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THE PREMIER NAME IN PINBALL

Cactus JACK'S™



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Technology

INSTRUCTION MANUAL

CactusJACK'S™

(GAME #729)

(2 BALL GAME)

INSTRUCTION MANUAL

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GAME PROM:	SOUND PROMS:	
(TYPE 27C512)	(TYPE 27C256)	(TYPE 27C010)
729/GPROM	729/DROM1	729/AROM 1
	729/YROM1	729/AROM 2

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.

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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.

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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 electroncis 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 grill 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 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.

   Reverse the aforementioned procedure as the first step to re-assemble the lightbox.

   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 grill towards the back-glass 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 moulding from the play-field.

8. Slide the cabinet glass toward you and remove it.

9. Raise the playboard, slide it for-ward and rest it on its support.

10. Unravel and straighten out the power line cord located at the rear of the pinball 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. Lower the playfield into the cabinet. Using the leg adjusters, level the playfield and set the pitch. Recommended pitch is 6°.

9. 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.

10. Reinstall the cabinet glass, front moulding and the lightbox assembly.

11. Plug the line-cord into a properly grounded 3-wire receptacle ONLY!

12. Refer to Section III to make all necessary game adjustments.

13. CAUTION! If this game has been subjected to extreme cold, allow to warm up to room temperature.

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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 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 outlet 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.

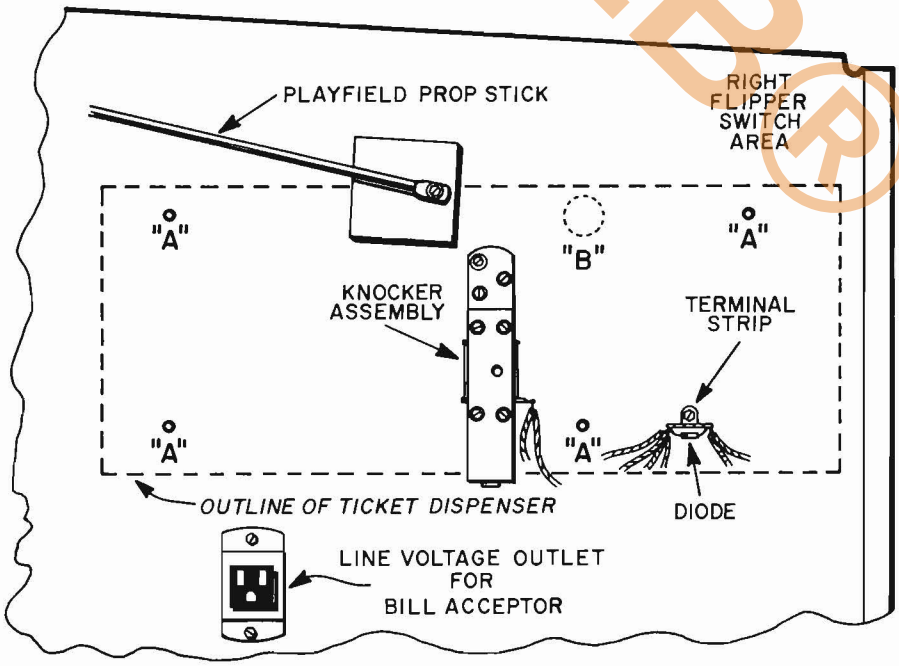


FIGURE 1.

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II. GAME PLAY AND SCORING



HOW TO PLAY

KICKING RUBBERS

- SCORE 30.
- TOGGLE OUTLANE SPECIAL IF SPECIAL IS LIT.

POP BUMPERS

- SCORE 3000 WHEN LIT.
- SCORE 100,000 WHEN FLASHING.
- TOGGLE OUTLANE SPECIAL IF SPECIAL IS LIT.

BANJO BONUS ROLLOVER

- SCORE 500.
- COLLECT BANJO BONUS WHEN FLASHING.

OUTLANES

- SCORE 50,000.
- AWARD SPECIAL WHEN LIT.

LEFT RETURN ROLLOVER

- SCORE 5000.
- LIGHT QUICK SHOT UNLESS IN A ROUND OR IN MULTIBALL.
- AWARD EXTRA BALL WHEN LIT.

RIGHT RETURN ROLLOVER

- SCORE 5000.
- LIGHT "THORNY SURPRISE" UNLESS IN A ROUND OR IN MULTIBALL.
- AWARD EXTRA BALL WHEN LIT.

SUBWAY

- SCORE 20,000.

BANJO BONUS SPOT TARGETS

- SCORE 3,000.
- THROW FRUIT IN MULTIBALL.
- COMPLETING 3 FLASHING TARGETS STARTS BANJO BONUS ROUND.

DROP TARGETS

- SCORE 300.
- COMPLETING ALL 4 TARGETS IN EITHER BANK RESETS THAT BANK.
- COMPLETION OF ALL FLASHING TARGETS ADVANCES TO NEXT FRUIT OR SCORES 500,000.

LOWER UPKICKER

- SCORE 20,000.
- AWARD THORNY SURPRISE WHEN FLASHING.

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II. GAME PLAY AND SCORING



TOP UPKICKER

- SCORE 20,000.
- LOCK BALL WHEN FLASHING.

TOP RIGHT SPOT TARGET

- SCORE 50,000.
- FLASH LOCK LIGHT WHEN LIT.
- THROW FRUIT IN MULTIBALL.

LEFT RAMP

- SCORE 3,000 UNLIT.
- SCORE LIT OR FLASHING VALUE AND ADVANCE SCORE VALUE.
- THROW FRUIT IN MULTIBALL.
- AWARD JACK'S POT VALUE WHEN IN JACK'S POT ROUND.

RIGHT RAMP

- SCORE 5,000 WHEN NOT IN MULTIBALL.
- ADVANCE E-X-T-R-A--B-A-L-L FEATURE WHEN LIT.
- AWARD QUICK SHOT VALUE WHEN FLASHING AND ADVANCE AWARD.
- THROW FRUIT IN MULTIBALL.

TOP ROLLOVERS

- SCORE 3,000 IF BALL DID NOT COME FROM RIGHT RAMP (UPPER LEVEL).
- SCORE 20,000 IF BALL CAME FROM RIGHT RAMP.
- 3rd ROLLOVER ONLY - AWARD SPECIAL WHEN ARROWS ARE STROBING.
- 2nd ROLLOVER ONLY - SCORE ADDITIONAL 200,000 IF BALL CAME FROM RIGHT RAMP (UPPER LEVEL).
- COMPLETING ALL ROLLOVERS ADVANCES MULTIPLIER AND MAY LIGHT RETURN LANE EXTRA BALL OR OUTLANE SPECIAL (SEE ADJUSTMENTS).

LEFT OR RIGHT FLIPPER

- CHANGE LIT LANE ON TOP ROLLOVERS.
- CHANGE LIT RETURN LANE FOR EXTRA BALL.

OUTHOLE

- SCORE FRUIT VALUE TIMES MULTIPLIER.

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SERVICE NOTES

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ADDITIONAL FEATURES

THORNY SURPRISE

- AWARD A MYSTERY AWARD.

CATCH-UP FEATURE (IN THORNY SURPRISE)

- PLAYER IMMEDIATELY IS GIVEN SAME SCORE AS NEXT HIGHER SCORE IF HE DOES NOT ALREADY HAVE THE HIGHEST SCORE.

MULTIBALL

- FOR EVERY "THROW" TARGET OR "THROW" SWITCH HIT, SCORE FRUIT VALUE.

FRUIT VALUES:

- EGG = 100,000.
- BANANA = 200,000.
- TOMATO = 300,000.
- PUMPKIN = 400,000.
- WATERMELON = 500,000.

E-X-T-R-A--B-A-L-L FEATURE

- GOING UP AND THROUGH RIGHT RAMP WHEN LIT ADDS A LETTER TO E-X-T-R-A--B-A-L-L. COMPLETING ALL LETTERS AWARDS EXTRA BALL.

QUICK SHOT

- GOING UP AND THROUGH RIGHT RAMP WHEN FLASHING AWARDS QUICK SHOT VALUE. PLAYER CAN SCORE 100,000, 200,000, 500,000 OR START POP BUMPER ROUND.

LEFT RAMP PUMP SHOT

- CONSECUTIVE SHOTS UP AND THROUGH THE LEFT RAMP INCREASE SCORING AWARDS (SEE ADJUSTMENTS).

BANJO BONUS

- COMPLETING 3 BANJO SPOT TARGETS STARTS BANJO ROUND. SHOOT THE LEFT TOP LANE OR THE 3rd TOP ROLLOVER TO COLLECT DISPLAYED SCORE OR SPECIAL.

POP BUMPER ROUND

- WHEN IN THIS ROUND (POP BUMPERS ARE FLASHING), EACH POP BUMPER HIT AWARDS 100,000. THIS ROUND IS A TIMED ROUND.

JACK'S POT ROUND

- WHEN IN THIS ROUND, YOU HAVE ONLY A CERTAIN TIME LIMIT TO SHOOT THE LEFT RAMP TO COLLECT JACK'S POT.

JACK'S POT

- AWARD 3,000,000 WHEN COLLECTED. COLLECT BY GOING UP AND THROUGH LEFT RAMP WHEN FLASHING.

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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. Depressing the appropriate button will select that 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 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 black cabinet button will decrement the active lamp number by one while the right black cabinet 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 display. 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 black cabinet button will decrement the driver number shown in the display while the right black cabinet button will increment the driver number. 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.

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 number(s) 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. Depressing the right black cabinet 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. LED DISPLAY TEST (NOT USED)

This test will allow the operator to check the operation of the individual digits of the LED Display Board.

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Depressing the right white cabinet button will advance to the next step of the test. The digits 0-9 will appear in numerical order starting from the leftmost digit (DIG1) to the rightmost digit (DIG12). Only one digit should light at a time during each step of this test.

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 black cabinet button is depressed, a tone should be heard from the Sound Board. During each tone, the sound line connection which is being tested will be displayed. After the tone stops the sound line which is being tested will still be kept at a low level (<.8v) until the right black cabinet button is depressed 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 three left steps (coin chute counts) will not be displayed unless the credit button is pressed during that active step number.

The left black cabinet button will allow the operator to reset all of the left (long term) and right (short term) bookkeeping values. The right black cabinet button will allow the operator to reset all of the short term (right) bookkeeping only. If the R.BOOK AUTO-RESET adjustment is ON, the 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 from time to time.

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 bookkeeping and adjust each value separately. 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 black cabinet button he may choose the appropriate language and then depress the Credit button 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

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button to proceed immediately to game adjustment step 1.

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.

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 black cabinet button to decrement the score and the right black cabinet 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 black cabinet button to decrement the score and the right black cabinet 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) LEFT CHUTE SETTING
10) RIGHT CHUTE SETTING
11) CENTER CHUTE SETTING
These three steps will set the coinage required to receive credits on the machine. The left black cabinet button is used to decrement the credits to be issued for the active coin while the right black cabinet button is used to increment the credits to be issued. The Credit button is used to change the active coin. The operator may enter up to a four coin sequence.
NOTE: If a coin sequence of less than four coins is used, enter 0 credits in each of the remaining coin positions.

Example 1
The following would be the setting for a 25 cent chute set to 50 cents for 1 play, 75 cents for 2 plays, and $1.00 for 3 plays.

COIN 1 = 0 CREDITS
COIN 2 = 1 CREDITS
COIN 3 = 1 CREDITS
COIN 4 = 1 CREDITS

Example 2
The following would be the setting for a 25 cent chute set to 50 cents per play.

COIN 1 = 0 CREDITS
COIN 2 = 1 CREDITS
COIN 3 = 0 CREDITS
COIN 4 = 0 CREDITS

12) GAME PERCENT PAYOUT
This step is used to set the game payout percentage used when the Auto-Percentaging adjustment is on. When the GAME MODE is set to Replay, Replay + Tickets, or Tickets, this setting refers to replay percentage. When the GAME MODE is set to Add a Ball this setting refers to extra ball percentage.

13) 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.

14) HIGH GAME REPLAYS
This step is used to set the

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number of replays to award when the highest game to date has been beaten.

15) MAXIMUM CREDITS
This step sets the maximum number of credits allowed on the game.

16) TILT WARNINGS
This step sets the number of tilts allowed before the ball in play is terminated.

17) BALLS PER GAME
This step sets the game to 3-ball play or 5-ball play.

18) 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 Specials and Score Level Replays award an extra ball in place of a replay. In Novelty mode all Specials award 1,000,000 points and the Score Replay Levels are disabled. Also, in both the Add a Ball and Novelty modes the Match is disabled.
NOTE: If either the Replay + Tickets or Tickets Only setting is selected do not set the COIN METER setting to on.

19) 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.
(see Installation section)

20) LANGUAGE
This step allows the Test Mode Steps to be displayed in English, German, or French.

21) LEFT AND RIGHT CHUTES
This step allows the left and right coin chutes to be set as separate or the same. If the chutes are set to be the same, all the coins passing through either chute are totaled and the sum is used toward a credit based on the Left Chute Setting (step 9). Also, the sum will be displayed in the Left Chute Coins bookkeeping step and the Right Chute Coins step will not be used.

22) LEFT AND RIGHT CHUTE BONUS
If this step is set to on, the player is allowed to add one coin for one credit if there are any credits remaining on the game, or during any game. If there are no credits left on the game at the time that the game ends the player is also allowed this option for a time period.

23) COIN METER
If this step is set to on, an electromechanical coin meter will be incremented for each accepted coin. (see Installation section)
NOTE: If this setting is on, do not use the Replay + Tickets or Tickets Only GAME MODE settings.

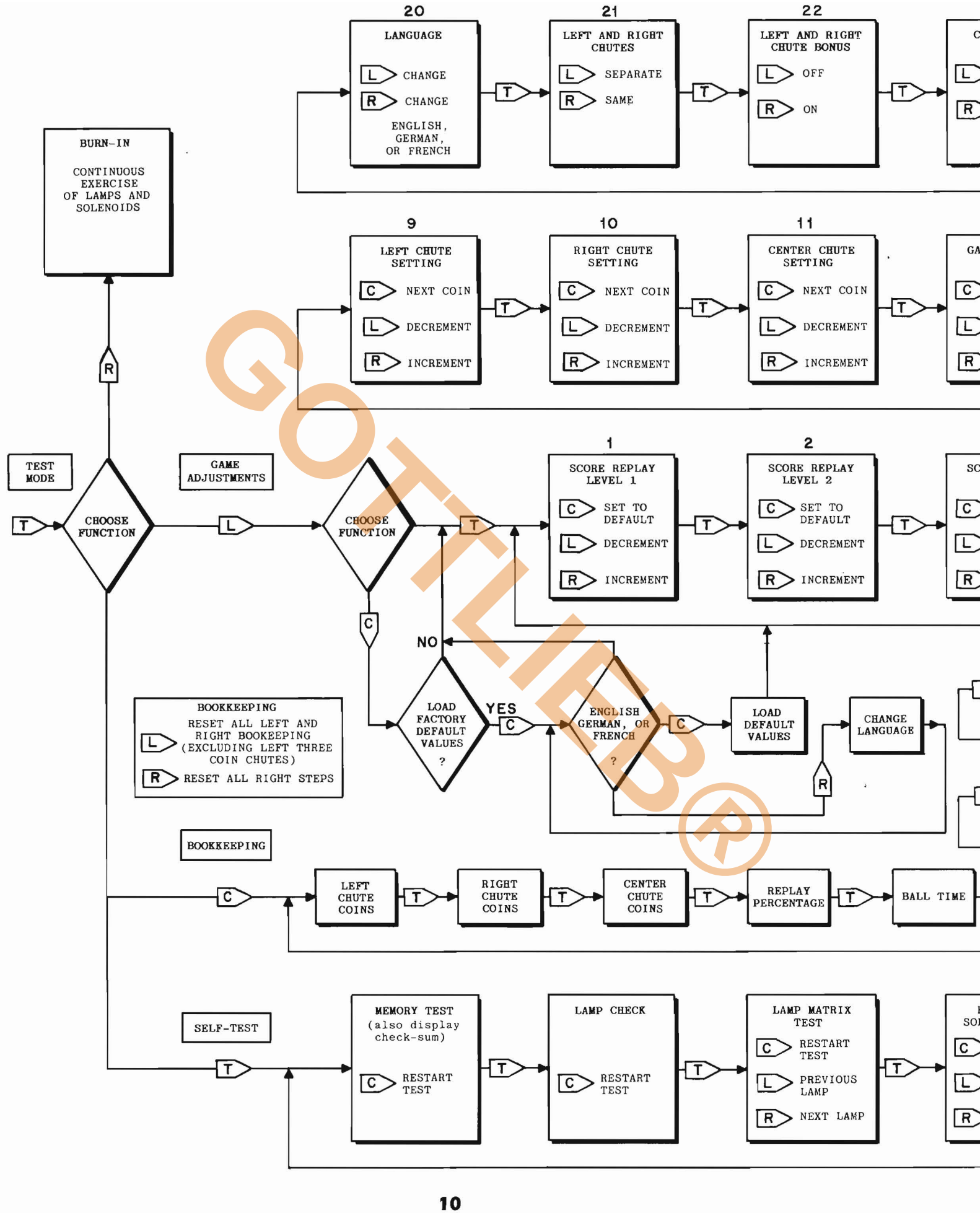
24) AUTO-PERCENTAGING
If this step is set to on, the Score Replay Levels will be adjusted periodically by 100,000 points so that the Game Percent Payout setting will match the actual Replay Percentage displayed in bookkeeping.
NOTE: If the GAME MODE is set to Add a Ball, the Extra Ball Percentage in bookkeeping is used in place of the Replay Percentage.

25) REPLAY LIMIT
This step may be set to no limit or one per player per game.

26) 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.

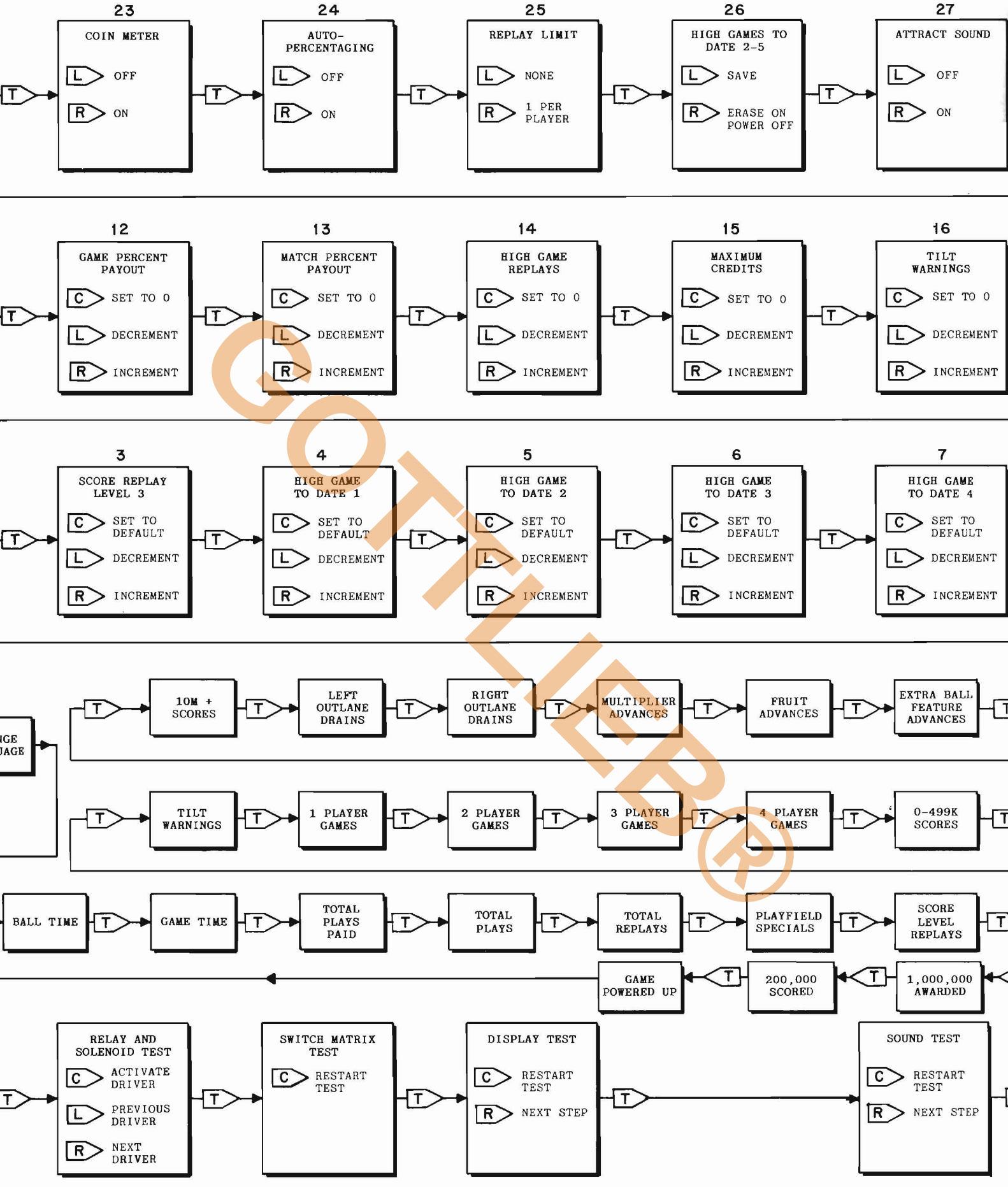
27) ATTRACT SOUND
This step determines whether or not sounds are enabled during the attract mode (game over).

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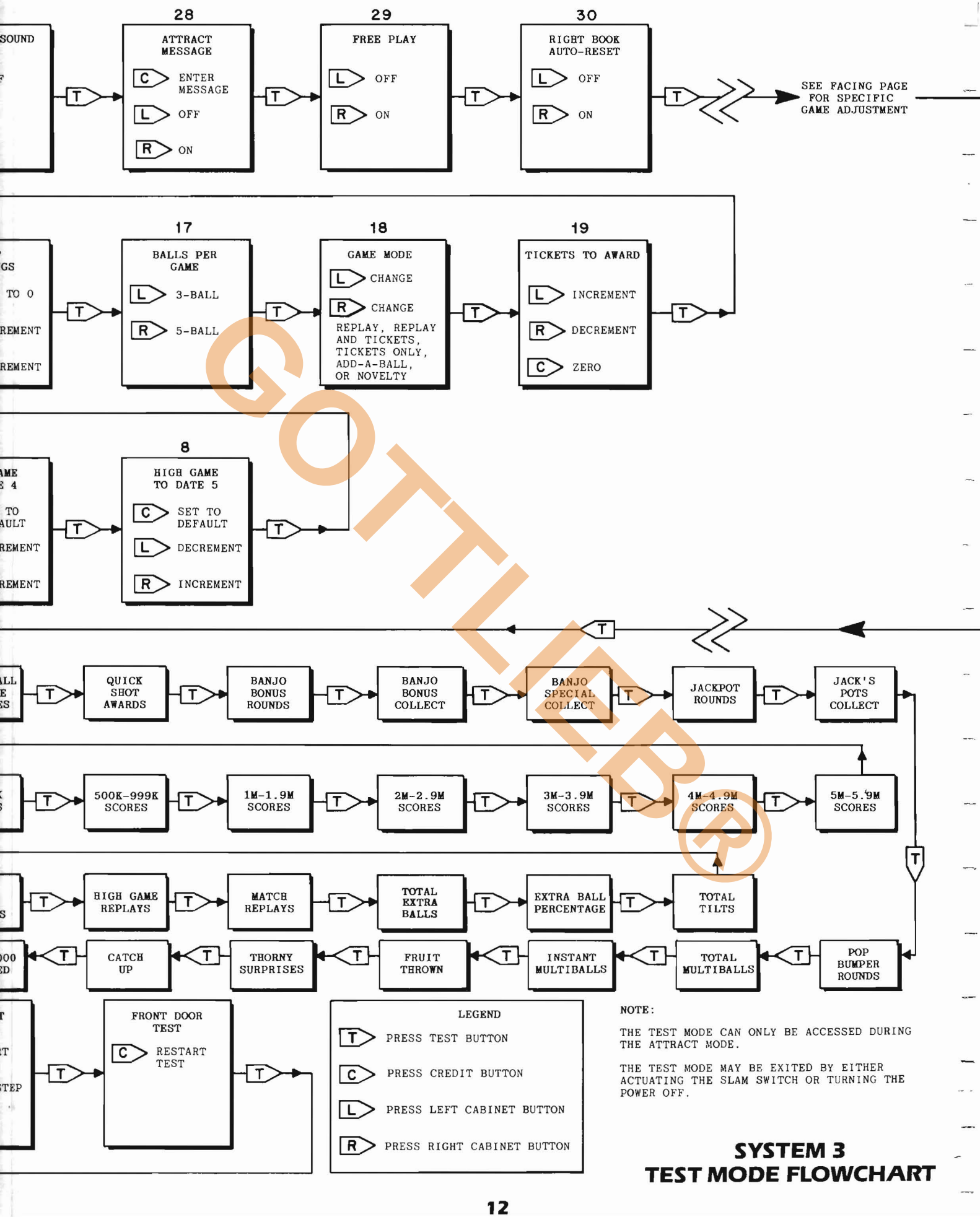

BURN-IN
CONTINUOUS EXERCISE OF LAMPS AND SOLENOIDS
TEST MODE
CHOOSE FUNCTION
GAME ADJUSTMENTS
CHOOSE FUNCTION
BOOKKEEPING
RESET ALL LEFT AND RIGHT BOOKEEPING (EXCLUDING LEFT THREE COIN CHUTES)
RESET ALL RIGHT STEPS
LOAD FACTORY DEFAULT VALUES ?
NO
YES
ENGLISH GERMAN, OR FRENCH ?
LOAD DEFAULT VALUES
CHANGE LANGUAGE
20
LANGUAGE
CHANGE
CHANGE
ENGLISH, GERMAN, OR FRENCH
21
LEFT AND RIGHT CHUTES
SEPARATE
SAME
22
LEFT AND RIGHT CHUTE BONUS
OFF
ON
9
LEFT CHUTE SETTING
NEXT COIN
DECREMENT
INCREMENT
10
RIGHT CHUTE SETTING
NEXT COIN
DECREMENT
INCREMENT
11
CENTER CHUTE SETTING
NEXT COIN
DECREMENT
INCREMENT
1
SCORE REPLAY LEVEL 1
SET TO DEFAULT
DECREMENT
INCREMENT
2
SCORE REPLAY LEVEL 2
SET TO DEFAULT
DECREMENT
INCREMENT
BOOKKEEPING
LEFT CHUTE COINS
RIGHT CHUTE COINS
CENTER CHUTE COINS
REPLAY PERCENTAGE
BALL TIME
SELF-TEST
MEMORY TEST (also display check-sum)
RESTART TEST
LAMP CHECK
RESTART TEST
LAMP MATRIX TEST
RESTART TEST
PREVIOUS LAMP
NEXT LAMP

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III. TEST MODE



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NOTE:

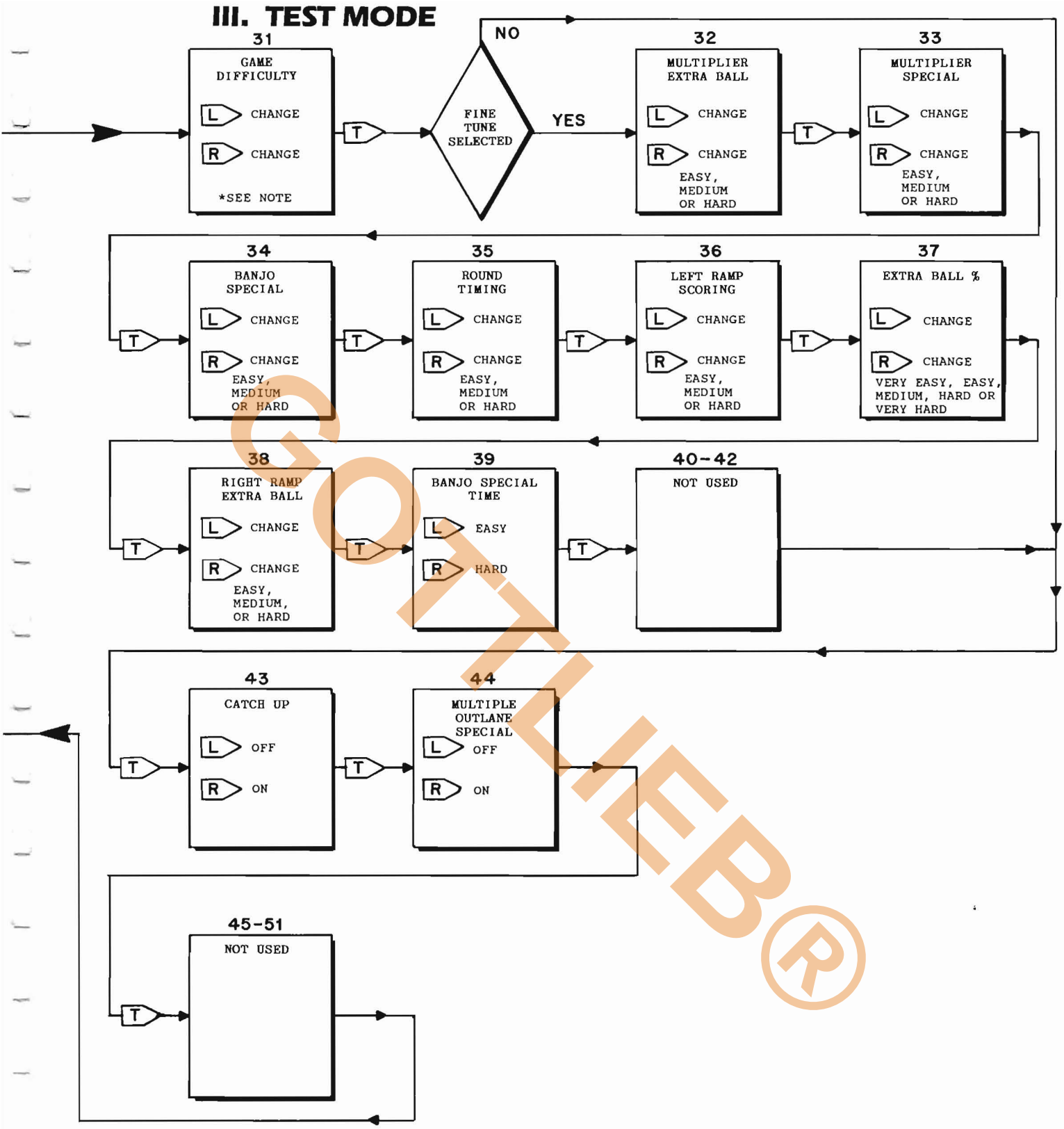
THE TEST MODE CAN ONLY BE ACCESSED DURING THE ATTRACT MODE.

THE TEST MODE MAY BE EXITED BY EITHER ACTUATING THE SLAM SWITCH OR TURNING THE POWER OFF.

SYSTEM 3
TEST MODE FLOWCHART

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III. TEST MODE



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* NOTE: THE GAME DIFFICULTY ADJUSTMENT (STEP 31) ALLOWS MOST OF THE INDIVIDUAL GAME ADJUSTMENTS TO BE CHANGED DURING THIS STEP TO PRE-DETERMINED FACTORY SETTINGS. SEE THE TABLE ON PAGE **14**.

IF FINE TUNE IS SELECTED IT WILL ALLOW THE OPERATOR TO SET EACH STEP HIMSELF. WHEN CHANGING FROM FINE TUNE TO OVERALL SETTINGS (VERY EASY, EASY, MEDIUM, HARD, AND VERY HARD) ALL PREVIOUS FINE TUNE SETTINGS WILL BE LOST.

SYSTEM 3, TEST MODE FLOWCHART

28) 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 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 black cabinet buttons.

29) FREE PLAY
If this step is set to on, a game may be started without any credits left on the machine.

30) 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.

GOTTLIEB®



ADJUSTMENTS

OPERATOR ADJUSTMENT SETTINGS

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

31) GAME DIFFICULTY
AUTOMATICALLY SETS VARIOUS ADJUSTMENTS LISTED BELOW IN STEPS 32 - 42. THE FINE-TUNE SETTING ALLOWS THE OPERATOR TO INDIVIDUALLY SELECT EACH ADJUSTMENT.

STEP				***		
31	GAME DIFFICULTY	VERY EASY	EASY	MEDIUM	HARD	VERY HARD
32	MULTIPLIER EXTRA BALL	EASY	EASY	EASY	MEDIUM	HARD
33	MULTIPLIER SPECIAL	EASY	EASY	EASY	MEDIUM	HARD
34	BANJO SPECIAL	EASY	EASY	MEDIUM	MEDIUM	HARD
35	ROUND TIMER	EASY	EASY	MEDIUM	MEDIUM	HARD
36	LEFT RAMP SCORING	EASY	EASY	EASY	MEDIUM	HARD
37	EXTRA BALL % SETTING	VERY EASY	EASY	MEDIUM	HARD	VERY HARD
38	RIGHT RAMP EXTRA BALL	EASY	MEDIUM	MEDIUM	MEDIUM	HARD
39	BANJO SPECIAL TIME	EASY	EASY	HARD	HARD	HARD
40	NOT USED	----	----	----	----	----
41	NOT USED	----	----	----	----	----
42	NOT USED	----	----	----	----	----

32) MULTIPLIER EXTRA BALL
EASY = LIGHTS AT 3X
MEDIUM = LIGHTS AT 4X
HARD = LIGHTS AT 5X

33) MULTIPLIER SPECIAL
EASY = LIGHTS AT 5X
MEDIUM = LIGHTS AT 6X
HARD = LIGHTS AT 7X

34) BANJO SPECIAL
EASY = LIGHTS ON 3rd BANJO ROUND
MEDIUM = LIGHTS ON 4th BANJO ROUND
HARD = LIGHTS ON 5th BANJO ROUND

35) ROUND TIMER
EASY = SLOWEST TIMING
MEDIUM = MEDIUM TIMING
HARD = FASTEST TIMING

36) LEFT RAMP SCORING
EASY = 10,000 - 40,000 - 1,000,000 - JACK'S POT - 1,000,000 - 1,000,000 - 1,000,000
MEDIUM = 10,000 - 20,000 - 40,000 - 1,000,000 - JACK'S POT - 1,000,000 - 1,000,000
HARD = 3,000 - 10,000 - 20,000 - 40,000 - 1,000,000 - JACK'S POT - 1,000,000

37) EXTRA BALL PERCENTAGE
VERY EASY = 50%
EASY = 40%
MEDIUM = 30%
HARD = 20%
VERY HARD = 10%

38) RIGHT RAMP EXTRA BALL
EASY = SPOT 'E', 'X', and 'T'
MEDIUM = SPOT 'E' and 'X'
HARD = NO LETTERS SPOTTED

39) BANJO SPECIAL TIME
EASY = WHEN LIT BANJO SPECIAL TIMES OUT, THEN LIGHT AN OUTLANE FOR SPECIAL
HARD = LIT BANJO SPECIAL IS TIMED OUT

43) CATCH-UP
OFF = NOT ALLOWED
*** ON = ALLOWED

44) OUTLANE SPECIALS
OFF = ONLY 1 ALLOWED
*** ON = MULTIPLE SPECIALS ALLOWED

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

The post at the mouth of the left outlane and the post at the mouth of the right outlane can be positioned for liberal/conservative play. The smaller openings produce a more liberal game.

IV. BURN-IN

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

SOTTLE®

IV. THEORY OF OPERATION

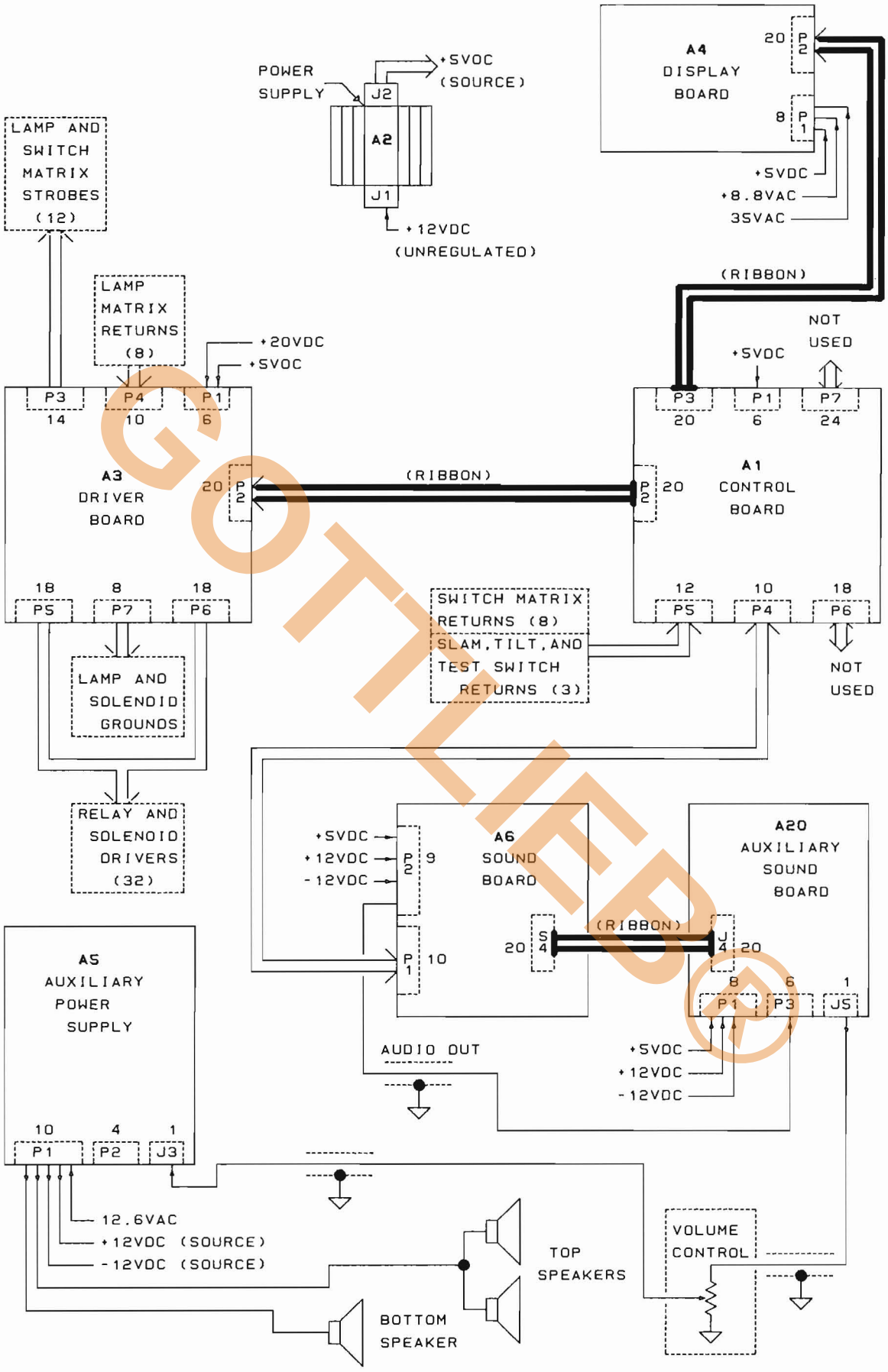


FIGURE 1, SYSTEM 3 BLOCK DIAGRAM

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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 (DBLNK), 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.

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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 auxillary board which may require it.

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 (Vref), 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 (Vcc). The board develops Vgg 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.

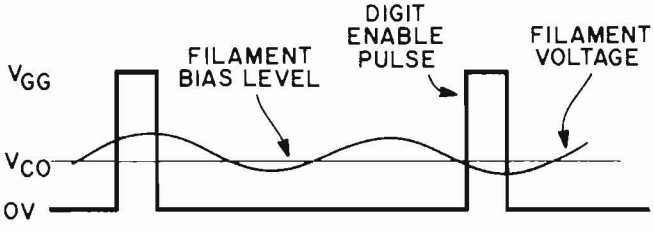


Figure 2. Display Waveform

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, input ports to receive commands from the game Control Board, and a low level audio output, which is sent to the Auxiliary Power Supply Board for amplification.

The Sound Board requires three supply voltages +5V DC, +12V DC and -12V DC. In addition a power up reset signal is required from the Control Board.

SYSTEM CLOCK

A 4 MHz oscillator is configured with R11, R12, C14, C15, C22, XTAL-1 and T1. This 4MHz clock is divided by 4 to a 1 or 2 MHz clock for both processors clock input, pin 37 of N1 and T3. A 250 KHz signal from S1 pin 11 is the clock for the programmable timer section consisting of N5, H5, T5 and K5, pin 2.

INPUT CODE LATCH SYSTEM

Eight input lines from the Control Board come in on A6P1 and are pulled up by S1P1 and sent to the two input code latches A3 and B2, one for each microprocessor system. A2, pin 8, becomes a logic high when any of it's inputs are low. this output is connected to pin 11 of the input code latches (A3 and B2). A positive edge at pin 11 causes A3 and B2 to latch the data at their inputs. A2 pin 8 is also connected to the clock inputs of two flip flops, A4 pin 3 and A4 pin 11. When A2 pin 8 goes high, both flip flops are clocked, setting both $\bar{Q}$ outputs low. The $\bar{Q}$ outputs, A4 pin 6 and pin 8, are connected to both of the 6502's active low interrupt request lines,

SOLID

T3 and N1, pin 4. The $\overline{Q}$ outputs of A4 will stay low until the associated 6502 reads its input port therefore clearing the interrupt.

SYSTEM EPROMS

The sound board is designed to accommodate different types of EPROMS. Jumpers JP1, 2, 3, and 4 should be set to the proper position based on the EPROM being used, (See Schematic Diagram).

RESET

The Sound Board receives an external reset signal from A1P4 pin 10. This active low reset signal is pulled up by R34 and sent to G5, pin 1 (2-input AND gate). However, if a manual reset is desired, pushing switch SW2 will reset the processor.

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.

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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
A13 - Resistor Board
A15 - Sensor Board
A17 - Diode Board
A20 - Auxiliary Sound Board
A22 - Playboard Lamp Board
A23 - LED Display 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.

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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		7-1/2 Amp
F10	Lightbox Illumination		7-1/2 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

FUSE	RATING	PART NO.	USAGE	COIL/COLOR
F15	1-1/2 AMP SLO-BLO	EL-24	LEFT POP BUMPER	16570(GREEN)
F16	1-1/2 AMP SLO-BLO	EL-24	RIGHT POP BUMPER	16570(GREEN)
F17	1-1/2 AMP SLO-BLO	EL-24	BOTTOM POP BUMPER	16570(GREEN)
F18	1-1/2 AMP SLO-BLO	EL-24	LEFT KICKING RUBBER	5195(WHITE)
F19	1-1/2 AMP SLO-BLO	EL-24	RIGHT KICKING RUBBER	5195(WHITE)
F20	1/2 AMP SLO-BLO	EL-20	BALL RELEASE OUTHOLE	26451(YELLOW) 26451(YELLOW)
F21	1-1/2 AMP SLO-BLO	EL-24	TOP UPKICKER	16570(GREEN)
F22	1 AMP SLO-BLO	EL-6	TOP BANK RESET BOTTOM BANK RESET BOTTOM UPKICKER	26926(BLUE) 26926(BLUE) 17876(TAN)
F23	1/2 AMP SLO-BLO	EL-20	CACTUS #1	27926(BLUE)
F24	1/2 AMP SLO-BLO	EL-20	CACTUS #2	26451(YELLOW)
F25	1/2 AMP SLO-BLO	EL-20	CACTUS #3	27926(BLUE)
F26	2 AMP SLO-BLO	EL-7	+6V DC	----------

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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-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

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VI. WIRING AND SCHEMATIC DIAGRAMS, PARTS LISTS

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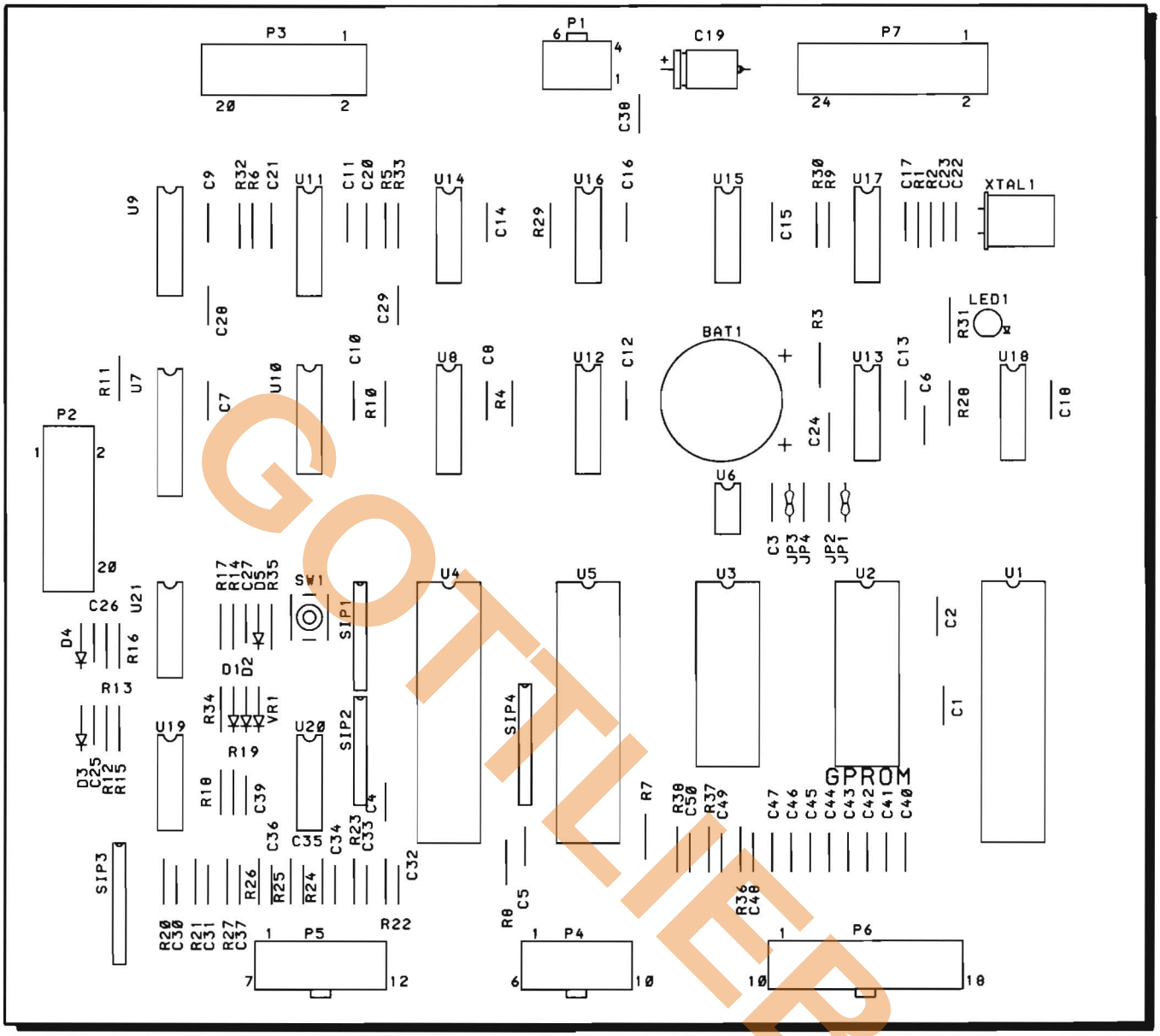
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VI. WIRING AND SCHEMATIC DIAGRAMS, PARTS LISTS

CONTROL BOARD (A1) COMPONENT LOCATION

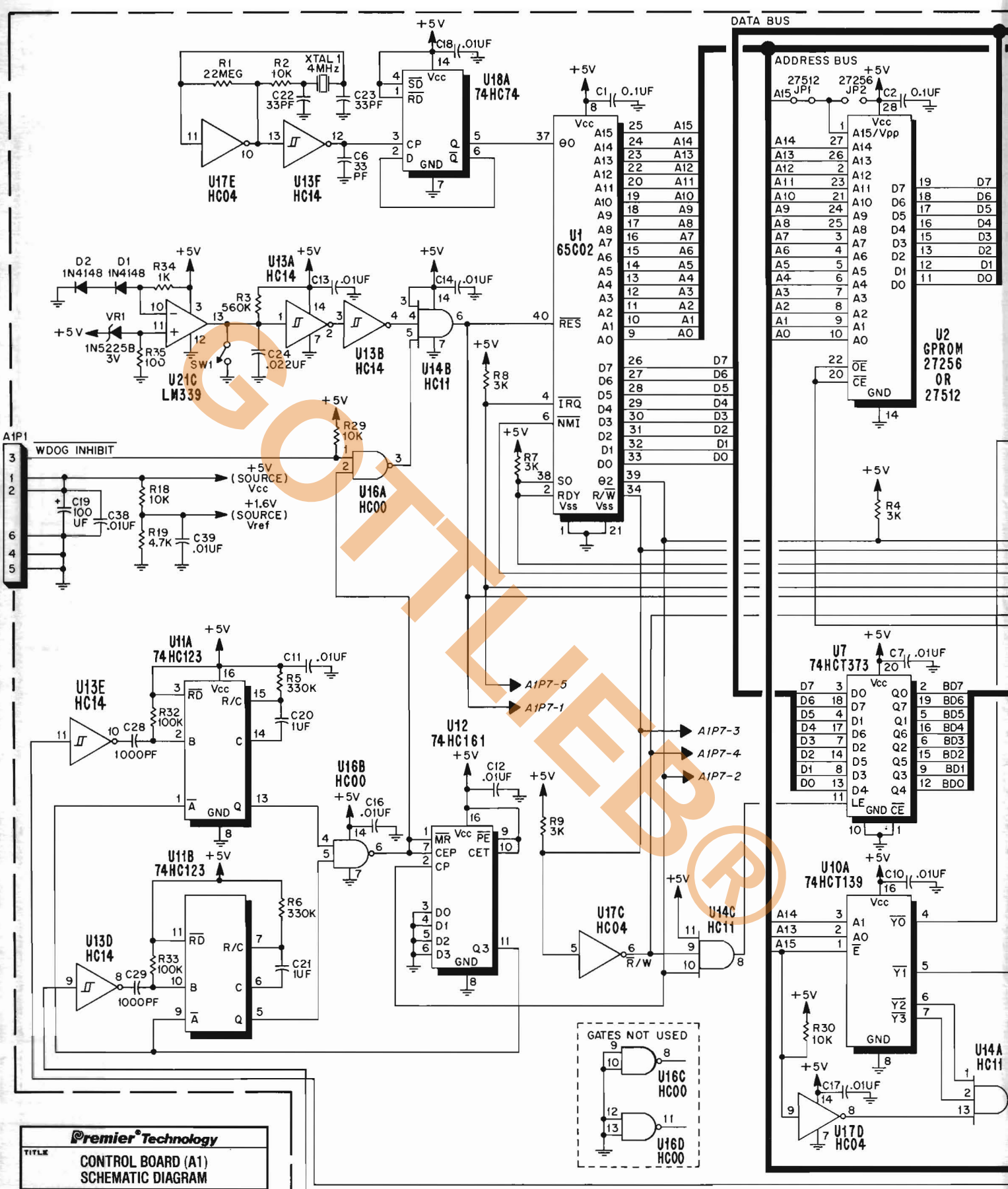


CONTROL BOARD (A1) PARTS LIST

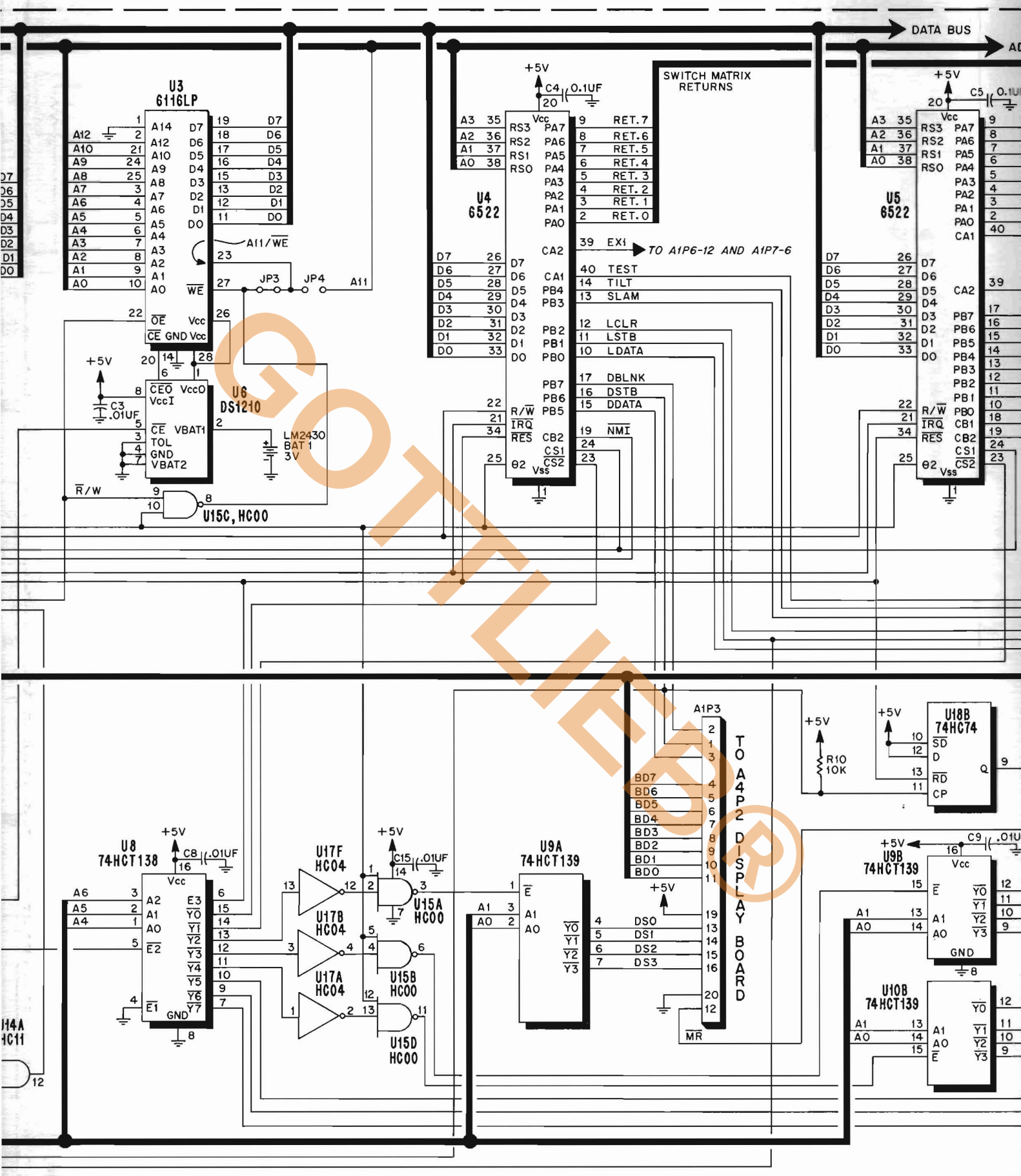
REFERENCE	DESCRIPTION	PART NUMBER
	Control Board Assembly (A1)	MA-1423
BAT 1	Lithium Battery, LM2430, 3V	X0-925
C3, C7-C18, C30-C50	Capacitor, .01UF, +80% -20%, 50V	X0-229
C1,C2,C4 C5,C25,C27	Capacitor, 0.1UF, +80% -20%, 50V	X0-230
C6,C22,C23	Capacitor, 33PF, 10%, 50V	X0-896
C19	Capacitor, 100UF, +80% -20%, 10V	X0-211
C20,C21	Capacitor, 1UF, 20%, 50V	X0-746
C24	Capacitor, .022UF, 10%, 50V	X0-873
C28,C29	Capacitor, 1000PF, 10%, 100V	X0-296
D1-D5	Diode, 1N4148	X0-261
LED 1	LED, MV5752 (Red)	X0-270
R1	Resistor, 22 MEGOHM, 5%, 1/4W	X0-74
R2,R10,R11 R18,R28,R30	Resistor, 10K OHM, 5%, 1/4W	X0-18
R3	Resistor, 560K OHM, 5%, 1/4W	X0-169
R5,R6	Resistor, 330K OHM, 5%, 1/4W	X0-47
R4,R7-R9	Resistor, 3K OHM, 5%, 1/4W	X0-23
R12-R14	Resistor, 2.2K OHM, 5%, 1/4W	X0-27
R15-R17	Resistor, 3.3K OHM, 5%, 1/4W	X0-38
R19-R27, R36-R38	Resistor, 4.7K OHM, 5%, 1/4W	X0-7
R31	Resistor 330 OHM, 5%, 1/4W	X0-34
R32-R33	Resistor, 100K OHM, 5%, 1/4W	X0-45
R34	Resistor, 1K OHM, 5%, 1/4W	X0-5
R35	Resistor, 100 OHM, 5%, 1/4W	X0-28
SIP1,SIP2	Resistor Pack, 10K OHM X 7, 5%, 1/4W	X0-926

REFERENCE	DESCRIPTION	PART NUMBER
SIP3,SIP4	Resistor Pack, 4.7K OHM X 8	X0-161
SW1	Switch, N.O.	X0-897
U1	IC, 65CO2P2, CPU, 2MHZ	X0-927
U3	IC, 6116LP, 2K X 8, Static Ram	X0-928
U4,U5	IC,6522AP, Versatile Interface Adaptor (VIA)	X0-929
U6	IC, DS1210, Non-Volatile Controller	X0-930
U7	IC, 74HCT373, Octal Latch	X0-931
U8	IC, 74HCT138, Decoder	X0-932
U9,U10	IC, 74HCT139, Dual Decoder	X0-933
U11	IC, 74HC123, Dual Multivibrator	X0-934
U12	IC, 74HC161, Binary Counter	X0-935
U13	IC, 74HC14, Schmitt Hex Inverters	X0-936
U14	IC, 74HC11, Triple "And" Gates	X0-937
U15,U16	IC, 74HC00, Quad "Nand" Gates	X0-782
U17	IC, 74HC04, Hex Inverters	X0-888
U18	IC, 74HC74, Dual "D" Flip-Flop	X0-939
U19,U20,U21	IC, LM339, Quad Comparators	X0-583
VR1	Zener Diode, 1N5225B, 3V, 5%	X0-269
XTAL1	Crystal, 4MHZ	X0-366
A1P1	Header, 6 Position	X0-910
A1P2,A1P3	Header, 20 Position (Ribbon)	X0-940
A1P4	Header, 10 Position	X0-912
A1P5	Header, 12 Position	X0-913
A1P6	Header. 18 Position	X0-916
	Jumper, Resistor, 0 OHM (2)	X0-469
	Socket, 28 Pin Dip	X0-536

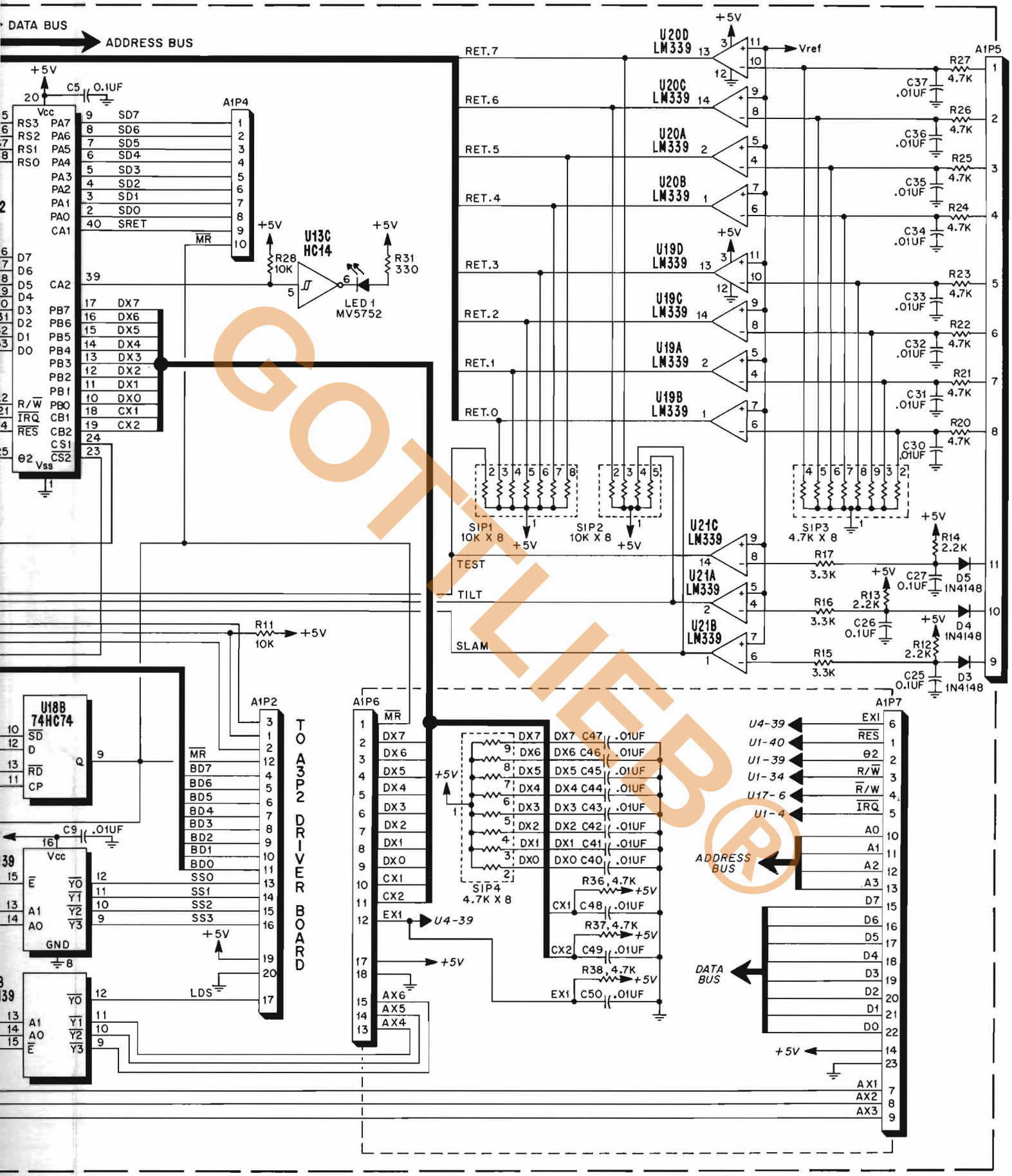
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DATA BUS
ADDRESS BUS
+5V
R1 22MEG
R2 10K
XTAL 1 4MHz
C22 33PF
C23 33PF
C18 .01UF
U18A 74HC74
U17E HC04
U13F HC14
C6 33 PF
C1 0.1UF
U1 65C02
D2 1N4148
D1 1N4148
R34 1K
VR1
1N5225B 3V
R35 100
SW1
R3 560K
C24 .022UF
U21C LM339
U13A HC14
C13 .01UF
U13B HC14
C14 .01UF
U14B HC11
R8 3K
R7 3K
R29 10K
U16A HC00
A1P1
WDOG INHIBIT
+5V (SOURCE) Vcc
+1.6V (SOURCE) Vref
C19 100 UF
C38 .01UF
R18 10K
R19 4.7K
C39 .01UF
U2 GPROM 27256 OR 27512
27512
27256
JP1
JP2
C2 0.1UF
R4 3K
U11A 74HC123
C11 .01UF
R5 330K
C20 1UF
U13E HC14
R32 100K
C28 1000PF
U12 74HC161
C12 .01UF
U16B HC00
C16 .01UF
R9 3K
U11B 74HC123
R6 330K
C21 1UF
U13D HC14
R33 100K
C29 1000PF
U17C HC04
U14C HC11
A1P7-5
A1P7-1
A1P7-3
A1P7-4
A1P7-2
U7 74HCT373
C7 .01UF
U10A 74HCT139
C10 .01UF
R30 10K
C17 .01UF
U17D HC04
U14A HC11
GATES NOT USED
U16C HC00
U16D HC00
Premier Technology
TITLE
CONTROL BOARD (A1)
SCHEMATIC DIAGRAM
DRAWN
APPROVED RHM
DATE 10-12-89
E-27033

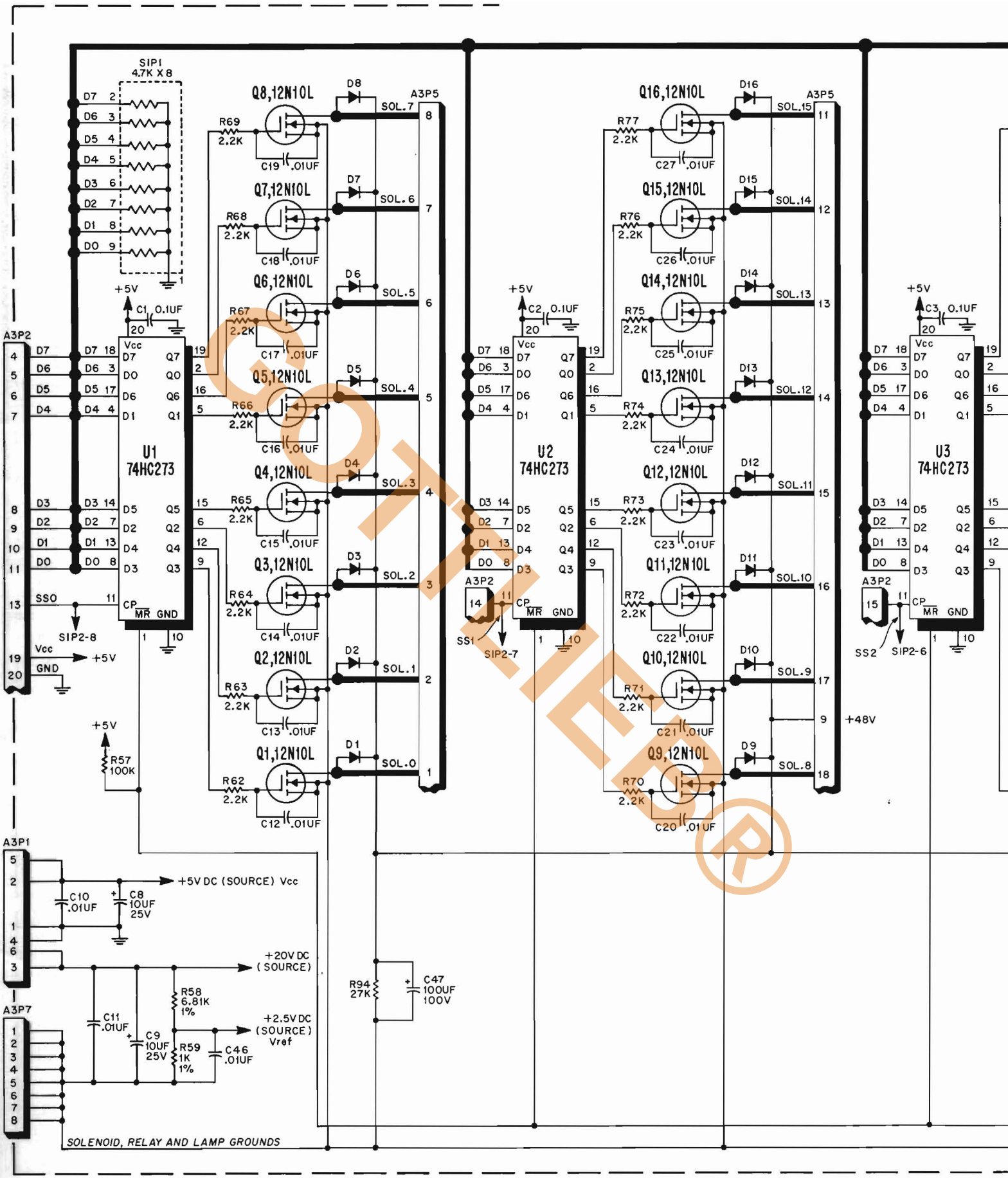
GOTLIEB®


DATA BUS
U3
6116LP
U4
6522
U5
6522
SWITCH MATRIX
RETURNS
RET.7
RET.6
RET.5
RET.4
RET.3
RET.2
RET.1
RET.0
TO A1P6-12 AND A1P7-6
TEST
TILT
SLAM
LCLR
LSTB
LDATA
DBLNK
DSTB
DDATA
NMI
U6
DS1210
LM2430
BAT 1
3V
U15C, HC00
+5V
JP3
JP4
A11
A11/WE
R/W
U8
74HCT138
U17F
HC04
U17B
HC04
U17A
HC04
U15A
HC00
U15B
HC00
U15D
HC00
U9A
74HCT139
U9B
74HCT139
U10B
74HCT139
U18B
74HC74
R10
10K
A1P3
TO A4P2 DISPLAY BOARD
BD7
BD6
BD5
BD4
BD3
BD2
BD1
BD0
DS0
DS1
DS2
DS3
MR

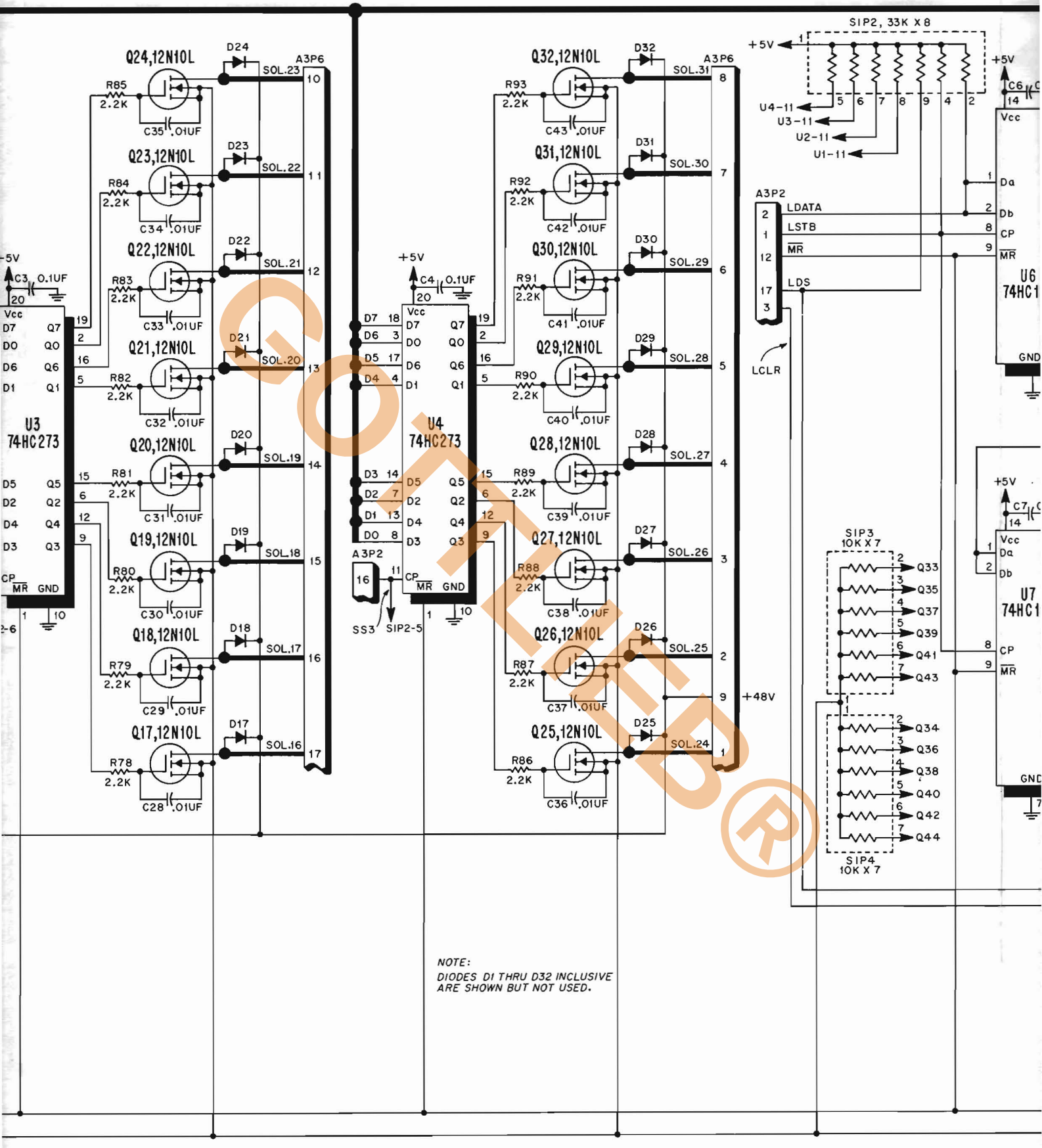
GOTTLIEB®


DATA BUS
ADDRESS BUS
+5V
C5 0.1UF
Vcc
RS3 RS2 RS1 RSO
PA7 PA6 PA5 PA4 PA3 PA2 PA1 PA0
CA1 CA2
PB7 PB6 PB5 PB4 PB3 PB2 PB1 PB0
CB1 CB2 CS1 CS2
R/W IRQ RES
D7 D6 D5 D4 D3 D2 D1 DO
Θ2 Vss
SD7 SD6 SD5 SD4 SD3 SD2 SD1 SDO SRET
A1P4
MR
U13C HC14
R28 10K
R31 330
LED 1 MV5752
DX7 DX6 DX5 DX4 DX3 DX2 DX1 DX0 CX1 CX2
RET.7 RET.6 RET.5 RET.4 RET.3 RET.2 RET.1 RET.0
U20D LM339
U20C LM339
U20A LM339
U20B LM339
U19D LM339
U19C LM339
U19A LM339
U19B LM339
Vref
A1P5
R27 4.7K
R26 4.7K
R25 4.7K
R24 4.7K
R23 4.7K
R22 4.7K
R21 4.7K
R20 4.7K
C37 .01UF
C36 .01UF
C35 .01UF
C34 .01UF
C33 .01UF
C32 .01UF
C31 .01UF
C30 .01UF
SIP1 10K X 8
SIP2 10K X 8
SIP3 4.7K X 8
TEST
TILT
SLAM
U21C LM339
U21A LM339
U21B LM339
R17 3.3K
R16 3.3K
R15 3.3K
R14 2.2K
R13 2.2K
R12 2.2K
C27 0.1UF
C26 0.1UF
C25 0.1UF
D5 1N4148
D4 1N4148
D3 1N4148
R11 10K
U18B 74HC74
SD D RD CP Q
C9 .01UF
Vcc E A1 AO GND Y0 Y1 Y2 Y3
BD7 BD6 BD5 BD4 BD3 BD2 BD1 BDO
SS0 SS1 SS2 SS3
LDS
A1P2
TO A3P2 DRIVER BOARD
A1P6
MR DX7 DX6 DX5 DX4 DX3 DX2 DX1 DX0 CX1 CX2 EX1 AX6 AX5 AX4
U4-39
SIP4 4.7K X 8
DX7 C47 .01UF
DX6 C46 .01UF
DX5 C45 .01UF
DX4 C44 .01UF
DX3 C43 .01UF
DX2 C42 .01UF
DX1 C41 .01UF
DX0 C40 .01UF
R36, 4.7K
R37, 4.7K
R38, 4.7K
CX1 C48 .01UF
CX2 C49 .01UF
EX1 C50 .01UF
A1P7
EXI RES Θ2 R/W R/W IRQ
U4-39 U1-40 U1-39 U1-34 U17-6 U1-4
ADDRESS BUS
DATA BUS
AO A1 A2 A3
D7 D6 D5 D4 D3 D2 D1 DO
AX1 AX2 AX3

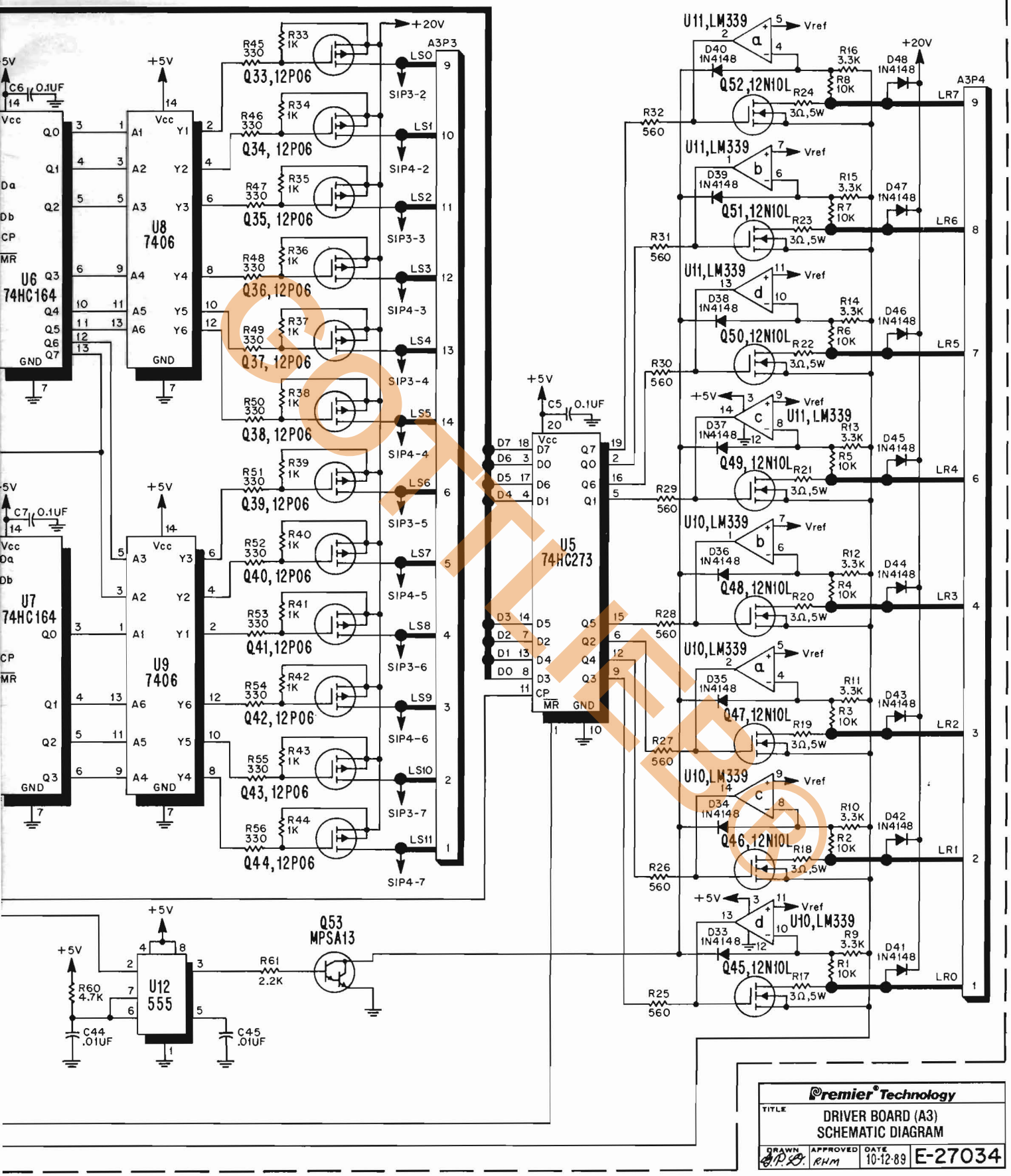
GOTTLIEB®


SIP1
4.7K X 8
A3P2
A3P5
A3P1
A3P7
U1
74HC273
U2
74HC273
U3
74HC273
Q8,12N10L
Q7,12N10L
Q6,12N10L
Q5,12N10L
Q4,12N10L
Q3,12N10L
Q2,12N10L
Q1,12N10L
Q16,12N10L
Q15,12N10L
Q14,12N10L
Q13,12N10L
Q12,12N10L
Q11,12N10L
Q10,12N10L
Q9,12N10L
+5V
+48V
SIP2-8
SIP2-7
SIP2-6
SS1
SS2
+5V DC (SOURCE) Vcc
+20V DC (SOURCE)
+2.5V DC (SOURCE) Vref
SOLENOID, RELAY AND LAMP GROUNDS

GOTTLIEB®


SIP2, 33K X 8
+5V
U4-11
U3-11
U2-11
U1-11
A3P2
LDATA
LSTB
MR
LDS
LCLR
U3
74HC273
U4
74HC273
U6
74HC1
U7
74HC1
Vcc
GND
CP
Da
Db
SIP3
10K X 7
SIP4
10K X 7
Q24,12N10L
Q23,12N10L
Q22,12N10L
Q21,12N10L
Q20,12N10L
Q19,12N10L
Q18,12N10L
Q17,12N10L
Q32,12N10L
Q31,12N10L
Q30,12N10L
Q29,12N10L
Q28,12N10L
Q27,12N10L
Q26,12N10L
Q25,12N10L
SOL.23
SOL.22
SOL.21
SOL.20
SOL.19
SOL.18
SOL.17
SOL.16
SOL.31
SOL.30
SOL.29
SOL.28
SOL.27
SOL.26
SOL.25
SOL.24
+48V
SS3
SIP2-5
NOTE:
DIODES D1 THRU D32 INCLUSIVE
ARE SHOWN BUT NOT USED.

GOTEK®



SOLD

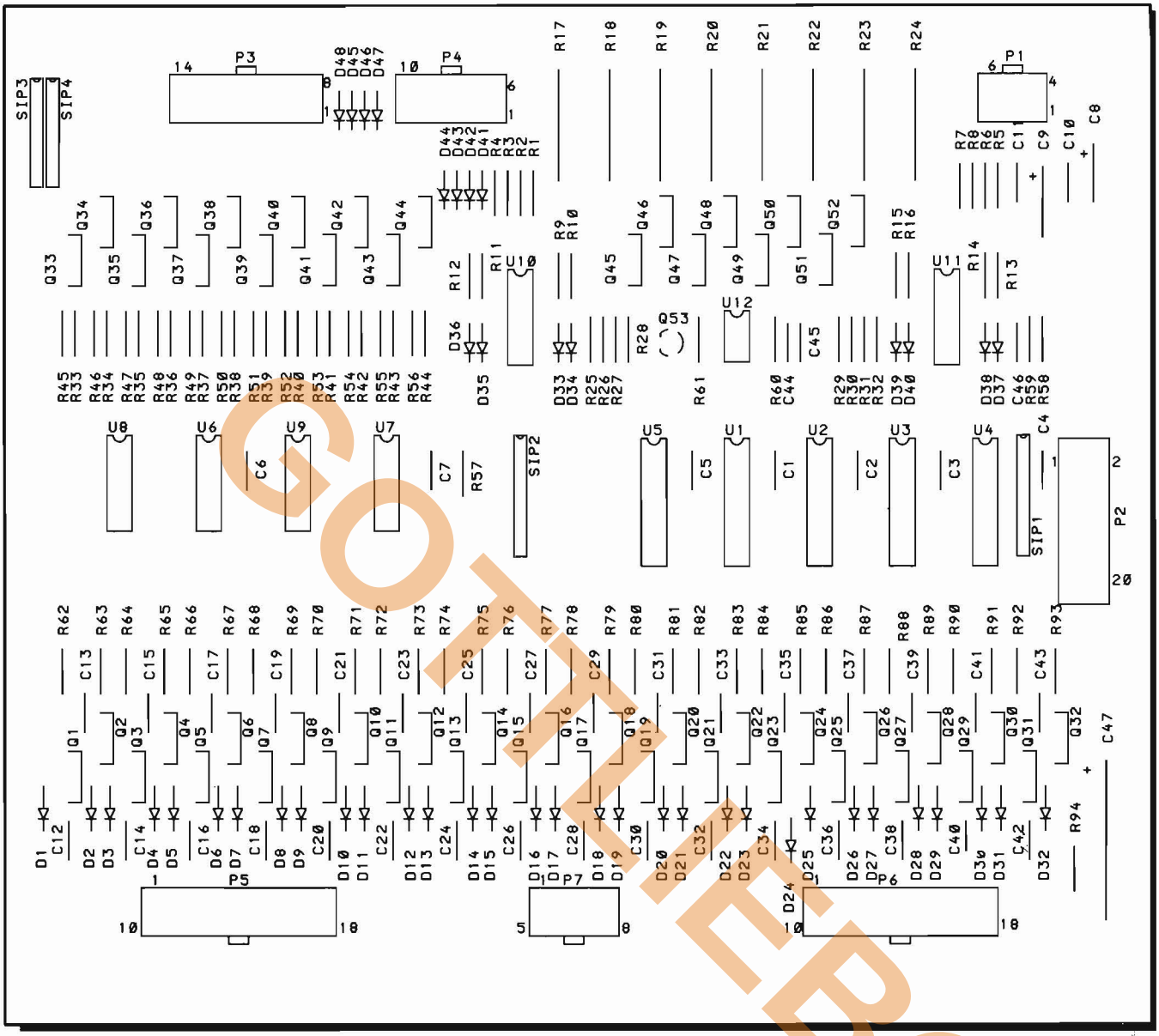
Premier® Technology

TITLE: DRIVER BOARD (A3) SCHEMATIC DIAGRAM

DRAWN	APPROVED	DATE	
G.R.S.	RHM	10-12-89	E-27034

VI. WIRING AND SCHEMATIC DIAGRAMS, PARTS LISTS

DRIVER BOARD (A3) COMPONENT LOCATION



GOTEK®

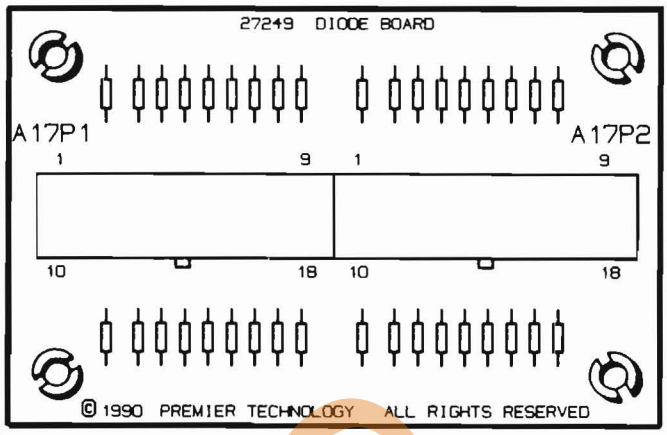
DRIVER BOARD (A3) PARTS LIST

REFERENCE	DESCRIPTION	PART NUMBER
	Driver Board Assembly (A3)	MA-1358
C1-C7	Capacitor, 0.1 UF, +80% -20%, 50V	XO-230
C8	Capacitor, 10UF, 20%, 25V	XO-127
C9	Capacitor, 10UF, +80% -20%, 25V	XO-225
C10,C11	Capacitor, .01UF, +80% -20%, 50V	XO-229
C45,C46		
C12-C44	Capacitor, .01UF, 10%, 50V	XO-696
C47	Capacitor, 100UF, 20%, 100V	XO-958
D33-D48	Diode, 1N4148	XO-261
Q1-Q32,	Transistor, RFP12N10L, OR IRL530,	XO-947
Q45-Q52,Q54	N-Channel MOSFET	
Q33-Q44	Transistor, RFP12P06, OR IRF9531, P-Channel MOSFET	XO-948
Q53	Transistor, MPSA13, Darlington	XO-304
R1-R8	Resistor, 10K Ohm, 5%, 1/4W	XO-18
R9-R16	Resistor, 3.3K Ohm, 5%, 1/4W	XO-38
R17-R24	Resistor, 3 Ohm, 5%, 5W	XO-942
R25-R32	Resistor, 560 Ohm, 5%, 1/4W	XO-36
R33-R44	Resistor, 1K Ohm, 5%, 1/4W	XO-5
R45-R56	Resistor, 330 Ohm, 5%, 1/4W	XO-34
R57	Resistor, 100K Ohm, 5%, 1/4W	XO-45

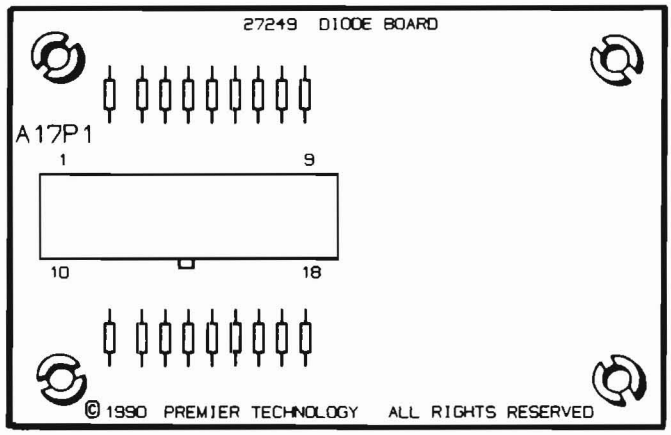
REFERENCE	DESCRIPTION	PART NUMBER
R58	Resistor, 6.81K Ohm, 1%, 1/4W	XO-943
R59	Resistor, 1K Ohm, 1%, 1/4W	XO-944
R60	Resistor, 4.7K Ohm, 5%, 1/4W	XO-7
R61-R93	Resistor, 2.2K Ohm, 5%, 1/4W	XO-27
R94	Resistor, 27K Ohm, 5%, 1/4W	XO-11
SIP1	Resistor Pack, 4.7K Ohm X 8,5%, 1/4W	XO-161
SIP2	Resistor Pack, 33K Ohm X 8,5%, 1/4W	XO-945
SIP3	Resistor Pack, 10K Ohm X 7,5%, 1/4W	XO-926
SIP4		
U1-U5	IC, Octal "D" Flip-Flops, 74HC273	XO-949
U6-U7	IC, Shift Register, 74HC164	XO-950
U8-U9	IC, Buffer, 7406	XO-85
U10-U11	IC, Quad Comparator, LM339	XO-583
U12	IC, Timer, NE555	XO-631
A3P1	Header, 6 Position	XO-910
A3P2	Header, 20 Position (Ribbon)	XO-940
A3P3	Header, 14 Position	XO-914
A3P4	Header, 10 Position	XO-912
A3P5,	Header, 18 Position	XO-916
A3P6		
A3P7	Header, 8 Position	XO-911

VI. WIRING AND SCHEMATIC DIAGRAMS, PARTS LISTS

DIODE BOARD (A17) COMPONENT LOCATION



DIODE BOARD (A17) COMPONENT LOCATION



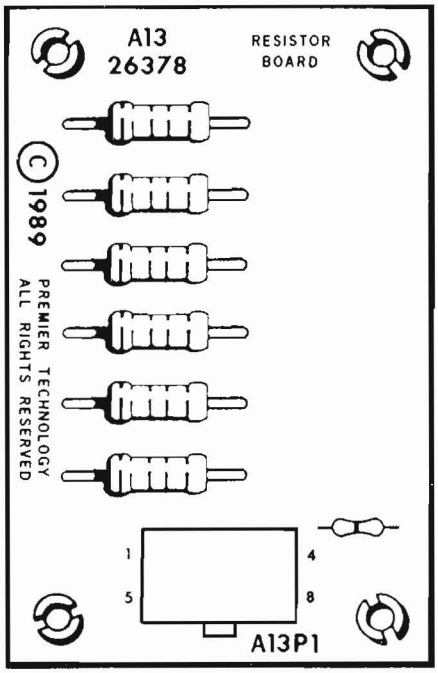
DIODE BOARD (A17) PARTS LIST

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

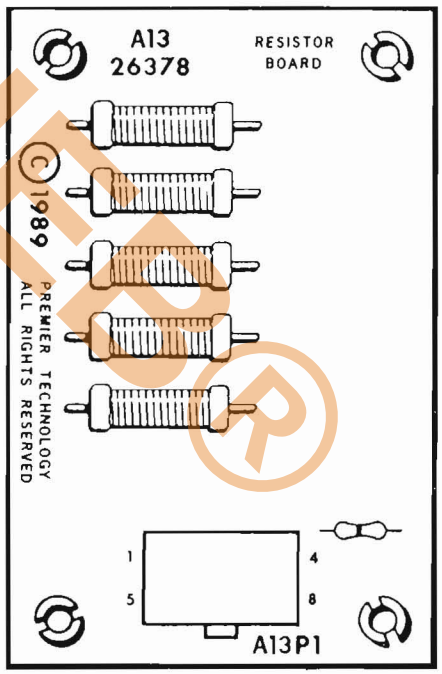
DIODE BOARD (A17) PARTS LIST

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

RESISTOR BOARD (A13) COMPONENT LOCATION



RESISTOR BOARD (A13) COMPONENT LOCATION



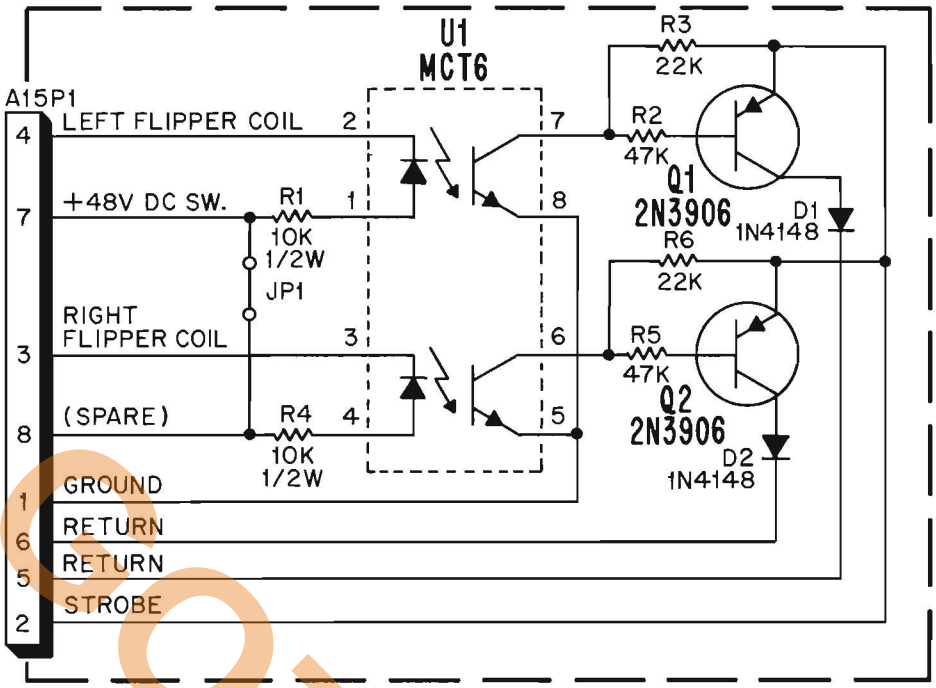
RESISTOR BOARD (A13) PARTS LIST

REFERENCE	DESCRIPTION	PART NUMBER
1A13	Resistor Board Assembly	MA-1461
R1-R6	Resistor, 6.6 OHM, 5%, 5W	XO-960
JP1	Jumper, Resistor, 0 OHM	XO-469
P1	Header, 8 Position	XO-911
	Circuit Board Support (4)	23984

RESISTOR BOARD (A13) PARTS LIST

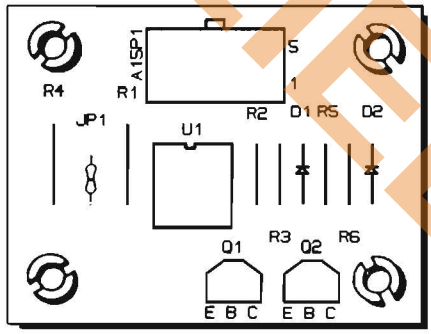
REFERENCE	DESCRIPTION	PART NUMBER
2A13	Resistor Board Assembly	MA-1510
R1-R5	Resistor 3.3 OHM, 5%, 7W	XO-959
JP1	Jumper, Resistor, 0 OHM	XO-469
P1	Header, 8 Position	XO-911
	Circuit Board (4)	23984

GOTTLIEB®



Premier® Technology			
TITLE: SENSOR BOARD (A15) SCHEMATIC DIAGRAM			
DRAWN	APPROVED	DATE	E-27041
	RHM	10-12-89	

SENSOR BOARD (A15) COMPONENT LOCATION

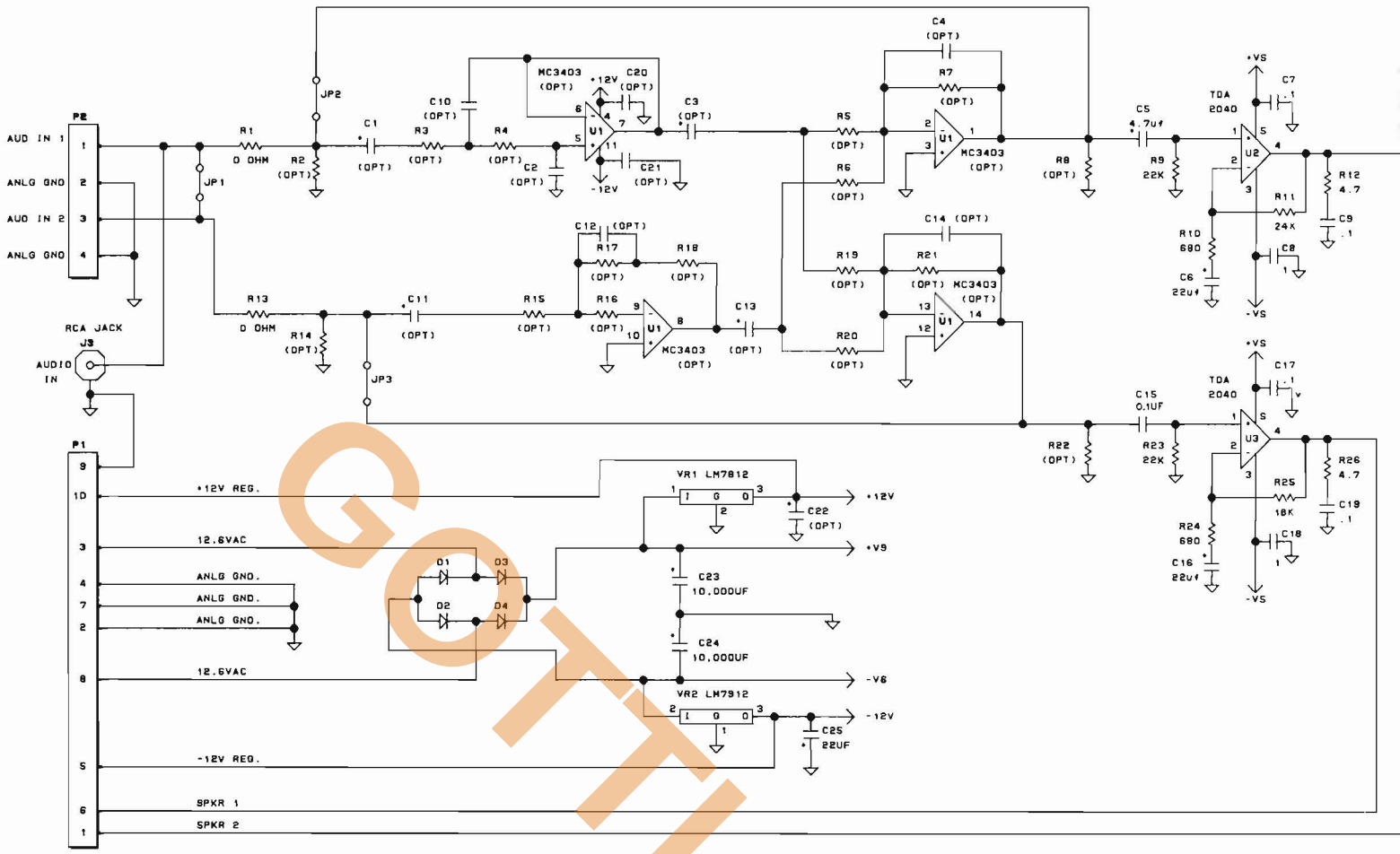


SENSOR BOARD (A15) PARTS LIST

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 ?6	Resistor, 22K Ohm, 5%, 1/4W	XO-42
U1	IC, Optocoupler, MCT6	XO-1000
A15P1	Header, 8 Position	XO-911
	Spacer (4)	23984

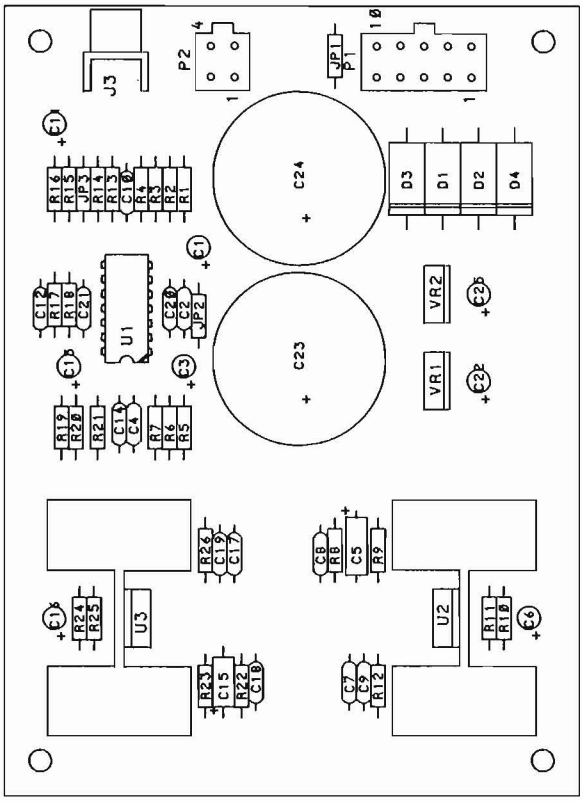
COTTLEB®

VI. WIRING AND SCHEMATIC DIAGRAMS, PARTS LISTS



GOTTLIEB®

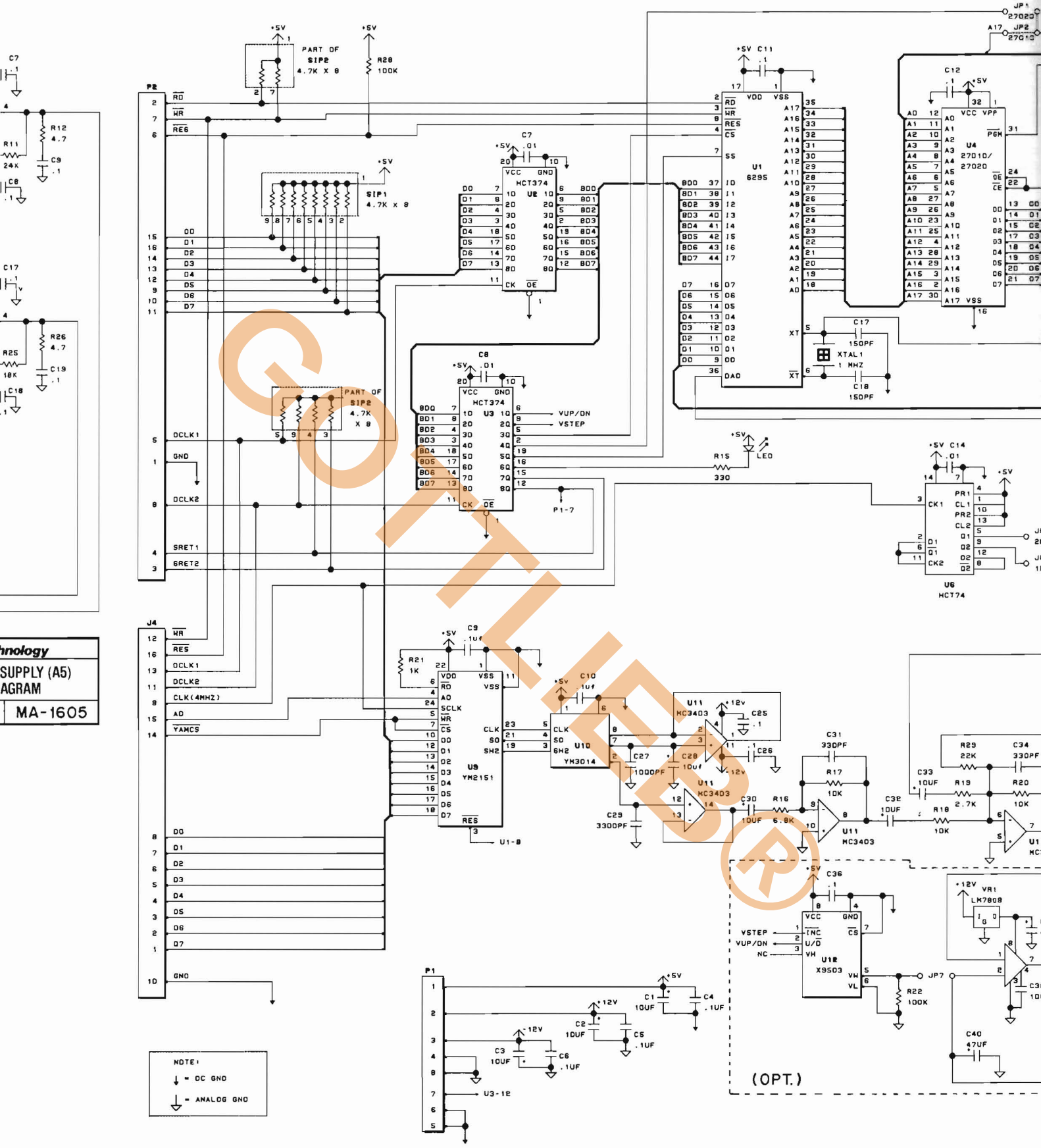
AUXILIARY POWER SUPPLY (A5) COMPONENT LOCATION



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

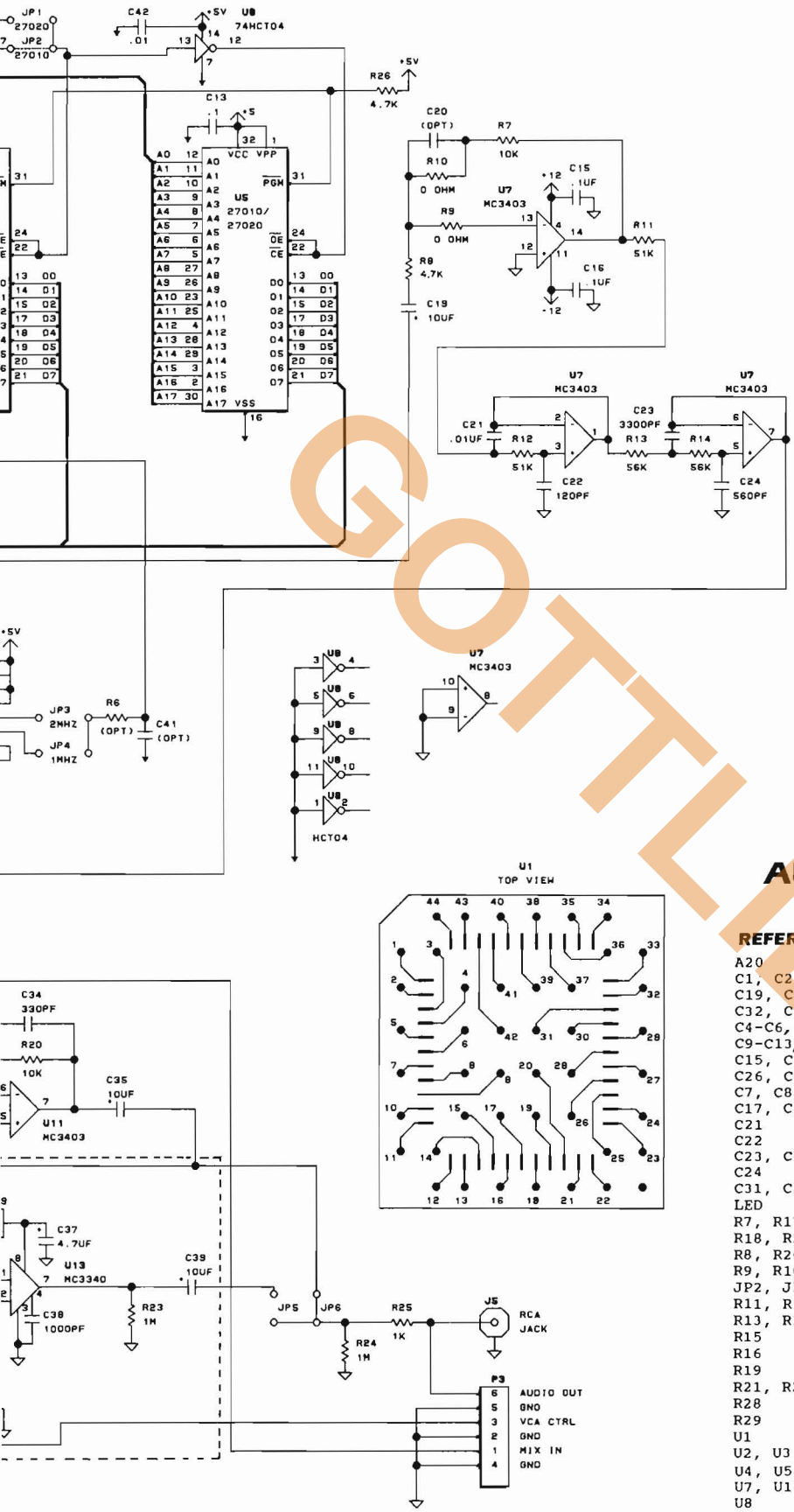
AUXILIARY POWER SUPPLY (A5) PARTS LIST

REFERENCE	DESCRIPTION	PART NUMBER
A5	Auxilliary 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, O 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

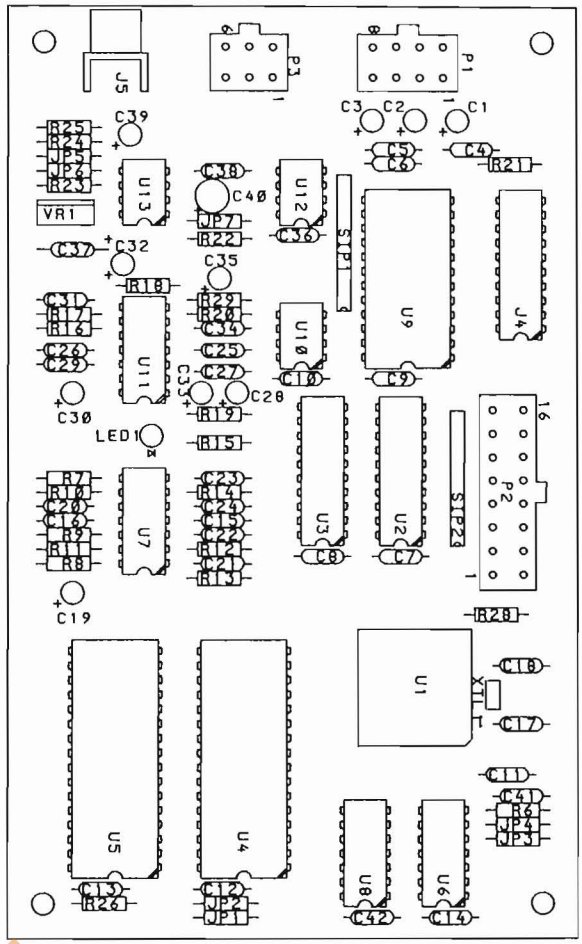


Premier Technology			
TITLE: AUXILIARY SOUND BOARD (A20) SCHEMATIC DIAGRAM			
DRAWN: C.B.	APPROVED: RHM	DATE: 4-2-91	MA-1604

GO TILFER®



AUXILIARY SOUND BOARD (A20) COMPONENT LOCATION



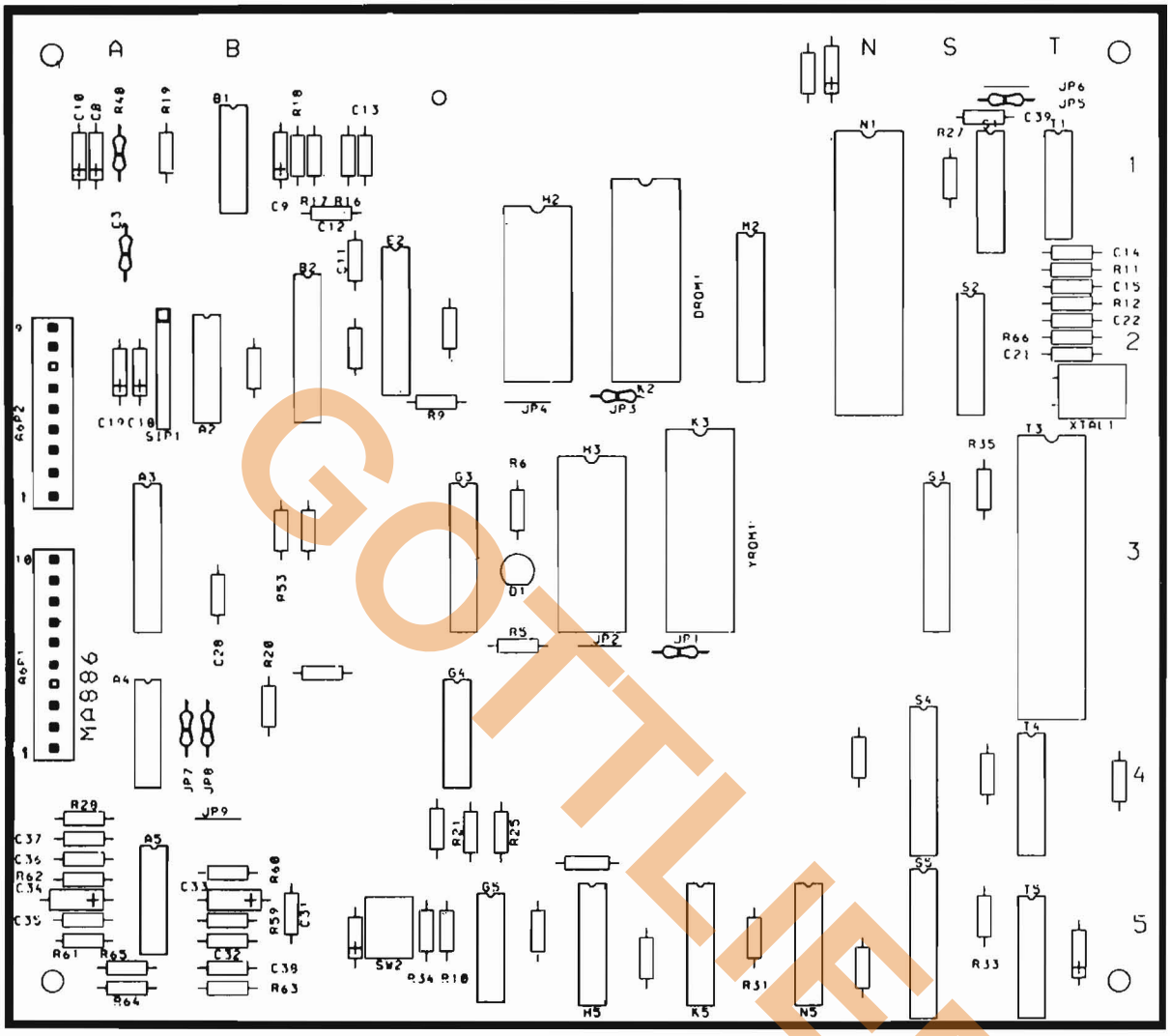
AUXILIARY SOUND BOARD (A20) PARTS LIST

REFERENCE	DESCRIPTION	PART NUMBER
A20	Auxiliary Sound Board	MA-1604
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, JP2, 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, 74HCT374, Octal"D" Flip Flop	XO-1024
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
	PCB Assembly, P/O *XO-1023	27922

GOTTLIEB

VI. WIRING AND SCHEMATIC DIAGRAMS, PARTS LISTS

SOUND BOARD (A6) COMPONENT LOCATION

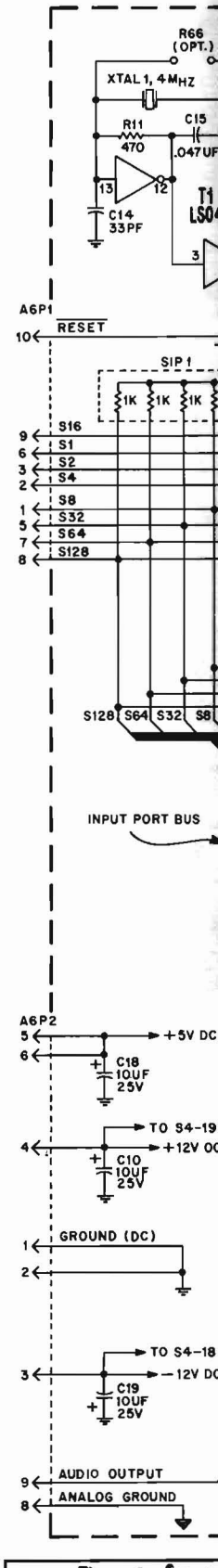


GOTTLIEB®

SOUND BOARD (A6) PARTS LIST

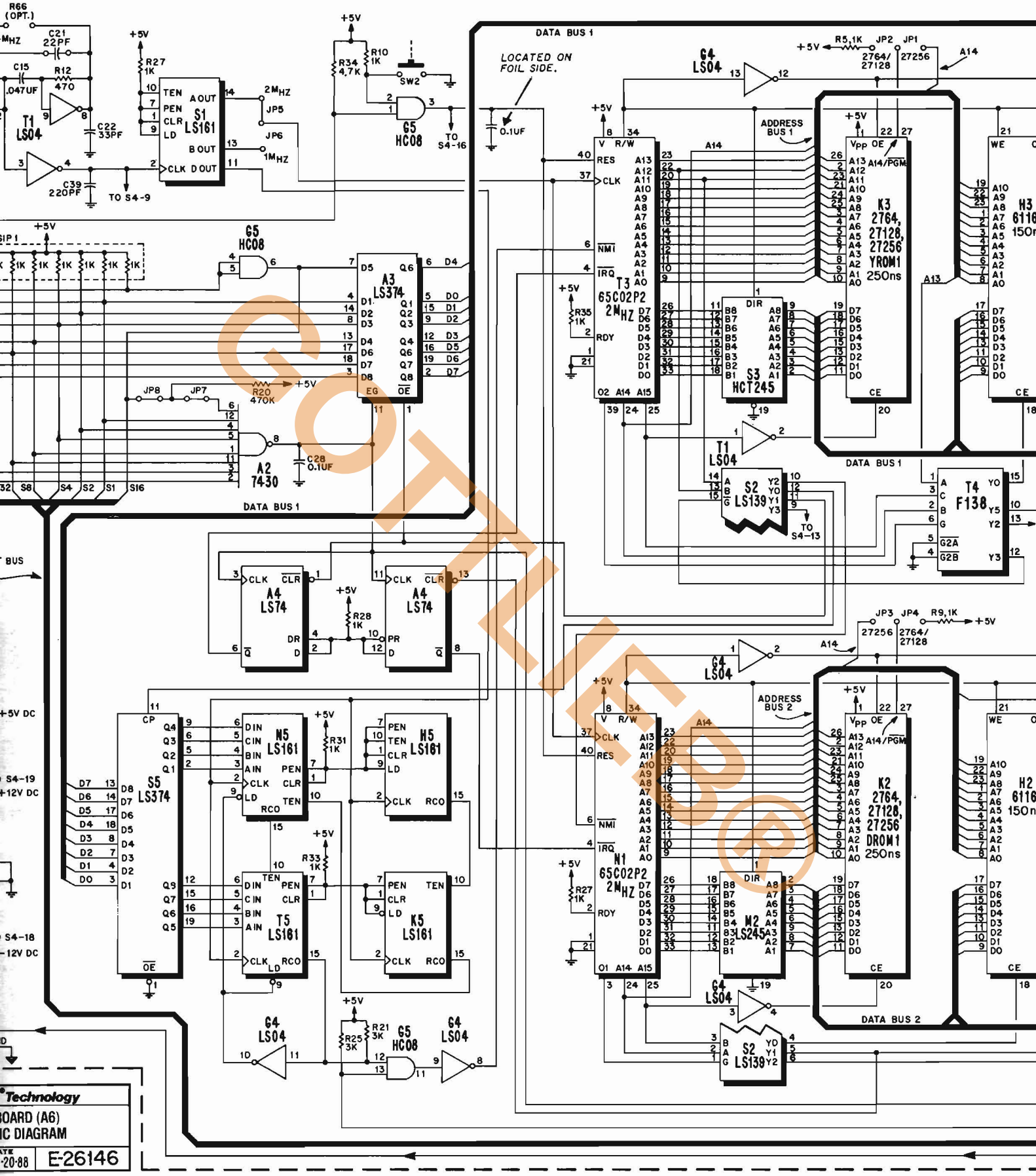
REFERENCE	DESCRIPTION	PART NUMBER
	Sound Board Assembly (1A6)	MA-1629
C13,C37	Capacitor, 1UF, 20%, 50V (Non-polar)	XO-746
C8,C9,C10, C18,C19, C33,C34 AND THREE UNMARKED CAPACITORS	Capacitor, 10UF, 20%, 25V (Tantalum)	XO-127
C11,C12	Capacitor, 10PF, +80%-20%, 50V	XO-635
C14,C22	Capacitor, 33PF, 10%, 100V	XO-896
C15	Capacitor, .047UF, 20%, 50V	XO-638
C21	Capacitor, 22PF, 10%, 50V	XO-633
C28 AND FIFTEEN UNMARKED CAPACITORS	Capacitor, 0.1UF, +80%-20%, 50V	XO-230
C31,C32	Capacitor, 0.1UF, 10%, 100V	XO-784
C35	Capacitor, 1000PF, 10%, 100V	XO-296
C36	Capacitor, 2200PF, 10%, 100V	XO-289
C38	Capacitor, .0033UF, 10%, 100V	XO-600
C39	Capacitor, 220PF, 10%, 100V	XO-694
D1	Diode, MV5752, (LED, Red)	XO-270
R5,R9,R10, R27,R28,R31, R33,R35	Resistor, 1K Ohm, 5%, 1/4W	XO-5
R6	Resistor, 240 Ohm, 5%, 1/4W	XO-173
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

REFERENCE	DESCRIPTION	PART NUMBER
R20,R34	Resistor, 4.7K Ohm, 5%, 1/4W	XO-7
R61-R64	Resistor, 33K Ohm, 5%, 1/4W	XO-43
R59,R60	Resistor, 100K Ohm, 5%, 1/4W	XO-45
R65	Resistor, 27K Ohm, 5%, 1/4W	XO-11
A2	IC, 7430, 8 Input NAND Gate	XO-643
A3,B2,S5	IC, 74LS374, Octal "D" Flip Flop	XO-96
A4	IC, 74LS74, Dual "D" Flip Flop	XO-434
A5	IC, MC3403P, Quad Op-Amp	XO-953
B1	IC, MC3403P, Quad Op-Amp	XO-953
E2	IC, AD7528J, Multiplier DAC	XO-647
G3	IC, 74LS377, Octal "D" Flip Flop	XO-97
G4,T1	IC, 74LS04, Hex Inverter	XO-418
G5	IC, 74HC08, Quad 2 Input "AND" Gate	XO-872
H2,H3	IC, 6116LP-15, 2K X 8 RAM	XO-928
H5,K5,N5 S1,T5	IC, 74LS161, Synchronous Presettable Binary Counter	XO-440
K2,K3	IC, Specified Per Game	
M2	IC, 74LS245, Octal Bus Transceiver	XO-79
N1,T3	IC, 65C02P2 or 6502A, CPU XO-927 or	XO-893
S2	IC, 74LS139, Dual 1 of 4 Decoder	XO-419
S3	IC, 74HCT245, Octal Bus Tranceiver	XO-891
T4	IC, 74F138 , 1 of 8 Decoder	XO-1041
SIP 1	Resistor Pack 1K Ohm X 8	XO-493
SW2	Switch, Pushbutton	XO-897
XTAL 1	Crystal, 4 MHZ	XO-366
A6P1,A6P2	Connector (2)	XO-879
	28 Pin Dip Socket (2)	XO-536
	Jumper, Resistor, 0 OHM (7)	XO-469
	20 Pin Dip Socket	XO-491

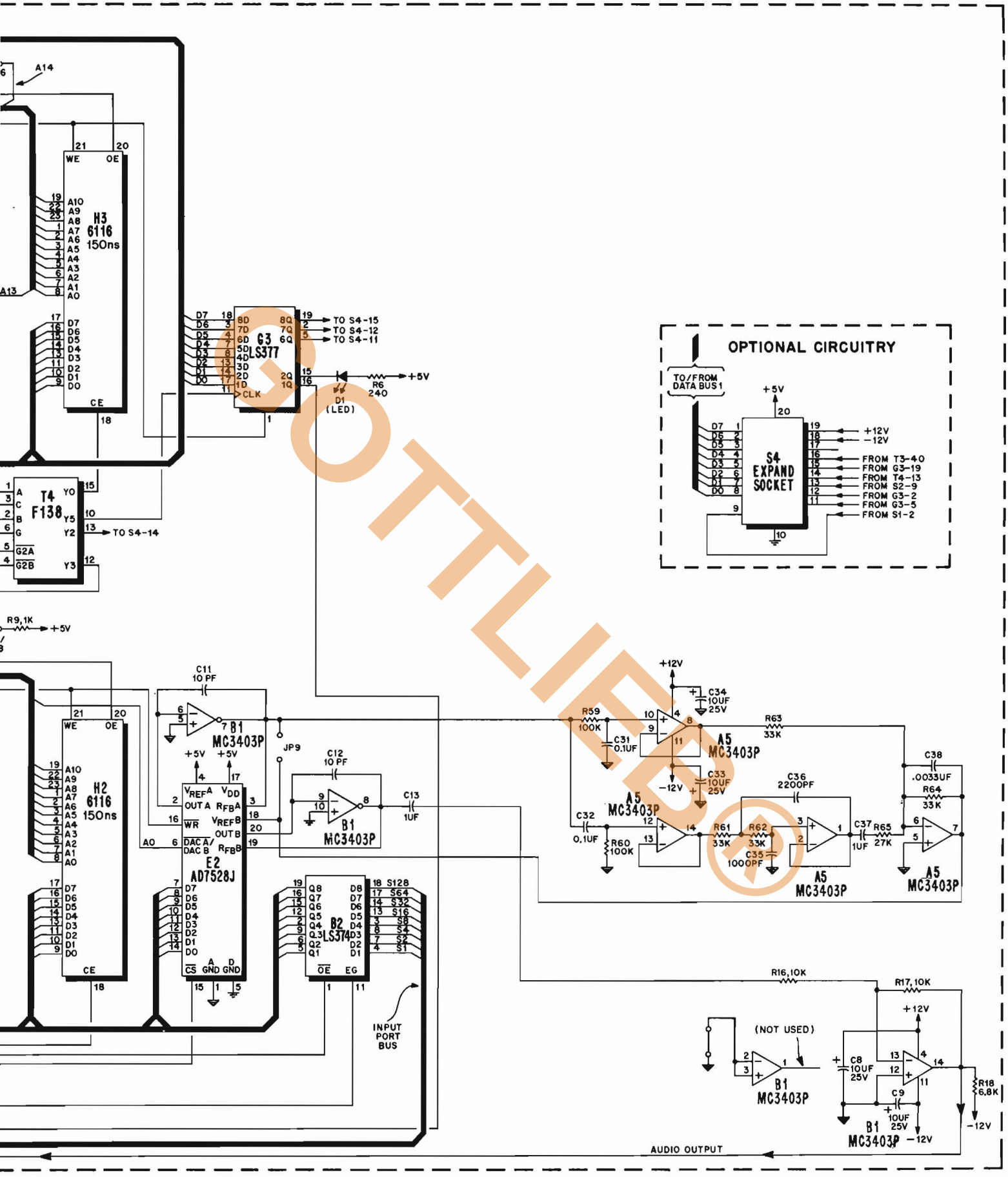


Premier® Technology

TITLE	
SOUND BOARD SCHEMATIC DIAG	
DRAWN B.P.S.	APPROVED RHM
DATE 9-20-88	


R66 (OPT.)
C21 22PF
C15 .047UF
R12 470
T1 LS04
C22 33PF
C39 220PF
TO S4-9
+5V
R27 1K
S1 LS161
TEN PEN CLR LD
AOUT BOUT CLK DOUT
2MHZ JP5
1MHZ JP6
R34 4.7K
R10 1K
SW2
G5 HC08
TO S4-16
DATA BUS 1
LOCATED ON FOIL SIDE.
0.1UF
G4 LS04
R5,1K JP2 JP1
2764/ 27128
27256
A14
ADDRESS BUS 1
T3 65C02P2 2MHZ
V R/W RES CLK NMI IRQ RDY
R35 1K
K3 2764, 27128, 27256 YROM1 250ns
Vpp OE A14/PGM CE
S3 HCT245
DIR
A13
WE
H3 6116 150n
T1 LS04
S2 LS139
TO S4-13
T4 F138
G2A G2B
A2 7430
C28 0.1UF
R20 470K
JP8 JP7
A3 LS374
D5 Q6 D4 D1 Q1 D0 D2 Q2 D1 D3 Q3 D2 D4 Q4 D3 D6 Q6 D5 D7 Q7 D6 D8 Q8 D7 EG OE
G5 HC08
SIP1 1K 1K 1K 1K 1K 1K
S32 S8 S4 S2 S1 S16
DATA BUS 1
A4 LS74
CLK CLR D Q DR PR
R28 1K
JP3 JP4 R9,1K
27256 2764/ 27128
G4 LS04
ADDRESS BUS 2
N1 65C02P2 2MHZ
K2 2764, 27128, 27256 DROM1 250ns
M2 LS245
S5 LS374
N5 LS161
T5 LS161
H5 LS161
K5 LS161
DIN CIN BIN AIN PEN CLR LD TEN RCO
R31 1K
R33 1K
R27 1K
R21 3K
R25 3K
G4 LS04
G5 HC08
G4 LS04
S2 LS139
DATA BUS 2
+5V DC
+12V DC
S4-19
S4-18
-12V DC
Technology
BOARD (A6)
IC DIAGRAM
E-26146

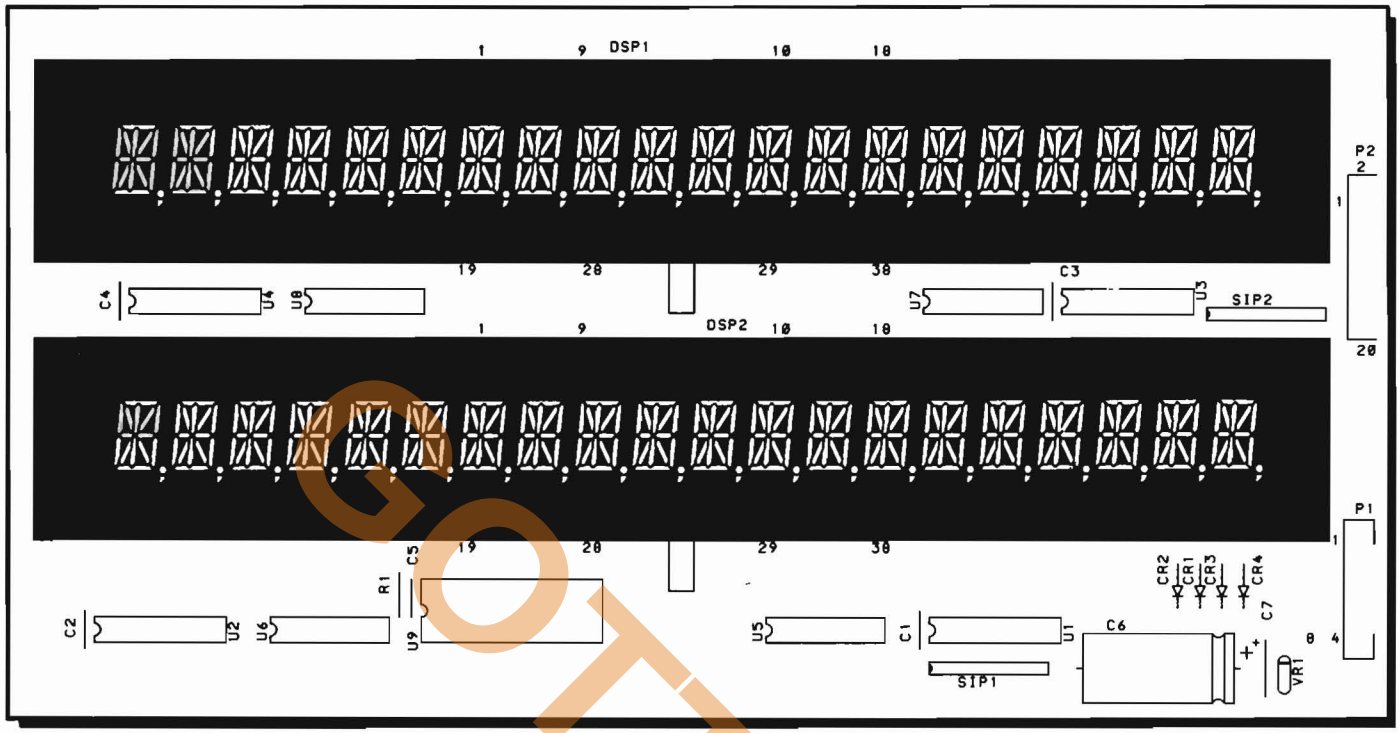
GOTEK FDD®


A14
H3
6116
150ns
WE
OE
CE
A13
G3
LS377
TO S4-15
TO S4-12
TO S4-11
+5V
R6
240
D1
(LED)
T4
F138
TO S4-14
R9,1K
+5V
OPTIONAL CIRCUITRY
TO/FROM
DATA BUS1
S4
EXPAND
SOCKET
+12V
-12V
FROM T3-40
FROM G3-19
FROM T4-13
FROM S2-9
FROM G3-2
FROM G3-5
FROM S1-2
C11
10 PF
B1
MC3403P
JP9
C12
10 PF
C13
1UF
H2
6116
150Ns
E2
AD7528J
B2
LS374
INPUT
PORT
BUS
R59
100K
C31
0.1UF
C34
10UF
25V
R63
33K
A5
MC3403P
C33
10UF
25V
C36
2200PF
C32
0.1UF
R60
100K
R61
33K
R62
33K
C35
1000PF
C37
1UF
R65
27K
C38
.0033UF
R64
33K
R16,10K
R17,10K
(NOT USED)
C8
10UF
25V
C9
10UF
25V
R18
6.8K
AUDIO OUTPUT

BOTTLIEB®

VI. WIRING AND SCHEMATIC DIAGRAMS, PARTS LISTS

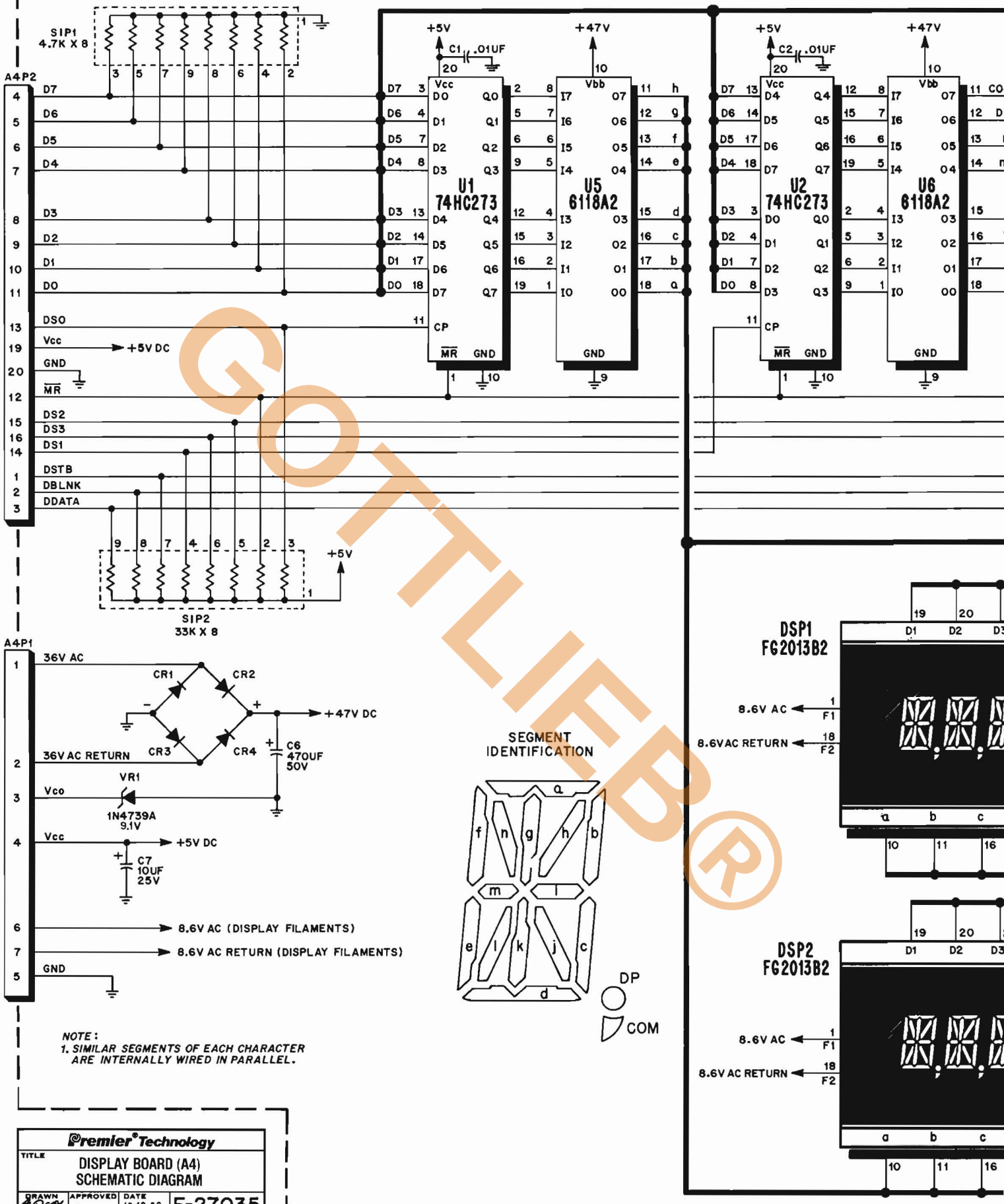
DISPLAY BOARD (A4) COMPONENT LOCATION



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

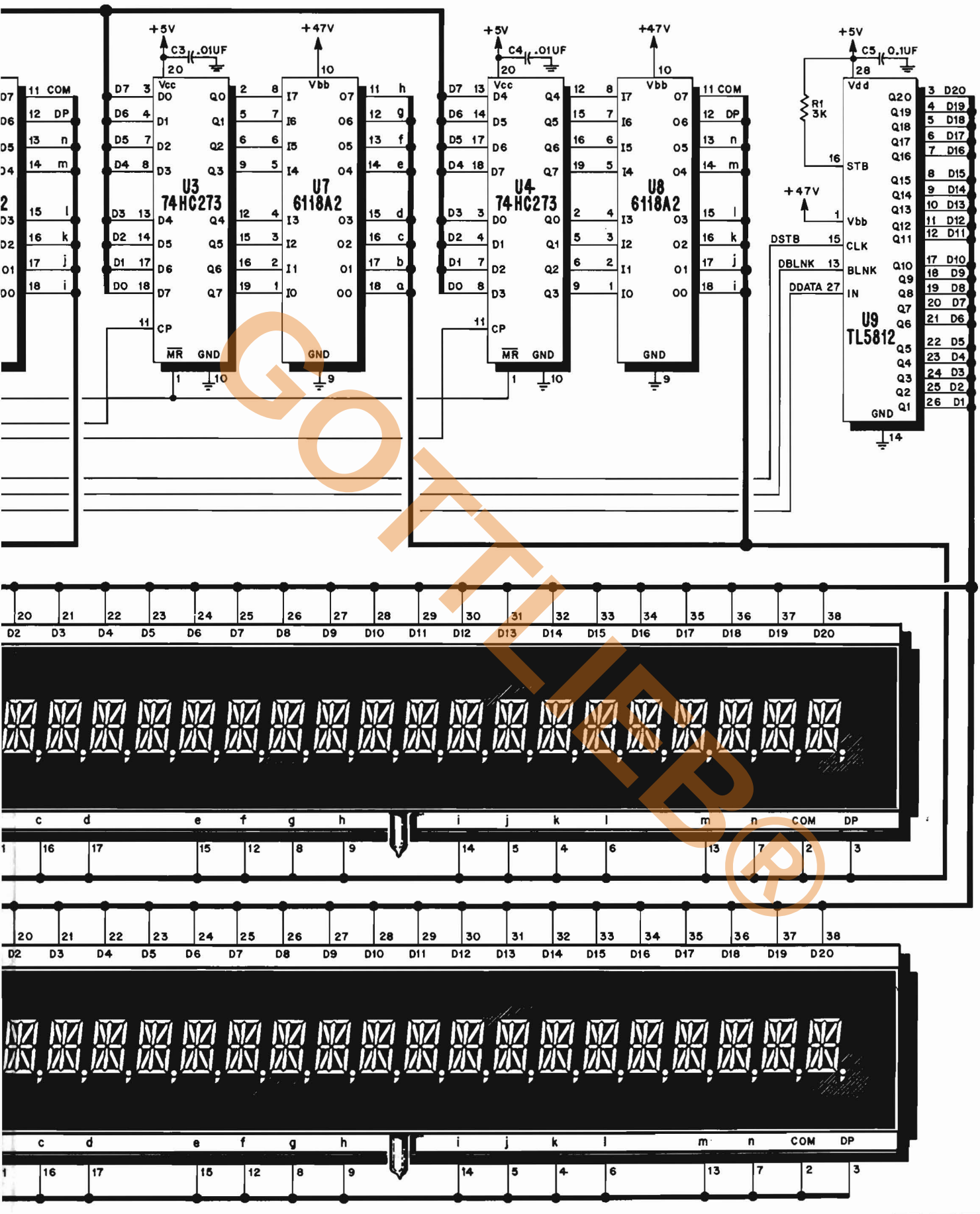
GOTTLIEB®



NOTE:
1. SIMILAR SEGMENTS OF EACH CHARACTER ARE INTERNALLY WIRED IN PARALLEL.

GOTTLIEB®

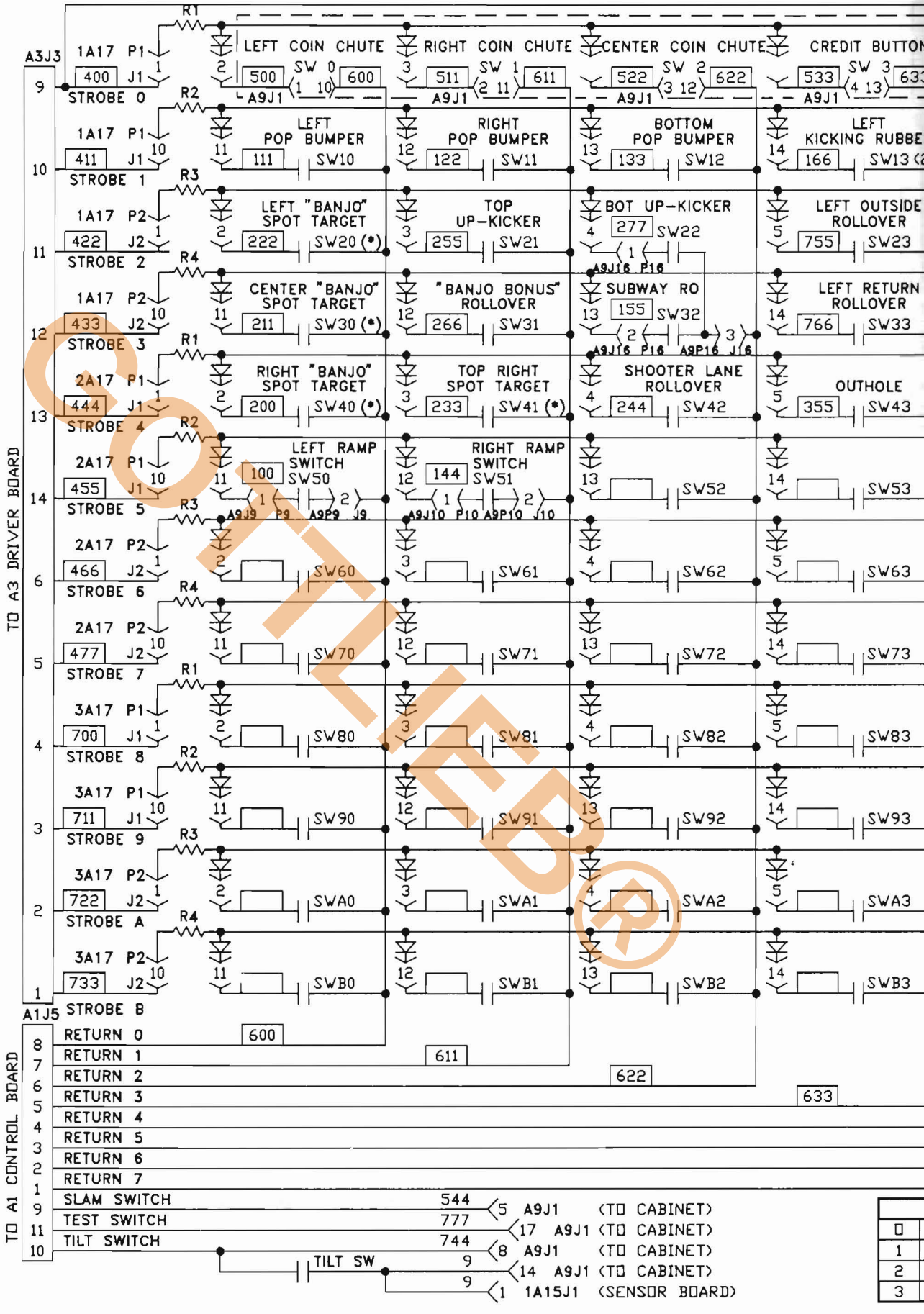
Premier® Technology			
TITLE: DISPLAY BOARD (A4) SCHEMATIC DIAGRAM			
DRAWN: R.P.S.	APPROVED: RHM	DATE: 10-12-89	E-27035


+5V
C3 .01UF
+47V
U3
74HC273
U7
6118A2
+5V
C4 .01UF
+47V
U4
74HC273
U8
6118A2
+5V
C5 0.1UF
R1
3K
+47V
U9
TL5812
DSTB
DBLNK
DDATA
STB
CLK
BLNK
IN
Vdd
Vbb
GND
COM
DP

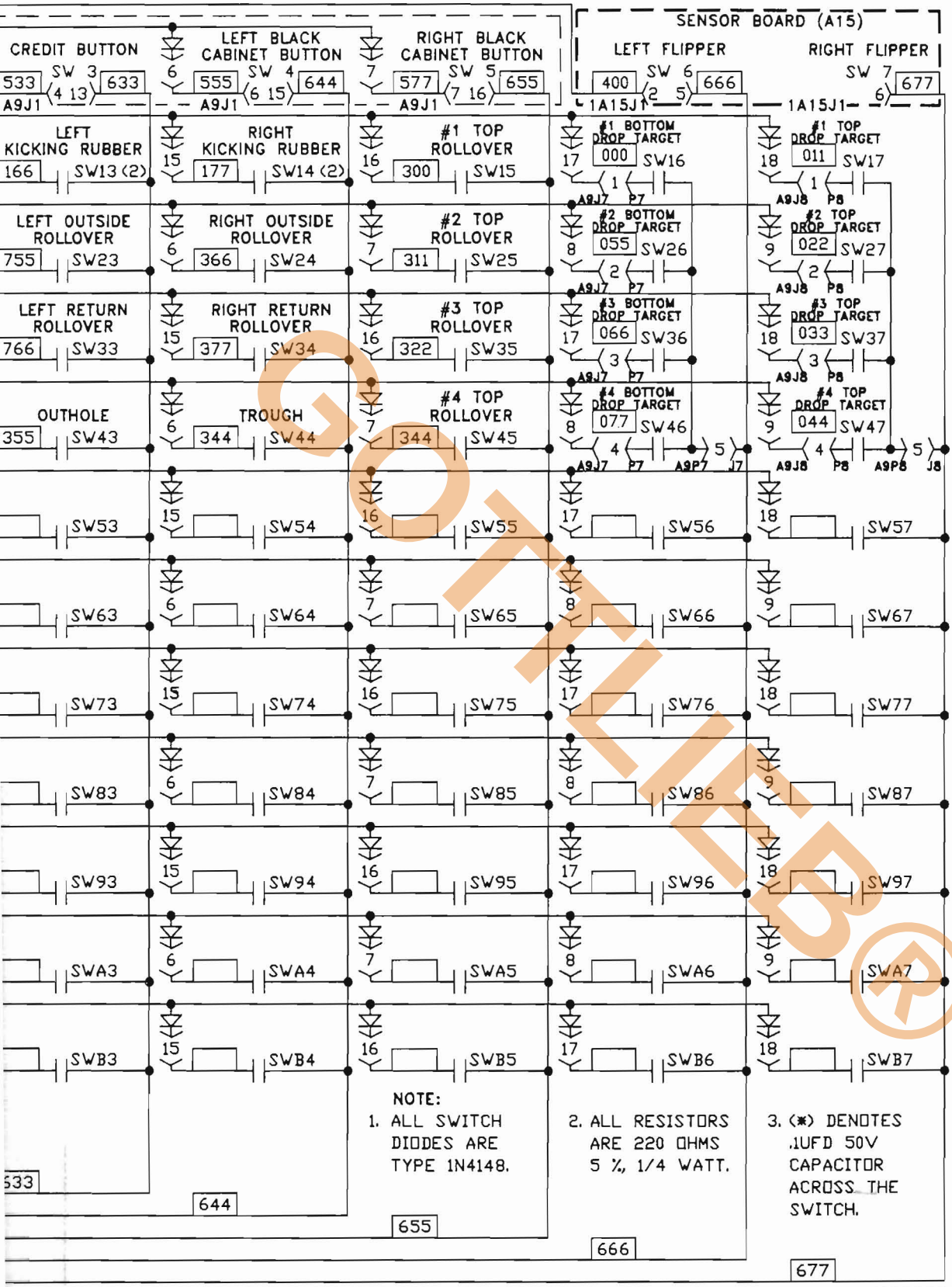
GOTTLIEB®

SERVICE NOTES

GOTTLIEB®


TO A3 DRIVER BOARD
A3J3
STROBE 0
STROBE 1
STROBE 2
STROBE 3
STROBE 4
STROBE 5
STROBE 6
STROBE 7
STROBE 8
STROBE 9
STROBE A
STROBE B
LEFT COIN CHUTE
RIGHT COIN CHUTE
CENTER COIN CHUTE
CREDIT BUTTON
LEFT POP BUMPER
RIGHT POP BUMPER
BOTTOM POP BUMPER
LEFT KICKING RUBBE
LEFT "BANJO" SPOT TARGET
TOP UP-KICKER
BOT UP-KICKER
LEFT OUTSIDE ROLLOVER
CENTER "BANJO" SPOT TARGET
"BANJO BONUS" ROLLOVER
SUBWAY RO
LEFT RETURN ROLLOVER
RIGHT "BANJO" SPOT TARGET
TOP RIGHT SPOT TARGET
SHOOTER LANE ROLLOVER
OUTHOLE
LEFT RAMP SWITCH
RIGHT RAMP SWITCH
TO A1 CONTROL BOARD
A1J5
RETURN 0
RETURN 1
RETURN 2
RETURN 3
RETURN 4
RETURN 5
RETURN 6
RETURN 7
SLAM SWITCH
TEST SWITCH
TILT SWITCH
TILT SW
(TO CABINET)
(SENSOR BOARD)

COPILEB®



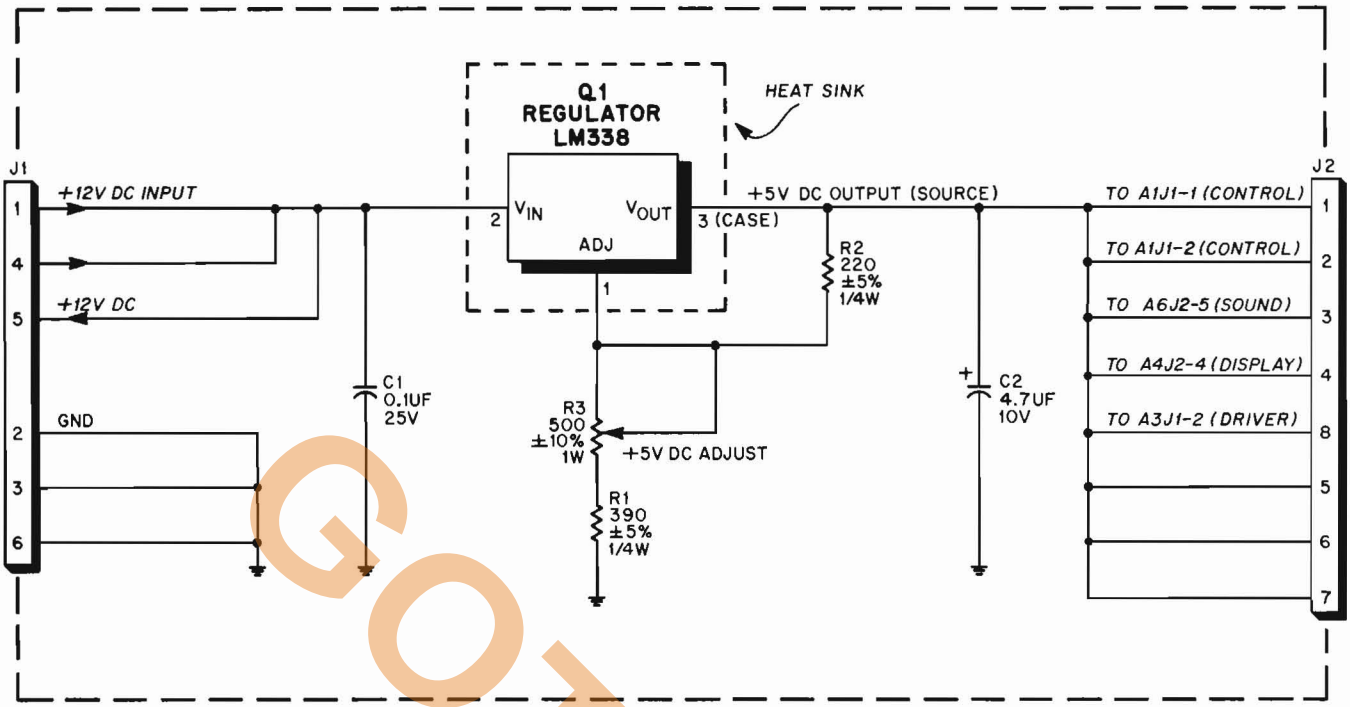
NOTE:
1. ALL SWITCH DIODES ARE TYPE 1N4148.
2. ALL RESISTORS ARE 220 OHMS 5 %, 1/4 WATT.
3. (*) DENOTES .1UFD 50V CAPACITOR ACROSS THE SWITCH.

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

Premier Technology			
TITLE: SWITCH MATRIX SCHEMATIC DIAGRAM			
USED ON: #729	DRAWN: RLM	DATE: 03-12-91	27907

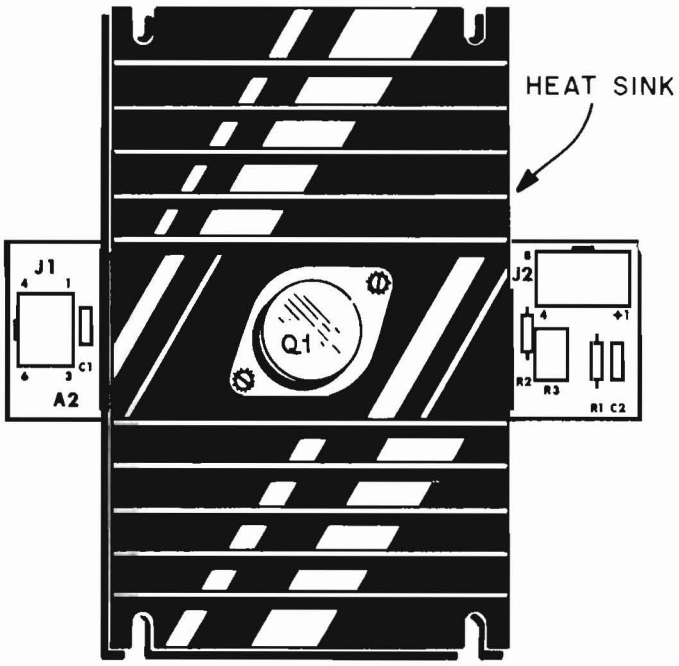
GOTTLIEB®

VI. WIRING AND SCHEMATIC DIAGRAMS, PARTS LISTS



Premier Technology			
TITLE: POWER SUPPLY (A2) SCHEMATIC DIAGRAM			
DRAWN: G.P.S.	APPROVED: RHM	DATE: 12 FEB 85	E-24441

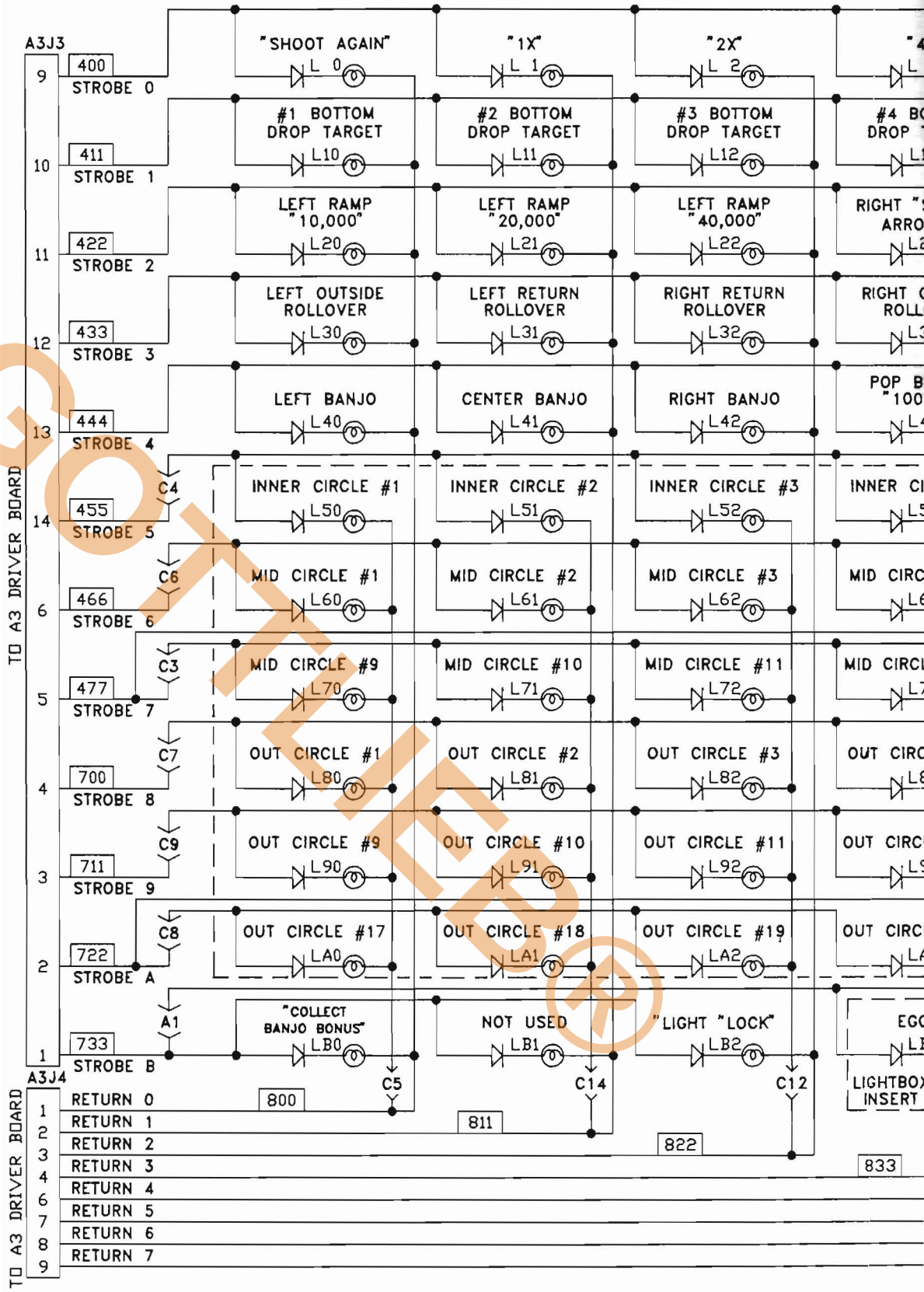
POWER SUPPLY (A2) COMPONENT LOCATION



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-226
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

GOTTLIEB®



NOTE:

1. ALL LAMP DIODES ARE TYPE 1N4004.
2. ALL LAMPS ARE TYPE #44.
3. A = A9J4/P4 TO LIGHTBOX INSERT
   B = A9J13/P13
   C = 1A22J1 TO A22 LAMP BOARD

GOTTLIEB®

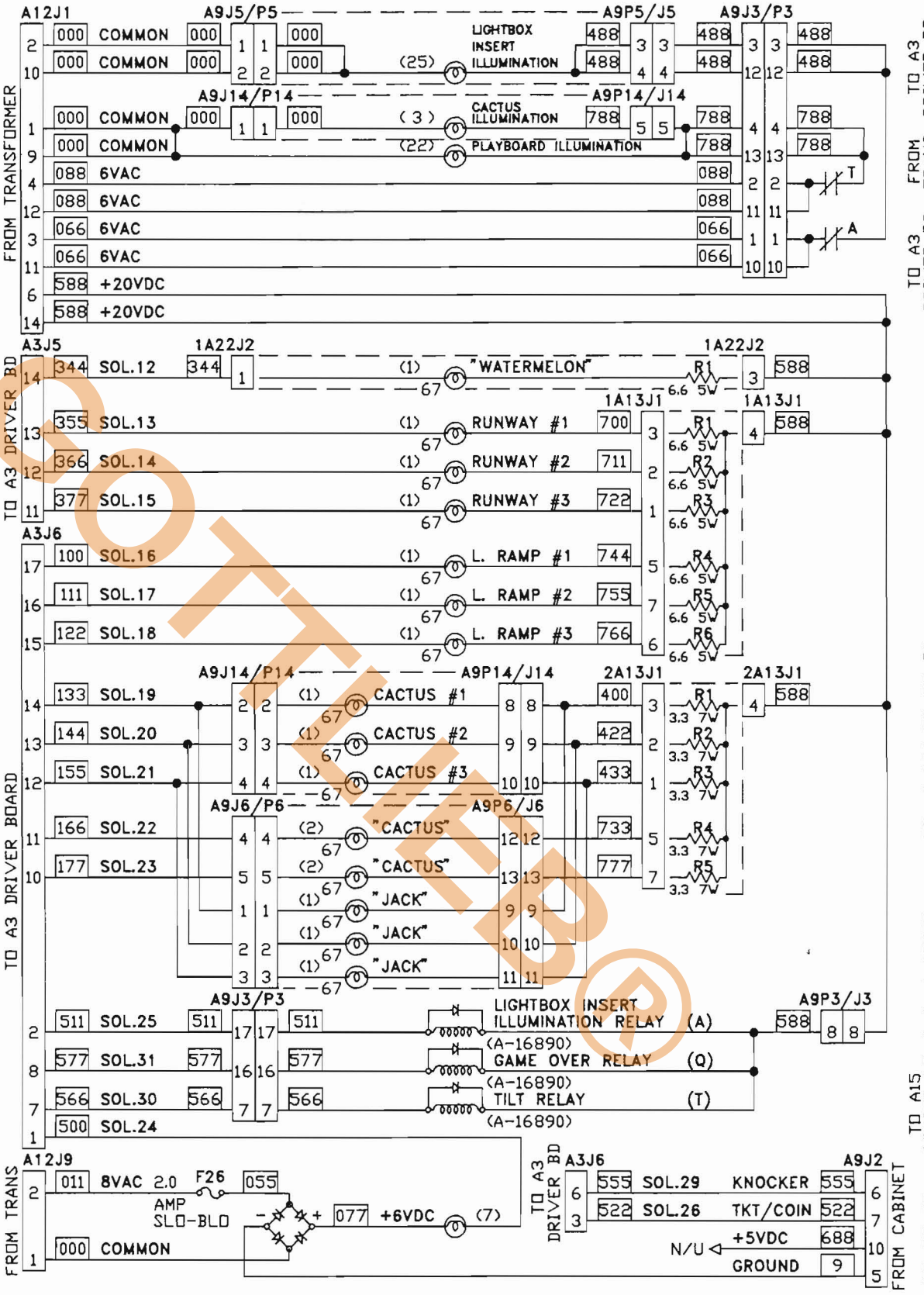


SERT
OARD

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

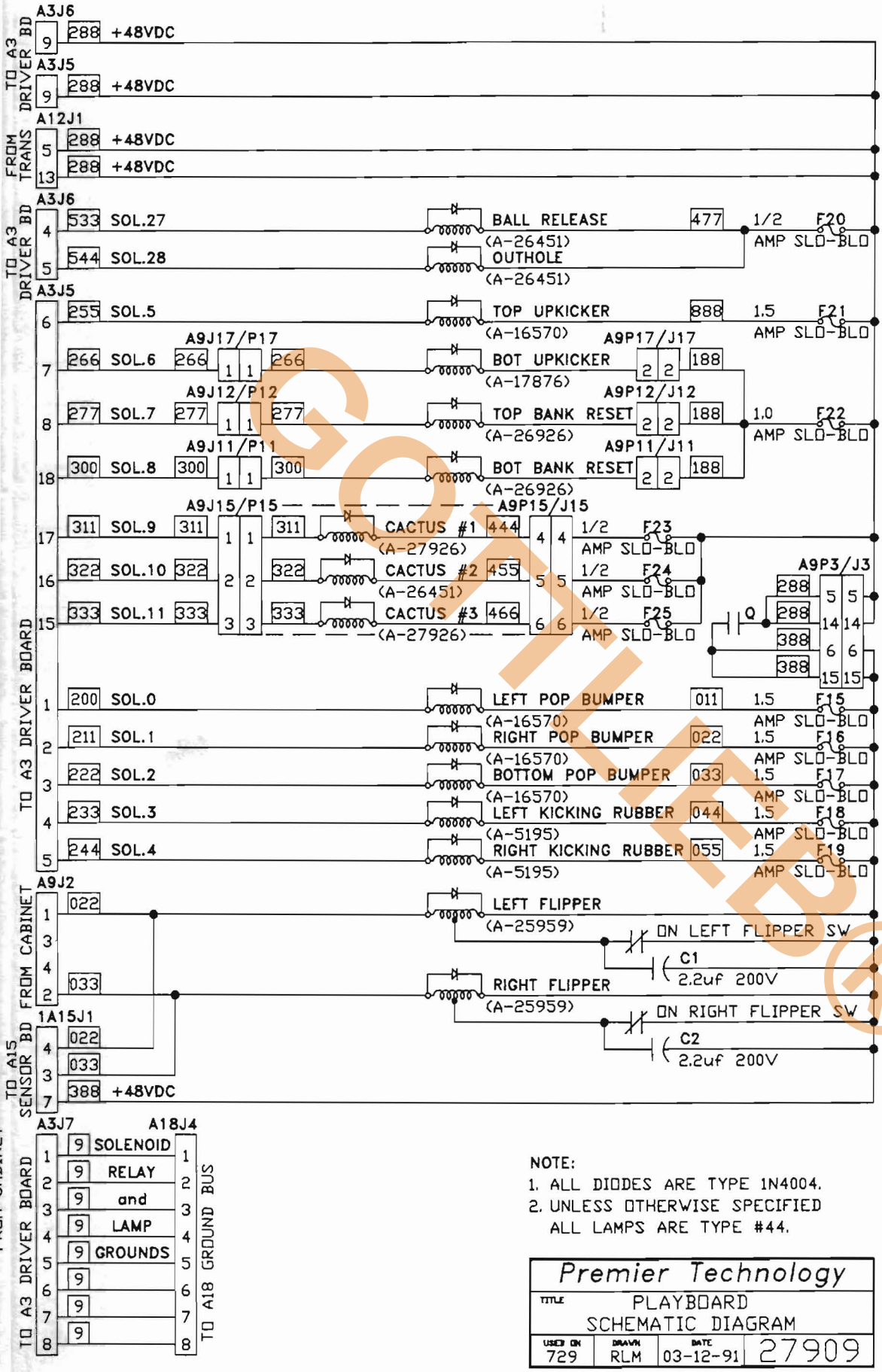
Premier Technology			
TITLE: LAMP MATRIX SCHEMATIC DIAGRAM			
USED ON: #729	DRAWN: RLM	DATE: 03-12-91	27908

GOTTLIEB®



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

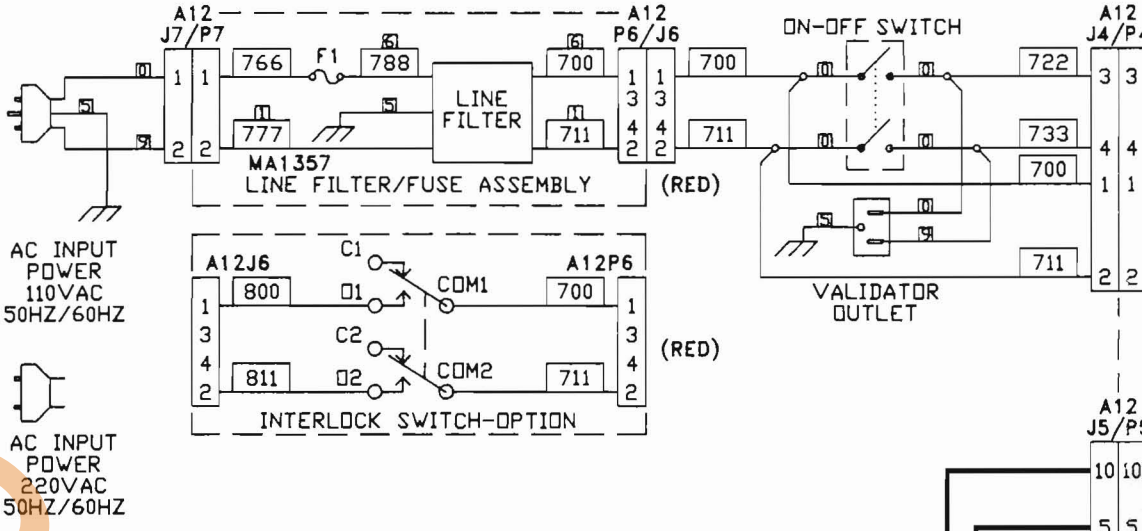
SOTTLER®

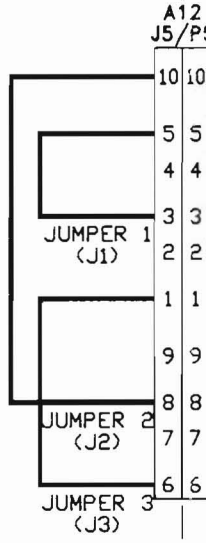


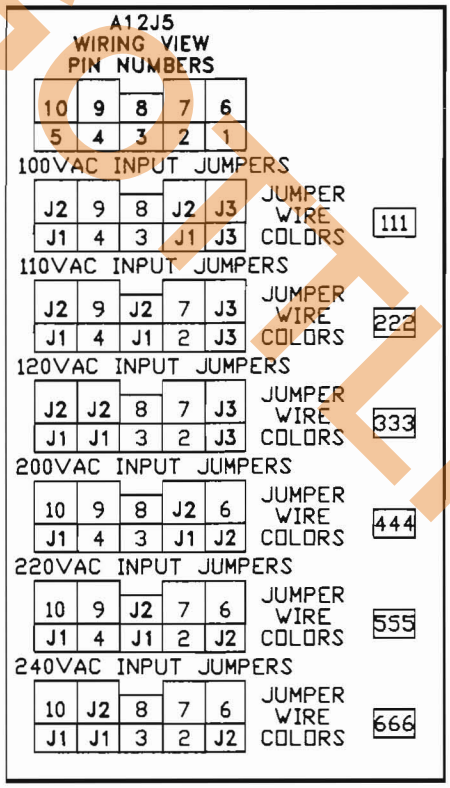
NOTE:
1. ALL DIODES ARE TYPE 1N4004.
2. UNLESS OTHERWISE SPECIFIED ALL LAMPS ARE TYPE #44.

Premier Technology			
TITLE: PLAYBOARD SCHEMATIC DIAGRAM			
USED ON: 729	DRAWN: RLM	DATE: 03-12-91	27909

GOTTLIEB®







NOTES:

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

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

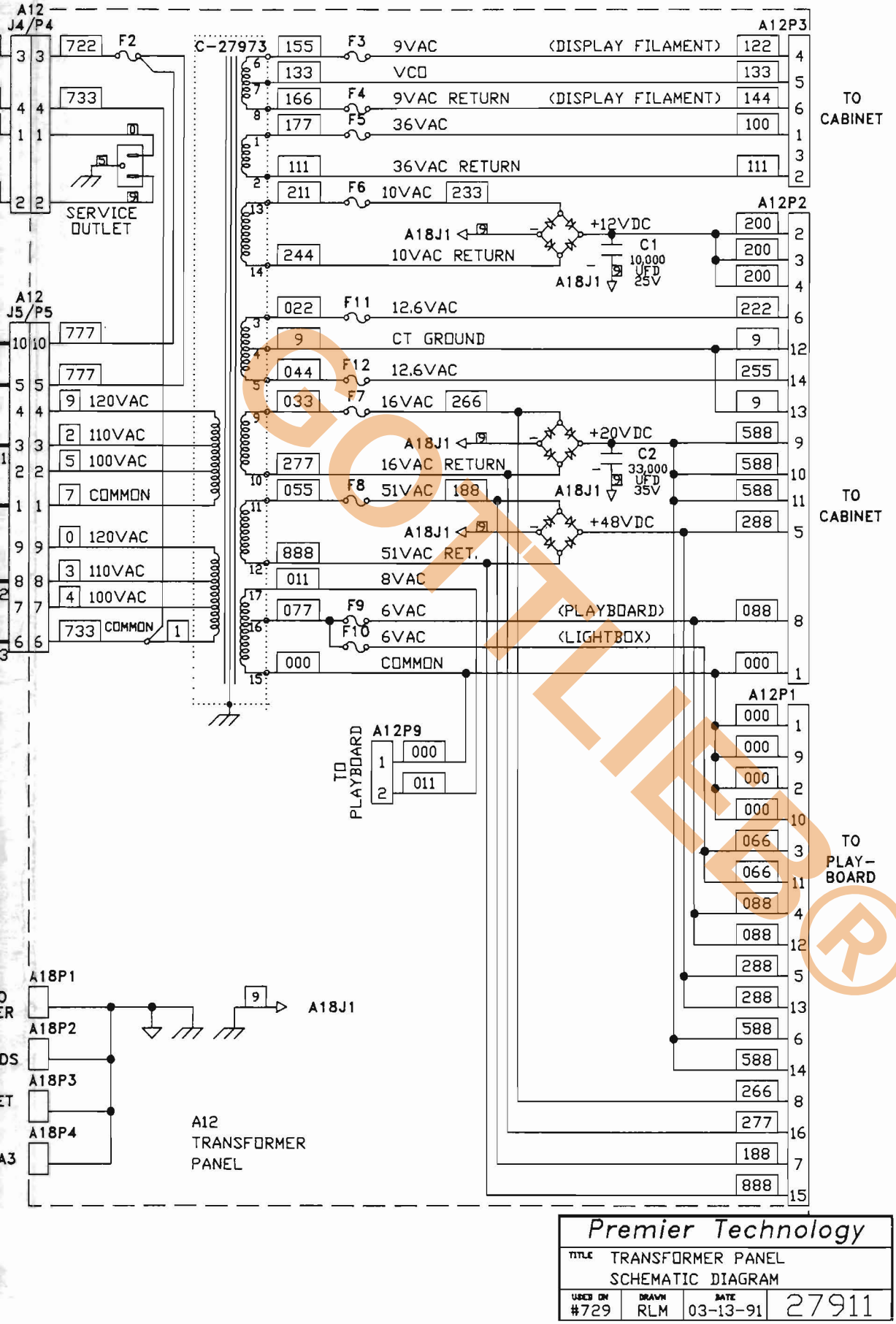
FUSE DESIGNATIONS TABLE				
FUSE	RATING	PART NO.	USAGE	
F1	8.0A SLO-BLO	EL26	LINE INPUT	110VAC
	4.0A SLO-BLO	EL33	LINE INPUT	220VAC
F2	5.0A SLO-BLO	EL8	PRIMARY POWER	110VAC
	2.5A SLO-BLO	EL21	PRIMARY POWER	220VAC
F3	1/2A	EL28	DISPLAY FILAMENT	9VAC
F4	1/2A	EL28	DISPLAY FILAMENT	9VAC
F5	1/4A SLO-BLO	EL5	DISPLAYS	36VAC
F6	2.5A SLO-BLO	EL21	POWER SUPPLY	10VAC
F7	10.0A SLO-BLO	EL36	CONTROLLED LAMPS	16VAC
F8	8.0A SLO-BLO	EL26	SOLENOIDS	51VAC
F9	7.5A	EL22	PLAYFIELD ILLUMINATION	6VAC
F10	7.5A	EL22	LIGHTBOX INSERT ILLUMINATION	6VAC
F11	3.0A SLO-BLO	EL9	AUXILLIARY POWER SUPPLY	12.6VAC
F12	3.0A SLO-BLO	EL9	AUXILLIARY POWER SUPPLY	12.6VAC

GROUNDS TO TRANSFORMER

GROUNDS TO CABINET

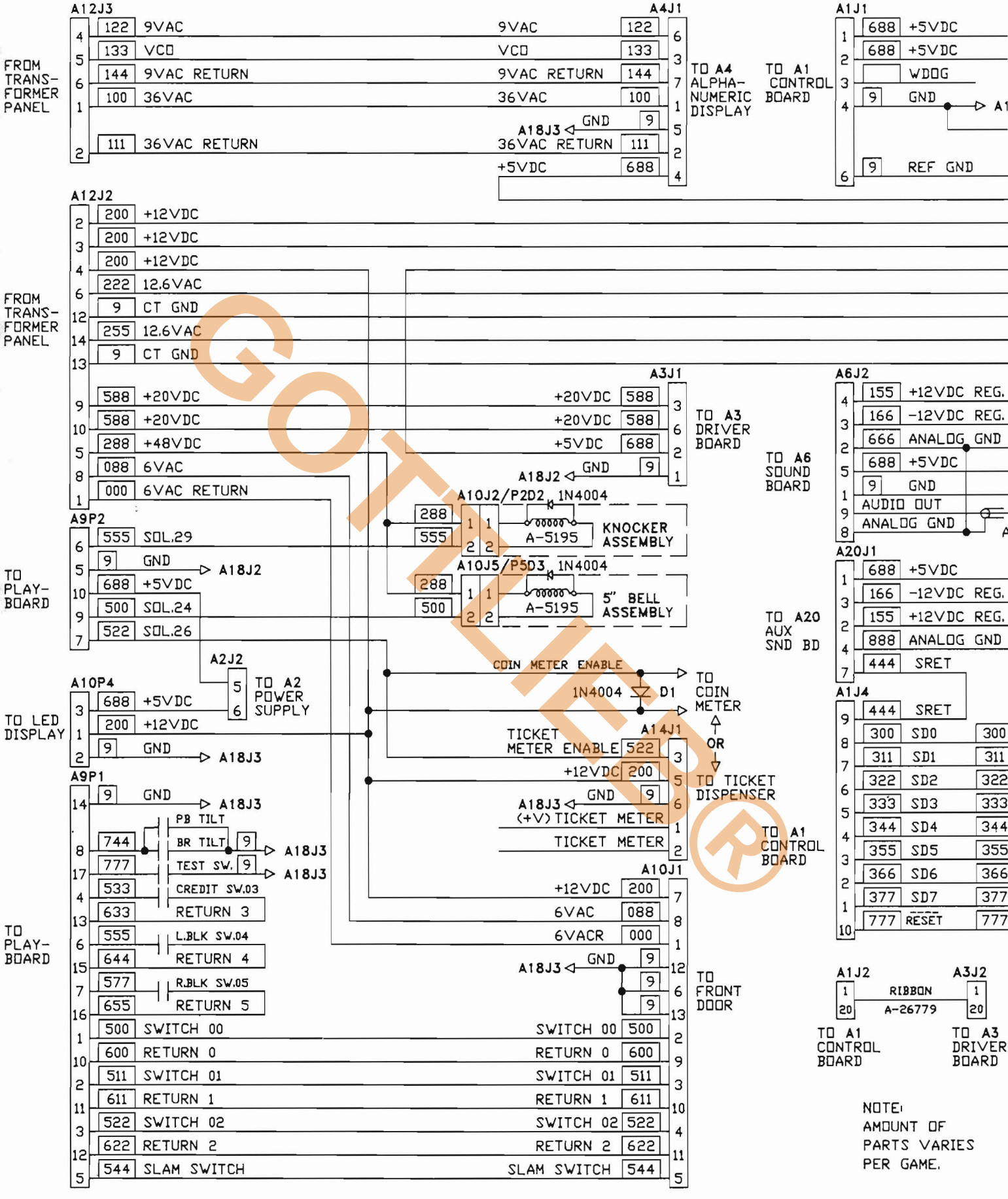
GROUNDS TO A3 DRIVER BOARD

GOTTLIEB®

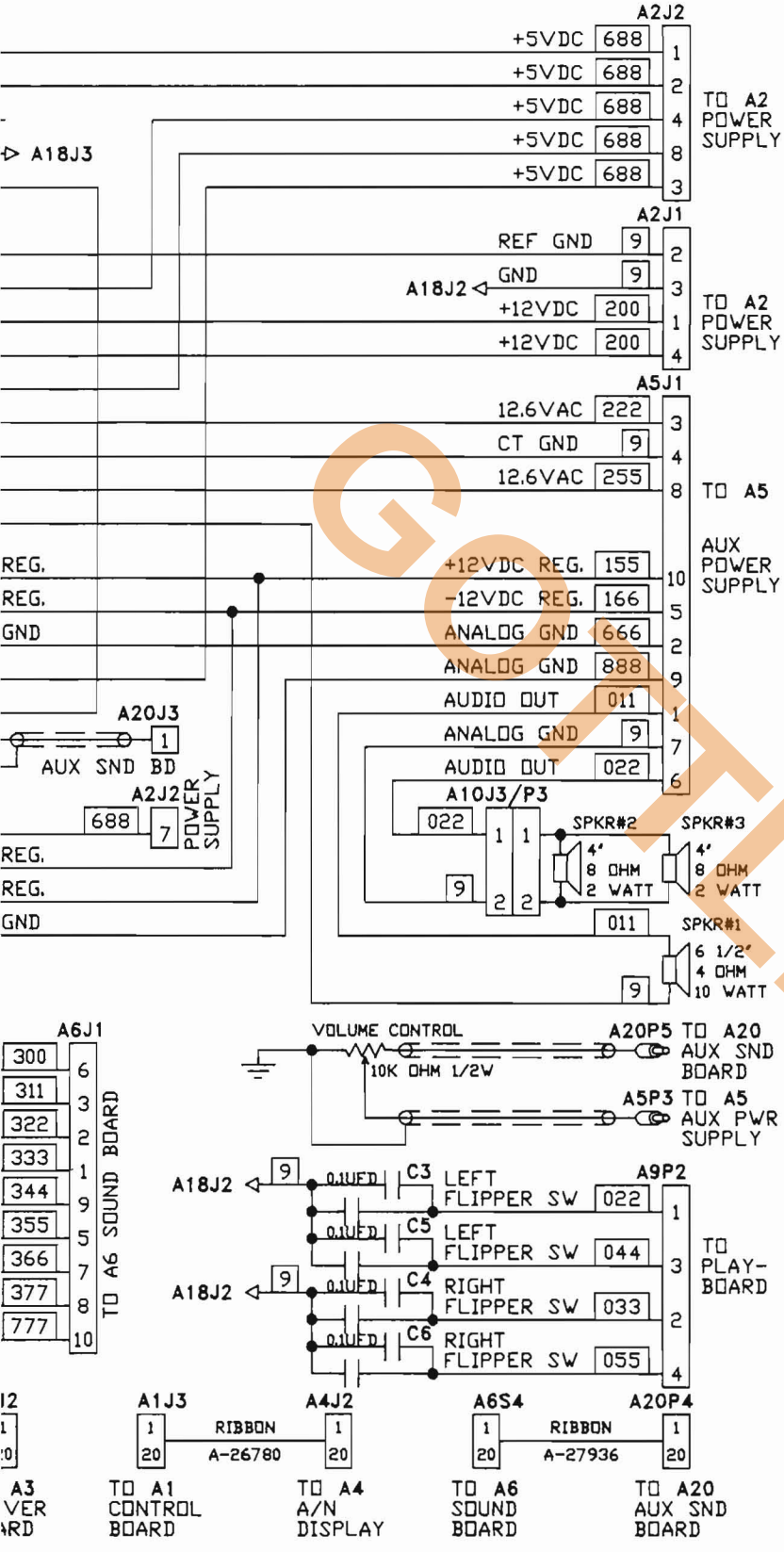


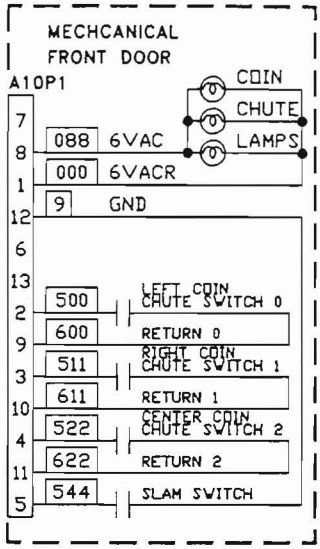
Premier Technology			
TITLE: TRANSFORMER PANEL SCHEMATIC DIAGRAM			
USED ON: #729	DRAWN: RLM	DATE: 03-13-91	27911

GOTLIEB®


A12J3
FROM TRANS-FORMER PANEL
122 9VAC
133 VCO
144 9VAC RETURN
100 36VAC
111 36VAC RETURN
A4J1
TO A4 ALPHA-NUMERIC DISPLAY
A18J3
GND 9
+5VDC 688
A1J1
TO A1 CONTROL BOARD
688 +5VDC
688 +5VDC
WDOG
9 GND
9 REF GND
A12J2
FROM TRANS-FORMER PANEL
200 +12VDC
222 12.6VAC
9 CT GND
255 12.6VAC
588 +20VDC
288 +48VDC
088 6VAC
000 6VAC RETURN
A3J1
TO A3 DRIVER BOARD
A18J2
A6J2
TO A6 SOUND BOARD
155 +12VDC REG.
166 -12VDC REG.
666 ANALOG GND
AUDIO OUT
ANALOG GND
A10J2/P2D2 1N4004
KNOCKER ASSEMBLY
A-5195
A10J5/P5D3 1N4004
5" BELL ASSEMBLY
A9P2
TO PLAY-BOARD
555 SOL.29
GND
500 SOL.24
522 SOL.26
A18J2
A20J1
TO A20 AUX SND BD
888 ANALOG GND
444 SRET
A2J2
TO A2 POWER SUPPLY
A10P4
TO LED DISPLAY
COIN METER ENABLE
1N4004 D1
TO COIN METER
OR
TICKET METER ENABLE
TO TICKET DISPENSER
A14J1
A18J3
A1J4
A9P1
PB TILT
BR TILT
TEST SW.
CREDIT SW.03
RETURN 3
L.BLK SW.04
RETURN 4
R.BLK SW.05
RETURN 5
744
777
533
633
555
644
577
655
A10J1
(+V) TICKET METER
TICKET METER
TO A1 CONTROL BOARD
6VAC
6VACR
TO FRONT DOOR
SWITCH 00
RETURN 0
SWITCH 01
RETURN 1
SWITCH 02
RETURN 2
SLAM SWITCH
A1J2
A3J2
RIBBON
A-26779
TO A1 CONTROL BOARD
TO A3 DRIVER BOARD
NOTE:
AMOUNT OF PARTS VARIES PER GAME.

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GOTTLIEB®

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 #729	DRAWN RLM	DATE 03-13-91	27910

VII. PARTS INFORMATION

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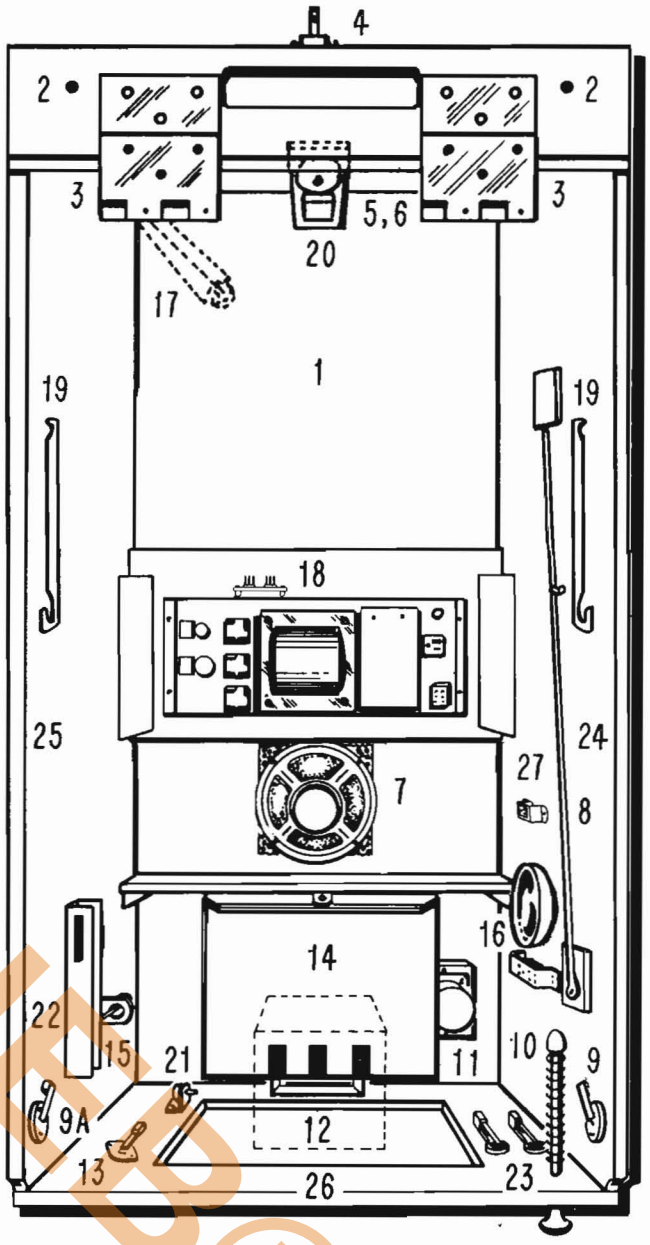
UNIQUE PARTS.....64

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VII. PARTS INFORMATION

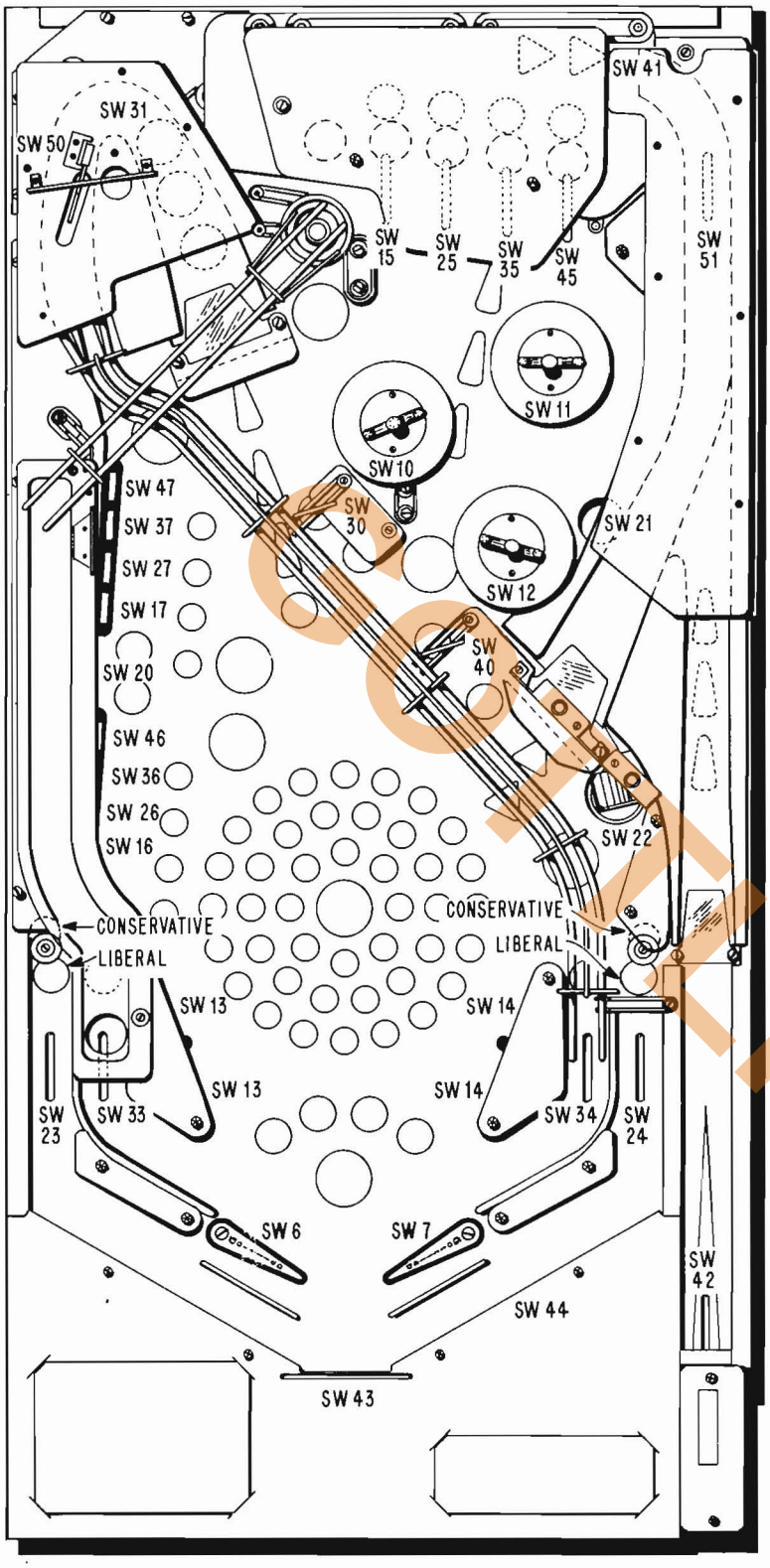
CABINET PARTS

ITEM	DESCRIPTION	PART NO.
1.	Cabinet	27970-729
2.	Lightbox Mounting Thumb Screw (2)	FA-162
	(Not Shown, For Reference Only, Part of Lightbox Assembly)	
3.	Butt Hinge (2)	26449
	(Attached to Lightbox)	
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	26423
9A.	Left Flipper Switch	26075
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-1347
	Slam Switch (N/O)	26130
	6V DC Lamp, Wedge Base	FD-2
	Frame, Door	FD-13
	Two Chute Door	24159
	Black Button Bezel	FD-14
	Entry/Reject Button	FD-15
	Button Spring	FD-16
	Reject Flap	FD-17
	Clamp, Frame	FD-18
	Flat Lock and Cam Assembly	FD-19
	Base Plate with Pivot and Stud	FD-20
	Microswitch Bracket	FD-21
	Clear Plastic Cover for Microswitch	FD-22
	Coin Microswitch with Wire	FD-23
	Lampholder	FD-24
	Black Reject Bezel	FD-26
13.	Replay Switch Assembly	18092
14.	Cashbox	25309
	Cover	25315
	Liner (Small) (3)	24870
	Liner (Large) (2)	24871
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)	26684
	Leg Bolt (8)	3775
	3" Leg Adjuster (4)	MH-21
	3/8-16", Jam Nut (8)	FA-665
18.	Transformer Panel Assembly	MA-1609
	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, 7-1/2 Amp	EL-22
	F10, 7-1/2 Amp	EL-22
	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, 100 Ohm, 2W	27944
	Switch, PLAY/TEST	EL-57



ITEM	DESCRIPTION	PART NO.
22.	Ball Roll Tilt	
	Housing and Switch Assembly	24394
	Switch	24393
23.	Button Holder and Switch (2)	23503
	Pushbutton (2) (Black)	24293
24.	Right Moulding (Not Shown)	22735
25.	Left Moulding (Not Shown)	22736
26.	Front Moulding (Not Shown)	16951
27.	Bracket, Voltage Outlet (Bill Acceptor)	18104

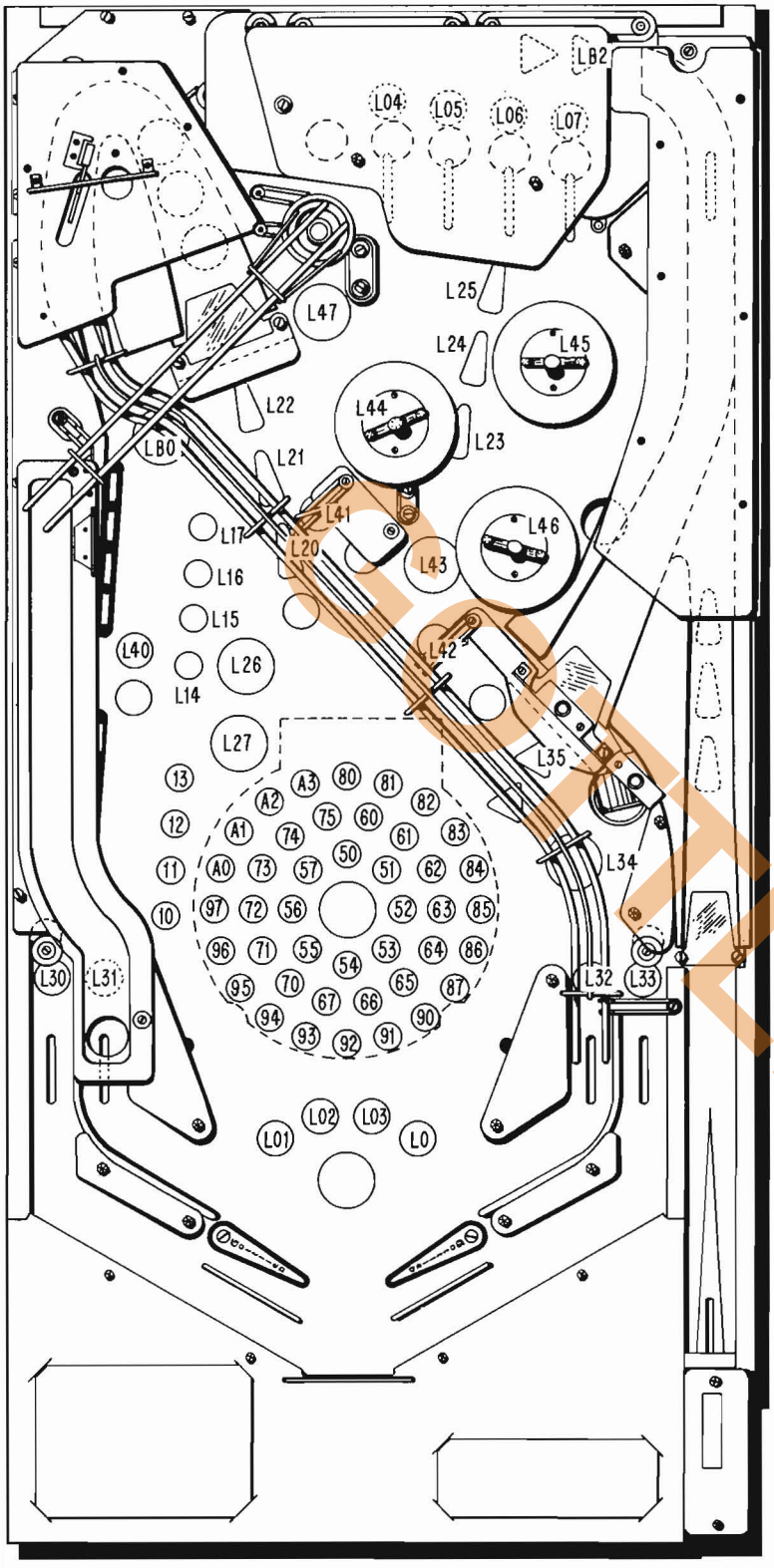
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PLAYBOARD SWITCH ASSIGNMENTS

SWITCH MATRIX NUMBER	SWITCH ASSIGNMENT	PART NO.
SW 0	LEFT COIN CHUTE	P/O FRONT DOOR
SW 1	RIGHT COIN CHUTE	P/O FRONT DOOR
SW 2	CENTER COIN CHUTE	P/O FRONT DOOR
SW 3	REPLAY(CREDIT)BUTTON	18092
SW 4	LEFT ADVANCE BUTTON	23503
SW 5	RIGHT ADVANCE BUTTON	23503
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	BOTTOM POP BUMPER	22705
SW 13	LEFT KICKING RUBBER (UPPER)	27702
SW 13	LEFT KICKING RUBBER (LOWER)	27701
SW 14	RIGHT KICKING RUBBER(UPPER)	27702
SW 14	RIGHT KICKING RUBBER(LOWER)	27701
SW 15	#1 TOP ROLLOVER	25824
SW 16	#1 BOTTOM DROP TARGET	18094
SW 17	#1 TOP DROP TARGET	18094
SW 20	LEFT "BANJO" SPOT TARGET	26231Z
SW 21	TOP UPKICKER	21415
SW 22	BOTTOM UPKICKER	21415
SW 23	LEFT OUTSIDE ROLLOVER	25824
SW 24	RIGHT OUTSIDE ROLLOVER	25824
SW 25	#2 TOP ROLLOVER	25824
SW 26	#2 BOTTOM DROP TARGET	18095
SW 27	#2 TOP DROP TARGET	18095
SW 30	CENTER "BANJO" SPOT TARGET(WHITE)	25460Z
SW 31	"BANJO BONUS" ROLLOVER	25824
SW 32	SUBWAY ROLLOVER	25824
SW 33	LEFT RETURN ROLLOVER	25824
SW 34	RIGHT RETURN ROLLOVER	25824
SW 35	#3 TOP ROLLOVER	25824
SW 36	#3 BOTTOM DROP TARGET	18093
SW 37	#3 TOP DROP TARGET	18093
SW 40	RIGHT "BANJO"SPOT TARGET(WHITE)	25460Z
SW 41	TOP RIGHT SPOT TARGET(GREEN)	25460S
SW 42	SHOOTER LANE ROLLOVER	25824
SW 43	OUTHOLE	26927
SW 44	TROUGH	26485
SW 45	#4 TOP ROLLOVER	25824
SW 46	#4 BOTTOM DROP TARGET	18093
SW 47	#4 TOP DROP TARGET	18093
SW 50	LEFT RAMP SWITCH	26366
SW 51	RIGHT RAMP SWITCH	26366

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SOLENOID FUNCTIONS/LOCATIONS

SOL.0	LEFT POP BUMPER	SOL.18	LEFT RAMP #3, #67
SOL.1	RIGHT POP BUMPER	*SOL.19	CACTUS #1, #67
SOL.2	BOTTOM POP BUMPER	SOL.20	CACTUS #2, #67
SOL.3	LEFT KICKING RUBBER	*SOL.20	"JACK'S", #67
SOL.4	RIGHT KICKING RUBBER	SOL.21	CACTUS #3, #67
SOL.5	TOP UPKICKER	*SOL.21	"JACK'S", #67
SOL.6	BOTTOM UPKICKER	*SOL.22	"CACTUS", #67, (2)
SOL.7	TOP BANK RESET	*SOL.23	"CACTUS", #67, (2)
SOL.8	BOTTOM BANK RESET	SOL.24	LIGHTSHOW ILLUMINATION
SOL.9	CACTUS #1	SOL.25	LIGHTBOX INSERT ILLUM. RELAY (A)
SOL.10	CACTUS #2	SOL.26	TICKET / COIN METER ENABLE
SOL.11	CACTUS #3	SOL.27	BALL RELEASE
SOL.12	"WATERMELON", #67	SOL.28	OUTHOLE
SOL.13	RUNWAY #1, #67	SOL.29	KNOCKER
SOL.14	RUNWAY #2, #67	SOL.30	TILT RELAY (T)
SOL.15	RUNWAY #3, #67	SOL.31	GAME OVER RELAY (Q)
SOL.16	LEFT RAMP #1, #67		
SOL.17	LEFT RAMP #2, #67		

*SEE PAGE 63 FOR LAMP LOCATIONS

PLAYBOARD LAMP ASSIGNMENTS

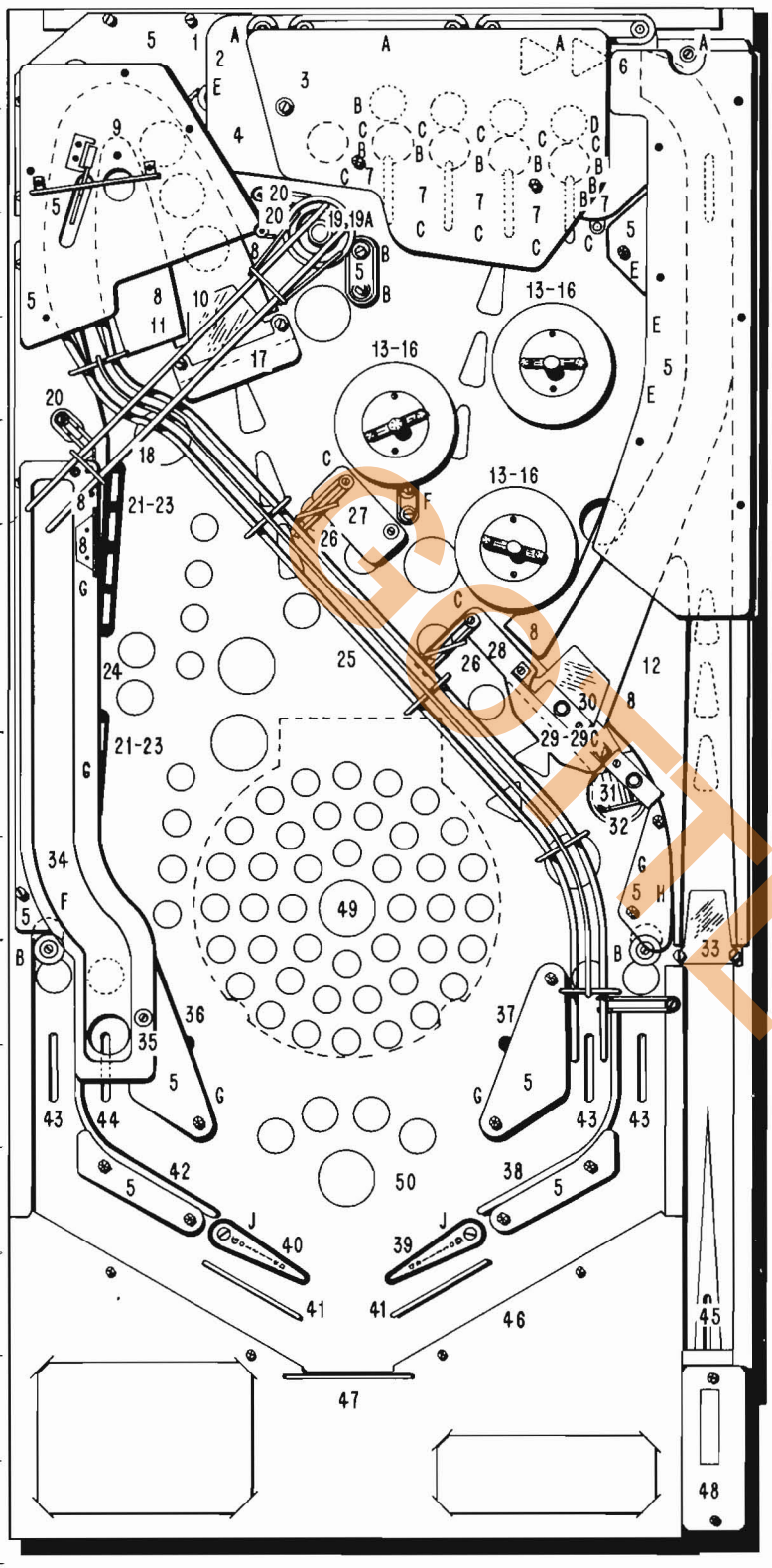
LAMP NUMBER	LAMP ASSIGNMENT
L0	"SHOOT AGAIN"
L1	"1X"
L2	"2X"
L3	"4X"
L4	#1 Top Rollover
L5	#2 Top Rollover
L6	#3 Top Rollover
L7	#4 Top Rollover
L10	#1 Bottom Drop Target
L11	#2 Bottom Drop Target
L12	#3 Bottom Drop Target
L13	#4 Bottom Drop Target
L14	#1 Top Drop Target
L15	#2 Top Drop Target
L16	#3 Top Drop Target
L17	#4 Top Drop Target
L20	Left Ramp "10,000"
L21	Left Ramp "20,000"
L22	Left Ramp "40,000"
L23	Right "SPECIAL" Arrow #1
L24	Right "SPECIAL" Arrow #2
L25	Right "SPECIAL" Arrow #3
L26	Drop Target Award "500,000"
L27	Drop Target Award "ADVANCE FRUIT"
L30	Left Outside Rollover
L31	Left Return Rollover
L32	Right Return Rollover
L33	Right Outside Rollover
L34	Right Bottom Hole "THORNY SURPRISE"
L35	Right Ramp "QUICK SHOT"
L36	Ramp Billboard
L37	Hole Billboard
L40	Left Banjo
L41	Center Banjo
L42	Right Banjo
L43	Pop Bumper "100,000"
L44	Left Pop Bumper
L45	Right Pop Bumper
L46	Bottom Pop Bumper
L47	"LOCK"
L50	Inner Circle #1
L51	Inner Circle #2
L52	Inner Circle #3
L53	Inner Circle #4
L54	Inner Circle #5
L55	Inner Circle #6
L56	Inner Circle #7
L57	Inner Circle #8
L60	Mid Circle #1
L61	Mid Circle #2
L62	Mid Circle #3
L63	Mid Circle #4
L64	Mid Circle #5
L65	Mid Circle #6
L66	Mid Circle #7
L67	Mid Circle #8
L70	Mid Circle #9
L71	Mid Circle #10
L72	Mid Circle #11
L73	Mid Circle #12
L74	Mid Circle #13
L75	Mid Circle #14
L76	(Not Used)
L77	(Not Used)
L80	Out Circle #1
L81	Out Circle #2
L82	Out Circle #3
L83	Out Circle #4
L84	Out Circle #5
L85	Out Circle #6
L86	Out Circle #7
L87	Out Circle #8
L90	Out Circle #9
L91	Out Circle #10
L92	Out Circle #11
L93	Out Circle #12
L94	Out Circle #13
L95	Out Circle #14
L96	Out Circle #15
L97	Out Circle #16
LA0	Out Circle #17
LA1	Out Circle #18
LA2	Out Circle #19
LA3	Out Circle #20
LA4	(Not Used)
LA5	(Not Used)
LA6	(Not Used)
LA7	(Not Used)
LB0	"COLLECT BANJO BONUS"
LB1	(Not Used)
LB2	"LIGHT LOCK"
**LB3	Egg
**LB4	Banana
**LB5	Tomato
**LB6	Pumpkin
**LB7	Watermelon

** LAMPS LB3 THRU LB7 ARE LOCATED ON THE LIGHTBOX INSERT. SEE PAGE 63 FOR LOCATION.

LAMP SOCKETS WITH DIODE BOARD	
TYPE	PART NO.
1-1/8" BRACKET	26621
1/2" BRACKET	26622
LAYDOWN	26623

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VII. PARTS INFORMATION



PLAYBOARD PARTS INFORMATION

PARTS LIST

ITEM	DESCRIPTION	PART NO.
1	Flat Rail	27917
2	Upper Playfield - Plexi Assembly	MA-1615
3	Plastic Shield, Upper Playfield	27968
4	Upper Playfield - Plexi	27931
5	Plastic Shield Set	27965
6	Spot Target Assembly, Green	25460S
7	Rollover Guide, Yellow (5)	15648T
8	Ball Deflector (6)	21158
9	Ramp Spacer, 3-13/32"	25702
10	Ramp Flap	27920
11	Ramp Assembly, Left	27993
	Micro Switch	26366
	Formed L Ramp Actuator	27953
	Ramp Decal	27983
12	Ramp Assembly, Right	27994
	Ramp	27912
	Micro Switch	26366
	Formed Right Ramp Actuator	27969
	Ramp Decal	27982
12A	Micro Switch Mounting Bracket	27985
	Ramp Spacer 2-29/32	25389
13	Bumper Cap Assembly(3)	27996
	Spring	10430
	Figurine	27960
	Figurine Decal	27986
	Clear Bumper Cap	27995
14	Pop Bumper Skirt, Yellow(3)	10433T
15	Pop Bumper Body & Socket Assembly	MA-1529
16	Pop Bumper Trim Platter	25732
17	Ball Deflector	27957
18	Wireform Ramp	27919
19	Upkicker Assembly	MA-1627
19A	Upkicker Coil	16570
20	Hex Post 1-7/16"(3)	27981
21	Drop Target Assembly 4 Position(2)	MA-1614
21A	Drop Target Coil(2)	26926
22	Drop Target Arm, White(8)	119052
23	Drop Target Decal(8)	27945
24	Spot Target Assembly, White	26231Z
25	Wireform Ramp	27918
26	Spot Target Assembly, White(2)	25460Z
27	Ball Deflector	27959
28	Ball Deflector	27958
29	Billboard Assembly	27998
29A	Billboard Decal	27984
29B	Billboard Lamp(2)	LAO
29C	Billboard Lamp Cover, Red(2)	24875U
30	Ramp Flap	27929
31	Ball Snubber	27256
32	Assembly Subway Upkicker	MA-1623
32A	Subway Upkicker Coil	17876
33	Ramp Flap	27930
34	Vacuum Form Ramp	27913
35	Ramp Spacer 2-3/4"(2)	25395
36	Assembly Left Kicker	MA-1083
37	Assembly Right Kicker	MA-1373
38	Ball Guide Rail	27916
39	Flipper Assembly	MA-1251B
	See Exploded View Illustration	
	Flipper Coil	25959
	Flipper Switch Assembly	26438
40	Flipper Assembly	MA-1250B
	See Exploded View Illustration	
	Flipper Coil	25959
	Flipper Switch Assembly	26439
41	Ball Snubber(2)	13798
42	Ball Guide Rail	27915
43	Wireform & Bracket Assembly(3)	4960
44	Wireform & Bracket Assembly	4961
45	Wireform & Bracket Assembly	27229
46	Tilt Switch & Bracket Assembly	9141
47	Cardholder	27979-729
48	Shooter Gauge & Plastic	27992
49	42 Position Light Strip	MA-1606
50	Mylar Overlay	28013

RUBBER RINGS

ITEM	DESCRIPTION	PART NO.
A	2" (3)	10221
B	3/8" (17)	10217
C	Mini-Post, Large (12)	15705
D	3/4"	10218
E	1" (4)	10219
F	7/16" (2)	17493
G	2-1/2" (4)	10222
H	1-1/2"	10220
J	Flipper, Red (2)	13149

MISCELLANEOUS PARTS

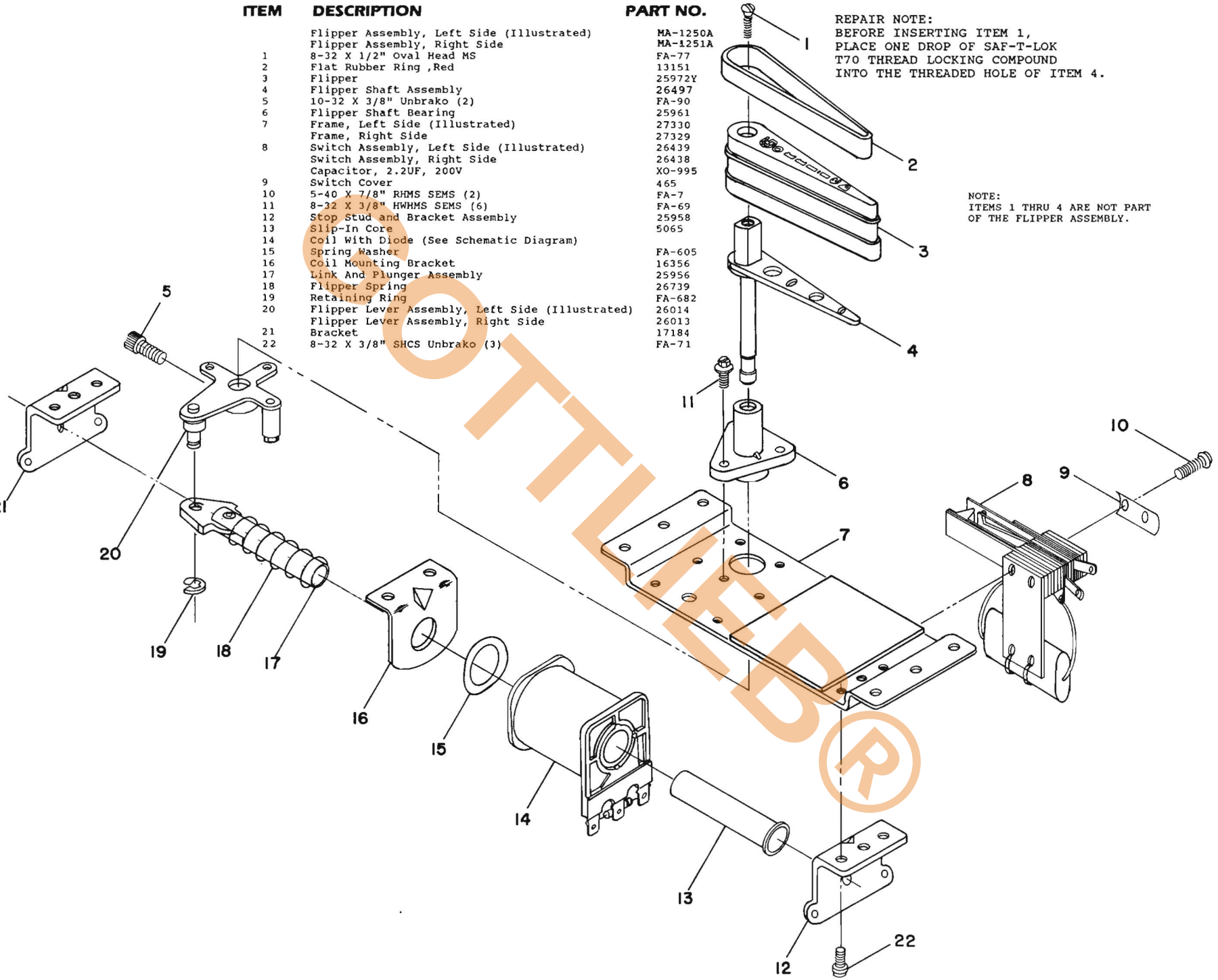
DESCRIPTION	PART NO.
Plastic Rivet	MP-10
Mini-Post Screw	14792
Siamese Post	17492
Support Post	20635P
Plastic Post, 1"	11561P
Plastic Post, 1-3/16"	11562P
"Q" Relay	MA-23
"T" Relay	MA-25
"A" Relay	MA-1021

BALLY (R)

ITEM	DESCRIPTION	PART NO.
	Flipper Assembly, Left Side (Illustrated)	MA-1250A
	Flipper Assembly, Right Side	MA-1251A
1	8-32 X 1/2" Oval Head MS	FA-77
2	Flat Rubber Ring ,Red	13151
3	Flipper	25972Y
4	Flipper Shaft Assembly	26497
5	10-32 X 3/8" Unbrako (2)	FA-90
6	Flipper Shaft Bearing	25961
7	Frame, Left Side (Illustrated)	27330
	Frame, Right Side	27329
8	Switch Assembly, Left Side (Illustrated)	26439
	Switch Assembly, Right Side	26438
	Capacitor, 2.2UF, 200V	XO-995
9	Switch Cover	465
10	5-40 X 7/8" RHMS SEMS (2)	FA-7
11	8-32 X 3/8" HWHMS SEMS (6)	FA-69
12	Stop Stud and Bracket Assembly	25958
13	Slip-In Core	5065
14	Coil With Diode (See Schematic Diagram)	
15	Spring Washer	FA-605
16	Coil Mounting Bracket	16356
17	Link And Plunger Assembly	25956
18	Flipper Spring	26739
19	Retaining Ring	FA-682
20	Flipper Lever Assembly, Left Side (Illustrated)	26014
	Flipper Lever Assembly, Right Side	26013
21	Bracket	17184
22	8-32 X 3/8" SHCS Unbrako (3)	FA-71

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

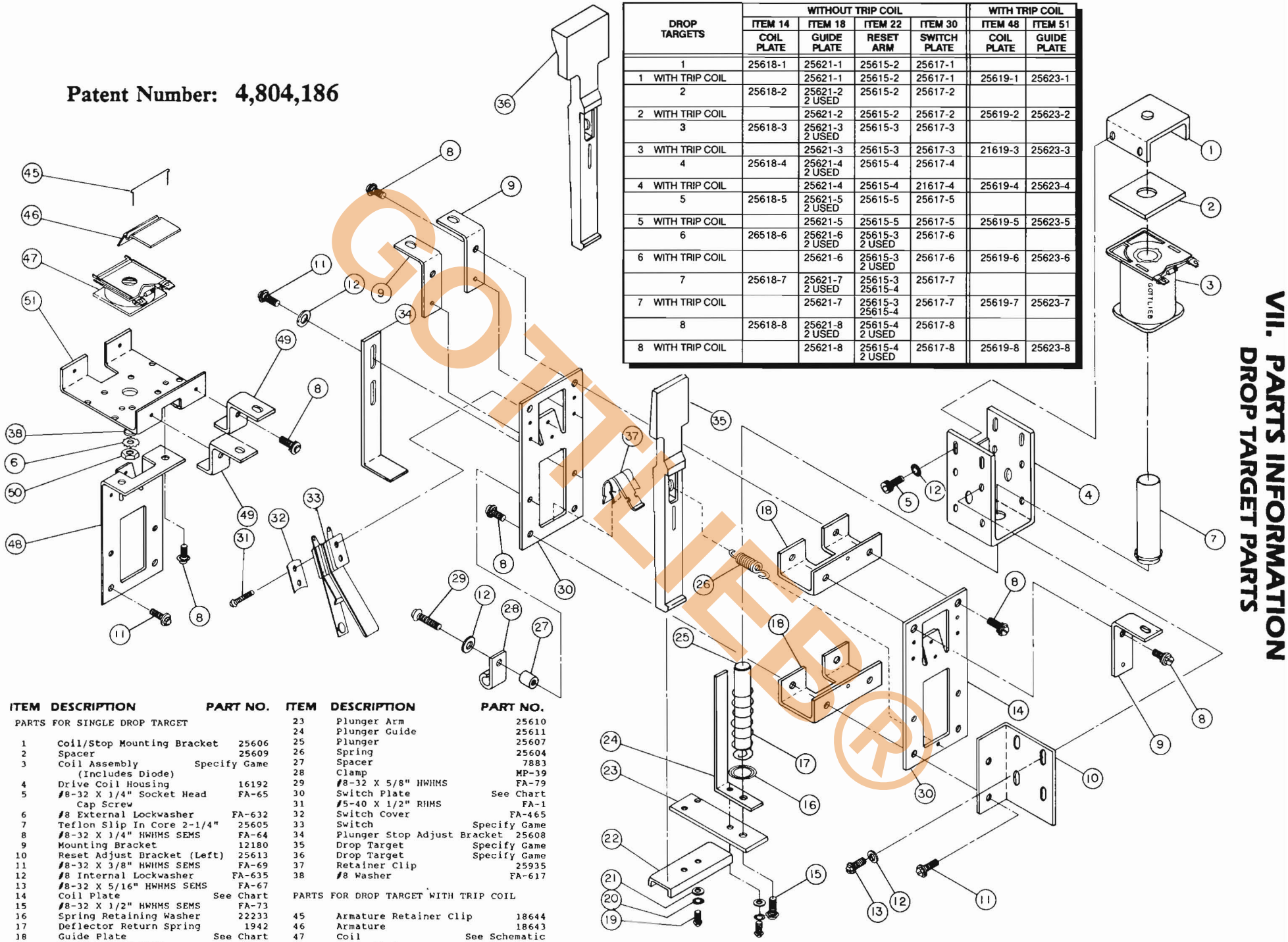
NOTE:
ITEMS 1 THRU 4 ARE NOT PART
OF THE FLIPPER ASSEMBLY.



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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	25618-1	25621-1	25615-2	25617-1		
1 WITH TRIP COIL		25621-1	25615-2	25617-1	25619-1	25623-1
2	25618-2	25621-2 2 USED	25615-2	25617-2		
2 WITH TRIP COIL		25621-2	25615-2	25617-2	25619-2	25623-2
3	25618-3	25621-3 2 USED	25615-3	25617-3		
3 WITH TRIP COIL		25621-3	25615-3	25617-3	21619-3	25623-3
4	25618-4	25621-4 2 USED	25615-4	25617-4		
4 WITH TRIP COIL		25621-4	25615-4	21617-4	25619-4	25623-4
5	25618-5	25621-5 2 USED	25615-5	25617-5		
5 WITH TRIP COIL		25621-5	25615-5	25617-5	25619-5	25623-5
6	26518-6	25621-6 2 USED	25615-3 2 USED	25617-6		
6 WITH TRIP COIL		25621-6	25615-3 2 USED	25617-6	25619-6	25623-6
7	25618-7	25621-7 2 USED	25615-3 25615-4	25617-7		
7 WITH TRIP COIL		25621-7	25615-3 25615-4	25617-7	25619-7	25623-7
8	25618-8	25621-8 2 USED	25615-4 2 USED	25617-8		
8 WITH TRIP COIL		25621-8	25615-4 2 USED	25617-8	25619-8	25623-8



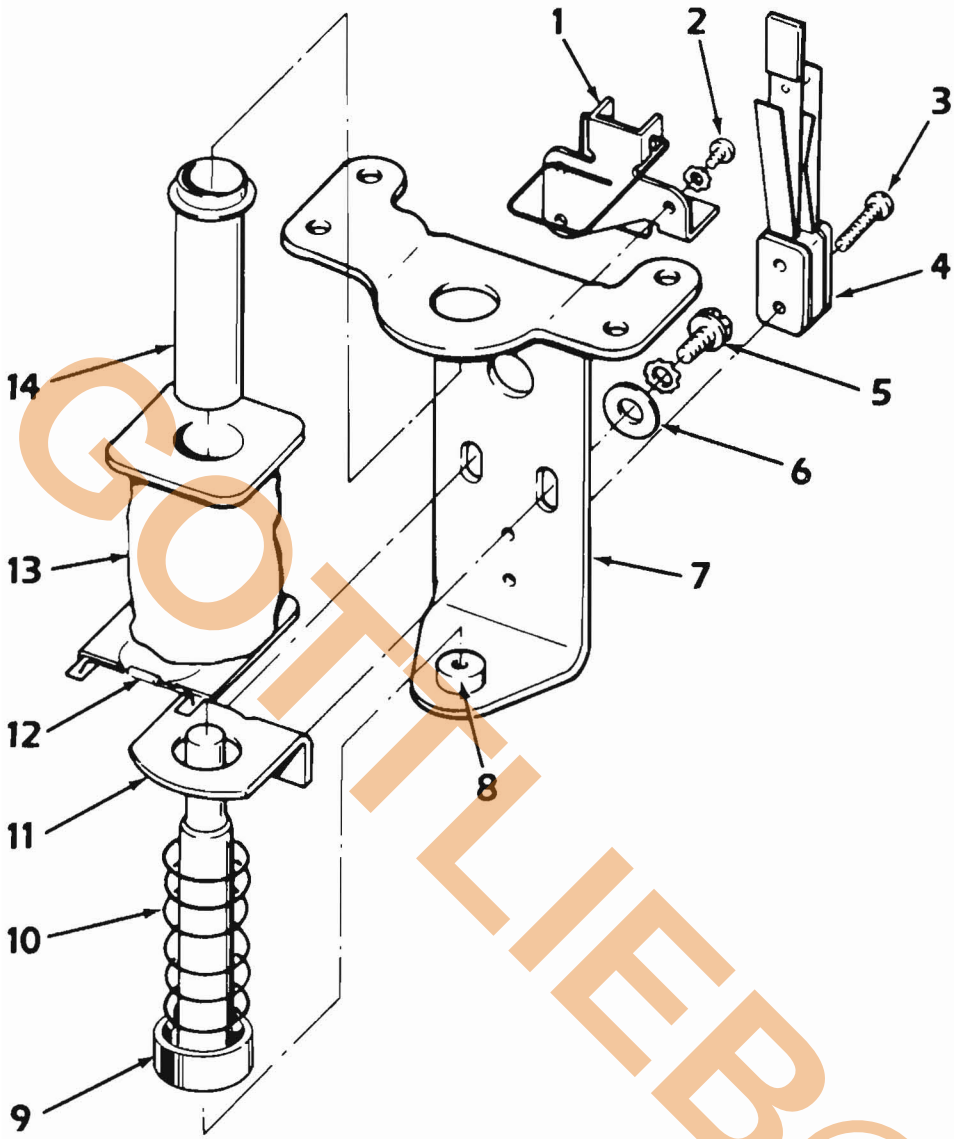
ITEM	DESCRIPTION	PART NO.
	PARTS FOR SINGLE DROP TARGET	
1	Coil/Stop Mounting Bracket	25606
2	Spacer	25609
3	Coil Assembly (Includes Diode)	Specify Game
4	Drive Coil Housing	16192
5	#8-32 X 1/4" Socket Head Cap Screw	FA-65
6	#8 External Lockwasher	FA-632
7	Teflon Slip In Core 2-1/4"	25605
8	#8-32 X 1/4" HWHMS SEMS	FA-64
9	Mounting Bracket	12180
10	Reset Adjust Bracket (Left)	25613
11	#8-32 X 3/8" HWHMS SEMS	FA-69
12	#8 Internal Lockwasher	FA-635
13	#8-32 X 5/16" HWHMS SEMS	FA-67
14	Coil Plate	See Chart
15	#8-32 X 1/2" HWHMS SEMS	FA-73
16	Spring Retaining Washer	22233
17	Deflector Return Spring	1942
18	Guide Plate	See Chart
19	#5-40 X 1/4" RHMS	FA-8
20	#5 External Lockwasher	FA-630
21	#5 Washer	FA-622
22	Reset Arm	See Chart

ITEM	DESCRIPTION	PART NO.
23	Plunger Arm	25610
24	Plunger Guide	25611
25	Plunger	25607
26	Spring	25604
27	Spacer	7883
28	Clamp	MP-39
29	#8-32 X 5/8" HWHMS	FA-79
30	Switch Plate	See Chart
31	#5-40 X 1/2" RHMS	FA-1
32	Switch Cover	FA-465
33	Switch	Specify Game
34	Plunger Stop Adjust Bracket	25608
35	Drop Target	Specify Game
36	Drop Target	Specify Game
37	Retainer Clip	25935
38	#8 Washer	FA-617
	PARTS FOR DROP TARGET WITH TRIP COIL	
45	Armature Retainer Clip	18644
46	Armature	18643
47	Coil	See Schematic
48	Guide Plate	See Chart
49	Mounting Bracket (Formed)	25612
50	#8-32 Hex Nut	FA-652
51	Coil Plate	See Chart

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VII. PARTS INFORMATION

VERTICAL UPKICKER PARTS

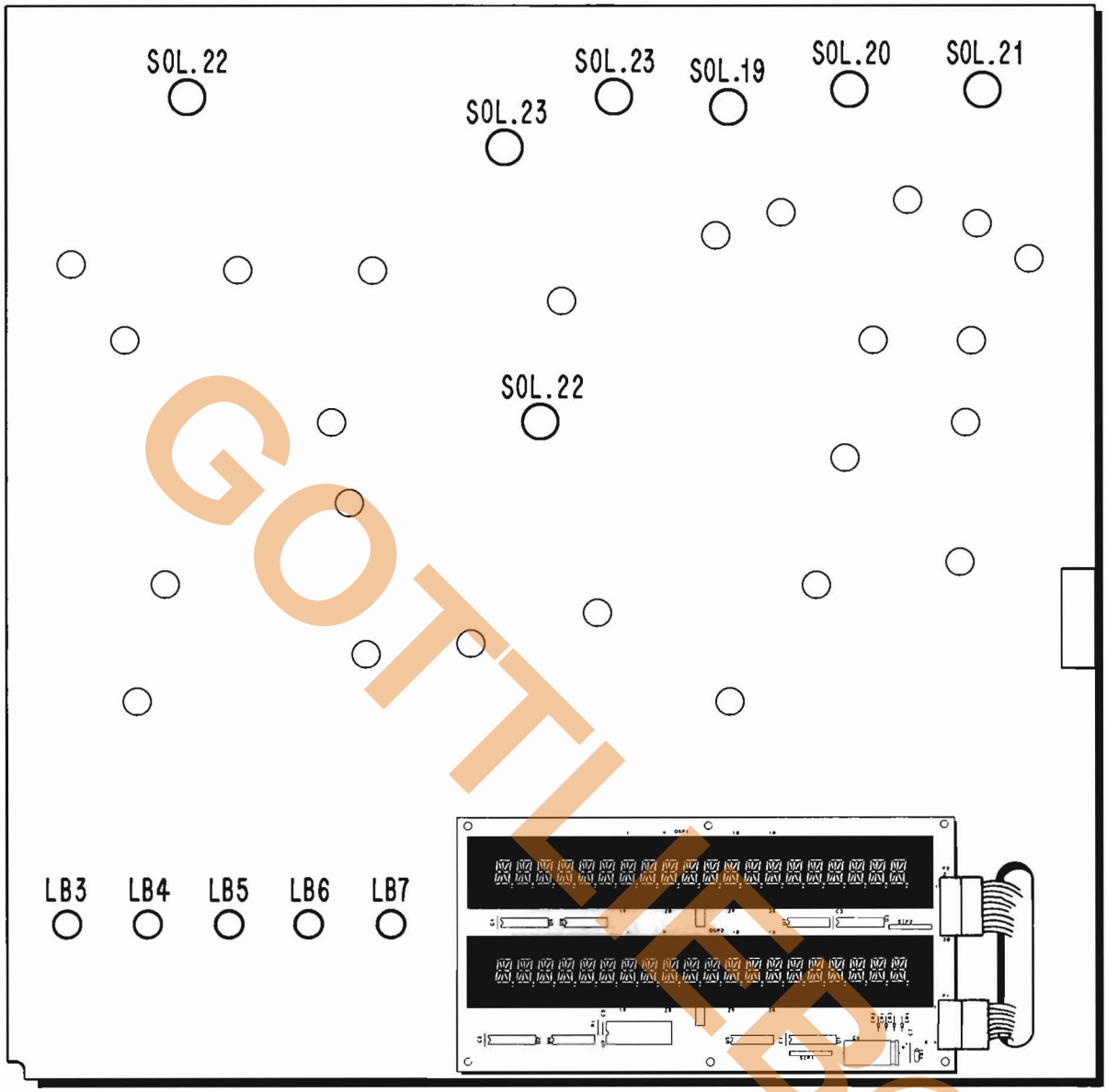


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ITEM	DESCRIPTION	PART NO.
	Upkicker Assembly	MA-1623 or MA-1627
1	Wire Form and Bracket	21414
2	Screw - RHMS 6-32 X 3/16" Lg. (3)	FA-30
3	Screw - RHMS 5-40 X 5/8" Lg.	FA-2
4	Switch	21415
5	Slotted Hex - WHMS 8-32 X 5/16" Lg.	FA-67
6	Standard Washer #8	FA-617
7	Coil Mounting Bracket	21416
8	Rubber Grommet	5240
9	Plunger	21412
10	Spring	1942
11	Coil Mounting Bracket	15409
12	Diode, 1N4004	XO-254
13	Coil	(See Schematic)
14	Sleeve	21411

XI. PARTS INFORMATION

LIGHTBOX INSERT LAMP IDENTIFICATION



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LAMP NUMBER	LAMP ASSIGNMENT	SOLENOID FUNCTIONS
LB3	EGG	SOLENOID 19 "JACK'S", #67 (SEE NOTE 1.)
LB4	BANANA	SOLENOID 20 "JACK'S", #67 (SEE NOTE 1.)
LB5	TOMATO	SOLENOID 21 "JACK'S", #67 (SEE NOTE 1.)
LB6	PUMPKIN	SOLENOID 22 "CACTUS", #67 (2)
LB7	WATERMELON	SOLENOID 23 "CACTUS", #67 (2)

NOTE:
1. SOLENOIDS 19, 20 AND 21 ALSO ILLUMINATE WITH SEPARATE #67 BULBS, CACTUS #1 (LEFT), CACTUS #2 (CENTER) AND CACTUS #3 (RIGHT) RESPECTIVELY. THESE FIGURINES ARE MOUNTED ON A LEDGE DIRECTLY BENEATH THE LIGHTBOX.

2. LAMPS NOT DESIGNATED ARE GENERAL ILLUMINATION, TYPE #44.

XI. PARTS INFORMATION

UNIQUE PARTS

The following listing denotes new parts and assemblies unique to Cactus Jack's, Game#729. Part Numbers prefixed with an asterisk (*) will be illustrated or can be located on pages 32 and 56. Numbers in parenthesis( ) indicate multiple quantities.

PLAYBOARD

ITEM/DESCRIPTION	PART NO.
Vacuum Form Ramp	*27913
Ball Guide Rail	*27915
Ball Guide Rail	*27916
Flat Rail	*27917
Wireform Ramp	*27918
Wireform Ramp	*27919
Ramp Flap	*27920
Light Strip Assembly, 42 Position	*MA-1606
Coil(2)	*27926
Cactus (Red Hat)(2)	27927
Cactus (Black Hat)	27928
Ramp Flat	*27929
Ramp Flat	*27930
Drop Target Decal (8)	*27945
Cactus Mounting Wireform (3)	27946
Left Ramp Actuator	*27953
Billboard Light Mounting Bracket	*27955
Ball Deflector	*27957
Ball Deflector	*27958
Ball Deflector	*27959
Cactus Figurine (3)	*27960
Plastic Shield Set	*27965
Shooter Lane Ramp Actuator	*27969
1-7/16" Hex Post With Grip (3)	*27981
Ramp Decal	*27982
Ramp Decal	*27983
Billboard Decal	*27984
Microswitch Mounting Bracket	*27985
Pop Bumper Cactus Decal (3)	*27986
Assembly Ramp, Switch & Plastic	*27993
Assembly Ramp, Switch & Plastic	*27994
Mylar Overlay	*28013
Cover Stage Lights	*28021
Light Strip Assembly, 42 Position	*MA-1606
Target Bank Assembly, 4 Position (2)	*MA-1614
Upper Playfield-Plexi Assembly	*MA-1615
Cactus Board Assembly	MA-1622
Subway Upkicker Assembly	*MA-1623
Cactus Unit Assembly (Left)	MA-1624
Cactus Unit Assembly (Right)	MA-1625
Cactus Unit Assembly (Center)	MA-1626
Vertical Kicker Assembly	*MA-1627

CABINET

ITEM/DESCRIPTION	PART NO.
Cardholder (Screened)	*27979-729
Cabinet (Screened)	*27970-729
Transformer	*27973
Shooter Gauge & Plastic	27992

LIGHTBOX

ITEM/DESCRIPTION	PART NO.
Lightbox (Screened)	27514-729
Styrene Backglass Art	27897-729
Auxiliary Sound Board, A5	MA-1604
Auxiliary Power Supply, A20	MA-1605
Sound Board, A6	MA-1629

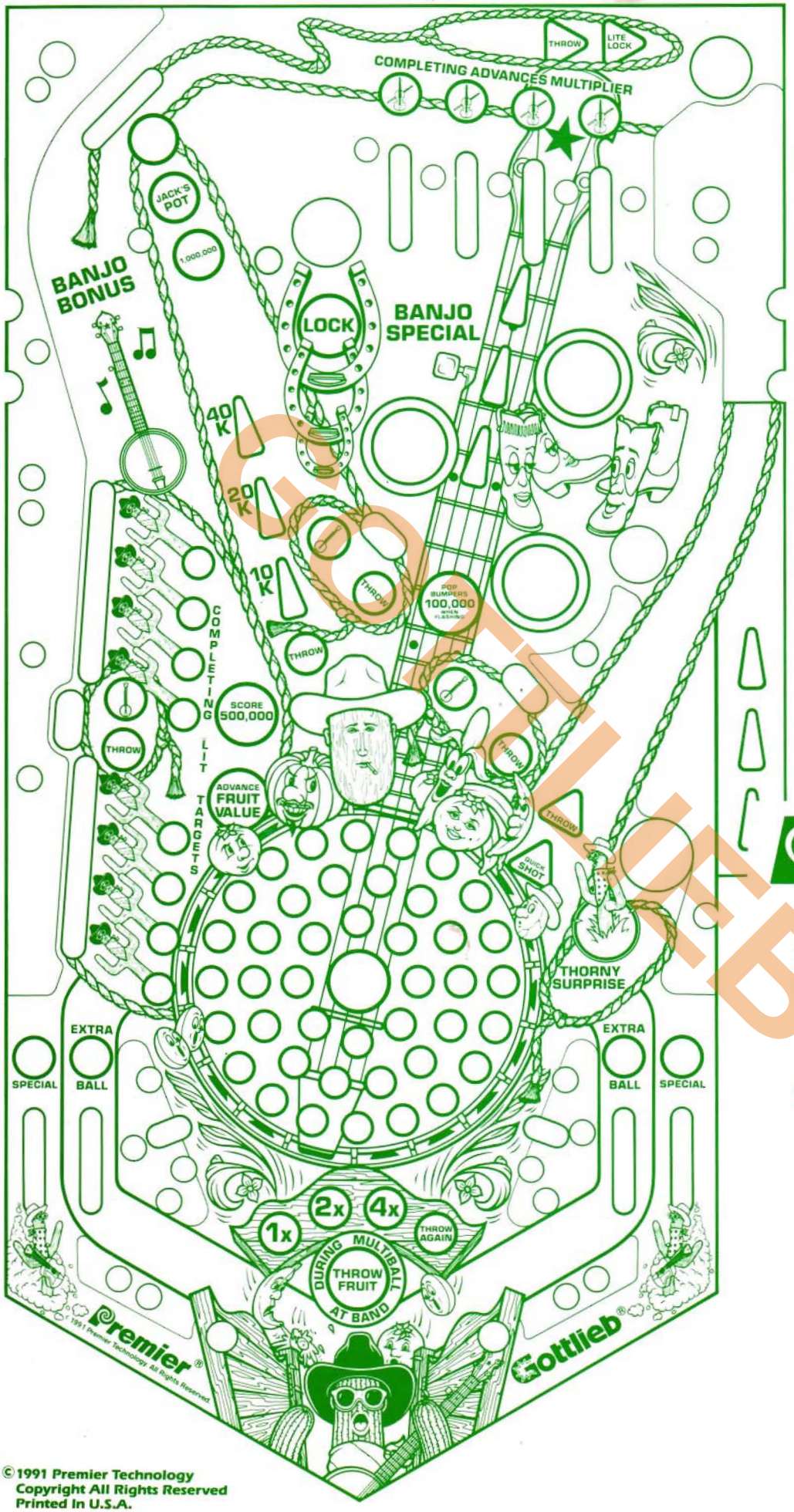
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