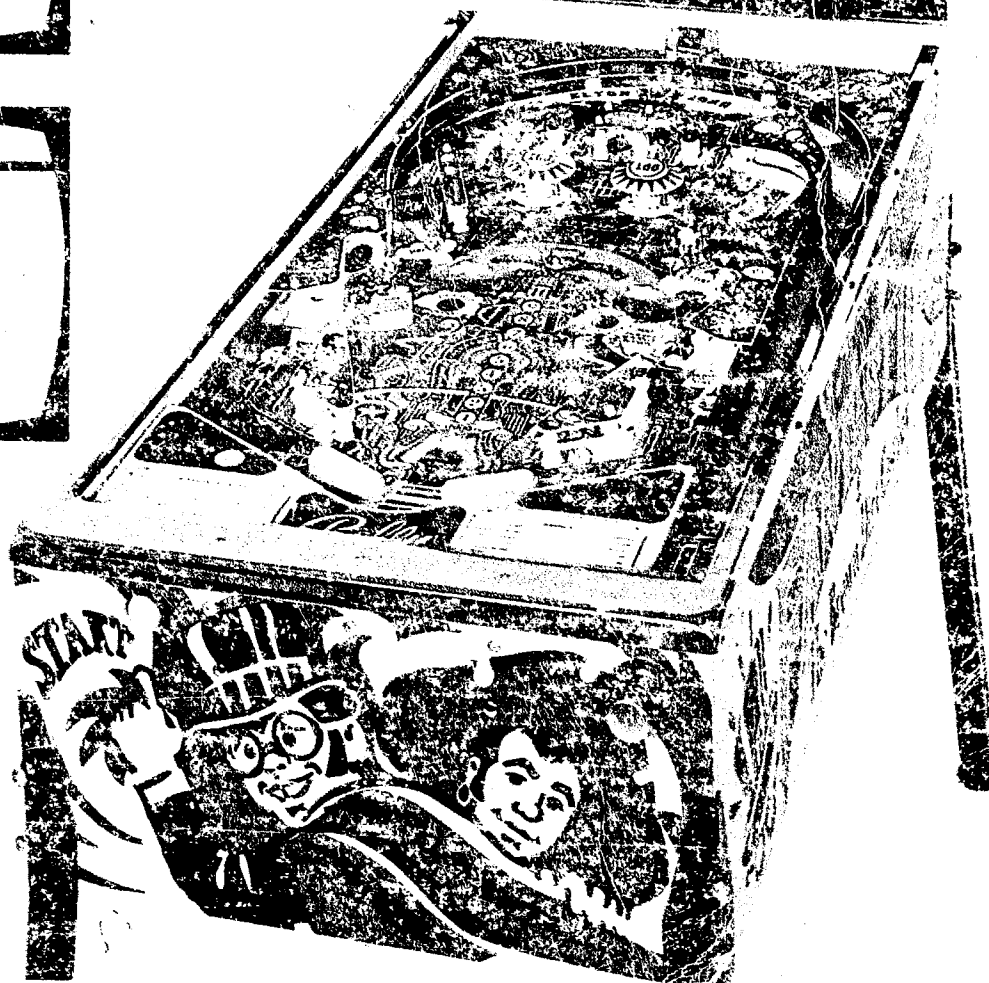
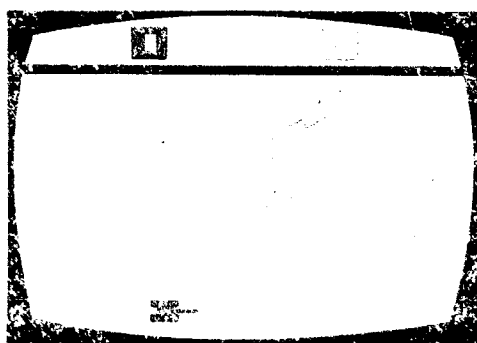
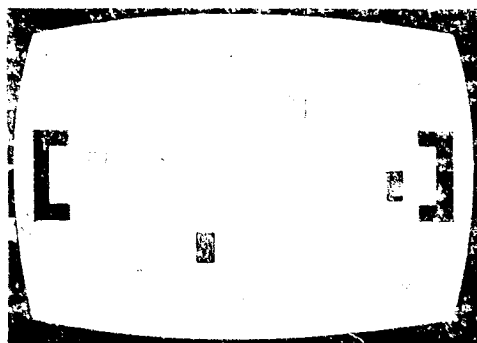


# How to Repair Video Games

Service/repair info for home video games and pinball machines.

By Robert Goodman



FIRST EDITION

FIRST PRINTING—MAY 1978

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## CHAPTER 9

# MIDWAY HOME PINBALL GAMES

Although one might first think that these amusement devices are electromechanical machines, it is not true with today's pinball games. What was a maze of wires and switches has become the playground of the microprocessor.

This chapter deals with four pinball machines: 606-1000 (Fireball), 614-1000 (Evel Knievel), 614-2000 (Captain Fantastic or Elton John), and 614-3000 (Fireball II).

These games have been built with the owner in mind. Solid-state electronic circuitry and plastic encapsulated switches have been utilized extensively because of their high degree of dependability. This system makes the game virtually trouble free.

### OPERATION & FEATURES

1. Depress the start button, located on the front of the game, one time for each player. The number of participating players is indicated by lit areas in the player section of the score glass (1, 2, 3, 4).
2. After each ball is played the score unit will scan through each player's score and come up to rest on the next player light, located in the player section of the score glass.
3. The game is equipped with a memory unit. Each participant plays his own game. That is, any features or partial features scored by a player (top rollovers; targets 1, 2 or 3; or the extra ball lights) are only his. The partial feature is called over to the player's next ball and is reset only after the indicated bonus is collected.
4. All target and rollover switches are scored as indicated on the playfield. A ball passing through a top rollover switch scores 1000 points, turns out its light, and advances the bonus score 1000 points. When all top rollover switches are scored, a 24,000-point bonus is awarded, the top rollover lights are reset, and the lower outside extra ball lights are lit.
5. Hitting targets 1, 2, and 3 in any order advances the bonus score 2000 points and awards double when targets 1 and 2 are made. It awards triple when targets 1, 2, and 3 are made. The points are awarded after the ball leaves the play area.
6. An extra ball is awarded when the ball played passes over the lower-outside rollover switch while the extra-ball lights are lit. When the top rollover switches are made and the extra ball switch in the easy position (50K), scores of 50,000, 100,000, and 150,000 are awarded; if the switch is in the hard position (100K), scores of 100,000, 200,000, and 300,000 are awarded. Refer to Fig. 9-1 for the location of the easy/hard extra ball switch. Extra balls may be accumulated if more than one feature is scored and are indicated by the same-player-shoots-again light on the lower playfield.
7. The diagnostic switch is provided only for test purposes and must be in the play position for the game to operate. See Fig. 9-1.

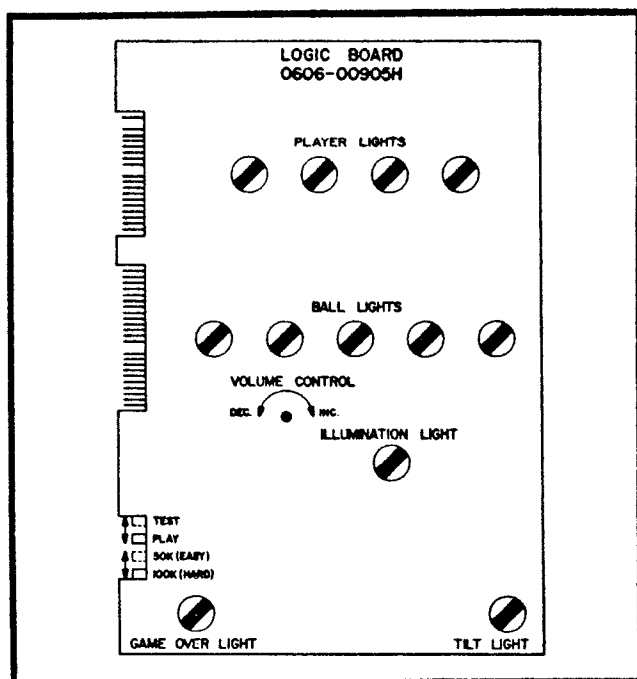


Fig. 9-1. Layout of logic board showing locations of 50K/100K switch and diagnostic test switch.

8. The volume control is located on the logic board. The volume can be varied by rotating the control as indicated in Fig. 9-1.
9. Shaking or pounding on the machine will result in a tilt. When the machine is tilted, all switches and bumpers are disabled and no bonus points are awarded. If an extra ball has been awarded previous to the tilt, the same player plays his extra ball.
10. There are five tones and seven songs played during different parts of a game. Tones and songs for the Evel Knievel game are listed below. Other games are similar.
  - Tone 1. Sound associated with a score of 1000.
  - Tone 2. Sound associated with a score of 500.
  - Tone 3. Sound associated with a score of 100.
  - Tone 4. Sound associated with a score of 50.
  - Tone 5. Sound associated with multiple players at the start of the game.
  - Beethoven's *Fifth Symphony* plays when the reset button is depressed.
  - *William Tell Overture* plays when the top rollovers are made.

- *Zippideedooda* plays when a double bonus is made.
- *Notre Dame Fight Song* plays when a triple bonus is made.
- *We're in the Money* plays when an extra ball is awarded.
- *Funeral March* plays when the game is tilted.
- *The Party's Over* plays when the game is over.

An overall schematic diagram for the 614-1000 (Evel Knievel) and the 614-3000 (Fireball II) is shown in Fig. 9-2. The 606-1000 (Fireball) is similar. The schematic diagram for the 614-2000 (Captain Fantastic) is shown in Fig. 9-3. You'll notice that the power supply sections of these overall schematics are not detailed. They show only input/output lines and connections. Detailed schematics of the 0606-00906 and 0614-00912 power supplies are shown in Figs. 9-4 and 9-5.

In addition, certain driver stages on the overall schematics are not detailed. They are only coded to references such as A, B, L, or Q and enclosed in logic symbols representing inverters or buffers. Figures 9-6 and 9-7 illustrate the drivers used in all pinball games covered here. Also in the diagrams are tables listing the values of bias components used by the drivers.

## DIAGNOSTIC TEST

These games have a special feature incorporated in them. This is the diagnostic test. It is strongly believed that this test can be effectively utilized to identify a good logic board and game, and help focus the problem area on an improperly functioning game.

The test is started by switching the diagnostic switch on the logic board to the test position. It will test the logic, the program, the drivers, the score display, the switches, the solenoids and the lamps.

## 606-1000 & 614-1000/3000

When the diagnostic switch is placed in the test position, the following sequence of testing takes place:

- 1—Logic and program test. When the program is correct, the machine will show 600c on the score display. When the logic or

program is wrong the score display will show gibberish or be off.

2—Score display and its driver plus switches and their drivers. The machine will go through a scanning sequence from 000000 to 999999.

- a. When a segment driver (lamp buffer) fails, the same segment on all digits will be permanently off or on.
- b. When a digit driver fails, that digit will be permanently off or on.
- c. When the score display fails, only one or more unrelated segments will be permanently off.
- d. When a switch is stuck or a driver fails, it is shown in a code on the display when the test is finished. See Fig. 9-8 for a cross-reference of these codes. Any other number shown in the display indicates that there is more than one stuck switch. In this case, the displayed number is the sum of these stuck-switch codes. Examples of this condition are as follows:

| DISPLAY  | SWITCHES                           |
|----------|------------------------------------|
| 00 00 11 | S-20 and S-1                       |
| 04 00 05 | S-11, S-20, and S-9                |
| 10 00 01 | S-20, S-13, and S-19               |
| 00 00 10 | S-6, S-14 (or S-15), S-8, and S-18 |

Switch locations are shown in Fig. 9-9.

3—The solenoids and drivers are activated in the following sequence:

- a. Ball return
- b. Left slingshot
- c. Right slingshot (not used by 614-1000)
- d. Left thumper bumper
- e. Right thumper bumper

## 614-2000

The 50K/100K free ball switch must be in the 100K position. When the diagnostic switch is placed in the test position, the following sequence of testing takes place:

1—Logic and program test. When the program is correct, it will display 600d on the

score readout. If it is wrong, the score display will be gibberish or be off.

2—Score display and its drivers plus the switches and their drivers.

- a. The score display will go through a scanning sequence from 000000 to 999999.
- b. When a segment driver (lamp buffer) fails, the same segment in all digits will either be permanently off or on.
- c. When a digit driver fails, that digit will be permanently off or on.
- d. When the score display itself fails, one or more unrelated segments will be permanently off.
- e. With the 50K/100K switch in the 100K position, 000000 will be shown on the score display. A stuck switch will not be indicated unless it was stuck prior to the test being started. See Fig. 9-8 for a cross-reference of stuck switch codes. Any other number in the score display indicates that there is more than one stuck switch. In this case, the displayed number is the sum of these stuck-switch codes. Examples of this condition are as follows:

| DISPLAY  | SWITCHES                           |
|----------|------------------------------------|
| 00 00 11 | S-20 and S-1                       |
| 04 00 05 | S-11, S-20, and S-9                |
| 10 00 01 | S-20, S-13, and S-19               |
| 00 00 10 | S-6, S-14 (or S-15), S-8, and S-18 |

Switch locations are shown in Fig. 9-9.

- f. With the 50K/100K switch in the 100K position, the diagnostic test will continue until the test/play switch is moved into the play position.
- g. During the diagnostic test the lights on the game will alternate in two groups as listed below:  
*Group 1*—P-1, P-2, B-1, B-2, L-1, L-2, L-4, L-10, L-11, L-14, L-15, L-16, L-17, L-18\*, and L-22.  
*Group 2*—P-3, P-4, B-3, B-4, B-5, L-3, L-6, L-7, L-8, L-9, L-12, L-13, L-18\*, L-19, L-20, L-21, and game over.

\*—L-18 illuminated in both groups.

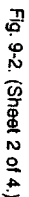
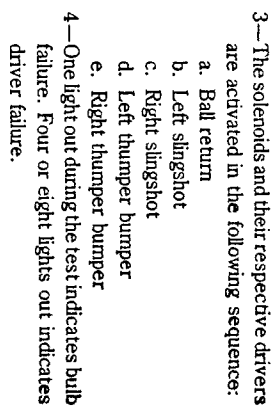


Fig. 9-2. (Sheet 2 of 4.)



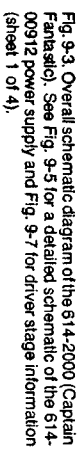
The game score is displayed using an array of LEDs mounted in one package, the Litronix DL-6830. If the numerals on the display miss some segments, it could be either due to a bad display itself or wrong information being fed into it.

The display can be viewed as a  $7 \times 6$  matrix. The 7 corresponding to the 7 outputs of the BCD-to-decimal decoders (7448) and the 6 corresponding to the 6 display drivers (D1 through D6). If one or more of the numerals are completely blanked out, then the corresponding driver transistor (T1P115) should be suspected and should be replaced if found defective. A typical display driver output is shown in Fig. 9-10. If one particular segment of the display is missing on all the numerals (e.g., segment a), then at that line should be followed backwards to isolate the problem.

Do not try to ground the outputs of the lamp buffer (FSC 9667) to determine if the display is good or bad, as this could permanently damage the display.

The best way to check for a good display, if it cannot be determined by the diagnostic test, is to cut the connection pin 3 (lamp test) on the decoder (7448) and ground it. This should light up all the

233



**Fig. 9-3. (Sheet 2 of 4.)**

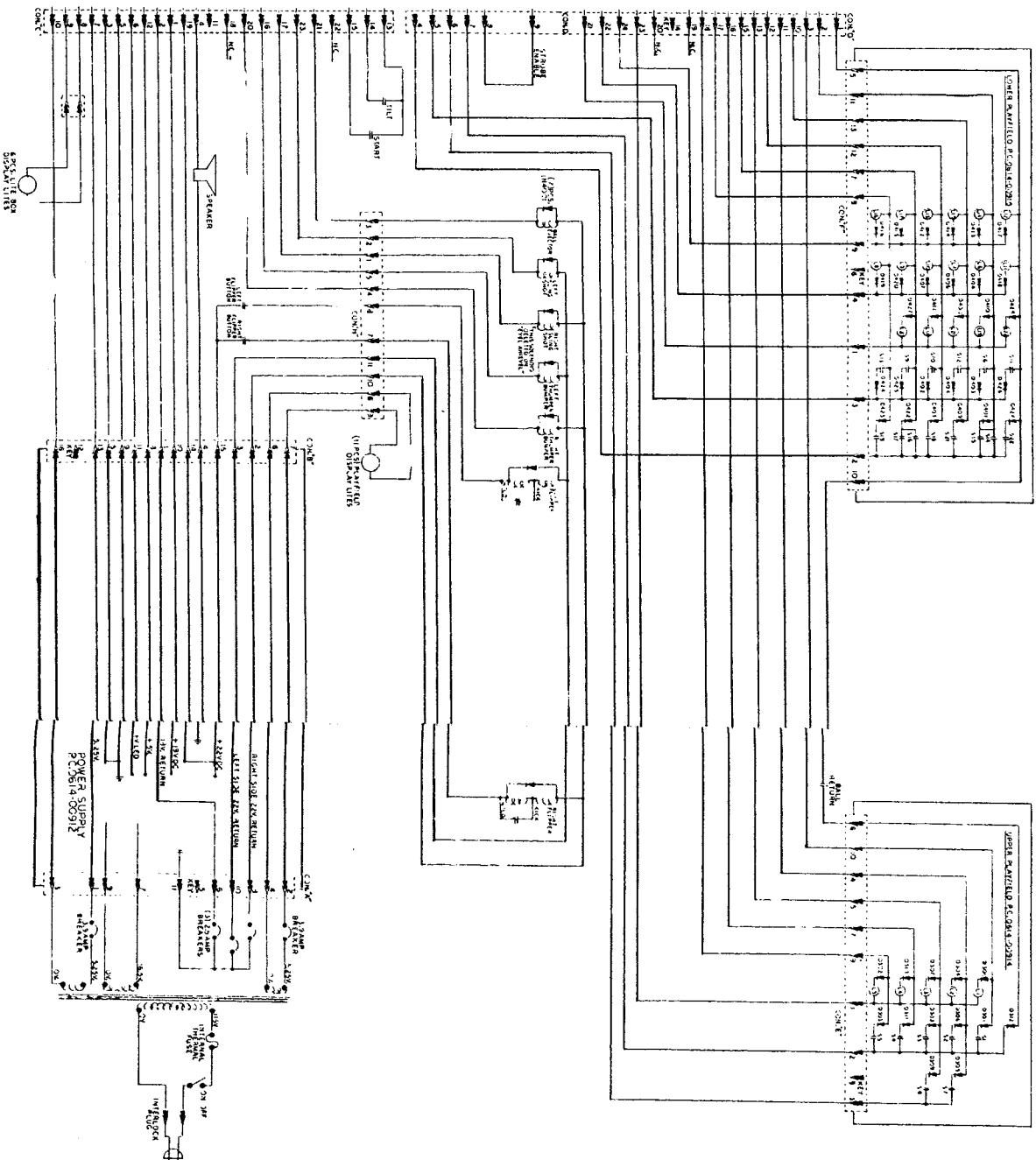


Fig. 9-3. Schematic diagram of the 614-2000 (Sheet 3 of 4).

Fig. 9-3. (Sheet 4 of 4.)

segments of the display. If one or more segments blank out on some numerals while being lit on others, then the display is bad and should be replaced. If all the numerals miss the same segment, then that line should be followed backwards to isolate the problem. This could happen due to a bad lamp buffer (FSC 9667) or a broken 180 resistor. In some instances, the decoder (7448) could also cause such problems, but it is usually not so.

The display of the 614-2000 can be viewed also as a  $7 \times 6$  matrix, the 7 corresponding to the 7 outputs of the CPU-to-decimal decoder, ULN2003B, and the 6 corresponding to the outputs of the Q-drivers in the ULN2074Bs. Each of the ULN2074Bs drives three numerals. If any of the numerals are missing, the output of the respective ULN2074Bs should be checked. A typical output is shown in Fig. 9-11. If one particular segment of the display is missing on all the numerals (e.g., segment a), then that line should be followed backwards to isolate the problem. This could happen due to a bad ULN2003B or one or more broken 470 resistors. In some instances the CPU could also cause such problems, but it is not usually so.

#### MATRIX SECTION

All the lights (except the tilt light and the 5.25V AC lights) and all the switches located on the logic board and upper and lower playfields are included in this section.

The lights form an  $8 \times 4$  matrix comprised of 8 multiplex (MX) lines and 4 light (LT) lines. The switches can similarly be viewed as a  $6 \times 4$  matrix comprised of 6 multiplex (MX) lines and 4 switch (SW) lines. The MX lines are driven by the A-drivers (TIP115), the LT lines are driven by the B-drivers (TIP110), and the SW lines feed into the optical isolators (LD74).

For the 614-2000, the MX lines are driven by the M-drivers (TIP125) and the LT lines are driven by the L-drivers (TIP110). The SW lines are fed into the CPU.

As can be seen from Fig. 9-12, the A-drivers (all models except 614-2000) control 4 lights each and the B-drivers 8 each. Therefore, anytime there is a problem with the lights, the best procedure would be to note the light numbers of missing lights, then check the matrix in Fig. 9-12 for the driver

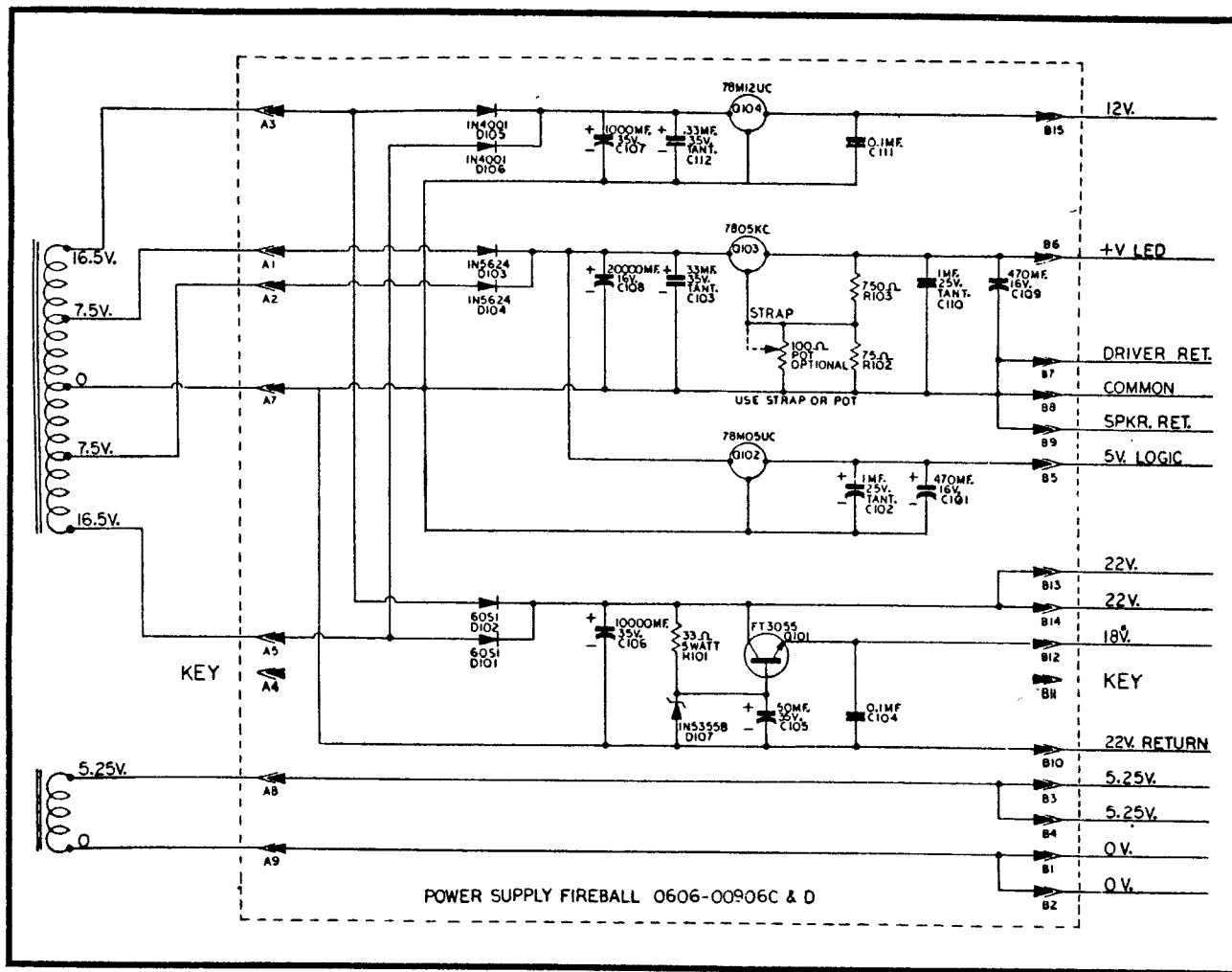


Fig. 9-4. Schematic diagram of the 0606-00906 power supply.

responsible. For example, if all 4 lights for the players (P1-P4) do not light up, then possibly driver A1 could be bad. A typical A-driver output is shown in Fig. 9-13. However, if light P1, light B1, and the game-over light on the logic board, together with lights L5, L4, L3, L2, and L1, do not light up, then possibly driver B1 is bad.

As can also be seen from Fig. 9-12 the M-drivers (model 614-2000) control 4 lights each and the L-drivers 8 lights each. Therefore, anytime there is a problem with the lights, the best procedure would be to note the light numbers of the missing lights, then check the matrix to find the responsible driver. For example, if all 4 lights for the players (P1-P4) do not light up, then possibly driver M8 could be bad. A typical M-driver output is shown in Fig. 9-13. However, if lights P1, B1, and the game-over light on the logic board, together with lights L1, L2, L3, L4, and L5, do not light up, then possibly driver L4 is bad.

Concerning models 606-1000, 614-1000, and 614-3000, if all the lights on the game and the logic board remain on after the diagnostic test as required, then all A-drivers and B-drivers are most likely good. Any problem with the switches on the game would then be associated with the switch (SW) lines. The best bet in a situation of this kind would be to note all switch numbers that do not function properly and, referring to the matrix, identify the SW line. Follow that line to the optical isolator (ILD74) and check it out both at the input and output. This could be done with the scope probe on the output and by closing the switches on the corresponding SW line. When one of the switches is closed, there should be pulses on the output of the ILD74. If this is not so, change the chip. If the pulses are present, make sure they reach the corresponding pin on the PSU #1 (pins 20, 23, 26, or 29). If the pulse is present at the input to the PSU and still the switch does not do its job, then change PSU #1.



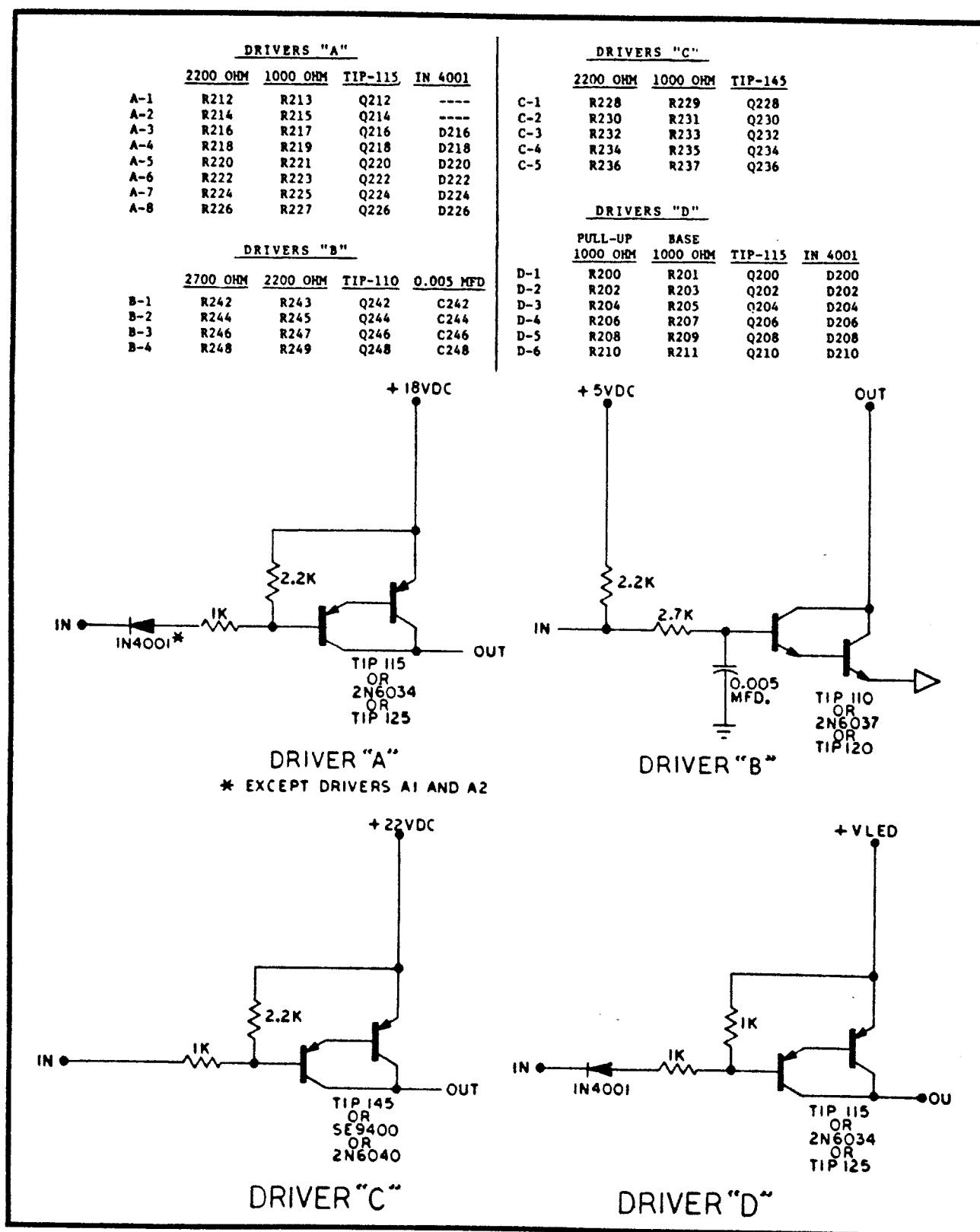


Fig. 9-6. Schematic diagram of driver stages used in the 614-1000 and 614-3000. Table lists component values.

On the 614-2000. If all the lights on the game and logic boards flash during the diagnostic test as required, then all the M-drivers and L-drivers are most likely good. Any problem with the switches on

the game would then be associated with the switch (SW) lines. The best bet in a situation of this kind would be to note all the switch numbers that do not function properly and, referring to the matrix, iden-

tify the SW line. Follow that line to the respective 240Ω resistor. Check carefully for a broken resistor or capacitor (0.01 μF) in this section. There should be a pulse on both sides of the resistor every time one of the switches on that switch line is closed. If the pulses are present, make sure that they reach the CPU. If they reach the CPU, check the outputs of the CPU at pins 9, 10, 11, 12, 13, and 14. If these are not present change the CPU.

## SOLENOID SECTION

This section can be easily checked by performing the diagnostic test. On performing this test, all five of the solenoids controlled by the logic board should be energized in the following order:

1. Ball return
2. Left slingshot (not used in 614-1000)
3. Right slingshot

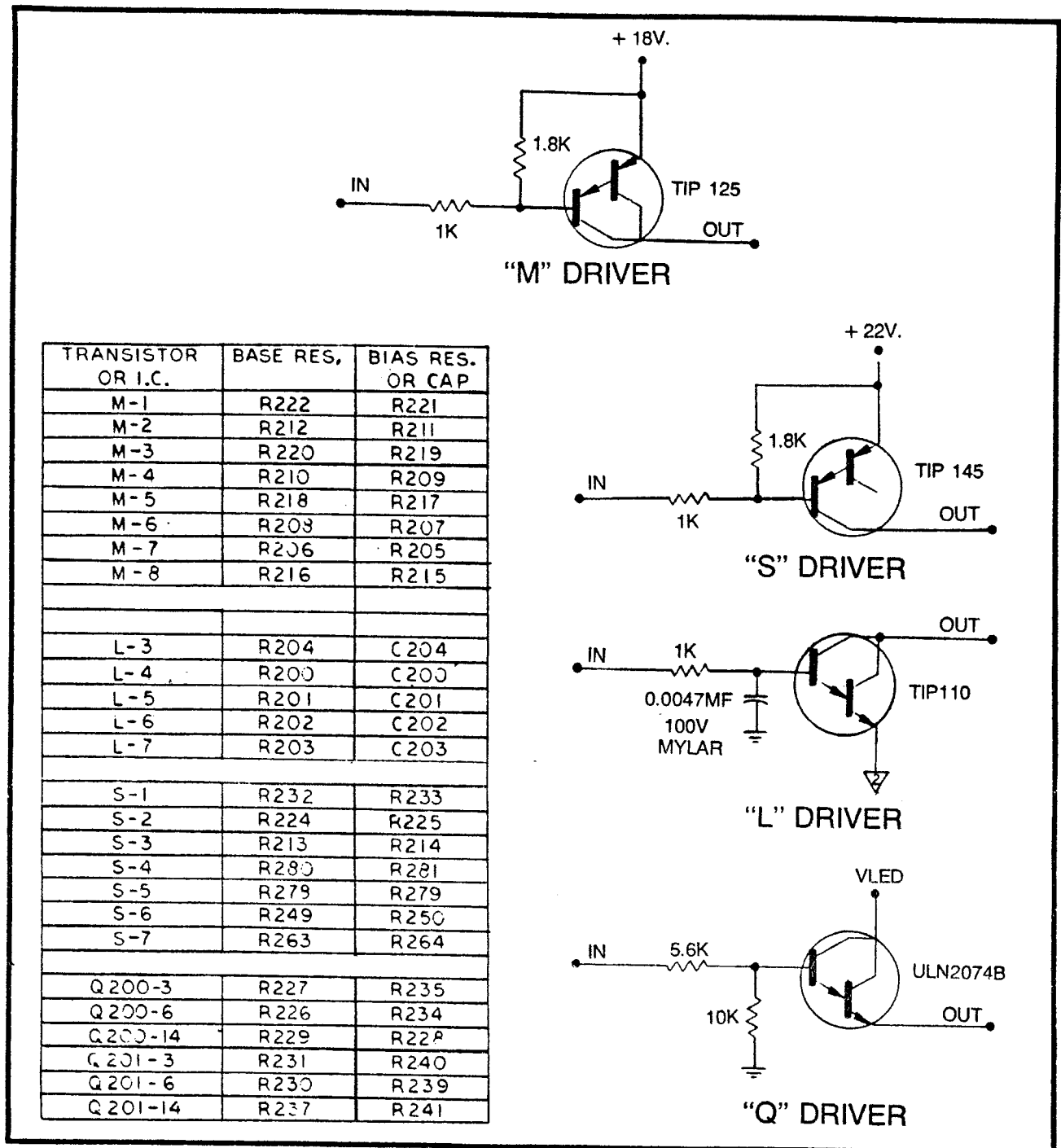


Fig. 9-7. Schematic diagram of driver stages used in the 614-2000. Table lists component values.

| READ OUT ON DISPLAY       |      |     |       |     |                  |             |            |             |                    |                        |                           |                                 |                        |                              |                                 |                                       |
|---------------------------|------|-----|-------|-----|------------------|-------------|------------|-------------|--------------------|------------------------|---------------------------|---------------------------------|------------------------|------------------------------|---------------------------------|---------------------------------------|
| LOCATION<br>ON<br>DISPLAY | 1    | 2   | 4     | 8   | 3                | 5           | 6          | 7           | 9                  | □                      | □                         | □                               | □                      | □                            | ⧻                               |                                       |
|                           | 1    | S20 | TILT  | S11 | S22              | S20<br>TILT | S20<br>S11 | TILT<br>S11 | S20<br>TILT<br>S11 | S20<br>S22             | TILT<br>S22               | S20<br>TILT<br>S22              | S11<br>S22             | S20<br>S11<br>S22            | TILT<br>S11<br>S22              | S20<br>TILT<br>S11<br>S22             |
|                           | 10   | S1  | START | S6  | S14<br>or<br>S15 | S1<br>START | S1<br>S6   | START<br>S6 | S1<br>START<br>S6  | S1<br>S14<br>or<br>S15 | START<br>S14<br>or<br>S15 | S1<br>START<br>S14<br>or<br>S15 | S6<br>S14<br>or<br>S15 | S1<br>S6<br>S14<br>or<br>S15 | START<br>S6<br>S14<br>or<br>S15 | S1<br>START<br>S6<br>S14<br>or<br>S15 |
|                           | 100  | S2  | S7    | S12 | S21              | S2<br>S7    | S2<br>S12  | S7<br>S12   | S2<br>S7<br>S12    | S2<br>S21              | S7<br>S21                 | S2<br>S7<br>S21                 | S12<br>S21             | S2<br>S12<br>S21             | S7<br>S12<br>S21                | S2<br>S7<br>S12<br>S21                |
|                           | 1K   | S3  | S8    | S10 | S18              | S3<br>S8    | S3<br>S10  | S8<br>S10   | S3<br>S8<br>S10    | S3<br>S18              | S8<br>S18                 | S3<br>S8<br>S18                 | S10<br>S18             | S3<br>S10<br>S18             | S8<br>S10<br>S18                | S3<br>S8<br>S10<br>S18                |
|                           | 10K  | S4  | 50K   | S9  | S16<br>or<br>S17 | X           | S4<br>S9   | X           | X                  | S4<br>S16<br>or<br>S17 | X                         | X                               | S9<br>S16<br>or<br>S17 | S4<br>S9<br>S16<br>or<br>S17 | X                               | X                                     |
|                           | 100K | S5  | X     | S13 | S19              | X           | S5<br>S13  | X           | X                  | S5<br>S19              | X                         | X                               | S13<br>S19             | S5<br>S13<br>S19             | X                               | X                                     |

Fig. 9-8. Stuck switch cross-reference diagram. See Fig. 9-9 for switch locations.

4. Left thumper bumper
5. Right thumper bumper

When one or more of these solenoids do not energize, then the components that could be suspected would be the driver transistor or the solenoid itself. In model 614-2000, the driver transistors are S1 through S5. In all others they are C1 through C5. A good and easy way to eliminate the solenoid is to connect the leads of the suspected solenoid to a good one and test again. Using a scope, the transistor could be checked out by performing the test again. In most cases, replacing the TIP145 transistor should set things right. However, if this does not solve the problem, check at the input to the transistor, before the 1K resistor, and see if it goes low or not when the diagnostic test is performed. If this does not occur, change the decoder IC(7445).

## SOUND SECTION

The sound section of the logic board is simple and straightforward. As can be seen from the

schematic (Fig. 9-2) it is comprised of (1) PSU #1, (2) transistor array Q270 (FPQ3724), (3) op amp Q262 ( $\mu$ A3401 or LM3900), and transistor Q250 (MPS6531).

The frequency of the sound signal is varied internally in PSU #1 as required and is outputted at pin 37 of PSU #1 as TONE. The strike is what makes the sound audible. In other words, when pin 2 of PSU #1 goes high, there will be a sound signal at pin 10 of op amp Q262.

If the logic board loses its sound, the first place to check would be pins 37 and 2 of PSU #1. Turn the power switch on and put the game in the 1-player, first-ball mode by pushing the start switch once. There should be a square wave at pin 37 as shown in Fig. 9-14.

Now every time one of the switches on the playfield is closed, pin 2 of PSU #1 should go high momentarily. If this checks out, check pin 3 of transistor array Q270 (FPQ3724). It should be noted here that the 0.1  $\mu$ F (Z5U) capacitor is very critical

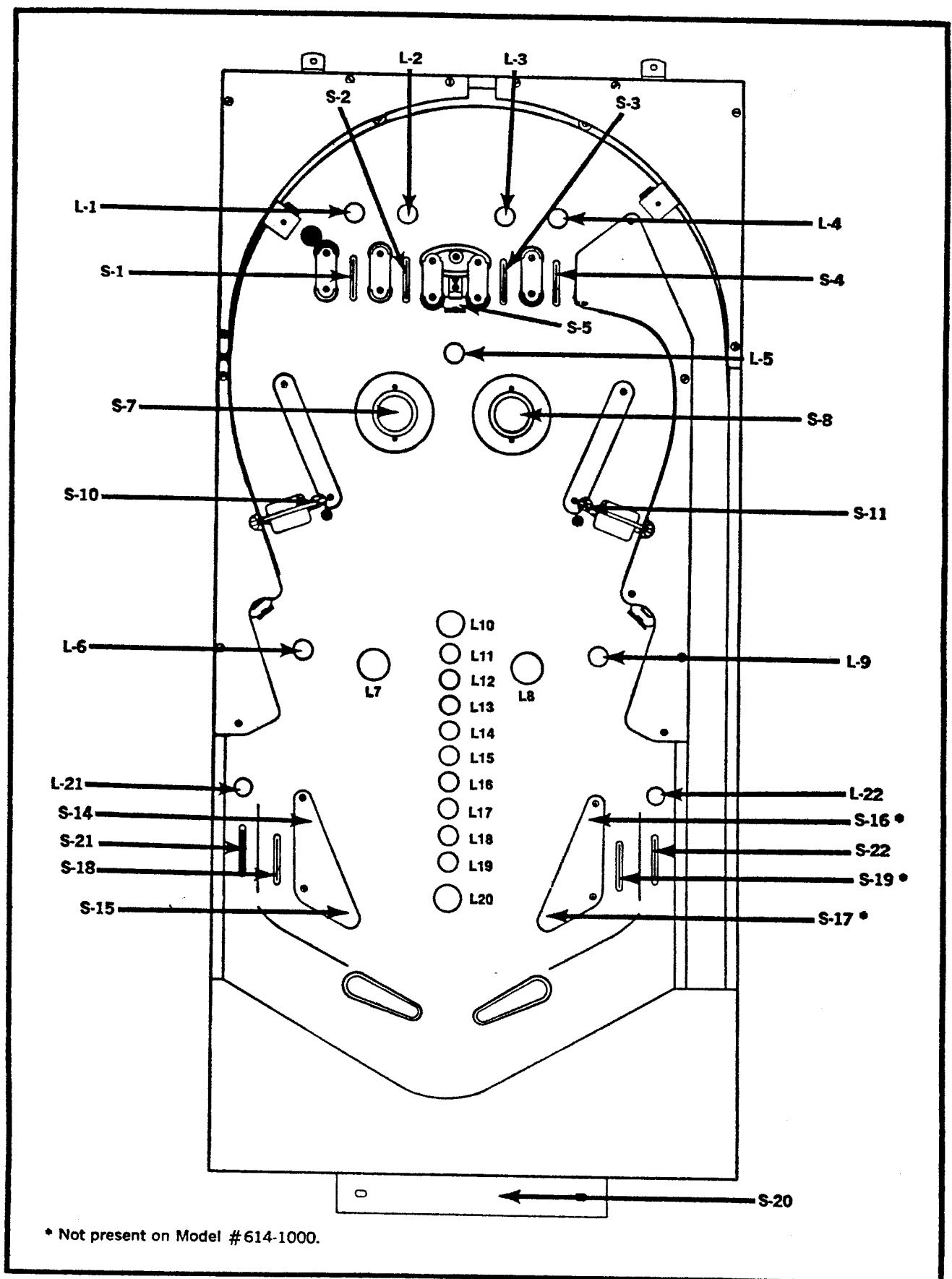
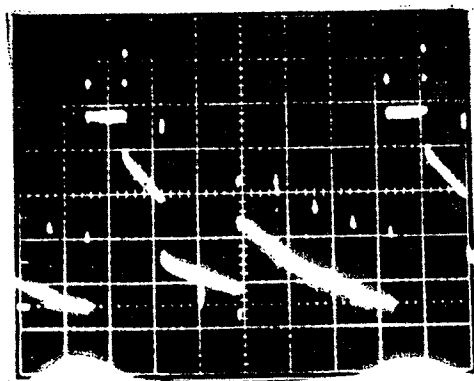
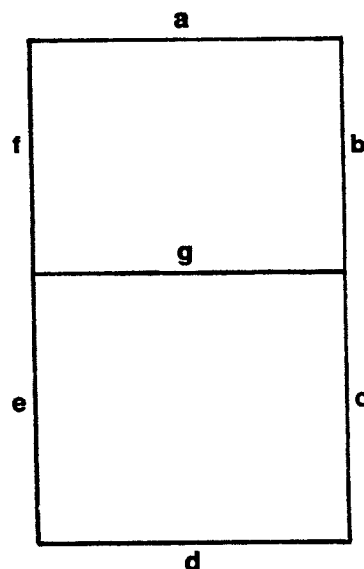


Fig. 9-9. Locations of switches and lamps. The playfield contains eight rollover switches (S1, S2, S3, S4, S18, S19, S21, and S22), six sling shot and side rubber switches (S12 through S17), three target switches (S5, S6, and S9), two thumper bumper switches (S7 and S8), one ball return switch (S20), and two spinner target switches (S10 and S11).



**Figure #1A — Typical display driver output**  
**Horz: 2ms/div.**  
**Vert: 1v/div.**



**Fig. 9-10. Waveform of a typical display driver (D-driver).** Scope horizontal controls are set for 2 ms/div with vertical controls set for 1V/div.

and should be replaced if suspected. Also, check if any of the resistors in this section are broken. If the sound signal appears at pin 10 of the op amp each time one of the switches is closed, check out transistor Q250 (MPS6531) and replace it if necessary.

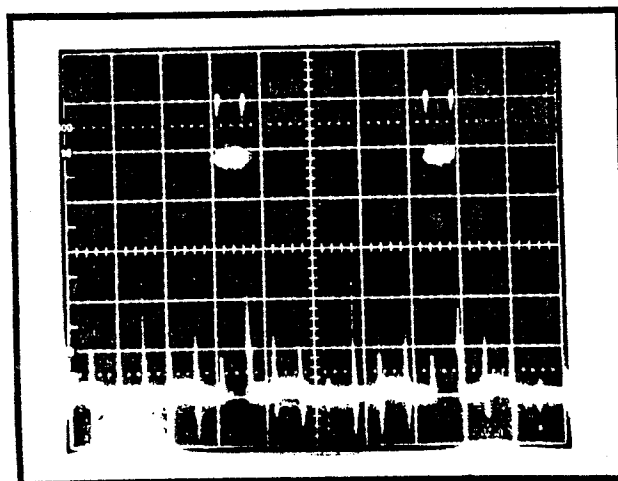
The sound section of the 614-2000 is comprised of (1) CPU Q260 (MK3870), (2) op amp Q202 (LM3900), and (3) a portion of the ULN2074B (Q201).

The frequency of the sound signal is varied internally in the CPU as required and is outputted at pin 17 of the CPU as tone. When pin 16 of the CPU goes high there will be a sound signal at pin 10 of op amp Q202 (LM3900).

If the logic board loses its sound, the first place to check would be pins 16 and 17 of the CPU. Turn the power switch on and put the game in the 1-player first-ball mode by pushing the start switch once. There should be a square wave at pin 17, as shown in Fig. 9-14. Now every time one of the switches on the playfield is closed, pin 16 of the CPU should go high momentarily. If this checks out, check pin 5 of op amp Q202 (LM3900). Check closely to see if any of the resistors are broken in this section. If the sound signal appears at pin 10 of the op amp, check out Q201 (ULN2074B). Replace it if necessary.

## THE INSIDE WORLD

The inside world, naturally, is comprised of the information processing of the central processing unit (CPU, Fig. 9-15) in conjunction with the instructions of the program storage unit (PSU, Fig. 9-16). It is anticipated that if all things in the *outside world* (electromechanical devices, etc.) remain normal, the inside world should function correctly. The famous computer science adage GIGO (garbage in-garbage out) applies to this minicomputer as well. If the right input is furnished to this computer,



**Fig. 9-11. Waveform of a typical Q-driver in the 614-2000.** Scope controls are 2 ms/div for the horizontal and 1V/div for the vertical.

there is no reason why the right output should not be obtained.

A quick and easy way to check if the CPU and PSUs are functioning properly would be to perform the diagnostic test. If the display shows the charac-

ters 600c at the beginning of the test as it is supposed to, then it is confirmed that the CPU and PSUs are linked and functioning correctly.

If the display does not read 600c at the beginning of the test, that is, if the score display shows

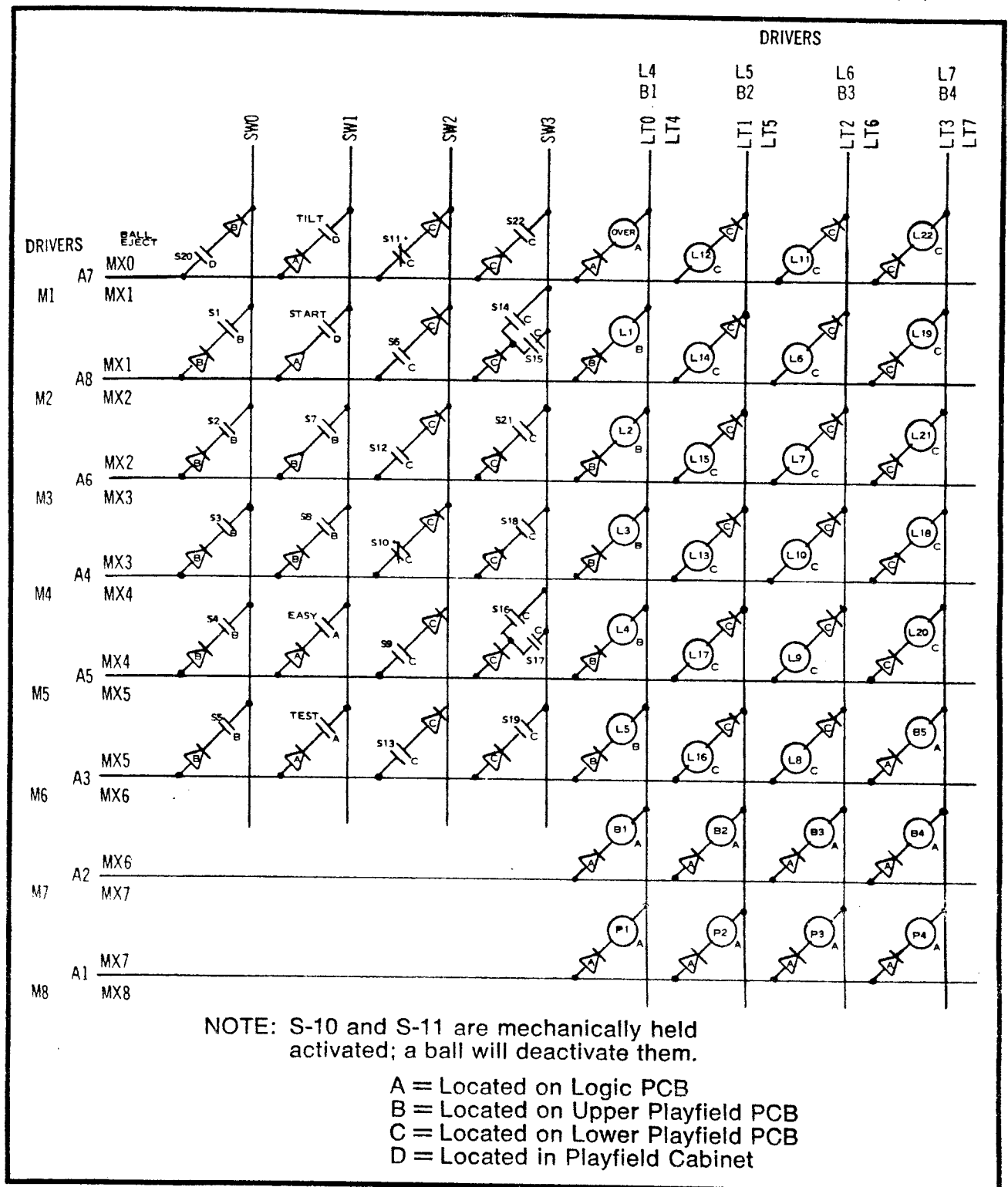


Fig. 9-12. The matrix. Data concerning the 614-2000 (Captain Fantastic) is shown in *italics*. To determine which lights driver A1 (614-1000 and 614-3000) controls, follow the horizontal plane, where driver A1 is located, across the figure. Lights P1 through P4 are controlled by driver A1. For the 614-2000, driver M8 controls the same set of lights, P1 through P4.

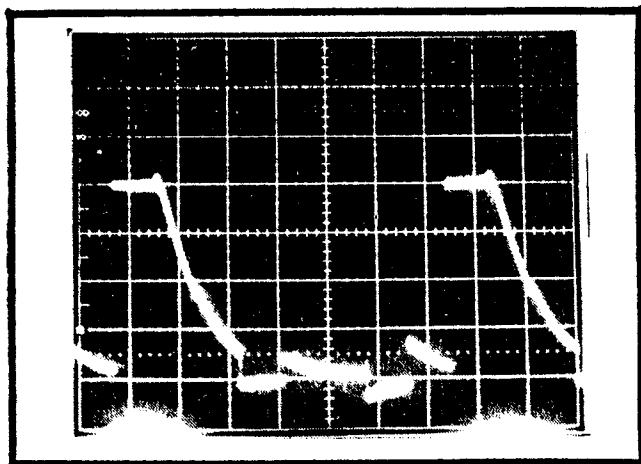


Fig. 9-13. Typical A-driver or M-driver output. Scope controls are 2 ms/div for the horizontal and 5V/div for the vertical.

gibberish or is off, then the logic and program are incorrect.

If the display is off, determine if the board is dead. If so, refer to the *Dead Board* symptom in this chapter. If not, change PSU #1 before changing PSU #2. If this does not help, change the CPU. The possibility of damage to either the CPU or a PSU is very remote unless the power supplied on the 12V and 5V lines changed drastically. It should be noted here that PSU #1 and PSU #2 act as one unit. The only purpose of using PSU #2 is to provide more memory to the system. In other words, PSU #2 is used only as an ROM (read-only memory).

If the 614-2000 display does not read 600d at the beginning of the test, then the logic and program are incorrect. If the display is off, determine if the board is dead and, if so, refer to the *Dead Board* symptom in this chapter. The possibility of damage to the CPU is very remote unless the 5V supplied to it has changed drastically, or the CPU, due to its static nature, has been mishandled.

## DEAD BOARD

When none of the light except the 5.25V AC lights upon turning the power on, and the diagnostic test cannot be performed, or the game cannot be started, the board is referred to as *dead*. Although this is not expected to happen, when it does happen, it could be due to various reasons. Some of the more common ones, along with the methodology to identify and rectify them, are listed below:

1. Check out the power supply. If another one is handy, replace the power supply.

2. Check all the voltages: 22V, 18V, 12V (not in 614-2000), +5V and VLED (5 to 6V) on the logic board. If any of these voltages are missing and it is found that the power supply is not responsible for it, check for possible shorts and bad capacitors. Regain the lost voltage first.
- 3A. If all the voltages seem good and the board remains dead, check the clock section (pins 39 and 38 of the CPU). These waveforms are shown in Figs. 9-17 and 9-18.
- 3B. For model 614-2000, pins 1 and 2 of the CPU are used instead of 38 and 39. Refer to Figs. 9-19 and 9-20 for these waveforms.
4. If these waveforms, as shown in Figs. 9-17 through 9-20, are not present, check the fail-safe circuit.

### NOTE

Steps 5 through 8 do not apply to model 614-2000.

5. If pins 38 and 39 look good, check the timing pulses on pins 1 and 2 of the CPU. These are shown in Figs. 9-21 and 9-22. If this is missing, check for +5V and +12V on the CPU at pins 3 and 4, respectively. If pins 1 and 2 do not have the right pulses with these voltages present at pins 3 and 4, change the CPU.
6. Now, check the control signals on pins 17, 18, 19, 20, and 21 of the CPU. Make sure these reach pins 13, 14, 15, 16, and 17 of PSU #1 and PSU #2. A typical waveform

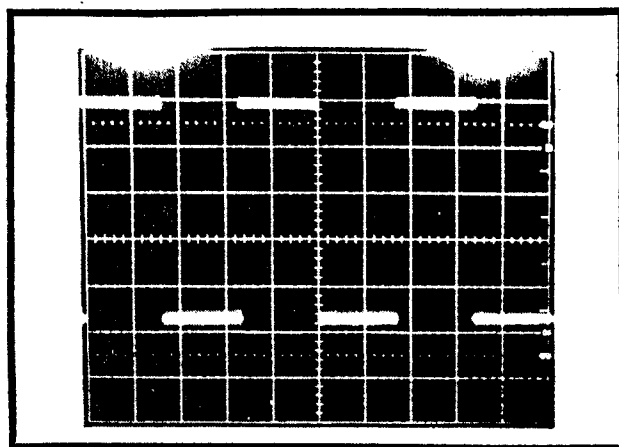


Fig. 9-14. Waveform of the tone output from the CPU in the 1-player, first-ball mode. Scope controls are 2 ms/div for the horizontal and 1V/div for the vertical.

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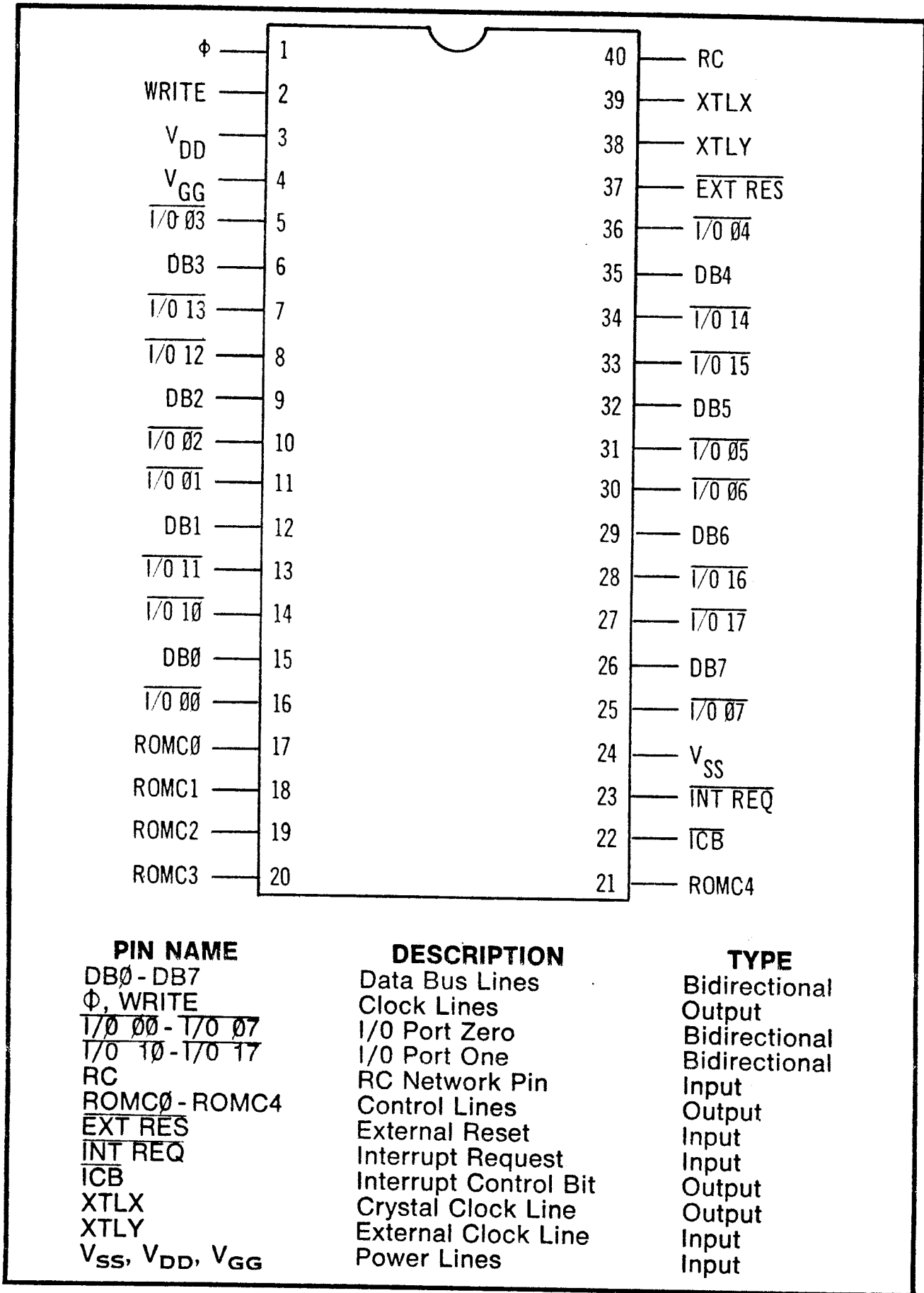
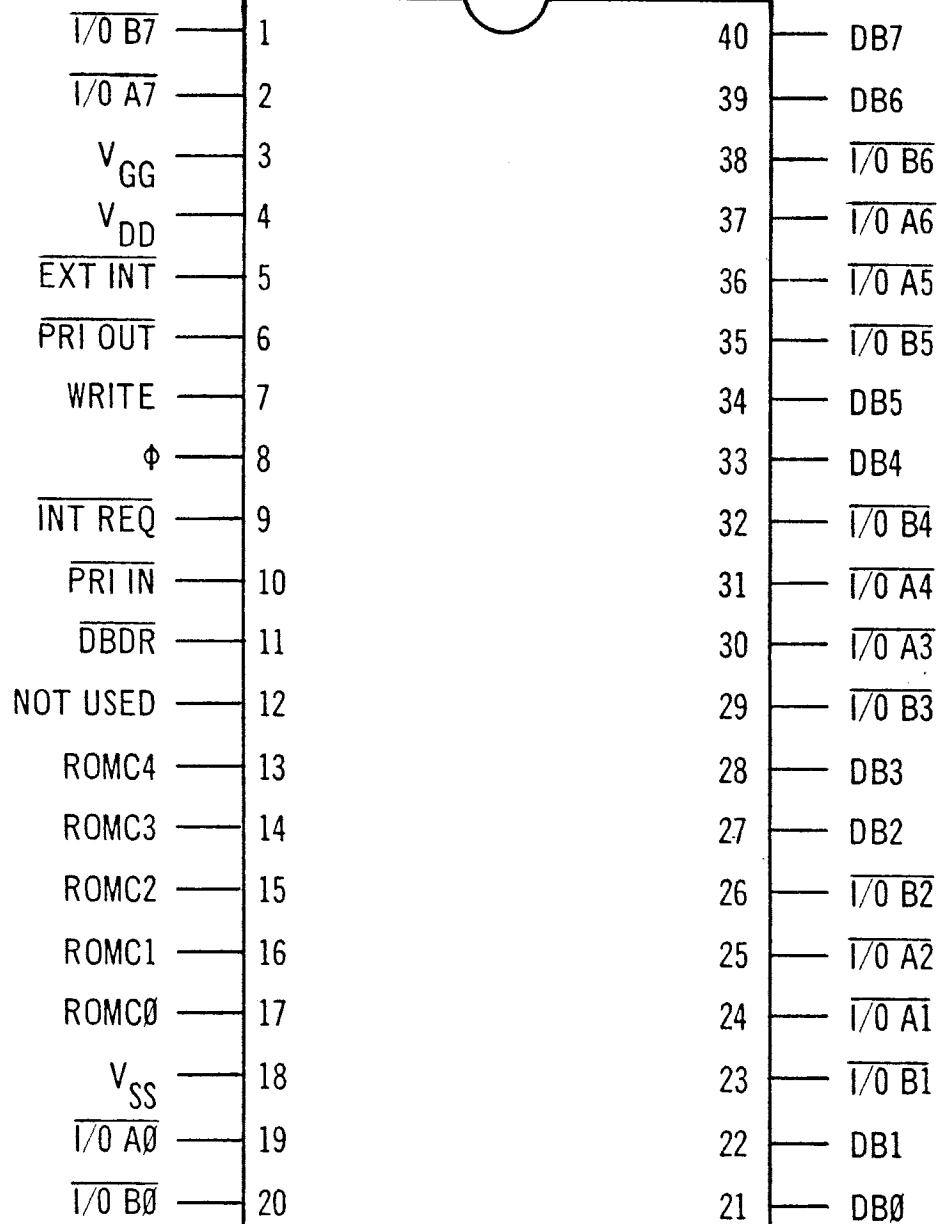


Fig. 9-15. Pin layout for the 3850 CPU.



| PIN NAME                                            | DESCRIPTION        | TYPE          |
|-----------------------------------------------------|--------------------|---------------|
| I/O A0 - I/O A7                                     | I/O Port A         | Bidirectional |
| I/O B0 - I/O B7                                     | I/O Port B         | Bidirectional |
| DB0 - DB7                                           | Data Bus           | Input         |
| ROMC0 - ROMC4                                       | Control Lines      | Input         |
| Φ, WRITE                                            | Clock Lines        | Input         |
| EXT INT                                             | External Interrupt | Input         |
| PRI IN                                              | Priority In        | Input         |
| PRI OUT                                             | Priority Out       | Output        |
| INT REQ                                             | Interrupt Request  | Output        |
| DBDR                                                | Data Bus Drive     | Output        |
| V <sub>SS</sub> , V <sub>DD</sub> , V <sub>GG</sub> | Power Supply Lines | Input         |

Fig. 9-16. Pin layout for the 3851 PSU.

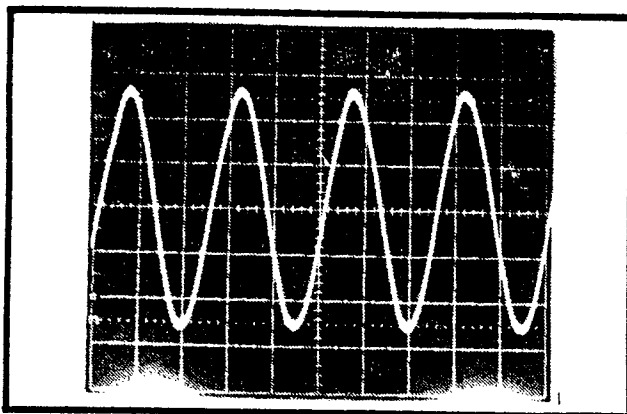


Fig. 9-17. Waveform at pin 37 of the 3850 CPU in 614-1000 and 614-3000. This is the clock input. Scope controls are  $0.2 \mu\text{s}/\text{div}$  for horizontal and  $1\text{V}/\text{div}$  for vertical.

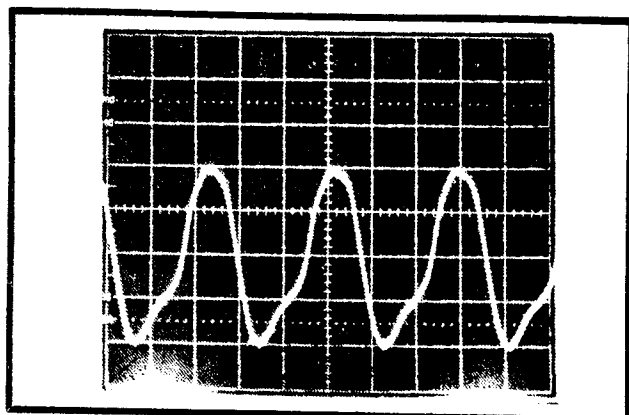


Fig. 9-19. Clock input at pin 1 of the MK3870 CPU in the 614-2000. Scope controls are at  $1 \mu\text{s}/\text{div}$  for the horizontal and  $1\text{V}/\text{div}$  for the vertical.

of the control pulse is shown in Fig. 9-23. If these check good, and in most cases they should, then proceed to step 7. If any of them do not seem right, proceed to step 8.

7. Check the data bus lines at pins 6, 9, 12, 15, 26, 29, 32, and 35 of the CPU. Make sure the signals on these lines read PSU #1 and PSU #2. There should be fast-switching pulses on these pins. A typical data bus line is shown in Fig. 9-24. Also make sure these are not shorted together. This could be done by holding the scope probe on one and momentarily grounding the others.
8. Check pins 11, 10, and 5 of the CPU. There should be square wave outputs on them. If pin 11 has a pulse (as shown in Fig. 9-25), then the CPU and PSU are functioning normally. If it is just a high, then there is something wrong on the data bus or the control lines, or PSU #1 may be

bad. Refer back to step 6 and change PSU #1 before changing the CPU.

### FAIL-SAFE CIRCUIT

This circuit is designed to prevent multiplexing if the CPU or PSU do not strobe properly. This protects the display and light bulbs from getting damaged. In other words, if pin 11 of CPU is high, pin 4 of op amp Q262 ( $\mu\text{A}3401$ ) would be high, which results in preventing the decoders (7445s) from decoding. If there is a pulse on pin 11 of the CPU (as shown in Fig. 9-25) and pin 4 of the op amp remains high, then check the fail-safe circuit thoroughly. Check the external strapping on connector D, pins 1 and 2 (strobe enable). Check for broken resistors or diodes in that section. If they seem good, replace the  $0.01 \mu\text{F}$  capacitors and IN4004 diodes before changing the op amp itself.

Concerning model 614-2000, if pin 9 of CPU is high, pin 4 of the op amp (LM3900) could be high, which results in preventing the decoders (7445)

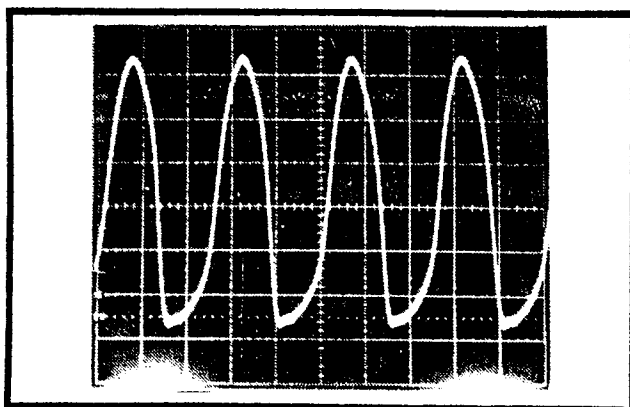


Fig. 9-18. Clock output at pin 39 of the 3850 CPU in the 614-1000 and 614-3000. This waveform was taken with the scope control at  $0.2 \mu\text{s}/\text{div}$  for the horizontal and  $1\text{V}/\text{div}$  for the vertical.

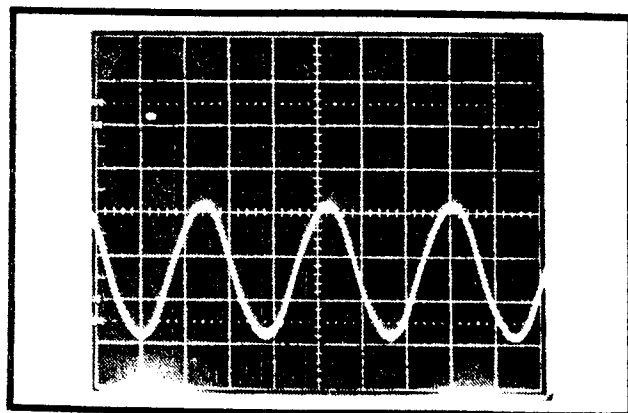


Fig. 9-20. Clock output at pin 2 of the MK3870 CPU in the 614-2000. Scope controls are at  $1 \mu\text{s}/\text{div}$  for the horizontal and  $1\text{V}/\text{div}$  for the vertical.

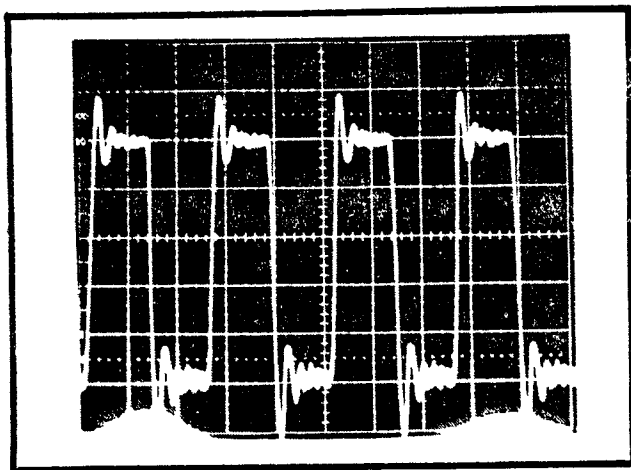


Fig. 9-21. Timing pulse output to both PSUs from pin 1 of the 3850 CPU in the 614-1000 and 614-3000. Scope controls are at 0.2  $\mu$ s/div for the horizontal and 1V/div for the vertical.

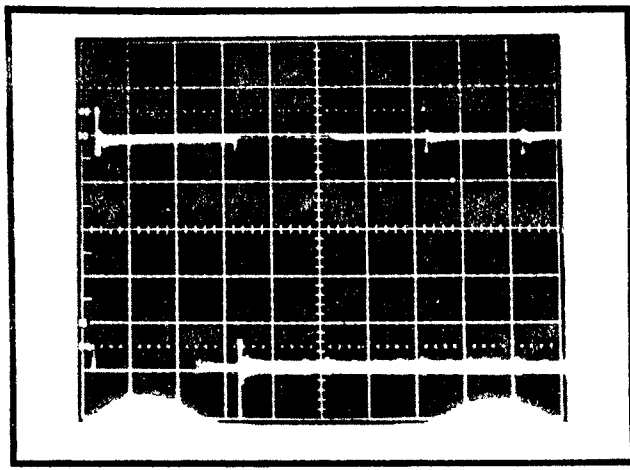


Fig. 9-23. Control signal at pin 17 of the 3850 CPU used in the 614-1000 and 614-3000. Scope controls are at 1  $\mu$ s/div for the horizontal and 1V/div for the vertical.

from decoding. If there is a pulse on pin 9 of the CPU (as shown in Fig. 9-25) and pin 4 of the op amp remains high, then check the fail-safe circuit thoroughly. Check the external strapping on connector D, pins 8 and 9 (strobe enable). Check closely for broken resistors or diodes in that section. If they seem good, replace the 0.01  $\mu$ F capacitors and the IN4004 diodes before changing the op amp itself.

#### TILT LIGHT

This is the only light other than the 5.25V AC lights which is not in the matrix but is controlled by the logic board. If the tilt light does not light when the tilt switch is closed, check the bulb and socket first. Then check pins 24 and 25 of PSU #1 and see if they go high when the tilt switch is closed with the game in the play mode. If this checks out, check the

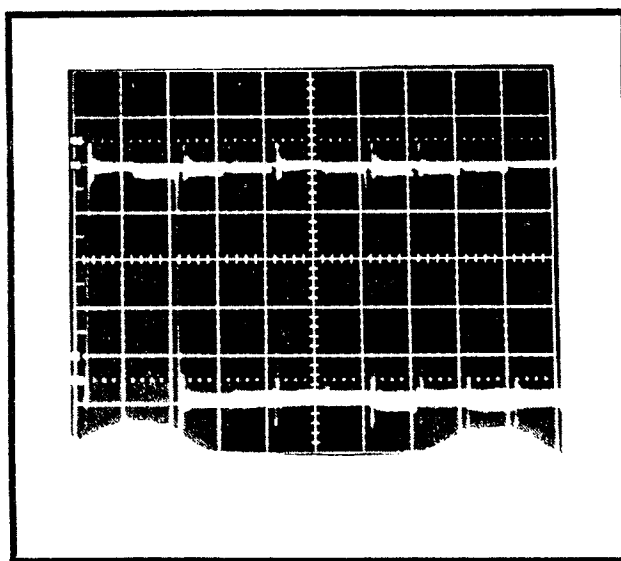


Fig. 9-24. Data bus line signal at pin 6 of the 3850 CPU. Scope controls are at 1  $\mu$ s/div for the horizontal and 1V/div for the vertical.

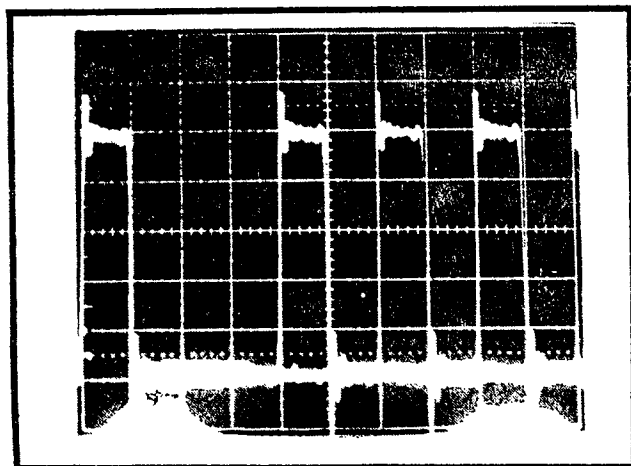


Fig. 9-22. Timing pulse output from pin 2 of the 3850 CPU to both PSCs in the 614-1000 and 614-3000. Scope controls are at 0.5  $\mu$ s/div for the horizontal and 1V/div for the vertical.

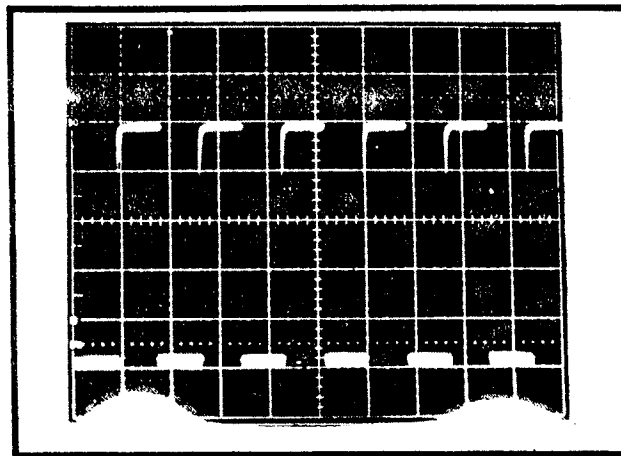


Fig. 9-25. Square wave output at pin 11 of the 3850 CPU. If this signal is present, the CPU and PSUs are working normally. Scope controls are at 2 ms/div for the horizontal and 1V/div for the vertical.

output of the decoder (7445) at pin 9 and see if it goes low or not. If it does, the decoder is good; change transistor array Q270 (FPQ3724). If pin 9 does not go low, change the decoder.

On the 614-2000, the tilt light is the only light, other than the 5.25V AC light, that is not in the matrix but is controlled by the logic. If the tilt light does not light when the tilt switch is closed, check the bulb and socket first. If the bulb appears to be good, check pin 6 of the CPU and see if it goes high when the tilt switch is closed with the game in the play mode. If this is okay, check driver L3's output. If the tilt light remains on all the time, check driver L3 for a short. If it appears to be good, check pins 6 of the CPU. If it is high without the tilt switch being closed, change the CPU.

### SERVICE PROCEDURES

The following procedures cover switch adjustments, cleaning the playfield, lamp replacement, and fuse replacement. Figure 9-9 indicates the locations of various switches and lamps on the playfield.

#### Rollover Switch

The ball must actuate the switch when rolling through the rollover area from both directions. To adjust the actuator proceed as follows:

1. Form the actuator as shown in Fig. 9-26 to ensure that the switch is actuated when the ball rolls over it in either direction. The actuator should be centered in the slot

when adjusted and not resting above the playfield surface.

2. Check the operation of the switch by rolling a ball over the actuator. The ball should not stop or hang up.
3. Check for spring return after the ball has passed over the actuator. The spring should return to the up position.

#### Sling Shot & Side Rubber Switch

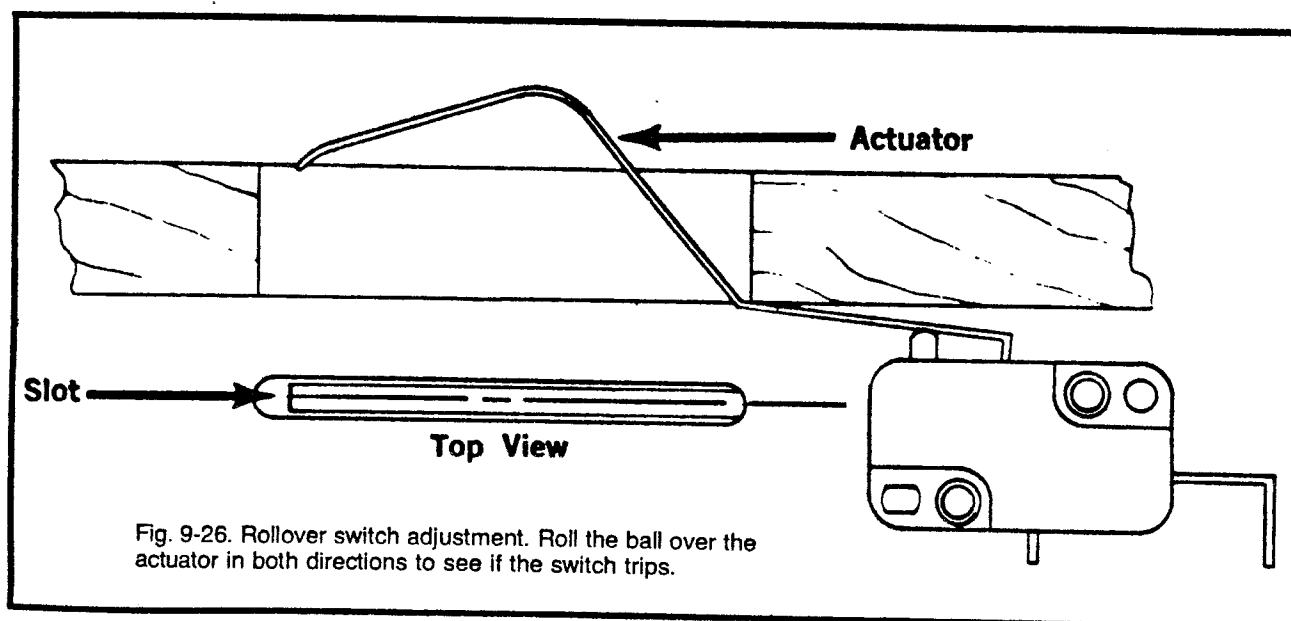
The rubber bumper must be evenly stretched around all posts. The switch actuator blade must be adjusted to make the switch actuate (clicking sound) when it moves 0.0625 inches (1.587 mm) from the rubber bumper. If the switch is adjusted too close, the sling shot will chatter. Refer to Fig. 9-27.

#### Target Switch

The switch must actuate and reset (click, click) freely in the playfield slot. The rear stop bracket must be adjusted for 0.1562 inches from the actuation point of the switch. Make this adjustment by bending the stop bracket. Refer to Fig. 9-28.

#### Thumper Bumper Switch

The thumper bumper spoon must be centered about the thumper bumper actuating point in all directions. Refer to Fig. 9-29. When the thumper bumper wafer is depressed at any point on the



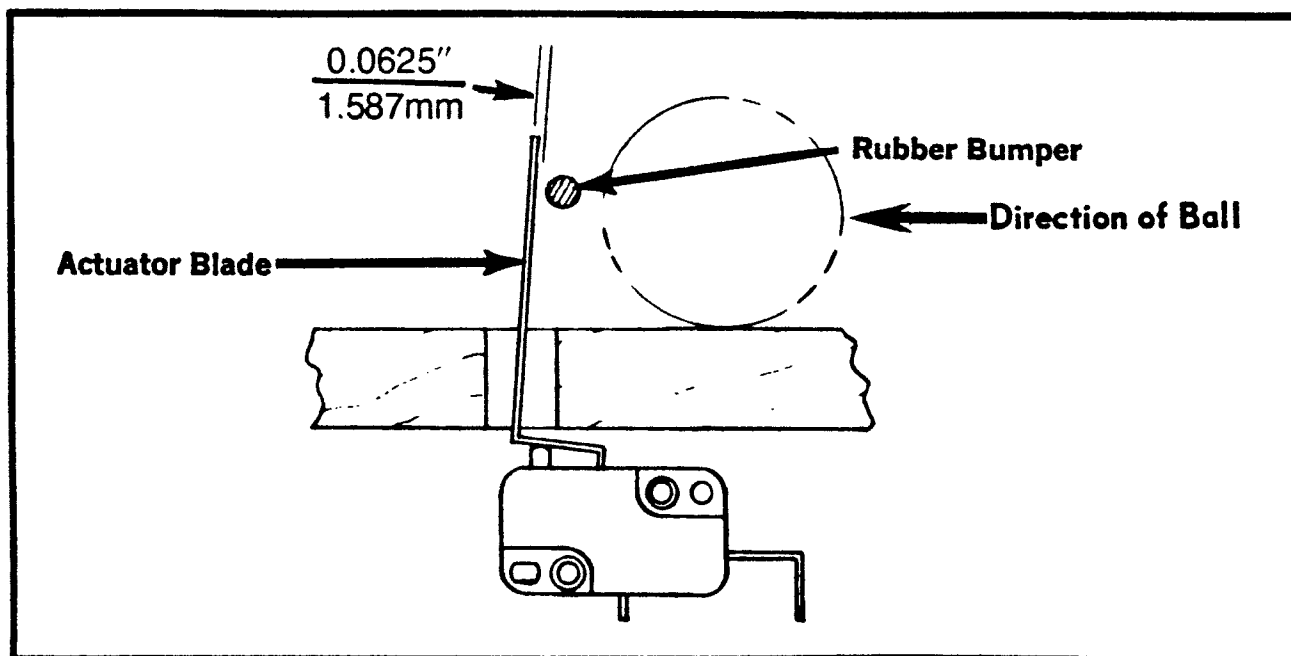


Fig. 9-27. Sling shot and side rubber switch adjustment. Adjust the actuator so that the switch trips within the limits shown.

periphery the switch must actuate. Adjust the switch actuator arm by bending it to meet this requirement. Note the 0.0625-inch (1.587 mm) clearance of the bumper wafer in the resting position.

#### Ball Return Switch

To adjust the ball return switch, adjust the switch actuator to actuate when the ball stops in the

position shown in Fig. 9-30. If the switch actuates before the ball returns to the position shown, ball ejection will start prematurely and cause the ball to hang up.

#### Spinner Target Switch

Adjust the switch actuation arm by bending it until the switch actuates (flick) in the lower third of spinner travel. See Fig. 9-31.

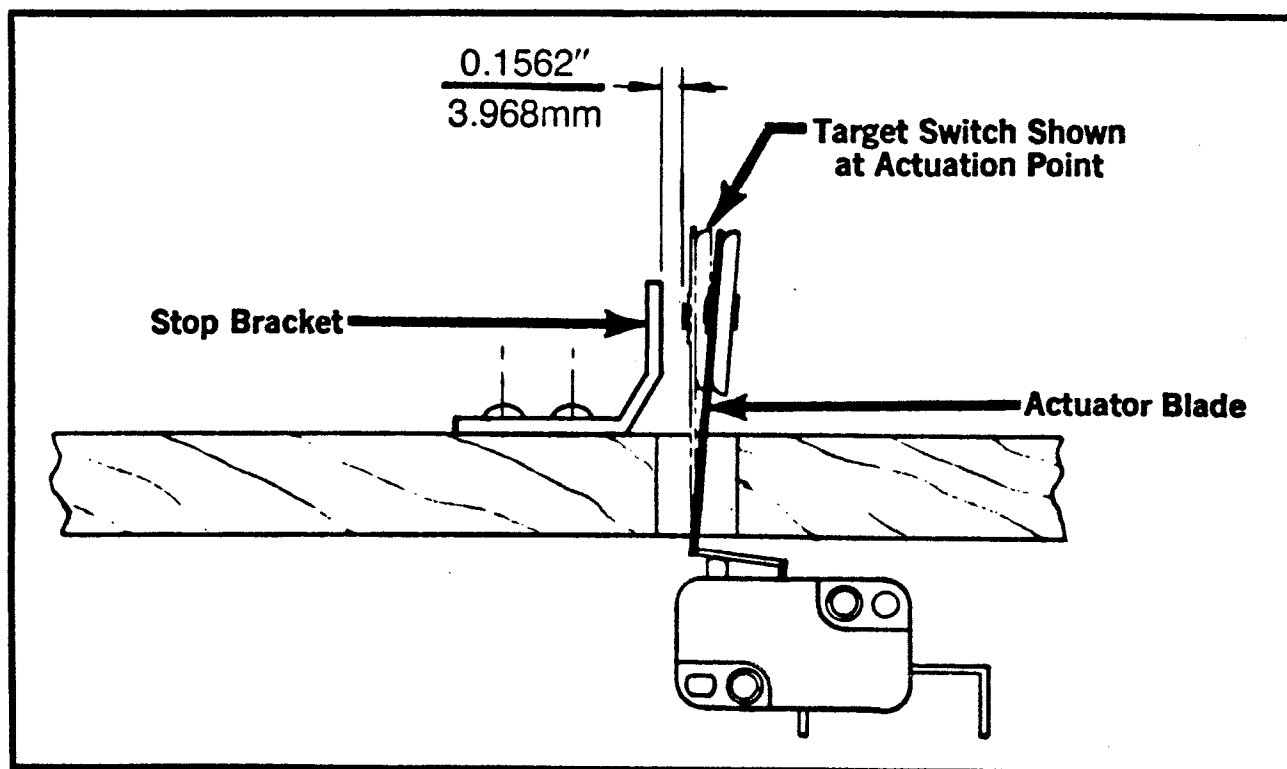


Fig. 9-28. Target switch adjustment. Bend the stop bracket to make the switch operate as indicated.

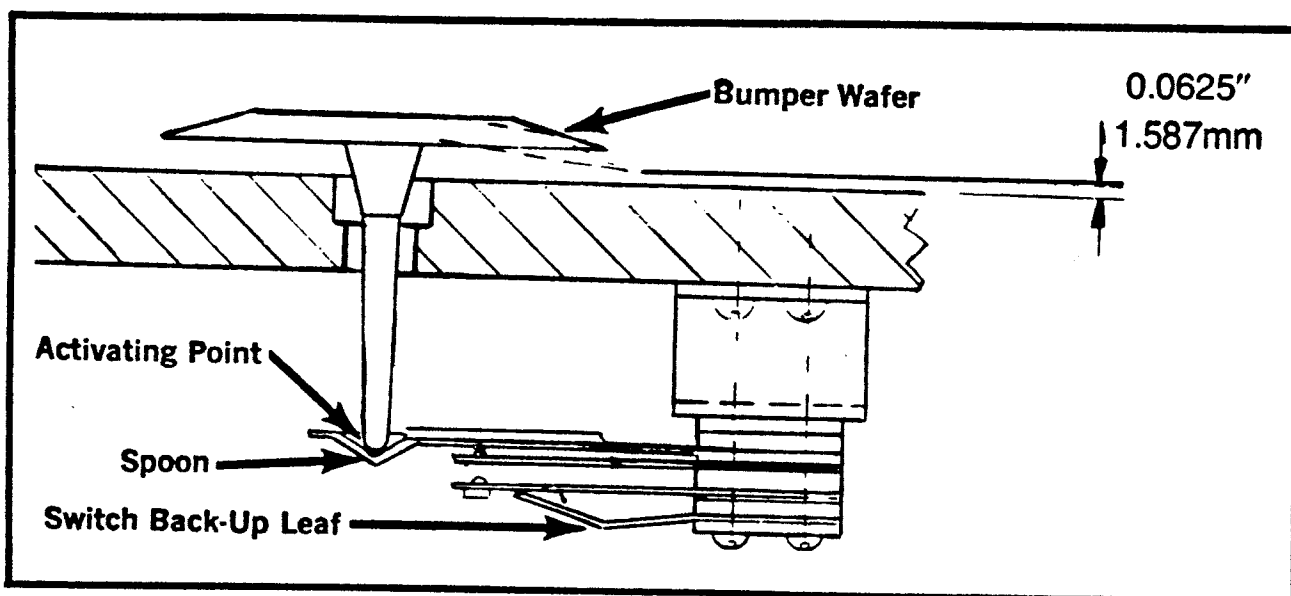


Fig. 9-29. Thumper bumper switch adjustment. First center the switch spoon. Then bend the switch actuator to operate the switch within the specifications shown.

### Cleaning Playfield

Remove the playfield glass as shown in Figs. 9-32 and 9-33. Wipe the playfield surface with a soft rag or slightly dampened towel.

### Servicing Bottom of Playfield

Remove the three screws in the front of the cabinet as shown in Fig. 9-32. Lift off the trim molding. Carefully slide out the playfield glass as shown in Fig. 9-33. Remove the two screws in the bracket holding down the playfield as shown in Fig. 9-33. Raise the playfield from the front and place it

against the cabinet back box with the playfield resting in the notches provided in the playfield support rails. Refer to Fig. 9-34. The playfield bottom (lamps, switches, and solenoids), flipper switches, tilt assembly, and power supply are now easily accessible.

### Tilt Pendulum

The tilt pendulum, which is located in the left-front section of the cabinet, can be adjusted as desired. To make the tilt more sensitive, loosen the thumb screw in the tilt bob. Refer to Fig. 9-35.

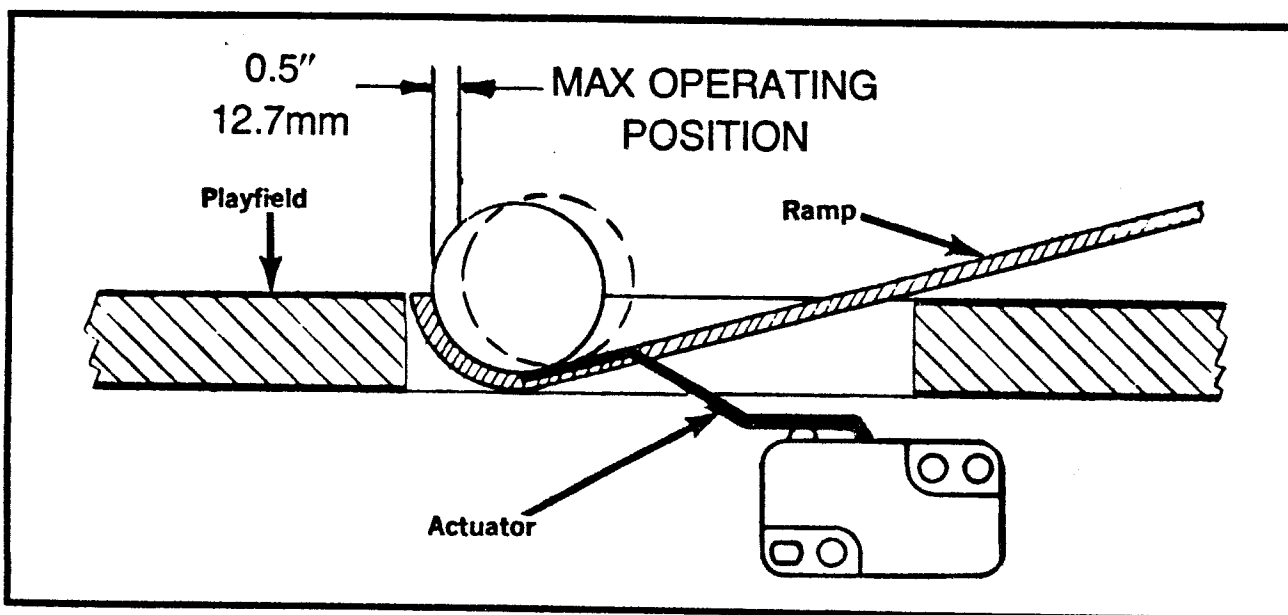


Fig. 9-30. Ball return switch adjustment. Bend the actuator to operate the switch as the ball stops in the position shown.

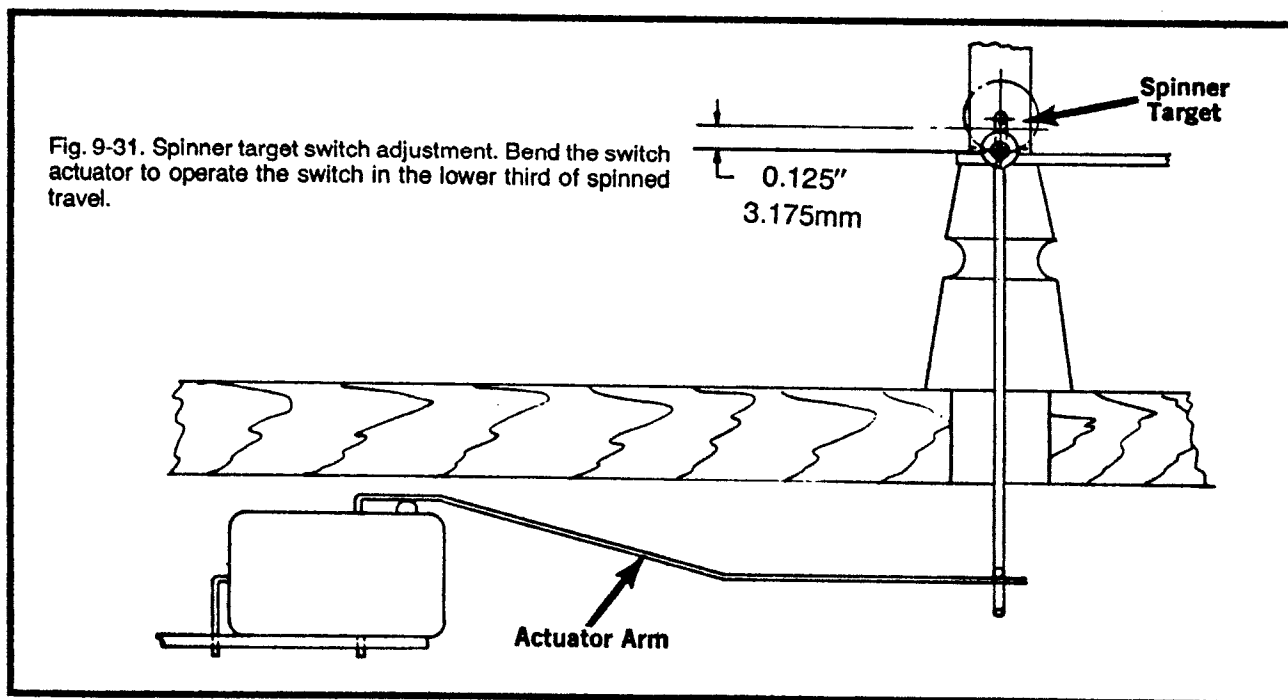


Fig. 9-31. Spinner target switch adjustment. Bend the switch actuator to operate the switch in the lower third of spinned travel.

Raise the bob closer to the bob ring. Then tighten the thumb screw. To make the tilt less sensitive, lower the bob.

plastic cap to move slightly on top of the bumper posts.

### Bumper Rubber Replacement

1. Remove the acorn nuts holding the plastic cap as shown in Fig. 9-36.
2. Remove the plastic cap.
3. Remove the worn bumper rubber.
4. Stretch the new bumper rubber around the bumper posts. Tension on the bumper rubber must be evenly distributed about all bumper posts.
5. Replace the plastic cap and acorn nuts. Do not overtighten the acorn nuts. Allow the

### Playfield Lamp Replacement

1. Remove the acorn nuts from the plastic cap covering the burned out lamp. Refer to Fig. 9-36.
2. Remove the plastic cap.
3. Pull the burned out lamp straight out of the receptacle. Insert a new lamp.
4. Replace the plastic cap and acorn nuts. Do not overtighten the acorn nuts. Allow the plastic cap to move freely on top of the bumper posts.

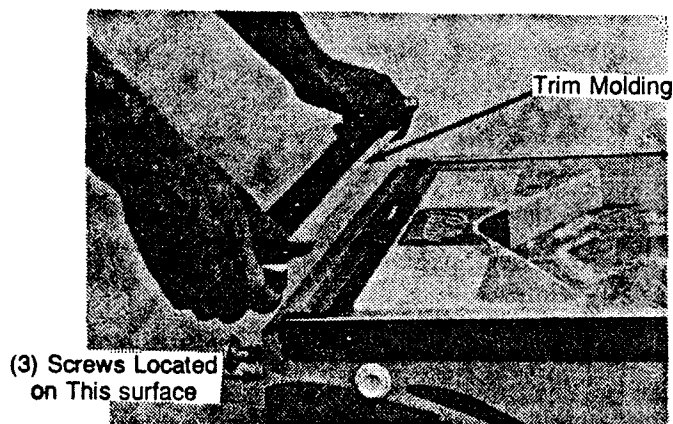


Fig. 9-32. Removing the trim molding to gain access to the playfield. Take out the three screws as indicated to remove the molding.

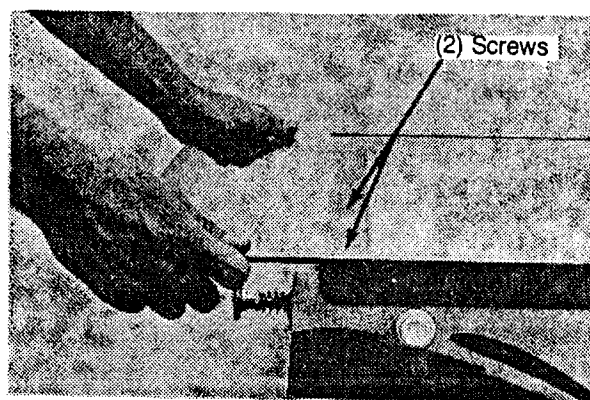


Fig. 9-33. Sliding out the glass. Remove the two screws shown, then carefully slide out the glass.

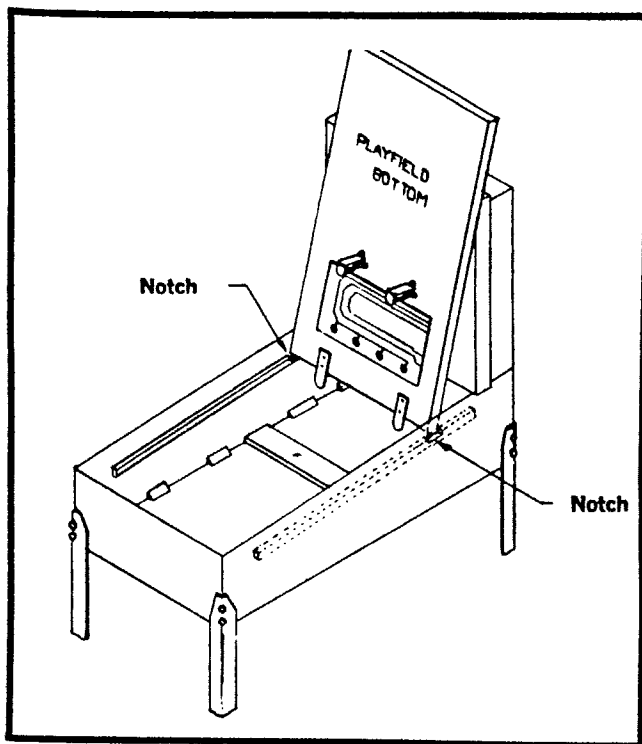


Fig. 9-34. Positioning the playfield. Place the playfield in the two notches shown, then let it rest against the cabinet back.

### PC Board Lamp Replacement

1. Twist lamp receptacle counterclockwise to remove it from the PC board. Refer to Fig. 9-37.
2. Pull the burned out lamp straight out of the receptacle. Insert a new lamp.
3. Twist lamp receptacle clockwise to position it back in the PC board.

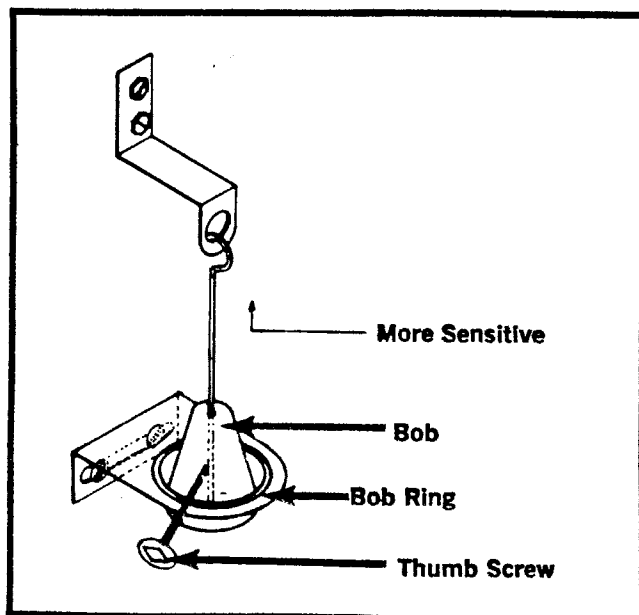


Fig. 9-35. Tilt pendulum adjustment. Raise the bob to make it more sensitive.

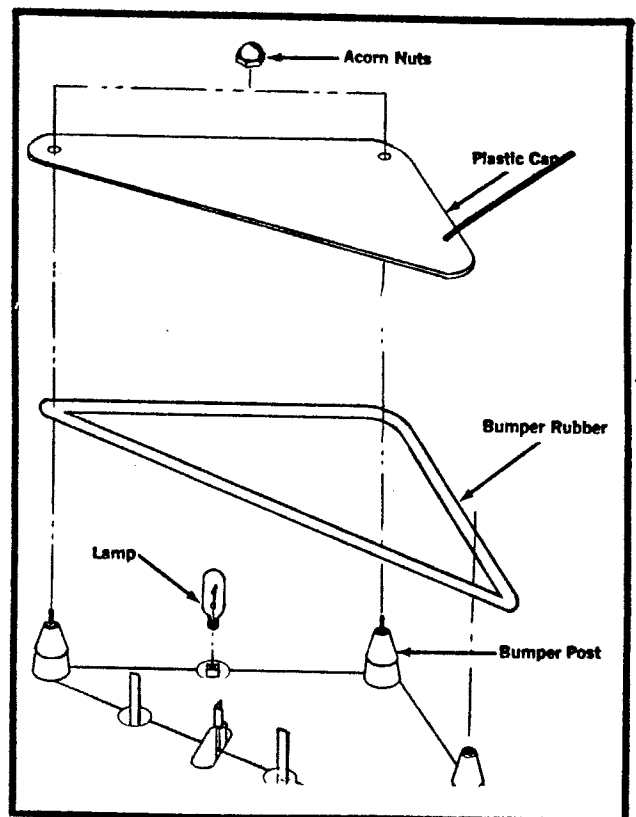


Fig. 9-36. Bumper rubber replacement. Do not overtighten the acorn nuts.

### Bumper Lamp Replacement

1. Remove the two screws in the thumper bumper cap.
2. Remove the thumper bumper cap.
3. Twist out the burned out lamp and replace it with a new 455-type bulb. Refer to Fig. 9-38.
4. Replace the thumper bumper cap and screws.

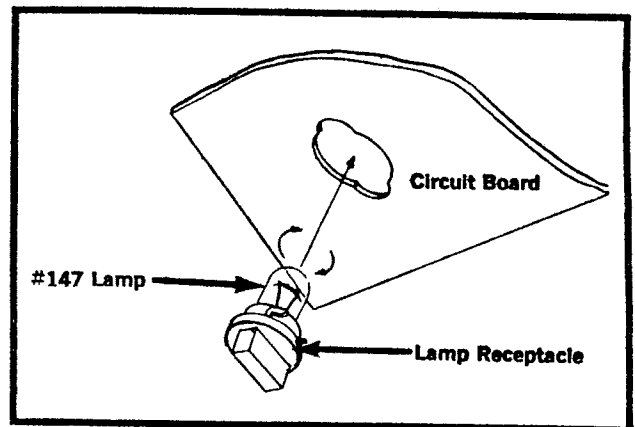


Fig. 9-37. PC board lamp replacement. Turn the lamp assembly counterclockwise to remove and clockwise to install.

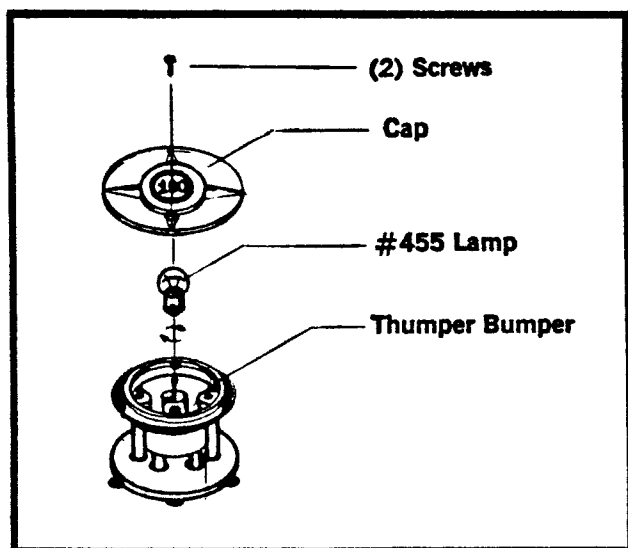


Fig. 9-38. Thumper bumper lamp replacement. Use a 455-type bulb.

### Insert Lamp Replacement

1. Remove the three screws in the insert molding. Remove the molding. Refer to Fig. 9-39.
2. Remove the insert display glass.
3. Replace the burned out lamp. Use a 147-type lamp.
4. Replace the display glass, molding, and three screws.

### Solenoid Wiring

If for any reason the wiring of any solenoid is removed, it must be replaced in the following manner: The white wire must be connected to the terminal identified with a white marking. The wire is attached by pushing the connector on the spade terminal. Refer to Fig. 9-40. Failure to connect the

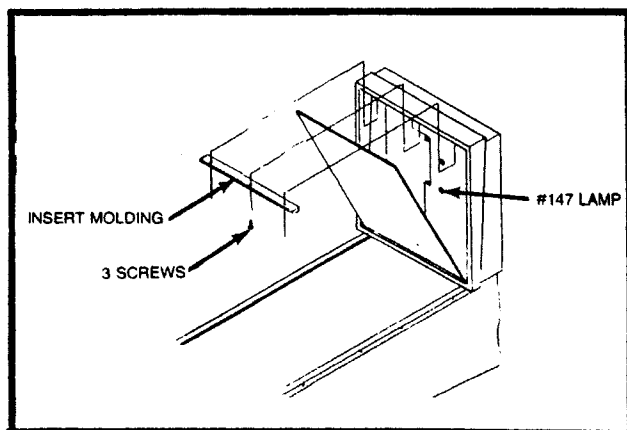


Fig. 9-39. Display insert lamp replacement. Use a 147-type bulb.

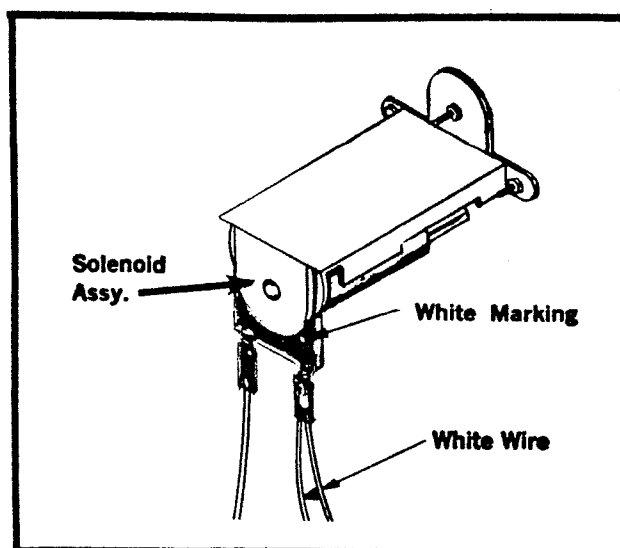


Fig. 9-40. Solenoid wiring. Match the white wire with the white marker on the solenoid.

solenoids as instructed will result in serious damage to electronic components on the logic board.

### Fuse Replacement

This procedure does not apply to the 614-2000 since there is no replaceable fuse in that model.

1. Remove the playfield glass as shown in Figs. 9-32 and 9-33. Raise the playfield as shown in Fig. 9-34.
2. The transformer assembly is located in the right-rear corner of the bottom of the cabinet. Remove the fuse from this assembly by twisting the fuse cap as shown in Fig. 9-41.
3. Replace the blown fuse with a new 8A fuse.

### 614-2000 CIRCUIT PROTECTION

Aside from the difference in the logic circuitry and physical appearance, the 614-2000 has one other distinct feature which is not present in the other pinball machine. This feature is the addition of five circuit breakers, two at 3.9A and three at 2.5A. These are all located in the secondary of the power transformer.

These circuit breakers have been added to prevent solenoid or transformer burnup. An explanation of the responsibilities of each circuit breaker is as follows:

### 3.9A Circuit Breakers

As stated, there are two circuit breakers of this rating. One is inserted in the playfield illumination line. It monitors the current through nine display lights on the periphery of the playfield and both thumper bumper lamps.

The other 3.9A circuit breaker is located in the scorebox illumination line. It monitors current through the six display lights behind the scorebox.

### 2.5A Circuit Breakers

As mentioned above, there are three circuit breakers in the 614-2000 of this rating. One of these monitors light current, while the other two monitor solenoid current. The circuit breaker monitoring light current is in the feature light line, which supplies current to all lights connected with switches and bonus scoring.

One of the 2.5A circuit breakers monitors current through the solenoids located on the right side of the playing surface, including the ball return solenoid. The final 2.5A circuit breaker monitors current through all solenoids located on the left side of the playing surface.

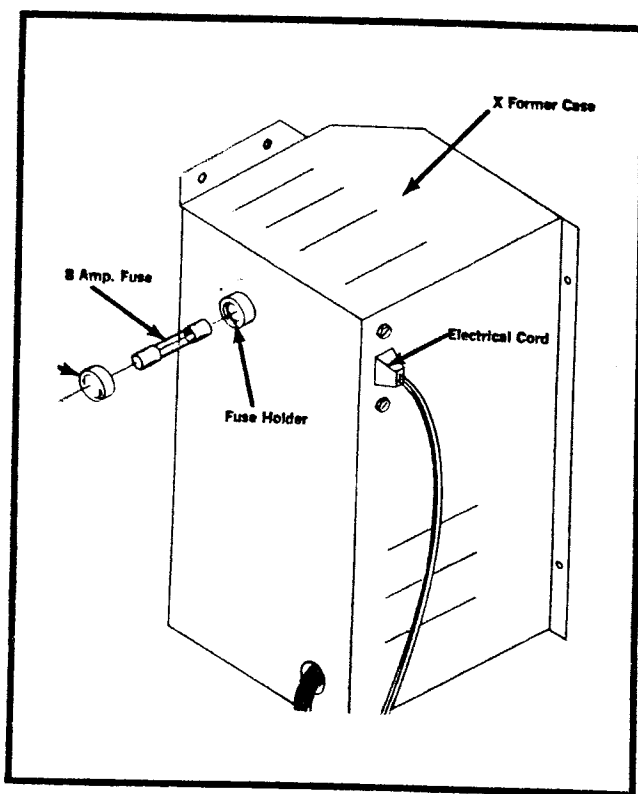


Fig. 9-41. Fuse replacement in the 614-1000 and 614-3000. The transformer assembly is located in the right-rear corner of the cabinet. Use an 8A fuse when replacing.

## ELECTROMECHANICAL TROUBLES

The following information is a list of some typical electromechanical symptoms that could occur to a pinball machine. Each symptom is displayed in boldface type as a heading. Directly below each symptom is a step-by-step procedure that can help locate the malfunctioning component or components. Or, in some cases, the steps indicate a remedy or adjustment procedure.

### No Lites—Nothing Works

1. Make sure the electrical cord is firmly inserted in the wall outlet.
2. Depress the on/off switch.
3. Reset the circuit breaker.
4. Check the 8A fuse.
5. Check the power supply connections.

### Insert Lites Okay—Playfield Lites Off

1. Remove the rear cabinet panel.
2. See that the connectors on the logic board are firmly in place.
3. Remove the playfield glass as shown in Figs. 9-32 and 9-33. Raise the playfield as shown in Fig. 9-34.
4. See that the connectors on the upper and lower playfield are firmly in place.

### Playfield Lites Okay—Insert Lites Off

1. Remove the rear cabinet panel.
2. See that the connectors on the logic board and display insert are firmly in place.

### Game Will Not Start

1. Remove playfield glass as shown in Figs. 9-32 and 9-33. Raise the playfield as shown in Fig. 9-34.
2. Make sure that the push-on connectors are firmly attached to the start switch terminals.
3. Actuate the start switch via the start button and listen for a clicking sound.
4. If the start button stroke is too short to actuate the switch, the switch blade can be bent slightly to obtain actuation.

## ORDER BY PART NUMBER ONLY

| ITEM | PART N <sup>o</sup> | DESCRIPTION                                      |
|------|---------------------|--------------------------------------------------|
| 1    | 0614-00516-0100     | BACK BOX - EVEL KNIEVEL                          |
|      | 0614-00501-0200     | BACK BOX - CAPTAIN FANTASTIC                     |
|      | 0614-00516-0200     | BACK BOX - FIREBALL II                           |
|      | 0017-00102-0021     | 1/4 - 20 x 1-3/4 HEX HD. BOLT, (2)               |
|      | 0017-00104-0039     | STEEL WASHER (2)                                 |
| 2    | 0614-00902-0100     | BACK BOX FRAME - EVEL KNIEVEL                    |
|      | 0614-00902-0200     | BACK BOX FRAME - CAPTAIN FANTASTIC & FIREBALL II |
| 3    | 0614-00920-0100     | BACK BOX GLASS - CAPTAIN FANTASTIC               |
|      | 0614-00920-0200     | BACK BOX GLASS - EVEL KNIEVEL                    |
|      | 0606-00901-0000     | BACK BOX GLASS - FIREBALL II                     |
|      | 0017-00101-0062     | #6 x 3/4 PHIL. PAN, HD S.M.S.                    |
| 4    | 0606-00919-0000     | NICKEL PL. (10)                                  |
| 5    | 0614-00100-000      | DECORATIVE SIDE CHANNEL (2)                      |
|      | 0017-00101-0357     | #5 x 1/2 PHIL. PAN. HD. S.M.S. (10)              |
| 6    | A614-0019-0000      | FRONT DECORATIVE MLDG. ASSY.                     |
|      | 0017-00101-0055     | #10 x 1-1/4 PHILIPS PAN HD. S.M.S.               |
| 7    | 0614-00515-0100     | NICKEL PL. (3)                                   |
|      | 0614-00509-0200     | BOTTOM CABINET - EVEL KNIEVEL                    |
|      | 0614-00509-0200     | BOTTOM CABINET - CAPTAIN FANTASTIC               |
| 8    | 0614-00515-0200     | BOTTOM CABINET - FIREBALL II                     |
|      | 0017-00102-0063     | 3/8 - 16 x 2-3/8 ACORN HD. MTG. BOLTS (8)        |
| 9    | 0606-00101-01PA     | LEGS (4)                                         |
| 10   | 0017-00102-0048     | LEG LEVELERS (4)                                 |
|      | 0017-00103-0026     | LEG LEVELER NUTS (4)                             |

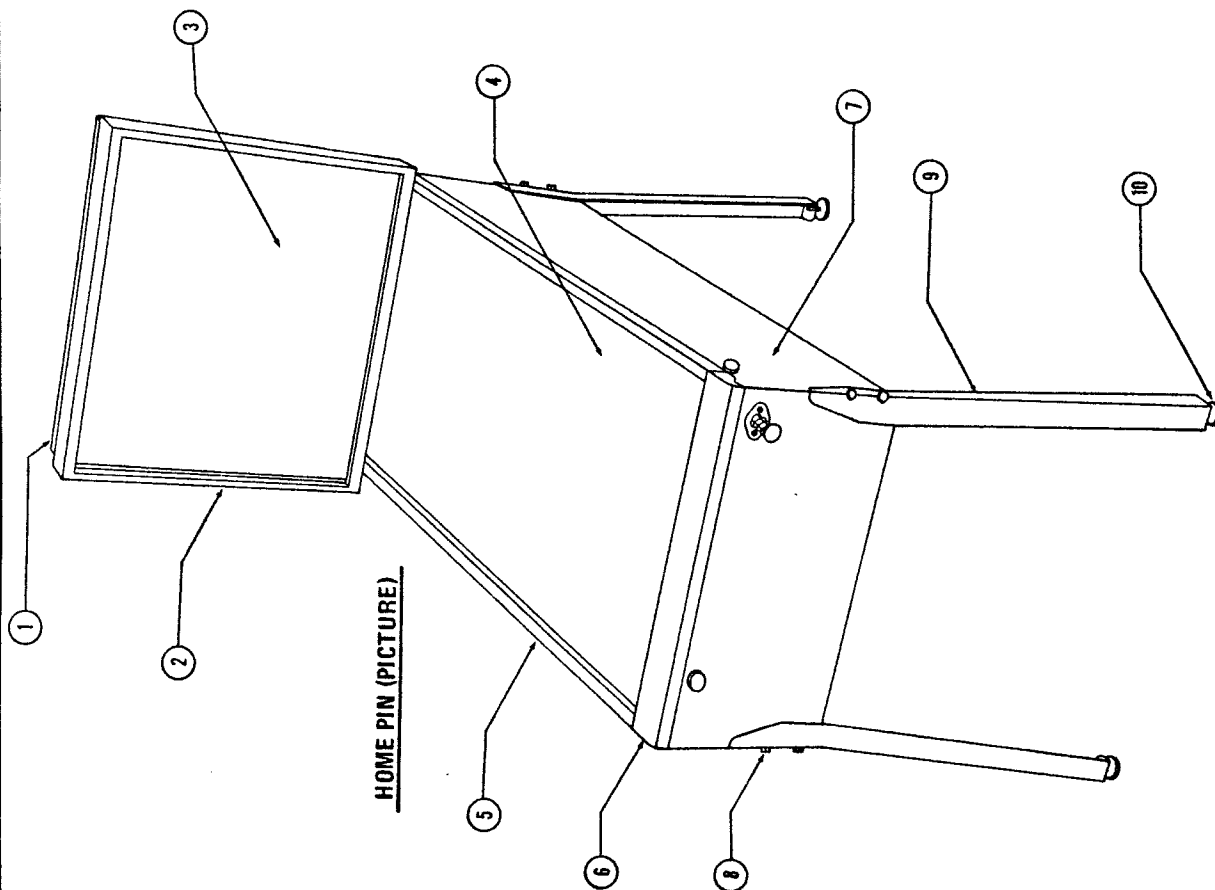


Fig. 9-42. Layout and parts list for major cabinet items.

### Ball Won't Eject to Shooter

1. Remove the playfield glass as shown in Figs. 9-32 and 9-33. Raise the playfield as shown in Fig. 9-34.
2. Make sure that the push-on connectors are firmly attached to the solenoid terminals and ball return switch terminals.
3. Check the switch adjustment. Refer to Fig. 9-30.

### Switch Won't Score

1. Remove the playfield glass. See Figs. 9-32 and 9-33.
2. Operate the switch manually and listen for actuation (clicking sound).
3. Adjust the switch indicated. Refer to Figs. 9-26 through 9-31.

### Solenoid Doesn't Operate

1. Remove the playfield glass. See Figs. 9-32 and 9-33.
2. Raise the playfield and position it as shown in Fig. 9-34.
3. Make sure the push-on connectors are firmly attached to the solenoid terminals.
4. Check the adjustment of the solenoid-operation switch for a click. If no click is heard, adjust it as indicated.

### Weak/Dead Flipper Solenoid

1. Remove the playfield glass. See Figs. 9-32 and 9-33. Raise the playfield into position. See Fig. 9-34.
2. Make sure that the push-on connectors are firmly attached to the flipper solenoid terminals.
3. Make sure that the flipper button switch is making solid contact. The switch may be adjusted by bending the switch blade slightly.
4. Clean the flipper button switch with a piece of fine emery cloth to ensure continuity.
5. When the flipper operates weakly, the switch on the coil assembly can be ad-

justed by bending it so that solid switch contact is made when the flipper is at read. These contacts must be open when the solenoid is at the end of its stroke. This condition can be simulated by moving the flipper to an up position manually.

### REPLACEMENT PARTS

Replacement parts for these pinball machines should be ordered from the manufacturer whenever possible. Parts information and pictorials of subassemblies are shown in Figs. 9-42 through 9-62. When ordering replacement parts be sure to indicate the manufacturer's part number. Also include a description of the desired part, but be sure to state the part number. These parts lists cover 614-1000 (Evel Knievel), 614-2000 (Captain Fantastic), and 614-3000 (Fireball II).

A list of what information is contained in each figure and the number is given below:

|                                                 |           |
|-------------------------------------------------|-----------|
| Major cabinet items                             | Fig. 9-42 |
| Thumper bumper assembly                         | Fig. 9-43 |
| Flipper unit assembly                           | Fig. 9-44 |
| Flipper unit assembly                           | Fig. 9-45 |
| Flipper and tilt assemblies                     | Fig. 9-46 |
| Ball shooter assembly                           | Fig. 9-47 |
| Sling shot assembly                             | Fig. 9-48 |
| Ball return kicker assembly                     | Fig. 9-49 |
| Flipper button assembly                         | Fig. 9-50 |
| 614-00912 power supply                          | Fig. 9-51 |
| 606-00906 power supply                          | Fig. 9-52 |
| Upper PC board                                  | Fig. 9-53 |
| Lower PC board                                  | Fig. 9-54 |
| 614-2000 logic board diagram                    | Fig. 9-55 |
| 614-2000 logic board parts                      | Fig. 9-56 |
| Evel Knievel/Fireball II<br>logic board diagram | Fig. 9-57 |
| Evel Knievel/Fireball II logic board parts      | Fig. 9-58 |
| Playfield assembly                              | Fig. 9-59 |
| Playfield assembly (continued)                  | Fig. 9-60 |
| Bottom arch assembly                            | Fig. 9-61 |
| Transformer                                     | Fig. 9-62 |

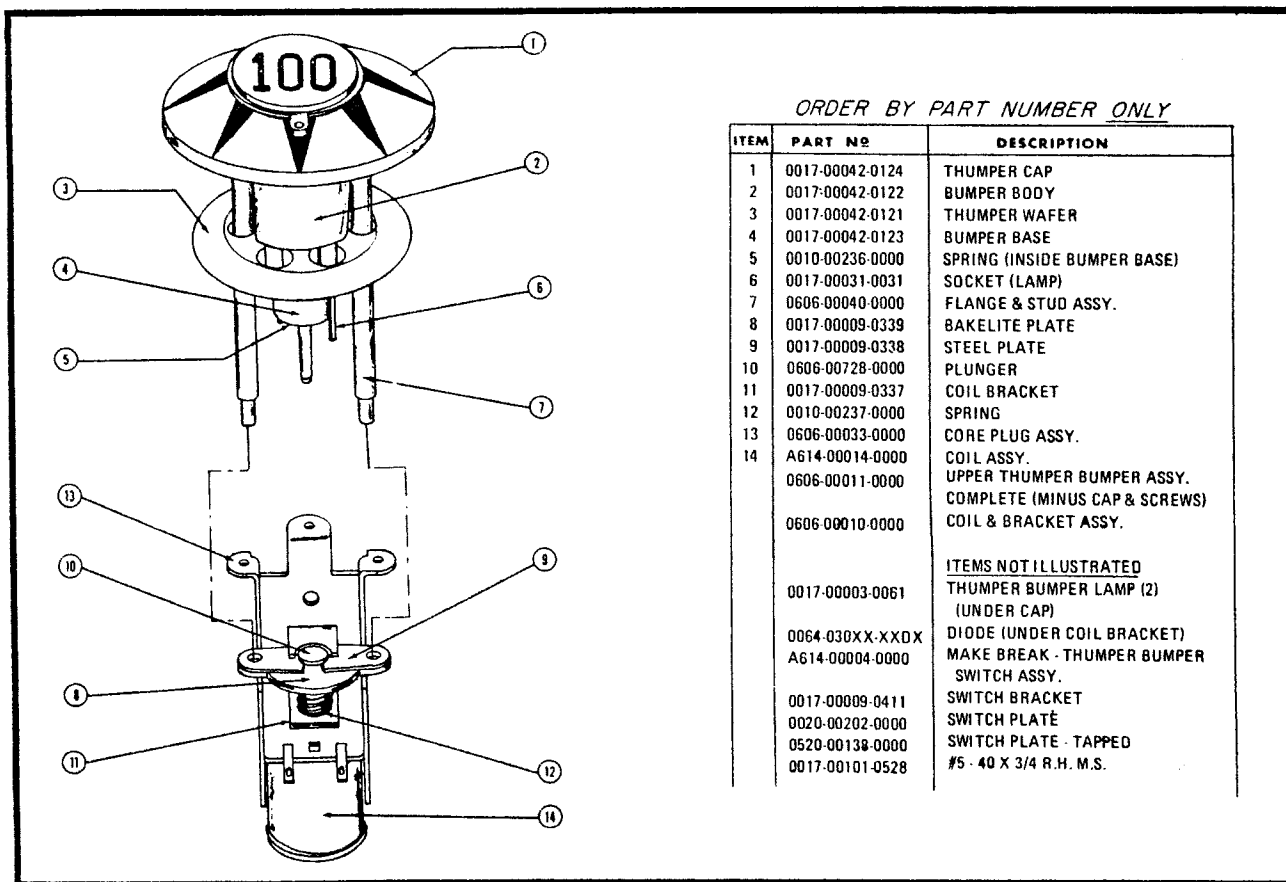


Fig. 9-43. Exploded view and parts list of the thumper bumper and coil assembly.

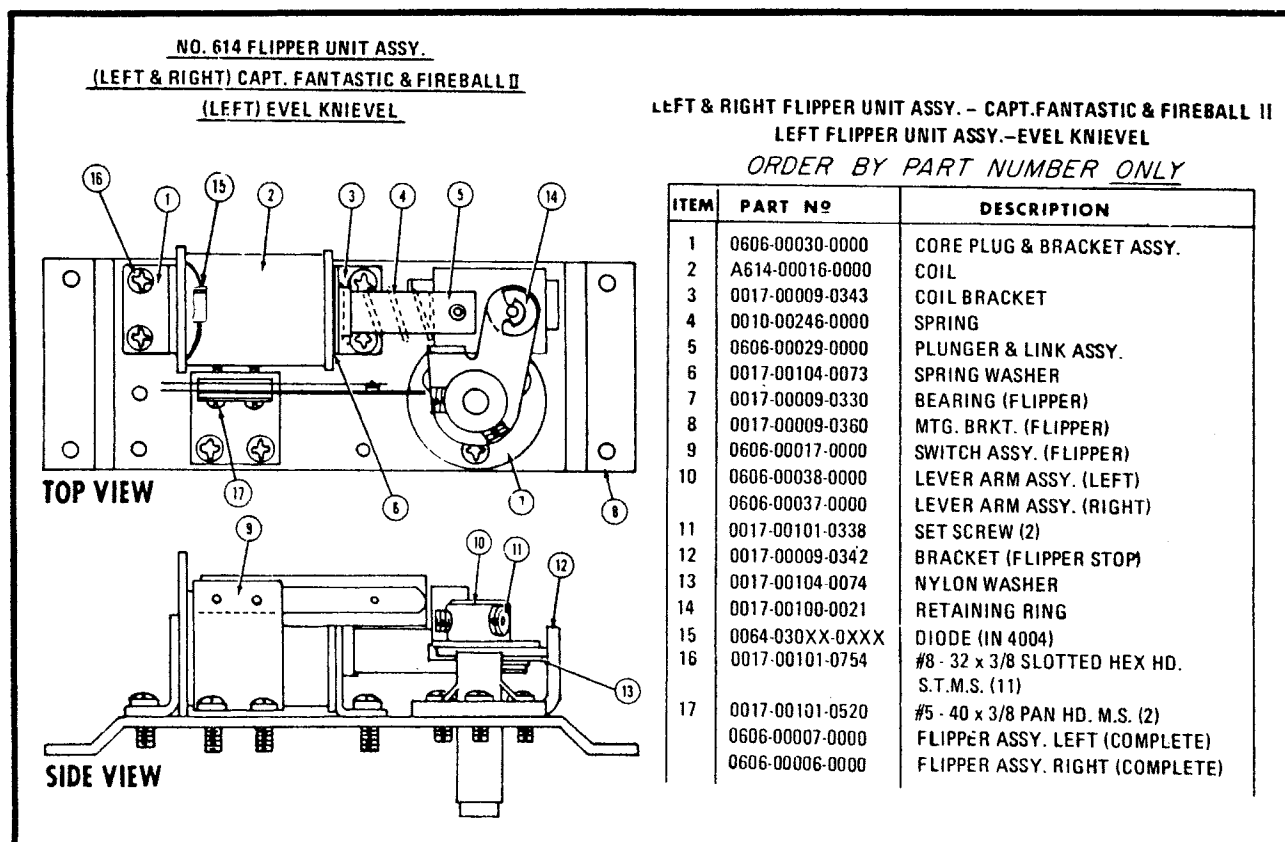
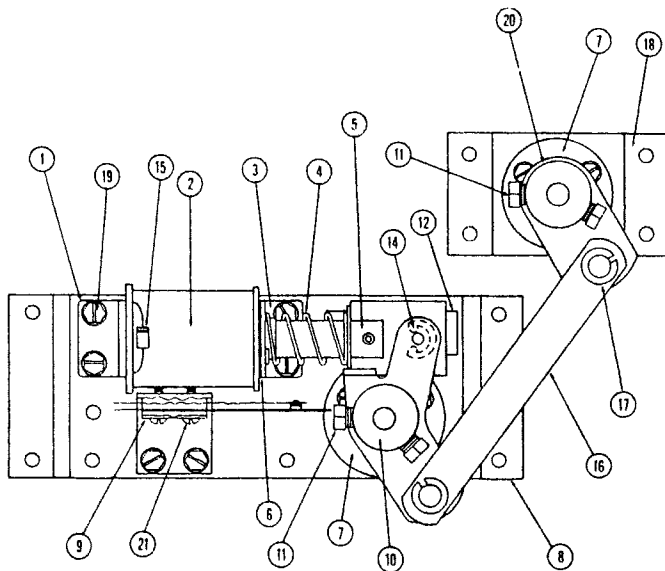


Fig. 9-44. Flipper unit assembly and parts list. Left and right flipper for Captain Fantastic and Fireball II. Left flipper for Evel Knievel.

# RIGHT FLIPPER UNIT ASSY. - EVEL KNEIVEL



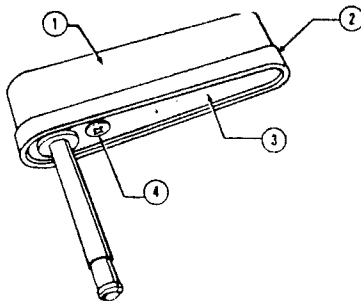
## RIGHT FLIPPER UNIT ASSY. - EVEL KNEIVEL

### ORDER BY PART NUMBER ONLY

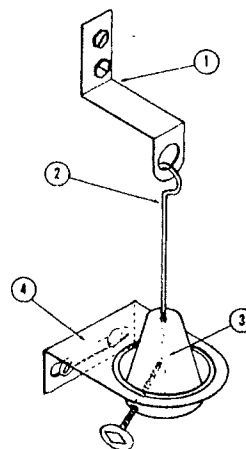
| ITEM | PART NO         | DESCRIPTION                             |
|------|-----------------|-----------------------------------------|
| 1    | 0606-00030-0000 | CORE PLUG & BRACKET ASSY.               |
| 2    | A614-00016-0000 | COIL                                    |
| 3    | 0017-00009-0343 | COIL BRACKET                            |
| 4    | 0010-00246-0000 | SPRING                                  |
| 5    | 0606-00029-0000 | PLUNGER & LINK ASSY.                    |
| 6    | 0017-00104-0073 | SPRING WASHER                           |
| 7    | 0017-00009-0330 | BEARING (FLIPPER) (2)                   |
| 8    | 0017-00009-0360 | MTG. BRKT. (FLIPPER)                    |
| 9    | 0606-00017-0000 | SWITCH ASSY. (FLIPPER)                  |
| 10   | A614-00038-0000 | LEVER ARM ASSY. (RIGHT) UPPER           |
| 11   | 0017-00101-0338 | SET SCREW (4)                           |
| 12   | 0017-00009-0342 | BRACKET (FLIPPER STOP)                  |
| 14   | 0017-00104-0074 | NYLON WASHER (NOT SHOWN)                |
| 15   | 0017-00100-0021 | RETAINING RING                          |
| 16   | 0064-030XX-0XXX | DIODE (IN 4004)                         |
| 17   | A614-00041-0000 | PIVOT LINK ASSY. (CONSISTING OF)        |
| 18   | 0614-00013-0000 | PIVOT LINK                              |
| 19   | 0017-00042-0093 | NYLINER (2)                             |
| 20   | A614-00042-0000 | MTG. BRKT. ASSY. (CONSISTING OF)        |
| 21   | 0614-00014-0000 | MTG. BRKT. (FLIPPER)                    |
|      | 0017-00101-0754 | #8-32 x 3/8 SLOT. HEX HD. S.T.M.S. (11) |
|      | 0614-00039-0000 | LEVER ARM ASSY. (RIGHT) LOWER           |
|      | 0017-00101-0520 | #5-40 x 3/8 PAN HD. MACH. SCR. (2)      |
|      | 0614-00040-0000 | FLIPPER ASSY. RIGHT (COMPLETE)          |

Fig. 9-45. Right flipper unit assembly and parts list for Evel Knievel.

# FLIPPER ASSY.



## BALL TILT ASSY.



## FLIPPER & BALL TILT ASS'YS

### ORDER BY PART NUMBER ONLY

| ITEM | PART NO         | DESCRIPTION                   |
|------|-----------------|-------------------------------|
| 1    | 0017-00042-0142 | FLIPPER ASSY.                 |
| 2    | 0017-00009-0357 | FLIPPER HOUSING               |
| 3    | 0606-00039-0000 | FLIPPER RUBBER                |
| 4    | 0017-00101-0014 | SHAFT & MTG BRKT. ASSY.       |
|      | A614-00032-0000 | #6 x 1/2 SELF TAP SCREW       |
|      |                 | FLIPPER ASSY. (COMPLETE)      |
|      |                 | CAPT. FANTASTIC & FIREBALL II |
|      |                 | (2 REQ'D.) EVEL KNEIVEL       |
|      |                 | (3 REQ'D.)                    |
|      |                 | BALL TILT ASSY.               |
| 1    | 0017-00009-0371 | TILT HANGER                   |
| 2    | 0010-00241-0000 | PLUMB BOB WIRE                |
| 3    | 0017-00009-0373 | PLUMB BOB W/THUMB SCREW       |
| 4    | 0017-00009-0372 | TILT CONTACT BRACKET          |

Fig. 9-46. Flipper arm and tilt mechanism with parts lists.

## ORDER BY PART NUMBER ONLY

| ITEM | PART N <sup>o</sup> | DESCRIPTION                                                          |
|------|---------------------|----------------------------------------------------------------------|
| 1    | 0606-00047-0000     | KNOB & SHOOTER ROD ASSEMBLY                                          |
| 2    | 0010-00235-0000     | COMPRESSION SPRING - SHORT                                           |
| 3    | 0017-00101-0777     | #10 - 32 X 1 1/4 PHIL. PAN. HD. S.M.S. -<br>NICKEL PLATED (2 REQ'D.) |
| 4    | 0017-00009-0406     | SHOOTER GUIDE                                                        |
| 5    | 0614-00107-0000     | BACK UP PLATE                                                        |
| 6    | 0614-00011-0000     | PLATE & NUT ASSEMBLY                                                 |
| 7    | 0010-00234-0000     | COMPRESSION SPRING - LONG                                            |
| 8    | 0017-00009-0369     | SPRING CUP (2 REQ'D.)                                                |
| 9    | 0017-00007-0126     | RETAINING RING                                                       |
| 10   | 0017-00041-0049     | ROUND TIP SHOOTER                                                    |
|      | 0614-00010-0000     | BALL SHOOTER ASSY. - COMPLETE                                        |
|      |                     | NOT SHOWN                                                            |
|      | 0017-00101-0025     | #8 X 1/4 HEX. HD. S.M.S. (2 REQ'D.)                                  |

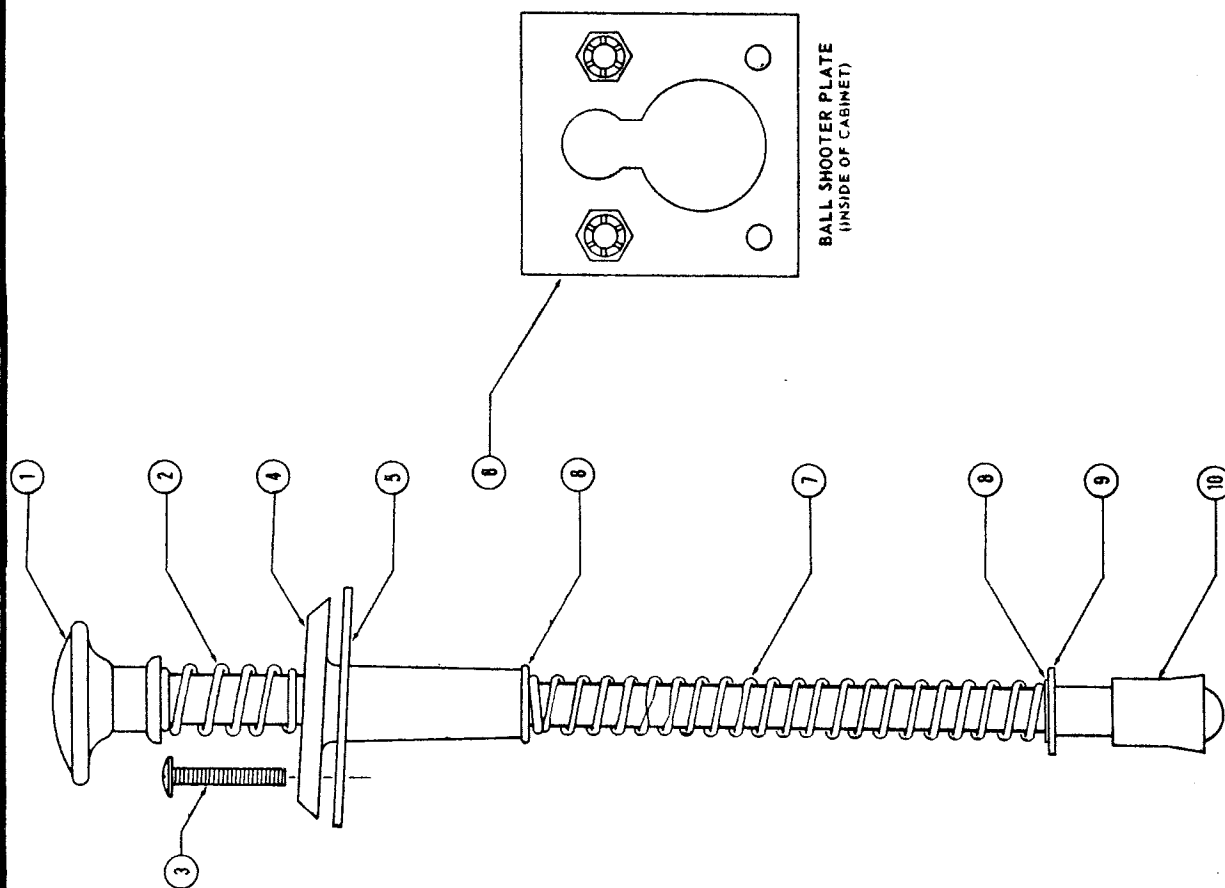
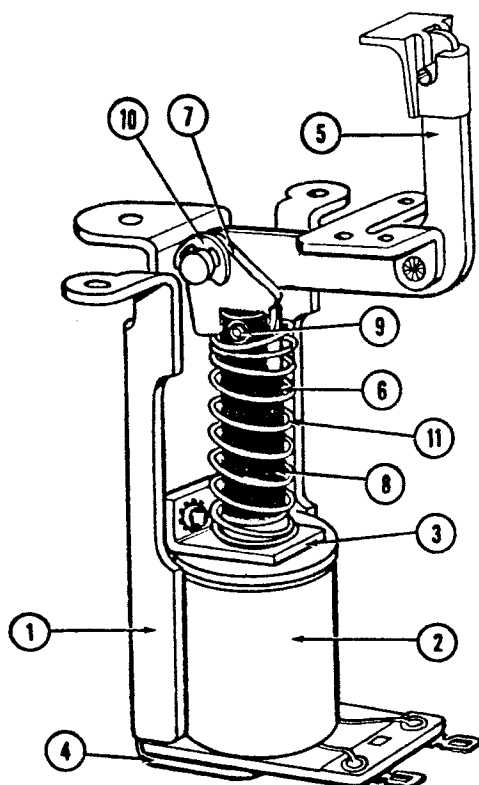


Fig 9-47. Ball shooter assembly and parts list.



# ORDER BY PART NUMBER ONLY

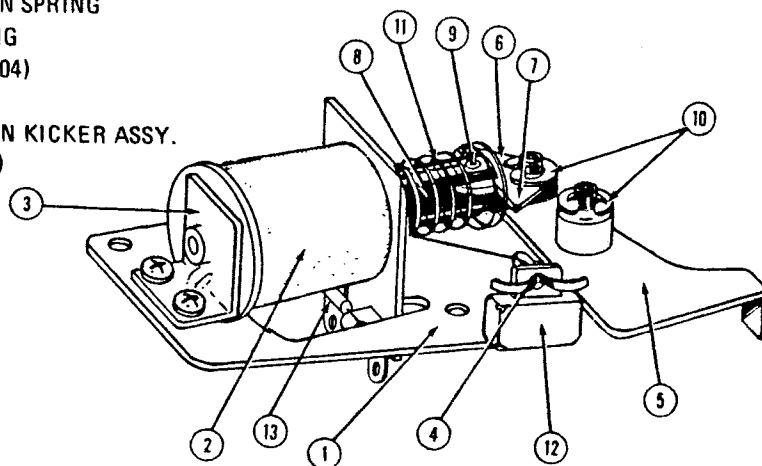
| ITEM | PART N <sup>o</sup> | DESCRIPTION                            |
|------|---------------------|----------------------------------------|
| 1    | 0606-00033-0000     | CORE PLUG ASSY.                        |
| 2    | A614-00017-0000     | COIL                                   |
| 3    | 0017-00009-0341     | SOLENOID BRACKET                       |
| 4    | 0606-00033-0000     | CORE PLUG ASSY.                        |
| 5    | A614-00005-0000     | KICKER ARM ASSY.                       |
| 6    | 0606-00043-0000     | PLUNGER & LINK ASSY.                   |
| 7    | 0017-00009-0317     | KICKER LINK                            |
| 8    | 0606-00707-0000     | PLUNGER                                |
| 9    | 0017-00007-0073     | ROLL PIN 1/8 x 7/16                    |
| 10   | 0017-00100-0021     | RETAINING RING                         |
| 11   | 0010-00239-0000     | COMPRESSION SPRING                     |
|      | 0606-00042-0000     | CORE PLUG & COIL ASSY.                 |
|      | A614-00006-0000     | SLINGSHOT KICKER COIL ASSY. (COMPLETE) |

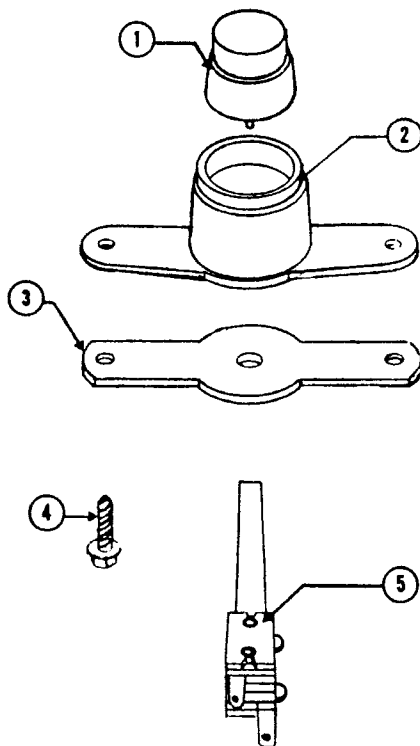
Fig. 9-48. Sling shot kicker coil assembly and parts list.

# ORDER BY PART NUMBER ONLY

| ITEM | PART N <sup>o</sup> | DESCRIPTION                         |
|------|---------------------|-------------------------------------|
| 1    | 0606-00045-0000     | BASE PLATE ASSY.                    |
| 2    | A614-00047-0000     | COIL ASSY.                          |
| 3    | 0606-00032-0000     | CORE PLUG ASSY.                     |
| 4    | 0017-00007-0124     | 3/32 x 3/8 COTTER PIN               |
| 5    | 0606-00044-0000     | KICKER ARM ASSY.                    |
| 6    | 0606-00043-0000     | PLUNGER & LINK ASSY.                |
| 7    | 0017-00009-0317     | KICKER LINK                         |
| 8    | 0606-00707-0000     | PLUNGER                             |
| 9    | 0017-00007-0073     | 1/8 DIA. x 7/16 ROLL PIN            |
| 10   | 0017-00100-0021     | RETAINING RING (2)                  |
| 11   | 0010-00240-0000     | COMPRESSION SPRING                  |
| 12   | 0017-00042-0120     | STRIKER RING                        |
| 13   | 0064-030XX-XXXX     | DIODE (IN 4004)                     |
|      | 0606-00009-0000     | BALL RETURN KICKER ASSY. (COMPLETE) |

Fig. 9-49. Ball return kicker assembly and parts list.





# FLIPPER BUTTON ASSY.

## ORDER BY PART NUMBER ONLY

| ITEM                         | PART NO         | DESCRIPTION                                |
|------------------------------|-----------------|--------------------------------------------|
| <u>FLIPPER BUTTON ASSY.</u>  |                 |                                            |
| 1                            | 0017-00042-0144 | FLIPPER BUTTON                             |
| 2                            | 0017-00042-0143 | FLIPPER BUTTON HOUSING                     |
| 3                            | 0017-00009-0366 | FLIPPER BUTTON MTG. PLATE                  |
| 4                            | 0017-00101-0025 | #8 x 1/2 SCREW (2)                         |
| 5                            | 0606-00016-0000 | FLIPPER BUTTON SWITCH                      |
| <u>ITEMS NOT ILLUSTRATED</u> |                 |                                            |
|                              | 0017-00005-0182 | ON SWITCH                                  |
|                              | A614-00012-0000 | SPEAKER ASSY. WITH<br>RESONATOR CONE       |
|                              | 0614-00048-0000 | SPEAKER CABLE ASSY.                        |
|                              | 0017-00005-0182 | STARTER SWITCH - LOCATED ON<br>FRONT PANEL |

Fig. 9-50. Flipper button assembly and parts list.

# POWER SUPPLY P.C. BOARD ASSY. CAPT. FANTASTIC ONLY

## ORDER BY PART NUMBER ONLY

| ITEM | PART NO         | DESCRIPTION                                          |
|------|-----------------|------------------------------------------------------|
| 1    | 0614-00912-0000 | P.C. BOARD                                           |
| 2    | 0064-168FF-XXXX | RECTIFIER - A14F (4 REQ'D)                           |
| 3    | 0064-168FF-XXXX | RECTIFIER - A15F (4 REQ'D)                           |
| 4    | 0017-00021-0271 | WAFER, 90° POL., - 4 PIN (2 REQ'D)                   |
| 5    | 0017-00021-0258 | WAFER, 90° POL., - 6 PIN                             |
| 6    | 0017-00021-0262 | WAFER, 90° POL., - 11 PIN                            |
| 7    | 0061-326DX-5EXX | 20,000 MFD., 16 V., ELECTROLYTIC<br>AXIAL CAPACITOR  |
| 8    | 0061-322CX-5EXX | 10,000 MFD., 35 V., ELECTROLYTIC<br>AXIAL CAPACITOR  |
| 9    | 0061-148G6-4FXX | .33 MFD., 35 V., 20% CAPACITOR<br>TANTALUM CAPACITOR |
| 10   | 0062-110B3-1XXX | 1/4 W. 5% RESISTOR - 100 OHM                         |
| 11   | 0066-785AX-XX0X | 78L18, 18V. VOLTAGE REGULATOR                        |
| 12   | 0065-494XX-XXXX | TIP 125 TRANSISTOR                                   |
| 13   | 0066-786AX-XXXX | 78M05, 5V VOLTAGE REGULATOR                          |
| 14   | 0017-00042-1050 | CABLE TIES, PANDUIT                                  |
| 15   | 0017-222GG-4FXX | 47MFD., 35V., 20% TANTALUM<br>CAPACITOR              |
| 16   | 0080-00102-0000 | HEAT SINK                                            |
|      | 0017-00042-0014 | SNAP BUSHING - NOT SHOWN                             |

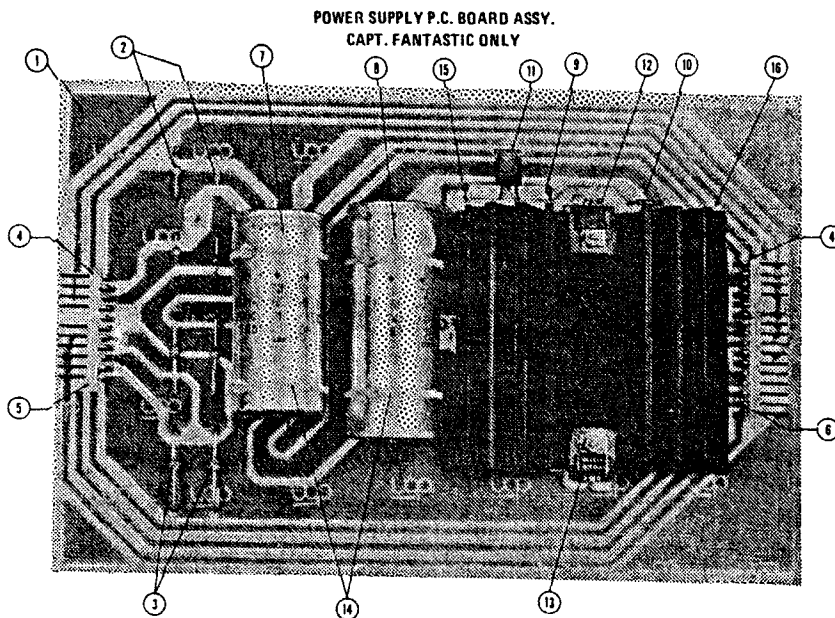


Fig. 9-51. Captain Fantastic (614-00912) power supply and parts list.

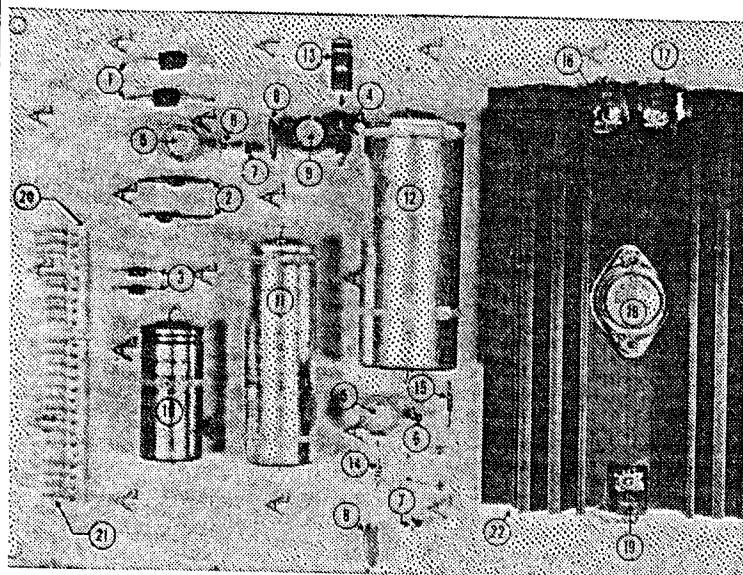


Fig. 9-52. Evel Knievel/Fireball II (606-00906) power supply and parts list.

NO. 0606 POWER SUPPLY P.C. BOARD ASSY.  
EVEL KNieVEL & FIREBALL II

ORDER BY PART NUMBER ONLY

| ITEM | PART NO          | DESCRIPTION                               |
|------|------------------|-------------------------------------------|
| 1    | 0064-166XX-XXHX  | 60SI D10DE (2)                            |
| 2    | 0064-150XX-XXGX  | IN 5624 D10DE (2)                         |
| 3    | 0064-025XX-XXCX  | IN 4001 D10DE (2)                         |
| 4    | 0064-143XX-XXXX  | IN 5355 B 18V ZENER DIODE 5W 5%           |
| 5    | 0061-2710X-5FXX  | 470 MF 16V ELECTROLYTIC RADIAL CAPACITOR  |
| 6    | 0061-163EX-4FRX  | 1MF 25V TANTALUM CAPACITOR (2)            |
| 7    | 0061-148G6-4FXX  | .33MF 35V 20% TANTALUM CAPACITOR          |
| 8    | 0061-132HX-1AXXX | .1MF 50V CER. DISC. CAPACITOR (2)         |
| 9    | 0061-224GX-5FBX  | 50MF 35V ELECTROLYTIC RADIAL CAPACITOR    |
| 10   | 0061-291GX-5EXX  | 1000MF 35V ELECTROLYTIC AXIAL CAPACITOR   |
| 11   | 0061-326DX-5EXX  | 20,000MF 16V ELECTROLYTIC AXIAL CAPACITOR |
| 12   | 0061-322GX-5E2X  | 10,000 35V ELECTROLYTIC AXIAL CAPACITOR   |
| 13   | 0062-074J3-1XXX  | 30 OHM 5W 5% RESISTOR                     |
| 14   | 0062-101B3-1XXX  | 75 OHM 1/4W 5% RESISTOR                   |
| 15   | 0062-171B3-1XXX  | 750 OHM 1/4W 5% RESISTOR                  |
| 16   | 0065-388XX-XXCX  | FT. 3055 TRANSISTOR                       |
| 17   | 0066-786AX-XXBX  | 78MD 5 UC VOLTAGE REGULATOR               |
| 18   | 0066-783AX-XXBX  | 7805 KC VOLTAGE REGULATOR                 |
| 19   | 0066-792AX-XXBX  | 78M12 UC VOLTAGE REGULATOR                |
| 20   | 0017-00021-0253  | 9 PIN JACK                                |
| 21   | 0017-00021-0256  | 15 PIN JACK                               |
| 22   | 0080-00100-0000  | HEAT SINK                                 |
|      | 0017-00042-0014  | SNAP BUSHING - NOT SHOWN                  |
|      | 0606-00906-0000  | POWER SUPPLY (COMPLETE)                   |

NO. 614 HOME PIN UPPER P.C. BOARD ASSY.

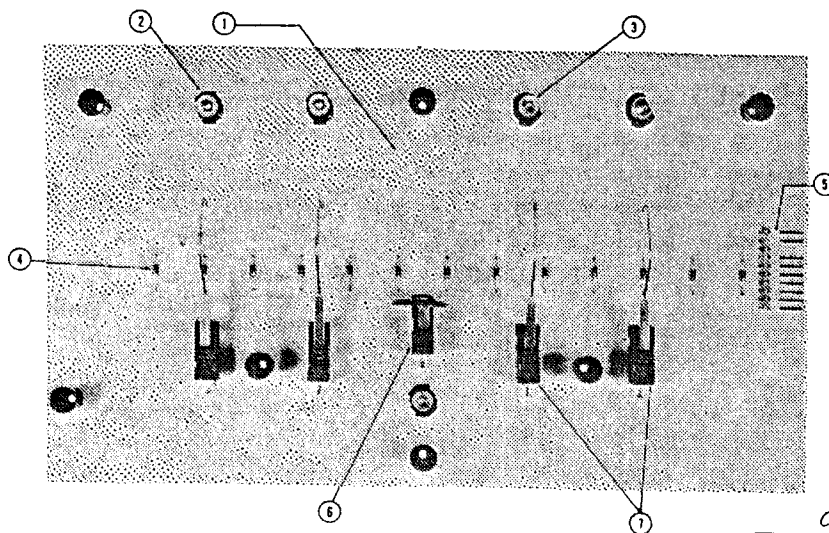


Fig. 9-53. Upper PC board assembly and parts list.

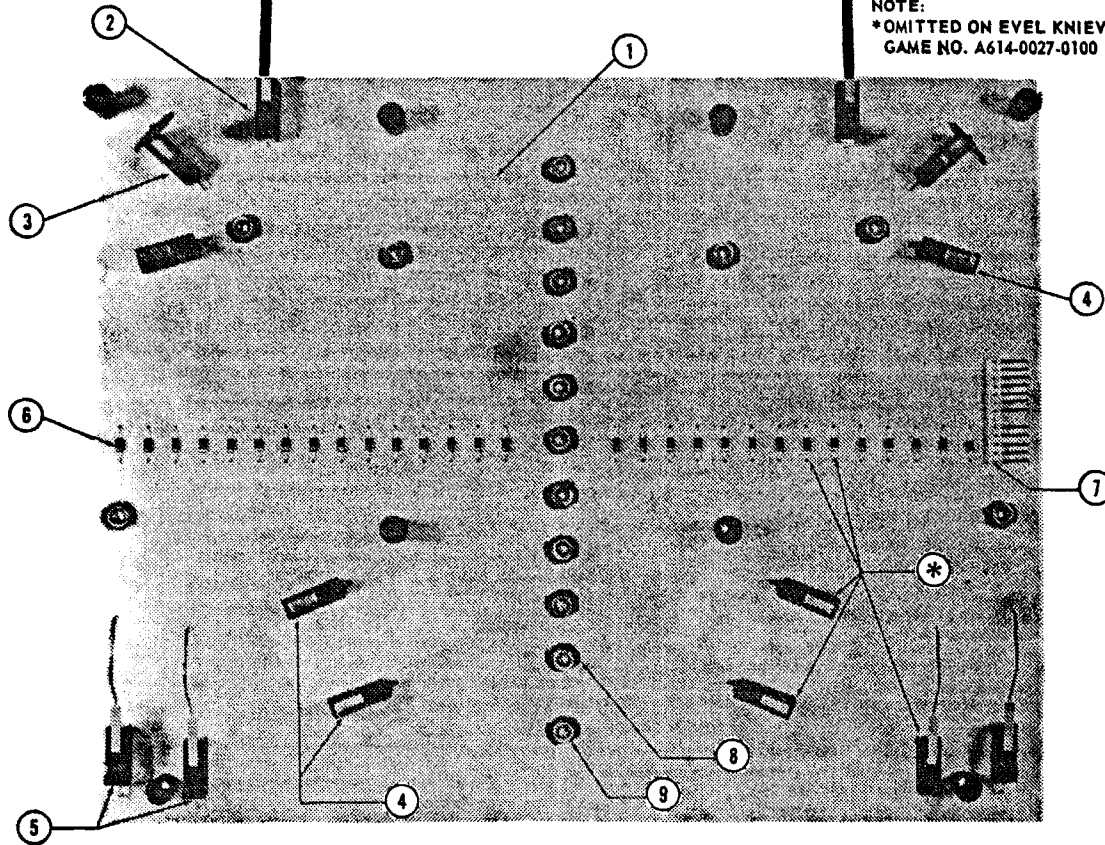
NO. 614 HOME PIN UPPER P.C. BOARD ASSY.

ORDER BY PART NUMBER ONLY

| ITEM | PART NO         | DESCRIPTION                        |
|------|-----------------|------------------------------------|
| 1    | 0614-00914-0000 | TOP ROLLOVER P.C. BOARD (COMPLETE) |
| 2    | 0017-00031-0029 | LAMP SOCKET (5 REQ'D.)             |
| 3    | 0017-00003-0182 | LAMP #147 (5 REQ'D.)               |
| 4    | 0064-025XX-XXXX | DIODE - IN4001 (13 REQ'D.)         |
| 5    | 0017-00021-0254 | CONNECTOR - 10 PIN                 |
| 6    | A606-00004-0000 | SWITCH - TARGET ASSY.              |
| 7    | 0017-00005-0184 | SWITCH - ROLLOVER (4 REQ'D.)       |
|      | A614-00037-0000 | JUMPER CABLE ASSY. (4 REQ'D.)      |
|      | 0614-00911-0100 | SPACER WITH LOCATOR COLLAR         |
|      | 0614-00911-0200 | SPACER WITHOUT LOCATOR COLLAR      |

# NO. 614 HOME PIN LOWER P.C. BOARD ASSY.

NOTE:  
\*OMITTED ON EVEL KNIEVEL  
GAME NO. A614-0027-0100



## ORDER BY PART NUMBER ONLY

| ITEM | PART NO         | DESCRIPTION                                                                                      |
|------|-----------------|--------------------------------------------------------------------------------------------------|
| 1    | 0614-00915-0000 | BOTTOM ROLLOVER P.C. BOARD<br>(COMPLETE)                                                         |
| 2    | 0017-00005-0186 | SWITCH - SPINNER (2 REQ'D.)                                                                      |
| 3    | A606-00004-0000 | SWITCH - TARGET ASSY. (2 REQ'D.)                                                                 |
| 4    | 0017-00005-0185 | SWITCH - SLING SHOT<br>(6 REQ'D. - CAPTAIN FANTASTIC<br>& FIREBALL) (4 REQ'D. -<br>EVEL KNIEVEL) |
| 5    | 0017-00005-0184 | SWITCH - ROLLOVER<br>(4 REQ'D. - CAPTAIN FANTASTIC<br>& FIREBALL) (3 REQ'D. -<br>EVEL KNIEVEL)   |
| 6    | 0064-025XX-XXXX | DIODE - IN4001<br>(29 REQ'D. - CAPTAIN FANTASTIC<br>& FIREBALL) (27 REQ'D. -<br>EVEL KNIEVEL)    |
| 7    | 0017-00021-0255 | CONNECTOR - 13 PIN                                                                               |
| 8    | 0017-00031-0029 | LAMP SOCKET (17 REQ'D.)                                                                          |
| 9    | 0017-00003-0182 | LAMP #147 (17 REQ'D.)                                                                            |
|      | 0614-00911-0100 | SPACER WITH LOCATOR COLLAR                                                                       |
|      | 0614-00911-0200 | SPACER WITHOUT LOCATOR COLLAR                                                                    |

Fig. 9-54. Lower PC board assembly and parts list.



ORDER BY PART NUMBER ONLY

| ITEM                                                                   | PART NO         | DESCRIPTION                                                                  |
|------------------------------------------------------------------------|-----------------|------------------------------------------------------------------------------|
| Q206                                                                   | 0066-197XX-XXXX | MICROPROCESSOR MK3870                                                        |
| Q203, Q205                                                             | 0066-675XX-XXXX | 7445 DECODER (2 REQ'D)                                                       |
| Q200-Q201                                                              | 0066-261BX-XXLX | DIGIT DRIVER ULN2074B (2 REQ'D.)                                             |
| Q204                                                                   | 0066-260BX-XXLX | SEGMENT DRIVER UNL2003B                                                      |
| Q202                                                                   | 0066-065BX-XXXX | OP. AMP. LM3900                                                              |
| L3-L7                                                                  | 0065-491XX-XXXX | TRANSISTOR TIP-110 (5 REQ'D.)                                                |
| M1-M8                                                                  | 0065-494XX-XXXX | TRANSISTOR TIP-125 (8 REQ'D.)                                                |
| S2-S6                                                                  | 0065-495XX-XXXX | TRANSISTOR TIP-145 (5 REQ'D.)                                                |
| D208-D210                                                              | 0064-038XX-XXXX | DIODE IN4148 (3 REQ'D.)                                                      |
| D200-D207,                                                             | 0064-025XX-XXXX | DIODE IN4001 (15 REQ'D.)                                                     |
| D211-D217                                                              |                 | 47 OHM, 1/4W, 5% RESISTOR                                                    |
| R251-R257,                                                             | 0062-086B3-1XXX | (14 REQ'D.)                                                                  |
| R265-R271                                                              |                 | 2.7 OHM, 1/4W, 5% RESISTOR                                                   |
| R244                                                                   | 0062-036B3-1XXX | 10 OHM, 1/4W, 5% RESISTOR                                                    |
| R-238                                                                  | 0062-051B3-1XXX | 100 OHM, 1/4W, 5% RESISTOR                                                   |
| R256, R274-277                                                         | 0062-110B3-1XXX | (5 REQ'D.)                                                                   |
| R283-R286                                                              | 0062-135B3-1XXX | 240 OHM, 1/4W, 5% RES. (4 REQ'D.)                                            |
| R200-R204,                                                             | 0062-179B3-1XXX | 1 K OHM, 1/4W, 5% RESISTOR                                                   |
| R206, R208                                                             |                 | (19 REQ'D.)                                                                  |
| R210, R212, R213, R216, R218, R220, R222, R224, R242, R249, R278, R280 |                 |                                                                              |
| R226, R227, R229, R231, R237, R239                                     | 0062-215B3-1XXX | 5.6K OHM, 1/4W, 5% RESISTOR (6 REQ'D.)                                       |
| R205, R207, R209, R211, R214, R215, R281                               | 0062-191B3-1XXX | R217, R219, R221, R225, R250, R279<br>1.8K OHM RESISTOR 1/4W, 5% (13 REQ'D.) |
| R228, R234, R235, R239, R240, R241, R248                               | 0062-227B3-1XXX | 10K OHM, 1/4W, 5% RESISTOR (7 REQ'D.)                                        |
| R245, R273                                                             | 0062-251B3-1XXX | 33K OHM, 1/4W, 5% RESISTOR (2 REQ'D.)                                        |
| R82                                                                    | 0062-195B3-1XXX | 2.2K OHM, 1/4W, 5% RESISTOR                                                  |
| R258, R262                                                             | 0062-275B3-1XXX | 100K OHM, 1/4W, 5% RESISTOR (2 REQ'D.)                                       |
| R247                                                                   | 0062-323B3-1XXX | 1 MEG OHM, 1/4W, 5% RESISTOR                                                 |
| R246                                                                   | 0062-347B3-1XXX | 3.3 MEG OHM, 1/4W, 5% RESISTOR                                               |
| R260, R272                                                             | 0063-355B3-1XXX | 4.7 MEG OHM, 1/4W, 5% RESISTOR (2 REQ'D.)                                    |

ORDER BY PART NUMBER ONLY

| ITEM                       | PART NO         | DESCRIPTION                                      |
|----------------------------|-----------------|--------------------------------------------------|
| R261                       | 0062-363B3-1XXX | 6.8 MEG OHM, 1/4W, 5% RESISTOR                   |
| R259                       | 0062-387B3-1XXX | 22 MEG OHM, 1/4W, 5% RESISTOR                    |
| VR200                      | 0063-277DX-31FX | 25K, 2W, 20%, POTENTIOMETER LINEAR               |
| XTAL                       | 0069-080XX-XX4X | CRYSTAL, 3.577 MHZ                               |
| C222                       | 0061-212D4-4FXX | 22 MFD, 16V., TANTALUM CAPACITOR                 |
| C221                       | 0061-203D6-4FXX | 10 MFD, 16V., TANTALUM CAPACITOR                 |
| C212-C213                  | 0061-212EX-5EXX | 22 MFD, 25V. ELECTROLYTIC CAP. (2)               |
| C211                       | 0061-136H4-3CXX | 0.15 MFD, 50V., 10%, MYLAR CAP.                  |
| C206-C210, C216-C218       | 0061-132HX-11XX | 0.1 MFD, 50V. AXIAL CER. DISC. CAPACITOR         |
| C214-C215                  | 0061-097K4-3CXX | 0.01 MFD, 100V, (2) 10% MYLAR CAP.               |
| C200-C204                  | 0061-088K6-3CXX | 0.0047 MFD, 100V. 20% MYLAR CAP. (5)             |
| L200-L204, L206, L211-L215 | 0017-00031-0029 | WEDGE BASE LAMP SOCKET (11 REQ'D.)               |
| L200-L204, L206, L211-L215 | 0017-00003-0182 | #147 LAMP (11 REQ'D.)                            |
| XTAL                       | 0017-00042-0105 | CABLE STRAP                                      |
| 1                          | 0017-00021-0244 | DISPLAY SOCKET ON LED DISPLAY 14 POSITION        |
|                            | 0606-00927-0000 | CARDBOARD BEZEL                                  |
|                            | 0017-00081-0078 | FOAM ADHESIVE PADS (4 REQ'D.)                    |
|                            | 0017-00101-0002 | 4-3/8 PHL. PAN. HD. SCREWS (2 REQ'D.)            |
|                            | 0017-00041-0606 | GROMMET (2 REQ'D.)                               |
| 2                          | 0017-00005-0187 | SLIDE SWITCH (2 REQ'D.)                          |
| 3                          | 0017-00021-0254 | RIGHT ANGLE WAFER - 10 PIN (2 REQ'D.)            |
| 4                          | 0017-00021-0255 | RIGHT ANGLE WAFER - 12 PIN                       |
| 5                          | 0017-00021-0294 | RIGHT ANGLE WAFER - 13 PIN                       |
| 6                          | 0614-00913-0000 | LOGIC P.C. BOARD - COMPLETE                      |
|                            | 0614-00025-0000 | VOLUME CONTROL 1 EXTENDER TUBE ASSY. (NOT SHOWN) |

Fig. 9-56. Captain Fantastic logic board assembly parts list.

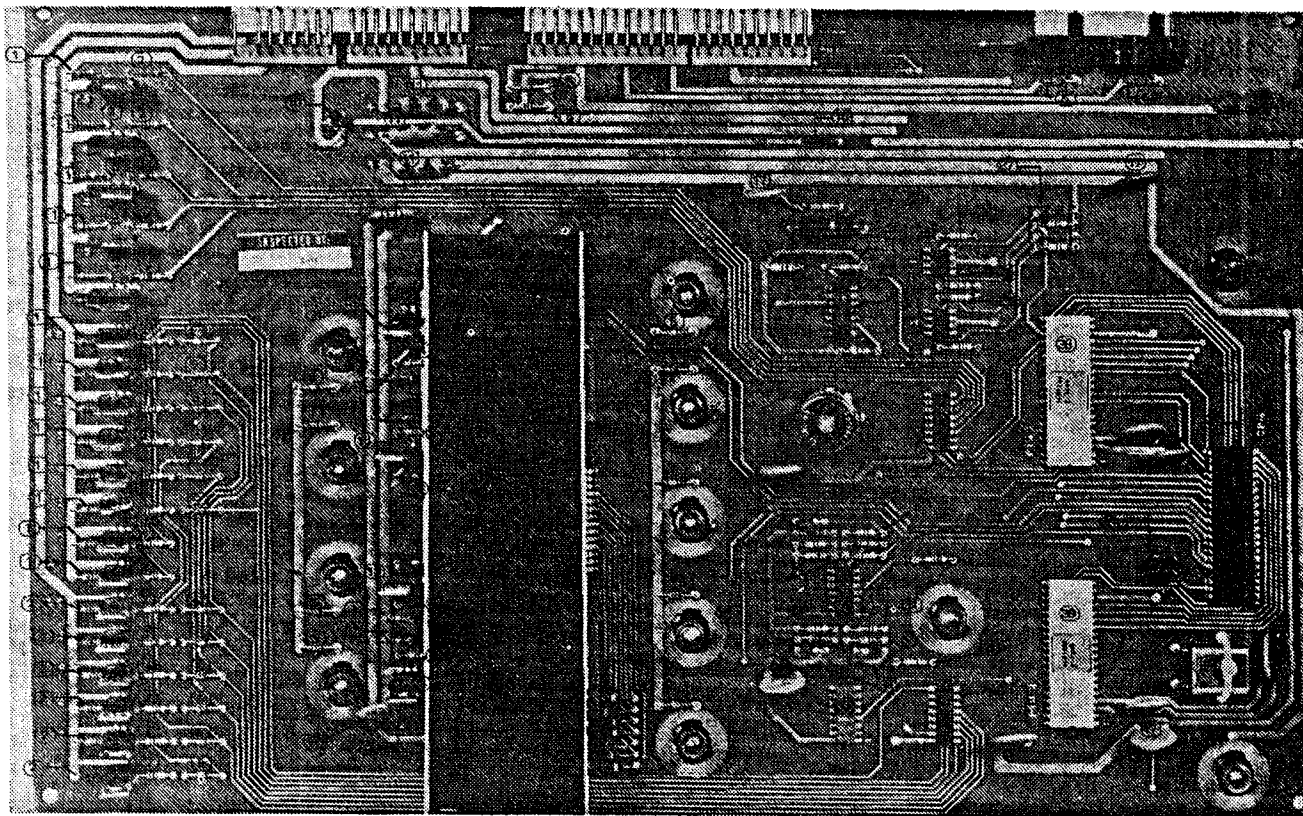


Fig. 9-57. Evel Knievel/Fireball II logic board diagram.

# ORDER BY PART NUMBER ONLY

| ITEM | PART NO         | DESCRIPTION                                 |
|------|-----------------|---------------------------------------------|
| 1    | 0062-195B3-1XXX | 2.2 K, $\frac{1}{2}$ W, 5% RESISTOR (18)    |
| 2    | 0062-179B3-1XXX | 1K, $\frac{1}{2}$ W, 5% RESISTOR (26)       |
| 3    | 0065-495XX-XXMX | T.I.P. 145 TRANS. (5)                       |
| 4    | 0065-493XX-XXMX | T.I.P. 115 TRANS. (14)                      |
| 5    | 0064-025XX-XXXX | DIODE 1N4001 (28)                           |
| 6    | 0017-00021-0253 | RIGHT ANGLE WAFER (9 PIN) (1)               |
| 7    | 0017-00021-0254 | RIGHT ANGLE WAFER (10 PIN) (2)              |
| 8    | 0017-00021-0255 | RIGHT ANGLE WAFER (13 PIN) (1)              |
| 9    | 0017-00005-0187 | SLIDE SWITCH SPOT - (2)                     |
| 10   | 0065-452XX-XXCX | MPS 6531 (TRANSISTOR) (1)                   |
| 11   | 0061-212EX-5EXX | 22 MF 25V ELECTROLYTIC CAP. (3)             |
| 12   | 0061-089K6-1A6X | .005 MF 100V., 20%, CER. DISC. CAP.(4)      |
| 13   | 0065-491XX-XXMX | TIP 100 TRANSISTOR (4)                      |
| 14   | 0062-199B3-1XXX | 2.7 K, $\frac{1}{2}$ W, 5% RESISTOR (5)     |
| 15   | 0062-05303-1XXX | 12 OHM $\frac{1}{2}$ WATT, RESISTOR (5)     |
| 16   | 0062-133B3-1XXX | 220 OHM, $\frac{1}{2}$ W, 5% RESISTOR (1)   |
| 17   | 0061-132H8-1AMX | .1 MF, 50V., CER. DISC. CAP. (13)           |
| 18   | 0061-132H8-1AXC | .1 MF, 50V., CER DISC. Z5U CAP. (1)         |
| 19   | 0062-122B3-1XXX | 150 OHM, $\frac{1}{2}$ W, 5% RESISTOR (1)   |
| 20   | 0062-063H3-1XXX | 22 OHM 2 WATT RESISTOR (1)                  |
| 21   | 0062-110B3-1XXX | 100 OHM, $\frac{1}{2}$ W, 5% RESISTOR (1)   |
| 22   | 0066-970AX-XXBX | FPQ 3724 TRANSISTOR ARRAY (1)               |
| 23   | 0063-2600X-31FX | 5K 2W POT (1)                               |
| 24   | 0062-287B3-1XXX | 22 MEG OHM, $\frac{1}{2}$ W, 5% RES. (1)    |
| 25   | 0062-355B3-1XXX | 4.7 MEG, $\frac{1}{2}$ W, 5% RESISTOR (2)   |
| 26   | 0062-363B3-1XXX | 6.8 MEG OHM, $\frac{1}{2}$ W, 5% RES. (1)   |
| 27   | 0062-275B3-1XXX | 100K, $\frac{1}{2}$ W, 5% RESISTOR (2)      |
| 28   | 0066-230B3-XXBX | VA 3401 I.C. (1)                            |
| 29   | 0062-347B3-1XXX | 3.3 MEG, $\frac{1}{2}$ W, 25V., 5% RES. (1) |
| 30   | 0061-097EX-1ALC | .01 MF 25V. CER. DISC., Z5U CAP (2)         |
| 31   | 0062-323B3-1XXX | 1 MEG OHM, $\frac{1}{2}$ W, 5%, RES. (1)    |
| 32   | 0062-227B3-1XXX | 10K, $\frac{1}{2}$ W, 5%, RESISTOR (1)      |
| 33   | 0066-690XX-XXXX | 7448 I.C. (1)                               |
| 34   | 0066-675XX-XXBX | 7445 I.C. (2)                               |
| 35   | 0062-144B3-1XXX | 330 OHM, $\frac{1}{2}$ W, 5%, RESISTOR (4)  |

# ORDER BY PART NUMBER ONLY

| ITEM | PART NO         | DESCRIPTION                                  |
|------|-----------------|----------------------------------------------|
| 36   | 0069-005XX-XXHX | ILD 74 I.C. (2)                              |
| 37   | 0062-211B3-1XXX | 4.7 K, OHM, $\frac{1}{2}$ W, 5% RESISTOR (1) |
| 38   | 0066-193XX-XXB1 | SL 31 281 PSU #1 (SL 31280) (1)              |
| 39   | 0066-193XX-XXB2 | SL 31 281 PSU 2 (1)                          |
| 40   | 0061-022P4-28KX | 15 PF, 500V, 10%, MICA CAP. (2)              |
| 41   | 0066-191XX-XXBX | C.P.U. 3850 (1)                              |
| 42   | 0069-068XX-XXJX | 2 MHZ CRYSTAL (1)                            |
| 43   | 0066-870AX-XXBX | FSC 9667 I.C. (1)                            |
| 44   | 0069-058XX-XXHX | SCORE DISPLAY DL-6830                        |
|      |                 | NOT SHOWN                                    |
|      | 0062-227B3-1XXX | 10K OHM, $\frac{1}{2}$ W, 5% RESISTOR (1)    |
|      | 0062-235B3-1XXX | 15K OHM, $\frac{1}{2}$ W, 5% RESISTOR (1)    |
|      | 0061-212D4-4FPX | 22 MF, 16V, 10% TANTALUM CAP. (1)            |
|      | 0614-00025-0000 | VOLUME CONTROL EXTENDER TUBE ASSY.           |

Fig. 9-58. Evel Knievel/Fireball II logic assembly parts list.

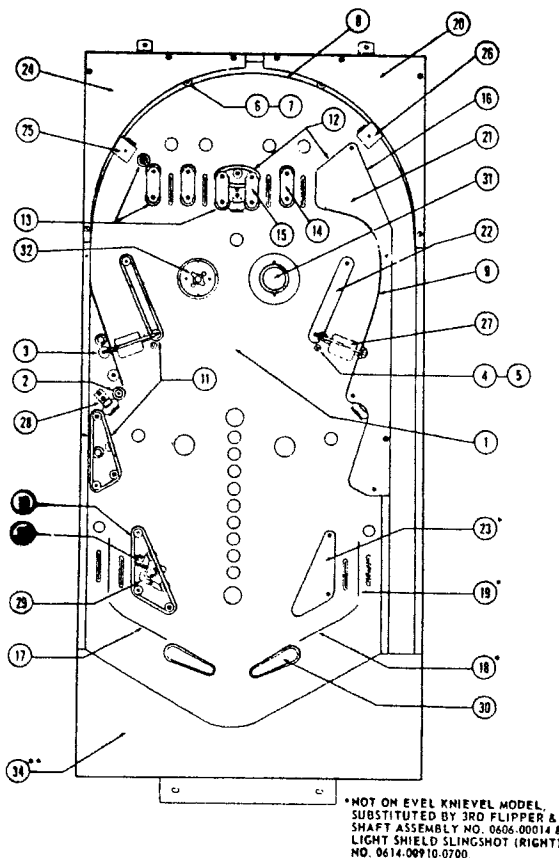


Fig. 9-59. Playfield assembly and parts list (part 1 of 2).

# ORDER BY PART NUMBER ONLY

| ITEM | PART NO         | DESCRIPTION                                                                                  |
|------|-----------------|----------------------------------------------------------------------------------------------|
| 1    | 0614-00502-0100 | PLAYFIELD (SCREENED) - EVEL KNieVEL                                                          |
|      | 0614-00504-0100 | PLAYFIELD (SCREENED) - CAPT. FANTASTIC                                                       |
|      | 0614-00504-0200 | PLAYFIELD (SCREENED) - FIREBALL II                                                           |
| 2    | 0614-00908-0000 | PUSH IN POST (31 REQ'D)                                                                      |
| 3    | 0017-00009-0362 | SHORT POST (4 REQ'D)                                                                         |
| 4    | 0017-00009-0408 | MINI POST (2 REQ'D)                                                                          |
| 5    | 0017-00041-0604 | RUBBER BUMPER (2 REQ'D)                                                                      |
| 6    | 0017-00042-0125 | RAIL POSTS (5 REQ'D)                                                                         |
| 7    | 0017-00042-0126 | RAIL POST CAP (5 REQ'D)                                                                      |
| 8    | 0606-00103-0000 | RAIL                                                                                         |
| 9    | 0606-00104-0000 | RAIL (SHORT)                                                                                 |
| 10   | 0017-00009-0309 | RUBBER 3" INSIDE DIAMETER EVEL KNieVEL (1 REQ'D) CAPT. FANTASTIC & FIREBALL II (2 REQ'D)     |
| 11   | 0017-00009-0306 | RUBBER 2 1/2" INSIDE DIAMETER EVEL KNieVEL (5 REQ'D) CAPT. FANTASTIC & FIREBALL II (4 REQ'D) |
| 12   | 0017-00009-0310 | RUBBER 1 1/2" I.D. (2 REQ'D)                                                                 |
| 13   | 0017-00009-0365 | RUBBER 1/2" I.D. (12 REQ'D)                                                                  |
| 14   | 0017-00042-0128 | PLASTIC GUIDE (3 REQ'D)                                                                      |
| 15   | 0017-00042-0129 | PLASTIC GUIDE (3 REQ'D)                                                                      |
| 16   | 0017-00009-0326 | BALL GUIDE (WIRE FORM)                                                                       |
| 17   | 0017-00009-0299 | BALL GUIDE (WIRE FORM)                                                                       |
| 18   | 0017-00009-0300 | BALL GUIDE - FIREBALL II & CAPT. FANTASTIC ONLY                                              |
| 19   | 0017-00009-0293 | BALL GUIDE - FIREBALL II & CAPT. FANTASTIC (2) - EVEL KNieVEL (1 REQ'D)                      |
| 20   | 0614-00909-0100 | LIGHT SHIELD (RIGHT) - FIREBALL II                                                           |
|      | 0614-00909-1100 | LIGHT SHIELD (RIGHT) - CAPT. FANTASTIC                                                       |
|      | 0614-00910-0100 | LIGHT SHIELD (RIGHT) - EVEL KNieVEL                                                          |

| ORDER BY PART NUMBER ONLY |                 |                                                                |
|---------------------------|-----------------|----------------------------------------------------------------|
| ITEM                      | PART N°         | DESCRIPTION                                                    |
| 21                        | 0614-00909-0200 | SPINNER GATE LIGHT SHIELD (LEFT) NOT SHOWN - FIREBALL II       |
|                           | 0614-00909-1200 | SPINNER GATE LIGHT SHIELD (LEFT) NOT SHOWN - CAPTAIN FANTASTIC |
|                           | 0614-00910-0200 | SPINNER GATE LIGHT SHIELD (LEFT) NOT SHOWN - EVEL KNEIVEL      |
|                           | 0614-00909-0300 | SIDE LIGHT SHIELD (LEFT) NOT SHOWN - FIREBALL II               |
|                           | 0614-00909-1300 | SIDE LIGHT SHIELD (LEFT) NOT SHOWN - CAPT. FANTASTIC           |
|                           | 0614-00910-0300 | SIDE LIGHT SHIELD (LEFT) NOT SHOWN - EVEL KNEIVEL              |
|                           | 0614-00909-0400 | SIDE LIGHT SHIELD (RIGHT) FIREBALL II                          |
|                           | 0614-00909-1400 | SIDE LIGHT SHIELD (RIGHT) CAPT. FANTASTIC                      |
|                           | 0614-00910-0400 | SIDE LIGHT SHIELD (RIGHT) EVEL KNEIVEL                         |
|                           | 0614-00909-0500 | LIGHT SHIELD SLING SHOT (LEFT) NOT SHOWN - FIREBALL II         |
|                           | 0614-00909-1500 | LIGHT SHIELD SLING SHOT (LEFT) NOT SHOWN - CAPT. FANTASTIC     |
|                           | 0614-00910-0500 | LIGHT SHIELD SLING SHOT (LEFT) NOT SHOWN - EVEL KNEIVEL        |
|                           | 0614-00909-0600 | SPINNER GATE LIGHT SHIELD (RIGHT) - FIREBALL II                |
|                           | 0614-00909-1600 | SPINNER GATE LIGHT SHIELD (RIGHT) - CAPT. FANTASTIC            |
|                           | 0614-00910-0600 | SPINNER GATE LIGHT SHIELD (RIGHT) - EVEL KNEIVEL               |
| 22                        | 0614-00909-0700 | LIGHT SHIELD SLING SHOT (RIGHT) - FIREBALL II                  |
|                           | 0614-00909-1700 | LIGHT SHIELD SLING SHOT (RIGHT) - CAPT. FANTASTIC              |

| ORDER BY PART NUMBER ONLY |                 |                                                                                                  |
|---------------------------|-----------------|--------------------------------------------------------------------------------------------------|
| ITEM                      | PART N°         | DESCRIPTION                                                                                      |
| 24                        | 0614-00910-0700 | LIGHT SHIELD SLING SHOT (RIGHT) - EVEL KNEIVEL                                                   |
|                           | 0614-00909-0800 | TOP CENTER LIGHT SHIELD - NOT SHOWN - FIREBALL II                                                |
|                           | 0614-00909-1800 | TOP CENTER LIGHT SHIELD - NOT SHOWN - CAPT. FANTASTIC                                            |
|                           | 0614-00910-0800 | TOP CENTER LIGHT SHIELD - NOT SHOWN - EVEL KNEIVEL                                               |
|                           | 0614-00909-0900 | LIGHT SHIELD (LEFT) - FIREBALL II                                                                |
|                           | 0614-00909-1900 | LIGHT SHIELD (LEFT) - CAPT. FANTASTIC                                                            |
|                           | 0614-00910-0900 | LIGHT SHIELD (LEFT) - EVEL KNEIVEL                                                               |
|                           | 0606-00013-0000 | BALL GATE (LEFT)                                                                                 |
|                           | 0606-00012-0000 | BALL GATE (RIGHT)                                                                                |
|                           | A606-00005-0100 | SPINNER GATE ASSY. (2 REQ'D.) FIREBALL II & EVEL KNEIVEL                                         |
| 25                        | A614-00023-0000 | SPINNER GATE ASSY. CAPT. FANTASTIC                                                               |
|                           | A614-00024-0000 | SPINNER GATE ASSY. W/GOGGLES CAPT. FANTASTIC                                                     |
|                           | 0606-00118-0000 | BACK UP BRKT. TARGET (3 REQ'D.)                                                                  |
|                           | 0606-00126-0000 | BACK UP BRKT. SLING SHOT (2 REQ'D.) EVEL KNEIVEL (1 REQ'D.)                                      |
|                           | 0606-00014-0000 | FLIPPER & SHAFT ASSY. (2 REQ'D.) EVEL KNEIVEL (3 REQ'D.)                                         |
|                           | 0606-00011-0000 | THUMPER BUMPER ASSY. - MINUS CAP & SCREWS (2 REQ'D.)                                             |
|                           | 0017-00003-0061 | THUMPER BUMPER LAMP (2 REQ'D.)                                                                   |
|                           | 0017-00003-0182 | LAMP (NOTE: ALL LAMPS ARE THE SAME ON PLAYFIELD EXCEPT THE 2 THUMPER BUMPER LAMPS)               |
|                           | A614-00028-0000 | BOTTOM ARCH ASSY. - FIREBALL II                                                                  |
|                           | A614-00018-0000 | BOTTOM ARCH ASSY. - CAPT. FANTASTIC                                                              |
| 26                        | A614-00035-0000 | BOTTOM ARCH ASSY. - EVEL KNEIVEL (NOTE: SEE SEPARATE ILLUSTRATION PAGE 38 FOR BOTTOM ARCH ASSY.) |

Fig. 9-60. Playfield assembly parts list (part 2 of 2).

| NO. 614 BOTTOM ARCH ASSY.<br>ORDER BY PART NUMBER ONLY |                 |                                                    |
|--------------------------------------------------------|-----------------|----------------------------------------------------|
| ITEM                                                   | PART N°         | DESCRIPTION                                        |
| 1                                                      | 0614-00906-0100 | BOTTOM ARCH - EVEL KNEIVEL                         |
|                                                        | 0614-00906-0200 | BOTTOM ARCH - CAPT. FANTASTIC                      |
|                                                        | 0614-00906-0300 | BOTTOM ARCH - FIREBALL II                          |
| 2                                                      | 0614-00905-0100 | BALL RUNWAY - EVEL KNEIVEL                         |
|                                                        | 0614-00905-0200 | BALL RUNWAY - CAPT. FANTASTIC & FIREBALL II        |
| 3                                                      | 0606-00009-0000 | KICKER ASSY. - BALL RETURN                         |
| 4                                                      | 0614-00924-0000 | INSTRUCTION CARD - CAPTAIN FANTASTIC & FIREBALL II |
|                                                        | 0614-00925-0000 | INSTRUCTION CARD - EVEL KNEIVEL                    |
| 5                                                      | 0614-00926-0000 | RATING CARD                                        |
| 6                                                      | 0017-00008-0407 | SWITCH - BALL RETURN                               |

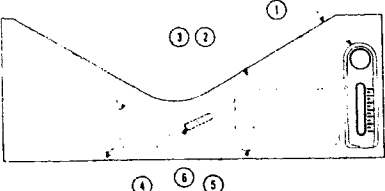


Fig. 9-61. Bottom arch assembly and parts list.

| TRANSFORMER (NOT SHOWN)<br>ORDER BY PART NUMBER ONLY |                 |                                  |
|------------------------------------------------------|-----------------|----------------------------------|
| ITEM                                                 | PART N°         | DESCRIPTION                      |
|                                                      |                 | EVEL KNEIVEL & FIREBALL II       |
|                                                      | 0017-00032-0039 | ON-OFF SWITCH                    |
|                                                      | 0017-00003-0185 | CIRCUIT BREAKER                  |
|                                                      | 0017-00003-0155 | FUSE HOLDER                      |
|                                                      | 3000-14144-0100 | A. C. INTERLOCK                  |
|                                                      | 0017-00003-0184 | FUSE 8 AMP                       |
|                                                      | 0606-00021-0000 | TRANSFORMER AND MTG. BRKT. ASSY. |
|                                                      | 0606-00058-0000 | TRANSFORMER COVER ASSY.          |
|                                                      | 0606-00913-0000 | LINE CORD                        |
|                                                      |                 | CAPTAIN FANTASTIC                |
|                                                      | 0017-00032-0039 | ON-OFF SWITCH                    |
|                                                      | 0017-00003-0179 | CIRCUIT BREAKER (4)              |
|                                                      | 0017-00003-0193 | CIRCUIT BREAKER                  |
|                                                      | 3000-14144-0100 | A. C. INTERLOCK                  |
|                                                      | 0017-00042-0139 | PLASTIC GROMMET (7)              |
|                                                      | A614-00043-0000 | TRANSFORMER MTG. BRKT. ASSY.     |
|                                                      | A614-00044-0000 | TRANSFORMER COVER ASSY.          |
|                                                      | 0606-00913-0000 | LINE CORD                        |

Fig. 9-62. Transformer parts list.

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