FOREWORD

This is a basic instruction manual that provides information unique to LASER BALL. For detailed troubleshooting and interconnection information refer to the Williams Solid State Flipper Maintenance Manual.

SPECIAL CONSIDERATIONS WHEN REPLACING CIRCUIT BOARDS

CPU BOARD

1. For memory protection feature, revision level 6 CPU Boards (batteries located on lower right corner of board) must be used. Revision level 4 CPU BOARDS equipped with three PROM sockets may be used but the memory protection feature is lost.

2. Must be equipped with green-labeled LASER BALL PROMs and green-labeled flipper ROMs.

Sound Board

1. Must be equipped with two fuse clips.

2. Must be jumpered for ROM operation and be equipped with Sound ROM 2 or be jumpered for PROM operation and be equipped with LASER BALL Sound PROM.

Power Supply Board

1. Fuse F4 (10A SB) for flipper solenoids must be installed.

CONTENTS

Assembly and Interconnection .................................... iii
Inspection .......................................................... iv
Power Turn-On ...................................................... vi
Backbox Wiring Diagram ........................................ 1
CPU Board Assembly Drawing .................................... 2
CPU Board Logic Diagram ......................................... 3
Driver Board Assembly Drawing ................................. 4
Driver Board Logic Diagram (Sheet 1 of 2) .............. 5
Driver Board Logic Diagram (Sheet 2 of 2) .............. 6
Power Supply Assembly and
Schematic Diagrams ............................................ 7
Sound Board Assembly Drawing ................................. 8
Sound Board Logic Diagram ....................................... 9
D8000 Master Display Board Assembly
  Drawing (IC Drivers) .......................................... 10
D8000 Master Display Board Logic
  Diagram (IC Drivers) ......................................... 11
D8169 Master Display Board Assembly
  Drawing (Discrete Drivers) ................................ 12
D8169 Master Display Board Logic
  Diagram (Discrete Drivers) ................................. 13
Slave Display Board Assembly and
Schematic Diagrams ............................................ 14
Power and Cabinet Wiring Diagrams ...................... 15
Playfield Lamp and Solenoid
  Wiring Diagrams ............................................. 16
Playfield Switch and Insert Board
  Wiring ......................................................... 17
Assembly and Interconnection
With legs attached to cabinet, position backbox as shown and proceed as follows:

A Pull five cables from backbox.

B Reach into right side of pedestal hole, pull up ground strap, and push it into backbox.

C Remove the tie securing cabinet and playfield cables to cabinet and pull up these cables.

D Interconnect five cables. They are size and color coded except for power connector where wire colors do not match.

E Insert line cord into notch in cabinet. DO NOT PLUG IN AT THIS TIME.

F Push remote volume control cable into backbox.

G Lift up backbox and position on cabinet pedestal, engaging brackets for support.

H Remove shipping blocks.

I Secure backbox to cabinet using four bolts and washers.

J Connect ground braid under wing nut and washer.

K Loosely position remote volume control cable in harness and plug connector into 10J4 on Sound Board.
Inspection
A Check all connectors in backbox for loose wire terminations. Reseat any loose wires by pushing in on the termination.
B (Not called out) Push on all connectors attached to the CPU, Driver, Sound, and Power Supply Boards and check terminations on capacitor and bridge rectifiers.
C Gently press on the socketed IC packages on CPU Board: 1 MPU, 2 RAM, 6, 7, and 8 PROMs, and 4 and 5 ROMs.
D Gently press on the socketed IC packages on Sound Board: 1 MPU, 2 Sound ROM or PROM.
E Check that two fuses on Sound Board, five fuses on Power Supply, and three fuses on fuse card are secure.
F (Not called out) Push on all connectors attached to Master and Player Display Boards.

G Check the cabinet to coin door connectors for loose wire terminations. Reseat any loose wires by pushing in on the termination.

H Check that the line fuse is secure.
Power Turn-On
This machine MUST BE PLUGGED INTO A PROPERLY GROUNDED OUTLET to PREVENT SHOCK HAZARD and to ensure PROPER GAME OPERATION. DO NOT use a "cheater" plug to defeat the ground pin on the line cord, and DO NOT cut off the ground pin. The line voltage MUST agree with that specified on the back of the cabinet or serious damage to the machine could occur. For low-line applications (105 or 210V ac), refer to the power wiring diagram (page 23).

1. With the coin door closed, plug the game in and turn it ON. The game should come on in the game over mode as indicated by the player scores reading zero, player 1 up light flashing, game over lights lit, and the high score to date alternating with the player 1 score.

2. If the game comes on in the diagnostic mode (number of credits display showing 04, ball in play display showing 00, and player 1 display showing game identification) turn the game OFF and ON again.

   a. If the game now comes on in the game over mode the bookkeeping and game evaluation totals have been reset to zero.

   b. If the game still comes on in the diagnostic mode, open the coin door and turn the game OFF and ON twice. This is an indication of the batteries being removed with the power OFF or coming loose during shipment. This has also resulted in features reverting to factory settings. Any changes from factory settings must be reentered using procedures provided in the instruction booklet.

3. If the game still comes on in the diagnostic mode, refer to troubleshooting procedures in the maintenance manual.

4. Perform diagnostic tests and make any desired changes to features as described in the instruction booklet.
NOTES:
1. CONNECTIONS ARE INDICATED CIRCLED NUMBERS AS FOLLOWS:
   1. CPU BOARD
   2. DRIVER BOARD
   3. POWER SUPPLY BOARD
   4. MASTER DISPLAY BOARD
   5. SLAVE DISPLAY BOARD
   6. BACKBOX
   7. CABINET
   8. PLAYFIELD
   9. INSERT BOARD
  10. SOUND BOARD

2. PROMS #1, #2 and #3 ARE USED A GAME ROM IS NOT USED.

3. REFER TO POWER WIRING DIAGRAM (PAGE 15) FOR CONNECTIONS TO 3P2, 6BR1, 6BR2, 6F1, 6F2, AND 6F3.
Driver Board Assembly Drawing
Driver Board Logic Diagram
(Sheet 1 of 2)
NOTES:
1. C16 AND C17 MUST BE LOCATED AS CLOSE TO REGULATOR AS POSSIBLE.
2. ON FLIPPER GAMES F4 IS 10A DP DUAL ACTION FLIPPER; ON 8 MOS. 3.3V AND 5V IS 10A FOR FLIPPER COILS, AND 5.5V IS FOR GENERAL ILLUMINATION.
3. SOLID 2 IS NOT CONNECTED.
4. UNLESS OTHERWISE INDICATED ALL RESISTORS ARE 1/2 W AND ALL DIODES ARE TYPE IN4004.
*NOTE:
JUMPERS SHOWN WITH SOLID LINES CONNECT PROM OPERATION, THOSE SHOWN WITH DASHED LINES CONNECTED FOR ROM OPERATION.
**BILL OF MATERIAL**

<table>
<thead>
<tr>
<th>ITEM NO.</th>
<th>PART NO.</th>
<th>PART DESIGNATION</th>
<th>DESCRIPTION</th>
<th>REQ'D NO.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>IC-2001-100-2</td>
<td></td>
<td>BARE P.C. BOARD</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>54-8971</td>
<td>IC1, IC2, IC3</td>
<td>MC14065 HEX. INVERTER</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>54-8970</td>
<td>IC5, IC6</td>
<td>MC14543 BCD TO SEVEN SEGMENT LATCH/DECODER/DRIVER</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>54-8949</td>
<td>IC9, IC10</td>
<td>IC-7803G GAS DISCHARGE DISPLAY SEGMENT DRIVER</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>54-8966</td>
<td>IC1, IC11, IC12, IC13</td>
<td>IC-684 GAS DISCHARGE DISPLAY SEGMENT DRIVER</td>
<td>2</td>
</tr>
<tr>
<td>6</td>
<td>58-8961</td>
<td>R11 THRU R16</td>
<td>RESISTOR, 10K OHM 12% 1/2W</td>
<td>14</td>
</tr>
<tr>
<td>7</td>
<td>58-8982</td>
<td>R15 THRU R19</td>
<td>RESISTOR, 1/2W 10% 1/4W</td>
<td>4</td>
</tr>
<tr>
<td>8</td>
<td>54-9185</td>
<td>ZR1</td>
<td>1N4440 ZENER DIODE, 10 V 5% 1W</td>
<td>1</td>
</tr>
<tr>
<td>9</td>
<td>54-8980</td>
<td>C1, C4 THRU C7</td>
<td>CAPACITOR, CERAMIC, 01 MFD 50V</td>
<td>5</td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td>JUMPER, 22 GA. SOLID WIRE</td>
<td>1</td>
</tr>
<tr>
<td>11</td>
<td>58-8966</td>
<td>11</td>
<td>6 DIGIT DISPLAY</td>
<td>1</td>
</tr>
<tr>
<td>12</td>
<td>23A 6542</td>
<td></td>
<td>DISPLAY MTR. ADHESIVE FORM</td>
<td>1</td>
</tr>
</tbody>
</table>

**D8000 Master Display Board Assembly Drawing**

(1C Drivers)
## Digit Cross-Reference

<table>
<thead>
<tr>
<th>Digit</th>
<th>7-Segment Decoder</th>
<th>Strobe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Master 1 (Left)</td>
<td>IC4</td>
<td>15</td>
</tr>
<tr>
<td>Master 2</td>
<td>IC4</td>
<td>16</td>
</tr>
<tr>
<td>Master 3</td>
<td>IC4</td>
<td>7</td>
</tr>
<tr>
<td>Master 4 (Right)</td>
<td>IC4</td>
<td>8</td>
</tr>
<tr>
<td>#1 100,000</td>
<td>IC4</td>
<td>1</td>
</tr>
<tr>
<td>#1 10,000</td>
<td>IC4</td>
<td>2</td>
</tr>
<tr>
<td>#1 1,000</td>
<td>IC4</td>
<td>3</td>
</tr>
<tr>
<td>#1 100</td>
<td>IC4</td>
<td>4</td>
</tr>
<tr>
<td>#1 10</td>
<td>IC4</td>
<td>5</td>
</tr>
<tr>
<td>#1 Units</td>
<td>IC4</td>
<td>6</td>
</tr>
<tr>
<td>#2 100,000</td>
<td>IC4</td>
<td>9</td>
</tr>
<tr>
<td>#2 10,000</td>
<td>IC4</td>
<td>10</td>
</tr>
<tr>
<td>#2 1,000</td>
<td>IC4</td>
<td>11</td>
</tr>
<tr>
<td>#2 10</td>
<td>IC4</td>
<td>12</td>
</tr>
<tr>
<td>#2 Units</td>
<td>IC4</td>
<td>13</td>
</tr>
<tr>
<td>#3 100,000</td>
<td>IC3</td>
<td>1</td>
</tr>
<tr>
<td>#3 10,000</td>
<td>IC3</td>
<td>2</td>
</tr>
<tr>
<td>#3 1,000</td>
<td>IC3</td>
<td>3</td>
</tr>
<tr>
<td>#3 10</td>
<td>IC3</td>
<td>4</td>
</tr>
<tr>
<td>#3 Units</td>
<td>IC3</td>
<td>5</td>
</tr>
<tr>
<td>#4 100,000</td>
<td>IC3</td>
<td>9</td>
</tr>
<tr>
<td>#4 10,000</td>
<td>IC3</td>
<td>10</td>
</tr>
<tr>
<td>#4 1,000</td>
<td>IC3</td>
<td>11</td>
</tr>
<tr>
<td>#4 10</td>
<td>IC3</td>
<td>12</td>
</tr>
<tr>
<td>#4 Units</td>
<td>IC3</td>
<td>13</td>
</tr>
</tbody>
</table>

---

**Diagram Notes:**
- 4J3 Player #3
- 4J1 Player #1
- 4J7 Power Input
- 4J6 Segment BCD and Blanking
- IC6 Keep Alive 100V
- IC3, IC4 Connect to 7-Segment Decoders
D8169 Master Display Board Assembly
(Discrete Drivers)
NOTES:
1. FOR 105 OR 117 V.A.C., 7.5A FUSE B
   130 V. VARISTOR #5A-9044 ARE USED.
2. FOR 210 OR 235 V.A.C., 4A FUSE B
   275 V. VARISTOR #5A-9043 ARE USED.
3. JUMPER WIRES ON 6PI SHOWN WITH
   SOLID LINES ARE CONNECTED FOR
   117 V.A.C. OPERATION. ONLY THE ONE SHOWN
   WITH A DASHED LINE IS CONNECTED FOR
   220 V.A.C. OPERATION.
4. FOR LOW-LINE CONDITIONS (105 OR 210 V.A.C.)
   MOVE BLK-WHT WIRE FROM 6TI-4 TO 6TI-3
   AND MOVE 2 WHT-RED WIRES FROM 6TI-8
   TO 6TI-7.
5. FUSES 6FI, 6F2, AND 6F3 ARE MOUNTED ON
   FUSECARD, LOCATED BELOW POWER SUPPLY BOARD.