART NO.
1	Flipper Assembly, Left Side (Illustrated)	MA-1250B
2	Flipper Assembly, Right Side	MA-1251B
3	8-32 X 1 1/2" Oval Head MS	FA-77
4	Flat Rubber Ring, Red	13151
5	Flipper Shaft Assembly	25972Y
6	10-32 X 3/8" Unbrako (2)	26497
7	Flipper Shaft Bearing	FA-90
8	Frame, Left Side (Illustrated)	25961
9	Frame, Right Side	27310
10	Switch Assembly, Left Side (Illustrated)	27329
11	Switch Assembly, Right Side	26432
12	Capacitor, 2.2UF, 100V	26438
13	Switch Cover	XO-995
14	5-40 X 7/8" RHMS SEMS (2)	485
15	8-32 X 3/8" RHMS SEMS (6)	FA-7
16	Stop Stud and Bracket Assembly	FA-69
17	Slip-In Core	25958
18	Coil With Diode (See Schematic Diagram)	5065
19	Spring Washer	FA-605
20	Coil Mounting Bracket	16356
21	Link And Plunger Assembly	25956
22	Flipper Spring	3232
	Retaining Ring	FA-682
	Flipper Lever Assembly, Left Side (Illustrated)	26014
	Flipper Lever Assembly, Right Side	26013
	Bracket	17184
	8-32 X 3/8" SHCS Unbrako (3)	FA-71

VII. PARTS INFORMATION

VARI-TARGET PARTS

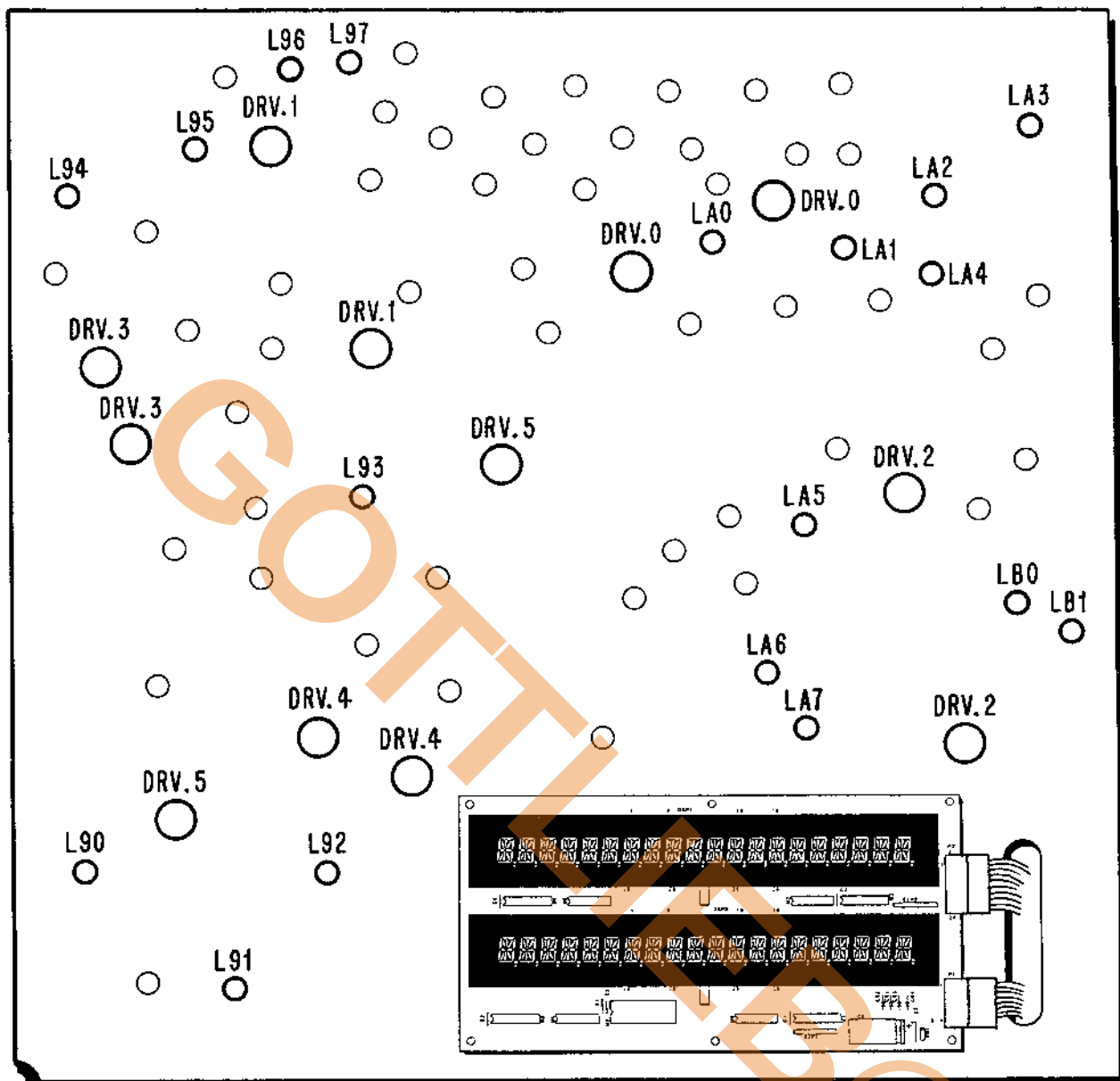
PAT. NO. 3.627.318



ITEM	DESCRIPTION	PART NO.
	Vari-Target Assembly	MA-1163
1	Spring	574
2	Housing	557
3	Bracket	12146
4	Coil	17564
5	Armature Assembly	18284
6	Target Arm and Cam	11535
7	Shoulder Screw	11527
8	Retaining Ring	FA-682
9	Spring	12144
10	Frame	11536
11	Switch	26136
12	Printed Circuit Board	26034-2
13	Flipper Stop Bracket	5024
14	6-32 x 3/8" HWHMS SEMS (7)	FA-28
	#6 Washer (7)	FA-615

XI. PARTS INFORMATION

LIGHTBOX INSERT LAMP IDENTIFICATION



LAMP NUMBER LAMP ASSIGNMENT

L90	EXPLOSION 1
L91	EXPLOSION 2
L92	EXPLOSION 3
L93	EXPLOSION 4
L94	EXPLOSION 5
L95	EXPLOSION 6
L96	EXPLOSION 7
L97	EXPLOSION 8
LA0	EXPLOSION 9
LA1	EXPLOSION 10
LA2	EXPLOSION 11
LA3	EXPLOSION 12
LA4	EXPLOSION 13
LA5	EXPLOSION 14
LA6	EXPLOSION 15
LA7	EXPLOSION 16
LB0	EXPLOSION 17
LB1	EXPLOSION 18

DRIVER FUNCTIONS

- *DRV.0 POWER PLANT, #67 (2)
- *DRV.1 RADAR BUNKER, #67 (2)
- *DRV.2 HELIPORT/ANTI-AIRCRAFT, #67 (2)
- *DRV.3 ENGINES #1, #67 (2)
- *DRV.4 ENGINES #2, #67 (2)
- *DRV.5 TRAIN, #67 (2)

NOTE:

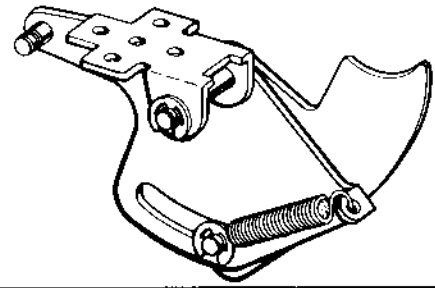
1. *LAMPS ENABLED BY DRIVERS ON AUXILIARY DRIVER BOARD.
2. LAMPS NOT DESIGNATED ARE GENERAL ILLUMINATION, TYPE#44.

VII. PARTS INFORMATION

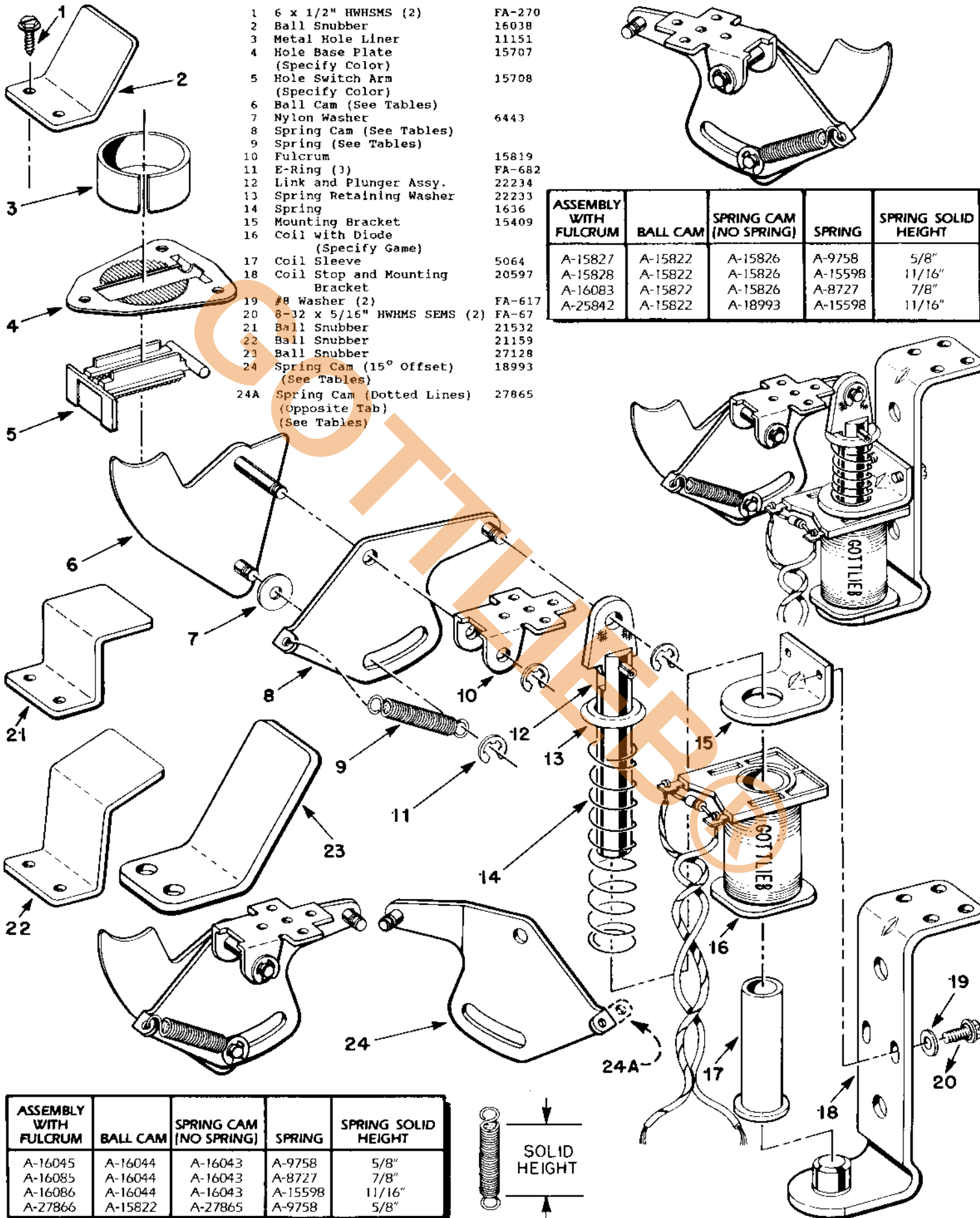
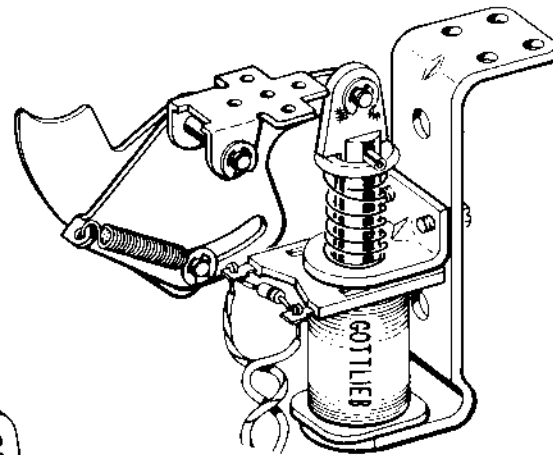
BALL HOLE KICKER PARTS

ITEM DESCRIPTION PART NO.

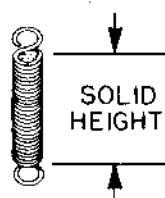
- | | | |
|-----|----------------------------|--------|
| 1 | 6 x 1/2" HWMS (2) | FA-270 |
| 2 | Ball Snubber | 16038 |
| 3 | Metal Hole Liner | 11151 |
| 4 | Hole Base Plate | 15707 |
| 5 | Hole Switch Arm | 15708 |
| 6 | Ball Cam (See Tables) | |
| 7 | Nylon Washer | 6443 |
| 8 | Spring Cam (See Tables) | |
| 9 | Spring (See Tables) | |
| 10 | Fulcrum | 15819 |
| 11 | E-Ring (3) | FA-682 |
| 12 | Link and Plunger Assy. | 22234 |
| 13 | Spring Retaining Washer | 22233 |
| 14 | Spring | 1636 |
| 15 | Mounting Bracket | 15409 |
| 16 | Coil with Diode | |
| | (Specify Game) | |
| 17 | Coil Sleeve | 5064 |
| 18 | Coil Stop and Mounting | 20597 |
| | Bracket | |
| 19 | #8 Washer (2) | FA-617 |
| 20 | 8-32 x 5/16" HWMS SEMS (2) | FA-67 |
| 21 | Ball Snubber | 21532 |
| 22 | Ball Snubber | 21159 |
| 23 | Ball Snubber | 27128 |
| 24 | Spring Cam (15° Offset) | 18993 |
| | (See Tables) | |
| 24A | Spring Cam (Dotted Lines) | 27865 |
| | (Opposite Tab) | |
| | (See Tables) | |



ASSEMBLY WITH FULCRUM	BALL CAM	SPRING CAM (NO SPRING)	SPRING	SPRING SOLID HEIGHT
A-15827	A-15822	A-15826	A-9758	5/8"
A-15828	A-15822	A-15826	A-15598	11/16"
A-16083	A-15822	A-15826	A-8727	7/8"
A-25842	A-15822	A-18993	A-15598	11/16"



ASSEMBLY WITH FULCRUM	BALL CAM	SPRING CAM (NO SPRING)	SPRING	SPRING SOLID HEIGHT
A-16045	A-16044	A-16043	A-9758	5/8"
A-16085	A-16044	A-16043	A-8727	7/8"
A-16086	A-16044	A-16043	A-15598	11/16"
A-27866	A-15822	A-27865	A-9758	5/8"



XI. PARTS INFORMATION

UNIQUE PARTS

The following listings denotes new parts and assemblies unique to Operation Thunder, Game #732. Part Numbers prefixed with an asterisk (*) will be illustrated or can be located on pages 32 and 56 thru 67. Numbers in parenthesis () indicates multiple quantities.

PLAYBOARD

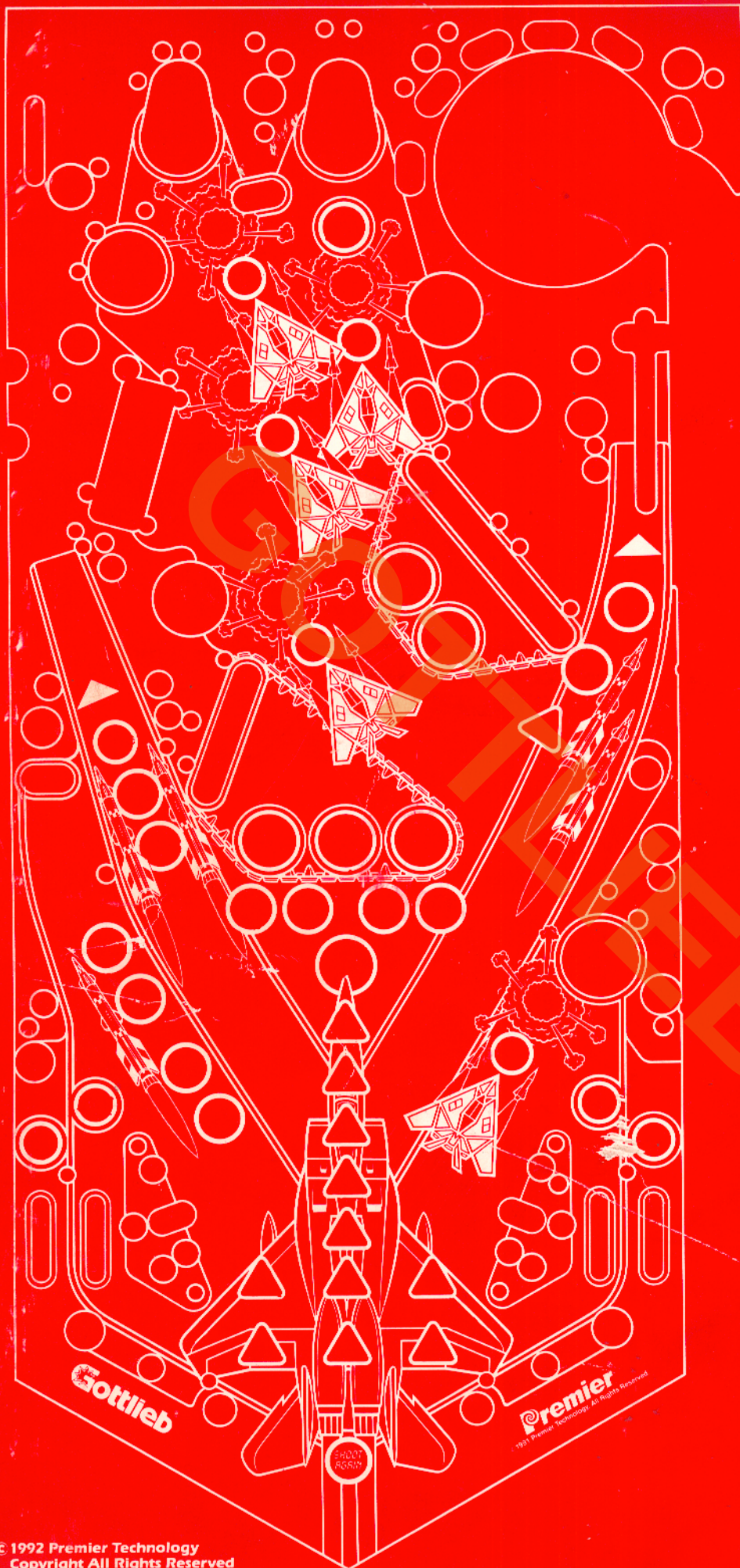
ITEM/DESCRIPTION	PART NO.
VARI-TARGET DISC PRINTED CIRCUIT.....	*26034-2
SPINNER DISC AND HUB ASSEMBLY.....	*26042
LEXAN MAT.....	*28795
SPINNER AND MOTOR ASSEMBLY.....	*26048
SHOOTER GAUGE AND PLASTIC.....	*27992-732
ROLLOVER SWITCH(6).....	*28265
WIREFORM RAMP.....	*28604
WIREFORM RAMP.....	*28605
MOLDED CARDHOLDER COVER.....	*28606
MOLDED RAMP.....	*28607
MOLDED RAMP.....	*28608
MOLDED RAMP.....	*28609
FLAT RAIL.....	*28615
FLAT RAIL.....	*28617
CARDHOLDER.....	*28620-732
VACUUM FORM DOME.....	*28621
MOLDED VACUUM FORM.....	*28622
MOLDED VACUUM FORM.....	*28624
MOLDED COVER.....	*28626
MOLDED COVER.....	*28627
MOTOR, 51V AC.....	*28629
SCOOP ASSEMBLY.....	*28651
BALL SNUBBER.....	*28656
RAMP FLAP.....	*28657
SPOT TARGET, RED.....	*28671U
SPOT TARGET, RED.....	*28672U
SPOT TARGET, YELLOW.....	*28672T
UPPER LEFT RAMP ASSEMBLY.....	*28674
CENTER RIGHT RAMP ASSEMBLY.....	*28675
LOWER LEFT RAMP ASSEMBLY.....	*28676
LOWER RAMP ASSEMBLY (UNDER PLAYBOARD).....	*28677
UPPER RIGHT VACUUM FORM ASSEMBLY.....	*28678
LOWER RIGHT VACUUM FORM ASSEMBLY.....	*28679
PLASTIC SHIELD SET.....	*28682
MYLAR OVERLAY.....	*28699
DECAL (2).....	*28722
DECAL.....	*28723
DECAL.....	*28725
DECAL.....	*28726
DECAL.....	*28727
DROP TARGET DECAL (8).....	*28728
SPOT TARGET, PURPLE.....	*28730R
SPOT TARGET, YELLOW.....	*28730T
SPOT TARGET, RED (4).....	*28731U
FLIPPER COIL.....	*28740
SPACER, 2-5/16" X 8-32.....	*28743
SPACER, 3-5/8" X 8-32.....	*28744
SPACER, 4-1/4" X 8-32 (3).....	*28745
F-4 PHANTOM AIRPLANE.....	*28747
STEALTH FIGHTER AIRPLANE.....	*28748
LED BOARD ASSEMBLY, A22.....	*MA-1721
BALL STOP PLUNGER ASSEMBLY.....	*MA-1723
BALL STOP PLUNGER ASSEMBLY.....	*MA-1724
3 POSITION TARGET BANK ASSEMBLY.....	*MA-1734
5 POSITION TARGET BANK ASSEMBLY.....	*MA-1735
BALL HOLE KICKER ASSEMBLY.....	*MA-1736
UPKICKER ASSEMBLY (3).....	*MA-1743

CABINET

CABINET (SCREENED).....	*28697-732
LEFT FLIPPER SWITCH.....	*28691
RIGHT FLIPPER SWITCH.....	*28693
RIGHT MOULDING, CHROME.....	28700
LEFT MOULDING, CHROME.....	28701

LIGHTBOX

LIGHTBOX (SCREENED).....	27514-732
STYRENE (BACKGLASS ART).....	28665-732
AUXILIARY DRIVER BOARD, A11.....	MA-1722



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