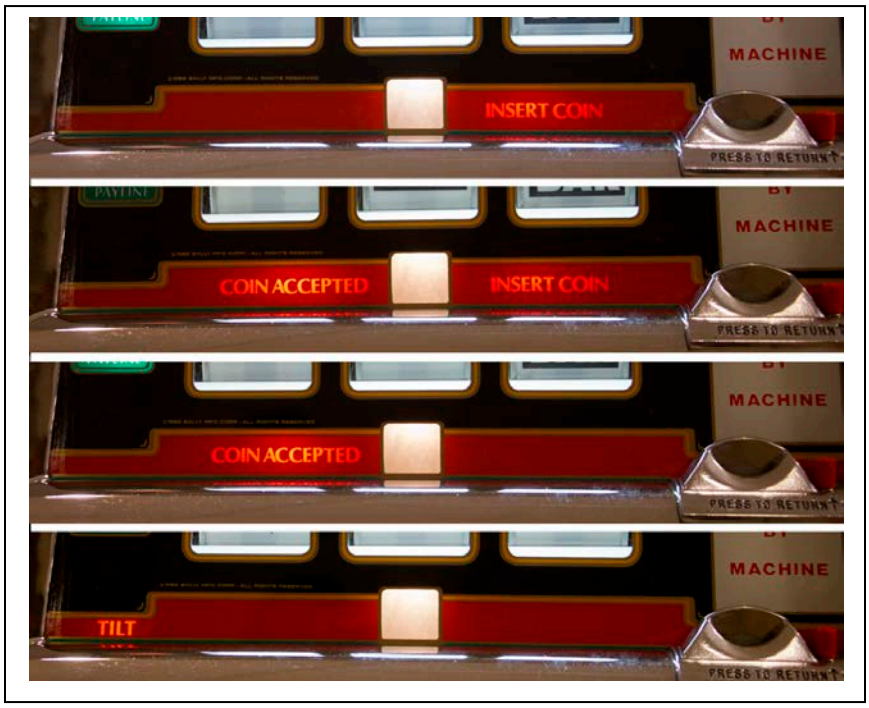
Maintaining your Bally Slot Machine

This slot machine, known as the E2000 series electro-mechanical slot, was originally placed in a casino, and has many hours of use on it. Built in 1983, it is over 25 years old and is fully legal for personal, home use. It has been reconditioned and brought back to its original specifications, and will provide hours of entertainment in your home. Old slot machines have a certain mystique about them. Your guests will enjoy inserting coins, pulling the handle, and hearing the winning coins hit the coin tray. Current-day slot machines no longer use the handle, and have gotten away from coin use, which makes these older machines more fun to play. Typically, the payout rate is around 85-90% of coins played and the big jackpot can hit at any time.

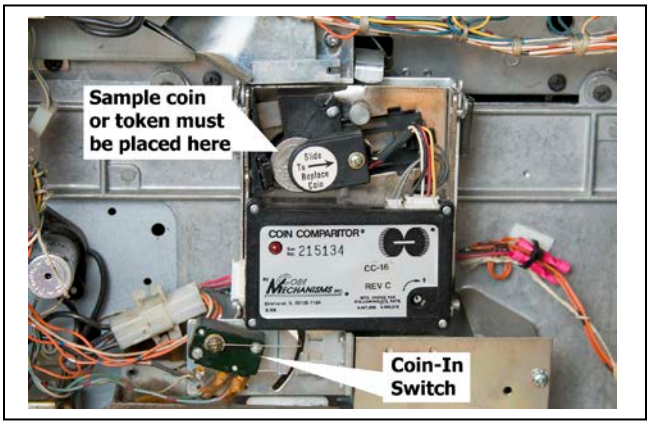
Normal use (as with any mechanical device) requires occasional maintenance, mostly keeping the machine clean and the mechanisms oiled. The following will outline some of the usual maintenance, and will define “error codes” that help diagnose conditions that may affect the operation of the machine. The error codes are displayed on the *Win Meter*, the red LED display on the right side of the machine. Every payout will display the quantity of coins won on the Win Meter. There is a soldered-in battery on the Microprocessor Unit (MPU) board that maintains the last win on the meter, even when the machine is shut off. This battery will last for years, but eventually will need to be replaced. A common replacement battery is an inexpensive, 3.6 volt NiMH cordless phone battery which can be soldered directly to the MPU circuit board.

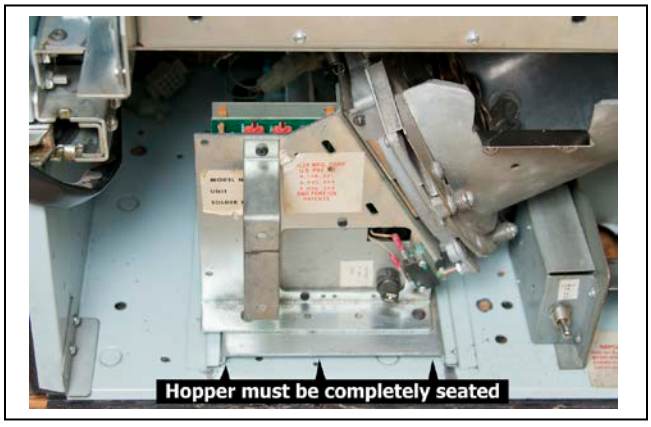
Here is a typical 3-line, 3 coin machine (E2224 shown). Turning the door lock key allows the front door to be swung open on its hinges, revealing the interior of the machine and all its workings. You can then access the coins in the coin hopper, remove the reel assembly, check for coin jams in the coin path, and have complete access to the internal parts of the machine. The section directly under the reel symbols will light up to tell you one of three things; Tilt, Coin Accepted and Insert Coin. When you first start the machine, you should see the “Insert Coin” panel illuminated. Once you insert your

coin or coins, the “Coin Accepted” panel lights up, and when you have reached the maximum number of coins to be played, the Coin Accepted light goes out. If there is a coin jam or other error, the “Tilt” panel lights up and you will need to correct the fault, and then press the Reset button on the coin hopper mechanism. The Insert Coin light will then illuminate, allowing you to play the machine.



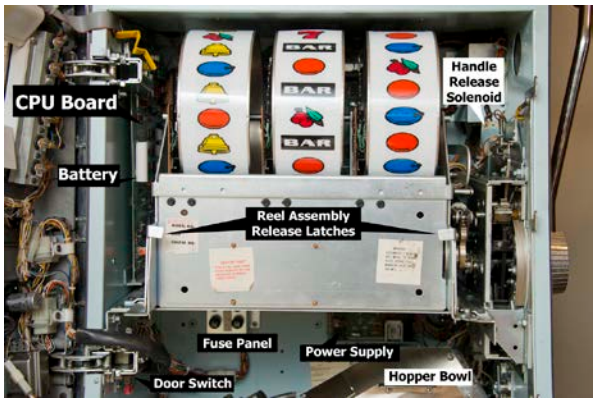
Let’s discuss the basic operation of a slot machine. When the coin enters the coin slot, it travels thru a chute to a device called a *coin comparitor*, which determines that the coin you inserted is the proper coin. The comparitor has a spring-loaded clamping mechanism on it, and holds a sample of the coin you are using; in the image below, you can see the US quarter in its holder. The comparitor looks at each coin that is played, and compares it to the coin in the holder. If it’s the same, the coin played is then routed thru a switch, and into the coin hopper. The machine then registers a coin played when it contacts the Coin In switch, and each coin played will light a payout line on the front of the machine. If an incorrect or different coin or token is played, the comparitor rejects it and sends it into the coin tray instead of the *Coin Hopper*. Note that a wrong size coin in the hopper could cause a coin-feed jam and should be avoided.

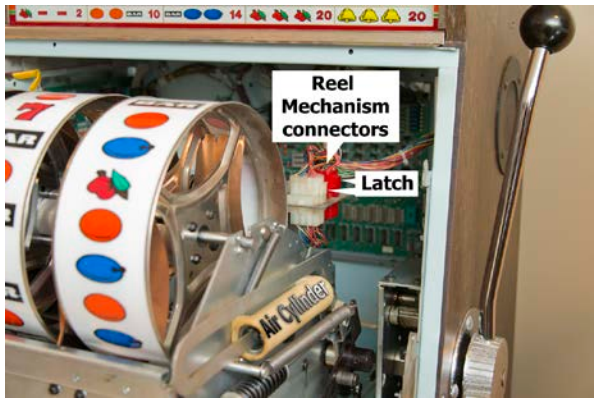




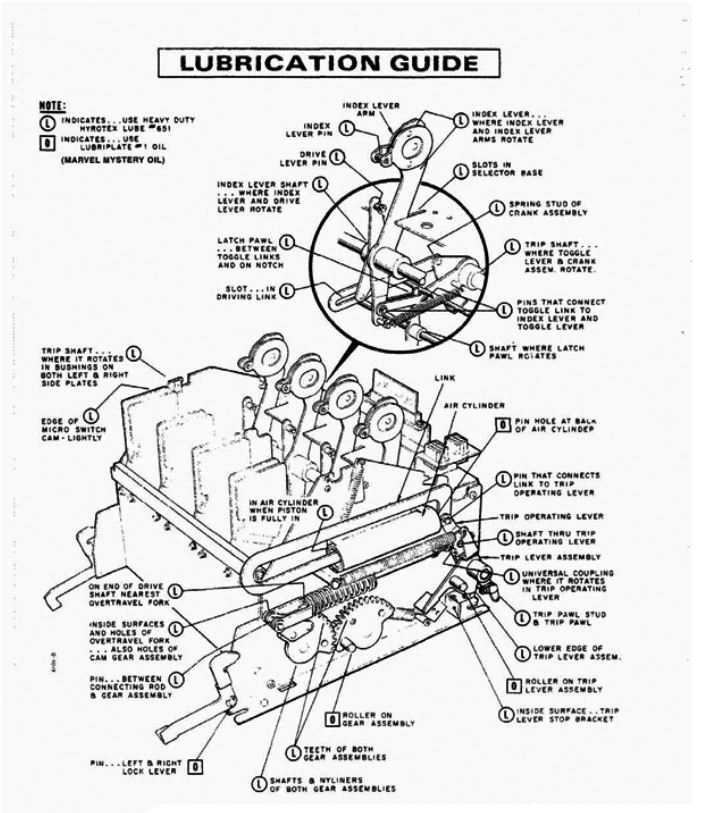
The coin hopper fills up with coins played, and is the “bank” that stores the coins for future payouts. In a casino environment, once the hopper fills completely, a switch on the hopper mechanism senses the weight of the coins and causes any played coins to be diverted to a chute that sends the coins into the cabinet base which the machine sits on.

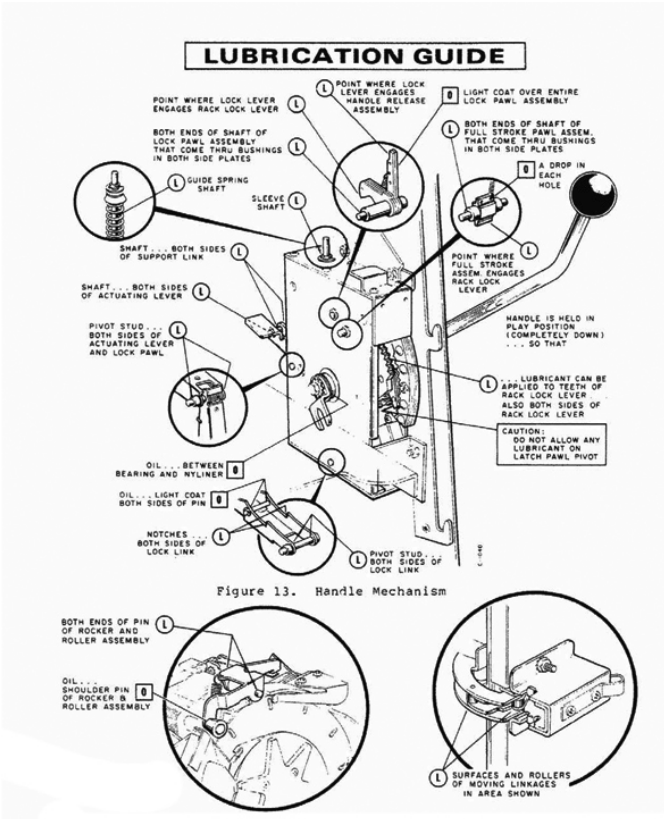
The coins collected in the machine base are the earnings for the casino. Since your home-use machine wouldn't ever see large quantities of coins, and you will re-use any coins or tokens you are playing with, the coin-to-base diverter has been disabled. Basically, you fill the machine with maybe 300-500 coins and occasionally open the front door to recycle the coins from the hopper bowl to be played again. Most home use machine owners keep several coins in the coin tray, or in a cup outside of the machine. These are the coins you and your guests will use to play the machine. *Note that if you remove the hopper, you must then return it to its fully inserted position. There is a floating electrical connector on the rear of the hopper that connects the electronics to the rest of the machine, and must be fully engaged.*





Looking at the reel assembly, maintenance lubrication can be performed easily by removing the entire assembly. There are two release latches as shown. Pivot these two latches downward so that they are perpendicular to the assembly, and pull partially out of the machine. Note the two electrical connectors, one white and one red, which need to be released from their connections by pressing the latches inward, and pulling the connectors from their mating receptacle. The reel assembly can then be removed from the machine. Below is a guide for lubrication of moving parts.



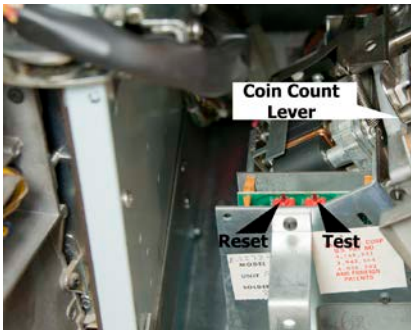


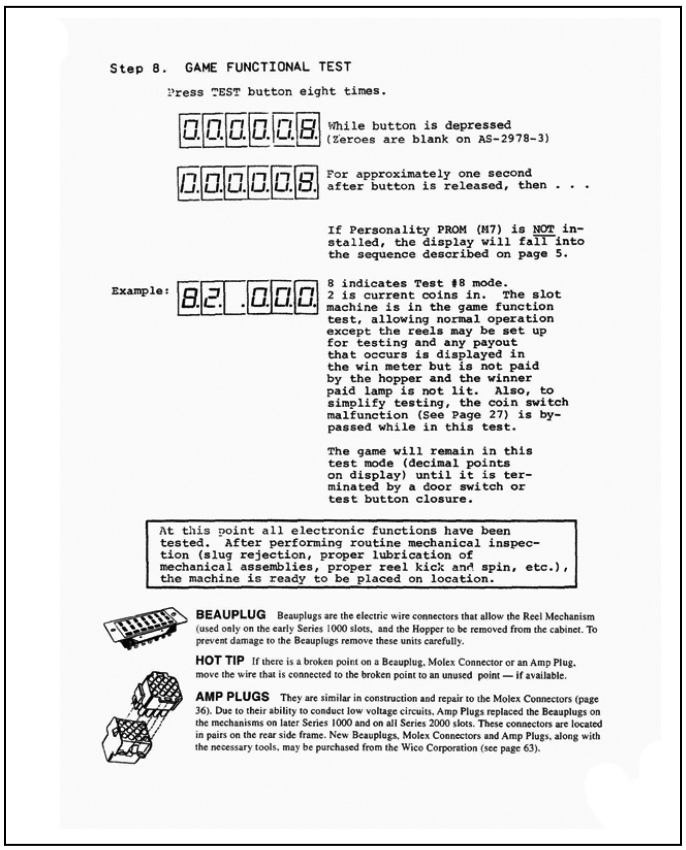
Game Malfunction Codes

This slot machine is built for reliability and consistent use. It has been in operation for thousands of hours and because it was designed to be a profit maker for the casino in which it was installed, so its design must be rugged and dependable. Home use, however, sees much less day-to-day use, and oddly, when the machine sits unused, sometimes errors start to happen. For example, the battery on the MPU circuit board will eventually discharge and cause data loss. This happens because the battery is normally constantly trickle-charging when the machine is powered up. When it's unplugged, however, the battery slowly discharges. Leaving the machine on for hours will keep the battery fully charged.

Also, the grease and oil on the moving parts tend to dry out or run off, necessitating the need for fresh lubrication. And, dust, dirt, and even spider webs will collect in odd places, causing problems as well.

So Bally provided a means to troubleshoot a malfunctioning machine by way of the Coin Win Meter display, using it to spell out malfunction codes. It does this by presenting a two-digit code that corresponds to a specific error. Below is The Bally instruction set relative to those malfunction codes. You can diagnose the machine one step at a time, using the TEST button located on the hopper mechanism PC board.





Step 8. GAME FUNCTIONAL TEST

Press TEST button eight times.

0.0.0.0.0.8. While button is depressed (Zeroes are blank on AS-2978-3)

0.0.0.0.0.8. For approximately one second after button is released, then . . .

If Personality PROM (M7) is NOT installed, the display will fall into the sequence described on page 5.

Example: 8.2. .0.0.0. 8 indicates Test #8 mode. 2 is current coins in. The slot machine is in the game function test, allowing normal operation except the reels may be set up for testing and any payout that occurs is displayed in the win meter but is not paid by the hopper and the winner paid lamp is not lit. Also, to simplify testing, the coin switch malfunction (See Page 27) is bypassed while in this test.

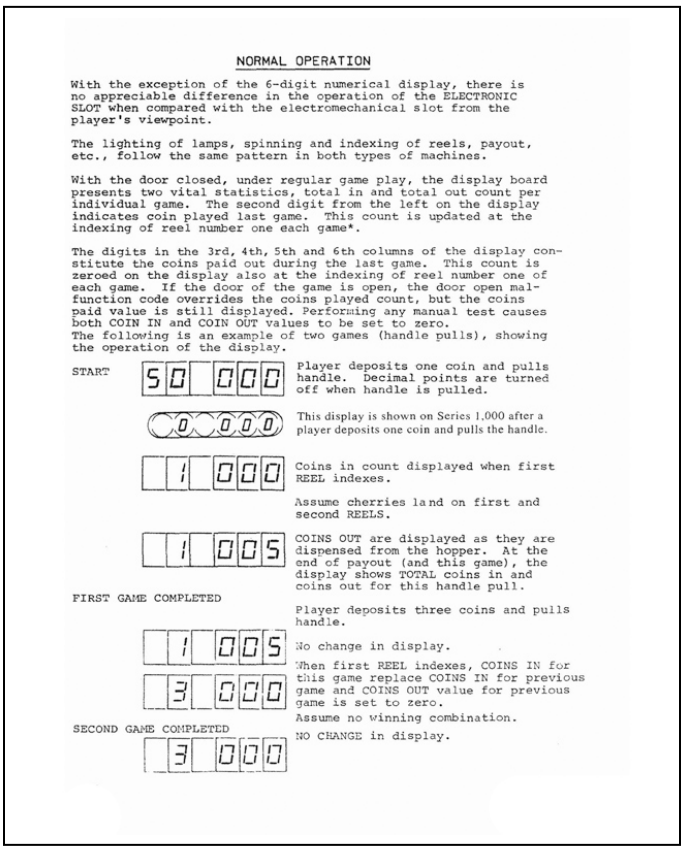
The game will remain in this test mode (decimal points on display) until it is terminated by a door switch or test button closure.

At this point all electronic functions have been tested. After performing routine mechanical inspection (slug rejection, proper lubrication of mechanical assemblies, proper reel kick and spin, etc.), the machine is ready to be placed on location.

BEAUPLUG Beauplugs are the electric wire connectors that allow the Reel Mechanism (used only on the early Series 1000 slots, and the Hopper to be removed from the cabinet. To prevent damage to the Beauplugs remove these units carefully.

HOT TIP If there is a broken point on a Beauplug, Molex Connector or an Amp Plug, move the wire that is connected to the broken point to an unused point — if available.

AMP PLUGS They are similar in construction and repair to the Molex Connectors (page 36). Due to their ability to conduct low voltage circuits, Amp Plugs replaced the Beauplugs on the mechanisms on later Series 1000 and on all Series 2000 slots. These connectors are located in pairs on the rear side frame. New Beauplugs, Molex Connectors and Amp Plugs, along with the necessary tools, may be purchased from the Wico Corporation (see page 63).



NORMAL OPERATION

With the exception of the 6-digit numerical display, there is no appreciable difference in the operation of the ELECTRONIC SLOT when compared with the electromechanical slot from the player's viewpoint.

The lighting of lamps, spinning and indexing of reels, payout, etc., follow the same pattern in both types of machines.

With the door closed, under regular game play, the display board presents two vital statistics, total in and total out count per individual game. The second digit from the left on the display indicates coin played last game. This count is updated at the indexing of reel number one each game*.

The digits in the 3rd, 4th, 5th and 6th columns of the display constitute the coins paid out during the last game. This count is zeroed on the display also at the indexing of reel number one of each game. If the door of the game is open, the door open malfunction code overrides the coins played count, but the coins paid value is still displayed. Performing any manual test causes both COIN IN and COIN OUT values to be set to zero.
The following is an example of two games (handle pulls), showing the operation of the display.

START 50 000 Player deposits one coin and pulls handle. Decimal points are turned off when handle is pulled.

0.0.0.0 This display is shown on Series 1,000 after a player deposits one coin and pulls the handle.

1 000 Coins in count displayed when first REEL indexes.

Assume cherries land on first and second REELS.

1 005 COINS OUT are displayed as they are dispensed from the hopper. At the end of payout (and this game), the display shows TOTAL coins in and coins out for this handle pull.

FIRST GAME COMPLETED

Player deposits three coins and pulls handle.

1 005 No change in display.

3 000 When first REEL indexes, COINS IN for this game replace COINS IN for previous game and COINS OUT value for previous game is set to zero.
Assume no winning combination.

SECOND GAME COMPLETED

3 000 NO CHANGE in display.

BOOKKEEPING METERS

The meter readings apear, one at a time, on the 6 digit display for about 6 seconds. Before each meter value is displayed, its assigned number is displayed for approximately one second. Numbers are assigned to the meters as follows*:

1. TOTAL IN 2. TOTAL OUT 3. CASH BOX
4. TOTAL GAMES PLAYED (HANDLE PULLS)

Meters one thru four are incremented according to their respective functions only with the door closed.

There are a total of 16 six digit meters available for display. The first four (five or six on models with attendant pays) are displayed with the door closed**.

The remaining meters are displayed by simply turning the door key counter clock-wise then actuating the key switch. These meters may monitor any condition specified, typically; number of 1 coin, 2 coin, 3 coin, etc. games played; number of 1st coin, 2nd coin, 3rd coin, etc. Jackpot wins that have occurred; and so on.

To determine which meters are used and the order in which they are displayed, refer to the FO-652-XXX form for the model in question.

The BOOKEEPING METERS are displayed in the same manner as the MAINTENANCE METERS, described in SECTION III, step 7.

When the meter reading sequence is completed or if a reset occurs while reading meters, the reading sequence is terminated and the display is restored to the condition present before meter reading was started, unless the door was opened while meters were being displayed. In this case, the door open code will replace coins in count.

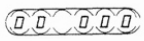
Example. 

On Series 2000, 50 is door open code and 005 is the number of coins paid out in the last game.

* In some models, Maintenance Meter #20 (Door Openings) is also displayed as Bookkeeping Meter #0.

** In some models, all bookkeeping meters used are displayed with the door open or closed.

THE DISPLAYS BELOW REFER TO SERIES 1000 ONLY



If a reset occurs while reading meters, the reading sequence is terminated and the display takes this form.

Under normal conditions, when the meter reading sequence is completed, the display takes this form.

GAME CONDITION MALFUNCTION CODES

In the course of normal machine operation, the CPU is continuously monitoring conditions by sensing the INPUTS and comparing them with what the PROGRAM says they should be. If the CPU detects a difference, it checks the PROGRAM to find out what to do next. Depending upon which INPUT is at fault, the PROGRAM instructs the CPU to take one or more of the following actions:

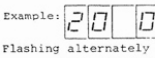
1. Display a MALFUNCTION CODE (Excepting the Door Open code (50), all malfunction codes are flashed alternately with COINS IN information.)
2. Suspend play
3. Flash feature lamps
4. Light the TILT lamp

These actions are terminated by correcting the malfunction and pressing the RESET button.

Note: The TEST button is disabled while the machine is in the TILT mode to prevent disruption of a game in progress.

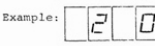
The following is an explanation of the standard MALFUNCTION CODES used:

1. COIN IN JAM - Play suspended, feature flashed, TILT lit.

Example: 

The 20 indicates a jam on the COIN SWITCH. The 014 equals coins paid out in previous game.

Flashing alternately with: The 2 equals coins in for current game.

Example: 

Clearing the jam and pressing the RESET switch causes the feature lites to stop flashing.

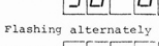
Example: 

Door may now be closed and play resumed.

Note: Any time the door is opened, the Display shows door open code. To see a malfunction code, actuate the KEY switch.

Note: Any time the RESET button is pressed, the center two decimal points are lit.

2. HOPPER OVERRIDE - Play suspended, feature flashed, TILT lit.

Example: 

The 30 indicates that too many coins were dispensed by the hopper.

Flashing alternately with: 006 equals number of coins paid out for this pull of the handle.

Example: 

2 indicates coins played for current game. The 2 does not appear on Series 1000

Although the occurrence of this malfunction is unlikely, the possibility that it may happen does exist and will be detected by the machine. The fact that it requires a service call allows the technician to determine the cause (most likely mechanical in nature) and prevent it from recurring. Press RESET button to start next game.

3. HOPPER JAM - Play suspended, feature flashed, TILT lit.

Example: 

31 is the malfunction code. 003 is the number of coins paid out.

Flashing alternately with

Example: 

Indicates a coin is stuck under the roller. To complete payout, clear jam and press the RESET button. The door must remain open until the TILT lamp lites, then goes out again (approx.1 sec.), after which the operator has 3 secs. to close the door before payout resumes. Appropriate feature lites are lit before payout is completed.

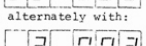
The 2 is the number of coins in for the current game. It doesn't appear in the Series 1000.

4. HOPPER EMPTY - Play suspended, feature flashed, TILT lit.

Example: 

Indicates that the specified time limit has elapsed without a coin being detected. After determing and correcting the cause, follow the same procedure as described above to complete payout.

Flashing alternately with:

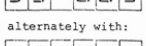
Example: 

5. RESET DURING PAYOUT - Play suspended, TILT lit.

Example: 

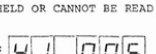
This code appears when a reset occurs during payout. This can be caused by momentary power interruption, low line voltage, or static interference, any of which could cause the microprocessor to perform a faulty execution of program instructions. Entering the TILT mode prevents potentially disastrous results.

Flashing alternately with:

Example: 

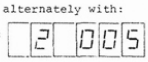
To complete the payout, follow the procedure described above for HOPPER JAM.

6. REEL HELD OR CANNOT BE READ - Play suspended, feature flashed, TILT lit.

Example: 

The 41 means the position reader on the 1st REEL has sensed one of the following (A) No motion, (B) 3 positional errors during this spin. 42 means the 2nd REEL is at fault; 43 means the 3rd REEL; 44 the 4th REEL and 45 the 5th REEL. The reels are numbered 1 thru 5, from left to right.

Flashed alternately with:

Example: 

005 is the number of coins paid out in previous game. After determining and correcting the cause, spin by hand any non-indexed reels, press the RESET button and close the door to complete the game in progress. If necessary, the game may be terminated by pressing the TEST button one time.

The 2 is the number of coins played for this handle pull.

7. DOOR OPEN - 5 second BUZZER alarm, Door Open Lamp (in tower) lit.

Example: 

The 50 indicates the DOOR has been opened.

The DOOR OPEN lamp stays lit for as long as the door is open. Closing the door while in this state does not disturb the display. The 50 is replaced by the number of coins in for previous game when the handle is pulled.

Example: 

If the door is closed on the Series 1000 while in MANUAL TEST mode, the display takes on the above display form.

Door opening is detected by the hinge switch or the lock cam switch. These switches are wired in series.

The BUZZER ALARM is activated for 5 seconds every minute while the door is open except during the time in which the machine is in a manual TEST mode.

Feature lamps flashing while this code is present means that some other malfunction has occurred. The KEY switch may be actuated to display the other malfunction information for as long as the KEY switch is held.

8. HANDLE PULLED WITH NO COINS IN Play suspended, feature flashed, TILT lit.

Example:

The 70 indicates there is a malfunction in the handle mechanism allowing the handle to be pulled with no coins played. Reels are not indexed because most causes of this condition are mechanical and, therefore, repetitive in nature.

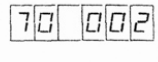
Flashed alternately with:

Example:

The 0 indicates no coins have been played.

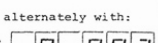
The 002 is the number of coins paid out last game.

9. ILLEGAL PLAY - DOOR OPEN Play suspended, feature flashed, TILT lit. (KEY switch must be actuated to see this code)

Example: 

The 70 indicates play has been attempted with the door open after Reel #1 indexed; 000, no coins paid out.

Flashed alternately with:

Example: 

3 is the number of coins played for this game.

Note: This malfunction is sensed only when a jumper is installed from ground to J2, Pin 8 of I/O Board. (See Page 27 Item D)

10. REEL DID NOT INDEX - Play suspended, feature flashed, TILT lit.

Example: 71 000

Flashed alternately with:

Example: 2 000

The 71 means the position reader on the 1st reel is not able to obtain a consistent reading. 72 means 2nd reel is at fault; 73, 3rd reel; 74, 4th reel; 75, 5th reel. If the reel in question is properly indexed, then this tilt indicates the reel has been moved since it was indexed. (This test is not performed in SDS (-1) program versions.) If the reel is not indexed, the cause for this malfunction is most likely mechanical. Self-test #2 (see page 7) may be used to verify the operation of the index coil. After the cause has been found and corrected, press the RESET button followed by depressing the TEST button once.

Note: See Jumper Selectable Options - Item D, on page 27.

11. POSITION ERRORS IN 2 OF LAST 8 SPINS - Play suspended, feature flashed, TILT lit.

Example: 91 005

Flashing alternately with:

Example: 2 005

The 91 means the 1st Reel; 92 means 2nd Reel; 93, 3rd Reel; 94, 4th Reel; 95, 5th Reel. This tilt indicades that during the last 8 games there was a positional error during the spin of that reel in 2 of the 8 games.

Note: Displays for the previous Malfunction Codes (8. Handle Pulled With No Coins In, 9. Illegal Play—Door Open, 10. Reel Did Not Index, 11. Position Errors in 2 of the Last 8 Spins) appear also on Series 1000 LEDS that use Program Proms (M1, M2, M3) that are numbered 564 and above.

GAME CONDITION — QUICK REFERENCE — MALFUNCTION CODES

CODE	DESCRIPTION	CODE	DESCRIPTION
20	Coin switch jam	71	Spinning after indexing - Reel #1
30	Too many coins dispensed	72	Spinning after indexing - Reel #2
31	Hopper jam (Roller arm up too long)	73	Spinning after indexing - Reel #3
32	Hopper empty (Roller arm down too long)	74	Spinning after indexing - Reel #4
33	Reset occurred during payout	75	Spinning after indexing - Reel #5
41	Improper spin (Reel held, etc.) - Reel #1	91	Position error (2 of last 8 spins) - Reel #1
42	Improper spin (Reel held, etc.) - Reel #2	92	Position error (2 of last 8 spins) - Reel #2
43	Improper spin (Reel held, etc.) - Reel #3	93	Position error (2 of last 8 spins) - Reel #3
44	Improper spin (Reel held, etc.) - Reel #4	94	Position error (2 of last 8 spins) - Reel #4
45	Improper spin (Reel held, etc.) - Reel #5	95	Position error (2 of last 8 spins) - Reel #5
50	Door has been opened		
70	Illegal handle pull (No coins played) ; or		
70	Illegal game (Coins played, door open)*