

TROUBLESHOOTING GUIDE

SYMPTOM: SCREEN TURNS RED OR HOPPER PAYS
OUT WHEN COIN IS INSERTED.

PROBABLE CAUSE: Yellow CREDIT wire is shorted to ground. This wire is paired with a black wire and is normally connected to the key switch on the front door. If it is not connected to the key switch, it is wrapped up just below the key switch on the front door. There is also a set behind the right coin mech on the wall. This problem usually arises if these wires accidentally touch each other while wrapped or if the key switch is accidentally left on.

SYMPTOM: GAME PAYS OUT MORE THAN THE SET PERCENTAGE

PROBABLE CAUSE: The most common cause of this problem is that the bookkeeping wire pair (brown and black) is used to re-initialize the game after a player is finished playing. THIS IS NOT THE INTENDED PURPOSE OF THESE WIRES. The bookkeeping wires should be attached to a separate toggle switch inside the game. The switch should be used ONLY to view the bookkeeping figures and to conduct the self-test.

The proper way to re-initialize the game after playing is to use the CREDIT wires (yellow and black). Normally, these wires should be connected to the key switch on the front door. When this switch is activated; the video screen will turn RED as a visual indication that proper initialization is taking place.

FUNCTIONING OF THE GAME'S INTERNAL BOOKKEEPING

To enter the bookkeeping mode, turn on the bookkeeping toggle switch located next to the coin drop tube while the game is in its attract mode. (NOTE-the bookkeeping switch is the one which has the BROWN and BLACK wires connected to it.) The video screen will now display the games's bookkeeping figures:

```

VERSION 30.01
  5000          0
 3500          0
   70          0
LAST WINNER    0

switches 12345678
          NN
          FFFF FF
hit cancel for test

```

Starting at the top of the screen, you will see the game's version number. Any updates in the game program will be reflected in this number.

Under the version number, you will see two columns of numbers. These columns represents a running total of:

```

TOTAL COINS TAKEN IN
TOTAL CREDITS WON
PAYOUT PERCENTAGE

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The figures in the left column may not be changed by the operator, however if the TOTAL COINS IN exceeds 50,000 a warning message will be displayed. At this point, the operator should press the STAND button to divide all figures by 10.

The payout percentage is adjustable by DIP switches 6,7 and 8. However, if the percentage is changed by re-adjusting the DIP switches, the game will not immediately begin paying out at the new percentage. It will become more liberal or more conservative in its payout until the new percentage is gradually reached. Once the new percentage has been reached, the game will be in an equilibrium condition and will accurately pay out at the correct percentage. Because of this fact, it is highly recommended that sudden drastic changes in the percentage NOT be made.

The right column of figures contains the same type of information but this column is resettable by the operator. This is done by pressing the first and third discard buttons at the same time.

Under these figures is located the payout to the last player. This figure is updated after each game.

At the bottom of the screen is shown the status of the DIP switches. This status is constantly being refreshed, so the screen will instantly reflect a change in the switch settings.

SYMPTOM: NOTHING HAPPENS WHEN
GAME IS TURNED ON.

1. Is 120 VAC present --NO--->Relocate game to
at wall socket?
!YES
2. Is 120 VAC present --NO--->Power cord is defective.
across black and
white wires on
power switch?
!YES
3. Is 120 VAC present --NO--->Power switch is defective.
across two top lugs
of power switch?
!YES
4. Is 120 VAC present --NO--->Wiring between switch
across two right and block defective.
lugs of fuse block?
!YES
5. Is 120 VAC present --NO--->Bad fuse.
across two left lugs
of fuse block?
!YES
6. Is 120 VAC present --NO--->Defective wiring
at two top lugs between fuse block
of line filter? and line filter.
!YES
7. Is 120 VAC present --NO--->Line filter is
at two bottom lugs defective.
of line filter?
!YES
8. Is 120 VAC present --NO--->Wiring between line
at two input lugs of filter and power
power supply? is defective.
!YES
9. Is 120 VAC present --NO--->Monitor wiring or PLUG
at power input line is defective.
to monitor?
!YES

Call us for further assistance.

SYMPTOM: GAME PLAYS POWER UP
TUNE OR APPEARS TO PLAY
BUT NO PICTURE ON SCREEN.

1. Is 120 VAC present --NO--->Monitor wiring or plug is
at power input line defective.
to monitor?
 - :YES
 2. Is video wiring harness --NO--->Install harness correctly.
correctly installed--with
yellow wire toward front
in monitor and yellow wire
toward top of mother board?
 - :YES
 3. Adjust "SCREEN" control, --NO--->Call us for
located at rear of monitor further assistance
just below "FOCUS" control.
Does picture appear?
 - :YES
- Mission Accomplished.

SYMPTOM: THIN HORIZONTAL WHITE AND DARK
LINES ON SCREEN.

PROBABLE CAUSE: The most common cause of this problem
is that the satellite board is not seated
correctly in its socket.
Make sure that the plug and socket between
the two boards line up correctly. It is
possible for the connector to be off by
one or more pins when the boards are
plugged together.

This pattern on the screen is a result
of the CPU not being able to read the
program.

FUNCTIONING OF SWITCHES AND LAMPS

All switch and lamp signals enter the circuit board through the edge connector on the left side of the main circuit board.

SWITCHES

The status of all switches is monitored by the CPU through the SOLID colored wires going into the edge connector. The switch wires are normally pulled to 5 volts by 4.7k OHM SIP resistors on the main circuit board. When a switch is activated, its corresponding signal wire is grounded. All switches are connected together by a common ground (black wire) from pins 22 and Z on the edge connector. ANY black wire in the game is a GROUND.

The switches communicate to the CPU via two 8255 I/O ports (I1 and I2). See the "I/O" page of the schematic diagram for details. As can be seen in the schematic, most of the keyboard switches use I2 to communicate their status. If a switch does not work, a defective 8255 can be verified by exchanging the two 8255's with each other and noting whether the problem is relocated to a different switch or lamp. If exchanging the two 8255's has no effect on the problem, it would be safe to assume that there is a loss of continuity somewhere between the circuit board and the ground wire at the suspected switch.

If the game acts as if a switch is constantly activated, the obvious thing to look for would be a shorted switch or a short somewhere in the wire going to the main circuit board for that switch. If this does not reveal anything definite, check the 8255's for abnormalities. Look for bent pins that are not seated in the socket and measure the voltage on the pin for the suspected switch. The "I/O" page of the schematic diagram will tell you which pin of the 8255 monitors the switch in question. If the voltage is about 5 volts, the 8255 is probably bad. If the voltage is close to 0 volts, there is probably a short in the line for that switch.

LAMPS

All lamps (and the coin lockout coil) are fed by a constant 12 VDC source. This source is the orange wire which runs from the power supply, to the coin mechanism, and to the keyboard. There should be 12 VDC on this wire at all times the game is in operation.

The lamps are controlled by all STRIPED wires which run from the keyboard to the circuit board edge connector. Note that the striped wire for the lamp is the same color as the solid wire for the corresponding switch. The CPU activates the lamps by shorting the striped wires to ground via the ULN2003 gates (16, 17, 18). The ULN2003's in turn are controlled by the 8255's (I1 and I2).

If a lamp will not light, the bulb, socket, and 12 volt source can be tested by manually shorting to ground the striped wire at the suspected lamp socket. If a string of lights will not work, there is probably a discontinuity in the 12 VDC source. See the following information for further assistance in solving lamp problems.

The coin lockout coil is activated in the same manner as a lamp.

SYMPTOMS: NONE OF THE KEYBOARD LIGHTS WILL LIGHT UP.

1. Measure the voltage --NO-->Power supply is at the 12 VDC pin on defective. the power supply socket (orange wire) with the plug removed. Is it present?
 |
 | YES
 2. Replace the power supply plug. Is 12 VDC present at --NO-->Wiring between orange wire on power supply and Molex plug located behind coin mech plug is BOTH sides of the plug and socket. defective.
 |
 | YES
 3. Is 12 VDC present at all --NO-->Defective wiring lugs to which orange wire between coin mech is connected underneath plug and keyboard. keyboard?
 |
 | YES
- Call us for assistance.

SYMPTOMS: THE LEFTMOST LIGHT, OR SEVERAL LIGHTS TOWARD THE LEFT HAND SIDE OF THE KEYBOARD DO NOT WORK.

1. Starting on the right hand --NO-->Defective wiring side of the keyboard, between the leftmost check the voltage at each lug that reads 12 VDC lug underneath the keyboard and the rightmost lug which has an orange wire that doesn't. connected to it. Do ALL of the lugs have 12 VDC present?
 |
 | YES
- Call us for further assistance.

SYMPTOM: SINGLE LIGHT NOT WORKING ON KEYBOARD.

1. Measure 12 VDC at orange wire on suspected lamp socket. Is it present?
 - NO-->Loss of continuity in orange wire under keyboard. This wire is a 12 volt source to all lamps.
 - YES
2. Carefully pull the switch/lamp assembly out of the button. Exchange the bulb with a good one. Does it light?
 - NO-->Replace defective light bulb.
 - NO
3. Check continuity between the STRIPED wire on the button to the same wire on the mother board edge connector. Is the wire continuous?
 - NO-->Fix break in wire or lug.
 - YES
4. Locate the three ULN2003 chips on the mother board. (16,17 and 18) They are located on the left side of the mother board next to the edge connector. Exchange the top chip with the center chip TAKING CARE NOT TO BEND ANY OF THE LEGS. Does this fix the problem?
 - NO-->Either 16 or 17 is bad. See the "I/O" page of the schematic to determine which it is. It is possible that swapping chips will move the problem to a different lamp.
 - NO
5. Locate the two 8255 chips on the mother board. They are located on the left side of the board, end to end, in 40 pin sockets, with the DIP switches in between. Exchange these two chips with each other, TAKING CARE NOT TO BEND ANY OF THE LEGS. Does this fix the problem?
 - YES-->The 8255 which was originally on the bottom is defective. It is possible that the game will now function properly with the chips reversed. If not, (one of the switches now may not work) this chip should be replaced.
 - NO

Call us for further assistance.

SYMPTOM: KEYBOARD BUTTON, COIN SWITCH, OR HOPPER TOKEN SWITCH NOT WORKING.

1. Place the game in the switch--YES--->The microswitch is bad.
test mode. On the suspected switch, manually short the black wire to the solid colored wire (NOT the orange wire). Does the switch number light up on the video screen?
 |
 | NO
 |
 2. Manually short the same solid--YES---->Bad ground on suspected
wire to an adjacent black switch.
wire. Does the number now light up on the screen?
 |
 | NO
 |
 3. Measure continuity between --NO---->Defective wiring between
the solid wire at the switch and the other end
switch and mother board.
at the mother board edge
connector. Is it continuous?
 |
 | YES
 |
 4. Locate the two 8255 chips on --YES---->One of the 8255's is bad.
the left side of the board. Look at the I/O page of
They are 40 pin DIPS mounted the schematic to deter-
end to end with the dip switches mine which one is bad.
in between them. Exchange these NOTE--Usually swapping
two chips with each other, taking these two chips will
care not to bend any of the pins, move the trouble some-
and taking note of polarity. where else. It is also
Does this cure the problem? possible that this will
cure it with no ill
 |
 | NO
 |
- Call us for further assistance.

CAUTION: HOPPER MOTOR USES 120 VAC. USE CARE WHEN TROUBLESHOOTING HOPPER CIRCUITS.

1. Check DIP switch #3 on the main circuit board. Is it off?
 - NO--->Turn DIP switch #3 on. If it is off, the game will operate in "CREDIT-BET" mode, and the hopper will not function.
 - ;YES
2. Check the plug and socket located directly behind the hopper. Is the hopper correctly plugged into its socket?
 - NO--->Seat the hopper firmly in its socket.
 - ;YES;
3. On the solid state relay located under the power supply, short the TOP two lugs to each other. CAUTION: 120 VAC PRESENT AT THESE LUGS. Does the hopper now work?
 - NO--->There is a problem in the source voltage for the hopper. See NOTES ON HOPPER OPERATION below.
 - ;YES;
4. Jump lug #3 on the solid state relay to 5 volts. (The red wires coming out of power supply are 5 volts). Make sure there is a valid ground (black wire) on lug #4. Does the hopper run?
 - NO--->The solid state relay is bad. See NOTES ON HOPPER OPERATION below.
 - ;YES;
5. Remove the power plug from the circuit board and jump the grey wire to 5 volts. Does the hopper operate?
 - NO--->There is a discontinuity in the grey wire between the circuit board and the solid state relay.
 - ;YES;
6. The 8255 (I1) is probably bad. This can be verified by exchanging it with I2 and noting if the hopper now operates. If it does, take no further action. If it doesn't, call for assistance.

NOTES ON HOPPER OPERATION

The hopper motor is actually fed by a simple AC circuit with the solid state relay in series to turn it on and off. The top two lugs (1 and 2) of the solid state relay are actually a "switch". The hopper can be turned on by shorting these lugs together. Lug #3 controls this "switch" with a small voltage fed by the main circuit board. This control voltage actually comes from the 8255 (I1) pin I2. When the control voltage is high (5 volts) the solid state relay turns on, which turns on the hopper.

SYMPTOM: NO SOUND

NOTES ON THE SOUND CIRCUIT

Like most other devices that are external to the main circuit board, the sound is also controlled by the 8255 I/O chip. As can be seen on the "I/O" page of the schematic diagram, the source of the sound is pin 10 of I1. This output pin feeds the base of a 2N2222 transistor which has the speaker as a load. In this circuit, the transistor acts as a switch, rapidly turning the speaker on and off to produce a sound. The volume control is located on the rear of cabinet to the left of the speaker.

1. Use an OHM meter to check --NO--->Replace the speaker.
the speaker for continuity.
Is it about 8 OHMS?

|
| YES
|

2. Check continuity between --NO--->The speaker is not
the black wire on the properly grounded.
speaker and a black wire
on the power supply. Is
it continuous?

|
| YES
|

3. Check continuity between --NO--->Faulty connection between
the yellow wire on the speaker and main circuit
speaker and the yellow wire board.
on the power plug at the
main circuit board.
Is it continuous?

|
| YES
|

4. Manually short the yellow --YES--->Replace the 2N222 tran-
wire to pin 10 of I1. Do sistor next to the edge
you hear a faint sound connector.
from the speaker while the
game is playing?

|
| NO
|

The 8255 I/O chip (I1) is probably bad. Exchange I1 and I2 with each other and note whether the problem disappears. If it does, take no further action. If the problem persists, call for further assistance.

VIDEO OUTPUT TO MONITOR

The video output consists of three similar circuits, one for each of the composite colors red, green, and blue. Each circuit consists of a 74165 shift register, a 2N2222 driver transistor (with associated biasing resistors), and a connecting harness between the circuit and monitor.

The video harness is designed so that either end can plug into either the circuit board or the monitor. The function of each of the wires is as follows:

THESE WIRES ARE LISTED AS THEY APPEAR ON THE MAIN CIRCUIT BOARD.	top pin	YELLOW - HORIZONTAL SYNC
		WHITE - VERTICAL SYNC
		BLACK - VIDEO GROUND
		BLUE - BLUE VIDEO SIGNAL
		GREEN - GREEN VIDEO SIGNAL
	bottom pin	RED - RED VIDEO SIGNAL

The circuit board supports either positive or negative sync signals. These can be adjusted with the two jumpers in the upper right hand corner of the circuit board. The monitor that is supplied with the game uses positive sync signals.

Refer to the VIDEO RAM page of the schematic diagram to supplement the following discussion.

The video signal begins at the 74165 shift registers (R12, B12 and G12). Video data is parallel loaded into each 74165 when PLSR (pin 1) pulses low. CLKSR is constantly pulsing to shift the video data out serially at pin 9. As it stands, this signal is not strong enough to drive the monitor, so a 2N2222 transistor is used as a buffer. Pin 9 of the 74165 drives the 2N2222 and this in turn drives the monitor. The 470 OHM resistors are for biasing the transistors. They are located inside the SIP packages on each side of the transistors.

NOTES ON THE SATELLITE BOARD

The satellite circuit board serves two important functions. First, it contains the program that the CPU requires in order to make the game run. Because the entire program is stored on this one small circuit board, it becomes very easy to convert your game to another by simply changing satellite boards or by changing individual ROM memory chips on the board.

The second major function of the satellite board is that it contains all of the bookkeeping information for that game. Through new ROM/RAM technology, this information can be held in a non-volatile memory without a battery backup.

If you hold a satellite board with the chips facing you and the edge connector up, the two leftmost chips are RAM memory. The CPU not only stores the bookkeeping data here, but also uses it to keep track of the progression of the game. If there is a loss of power in the middle of a game, these chips remember where the game left off. When power is restored, the game can continue without any loss of continuity.

The set of large chips next to the RAM is the game program. If you have a JOKER POKER game, there will be three program chips and one empty socket. If you have a 3-IN-1 game, there will be four program chips. The program is stored in EPROM memory, therefore it is advised that the white labels on the chips not be removed. It is possible that the program may be lost if the quartz window under the label is exposed to too much ambient light.

The single rightmost chip is used for decoding and accessing the individual ROM memory chips. On a JOKER POKER game, this will be a 7408. If you have a 3-IN-1 game, this chip is a PAL16R4.

THE FOLLOWING SYMPTOMS CAN BE LINKED TO A FAULTY PAL16R4:

"NO GAME" APPEARS ON THE SCREEN AS YOUR CHOICE OF GAMES.

THE SAME GAME NAME APPEARS AS ALL THREE CHOICES UPON INSERTION OF A COIN.

If a ROM memory chip is faulty, it will be detected upon power-up of the game. A "ROM BAD" message will flash on the screen.

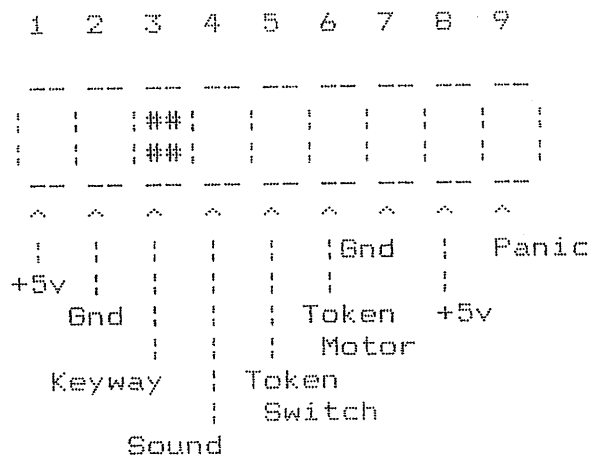
A faulty RAM memory chip may result in erratic bookkeeping figures. It will also cause a random number of credits to appear on the screen upon power-up.

Grayhound Electronics Video Board Connectors

Game Connector P1 1/0

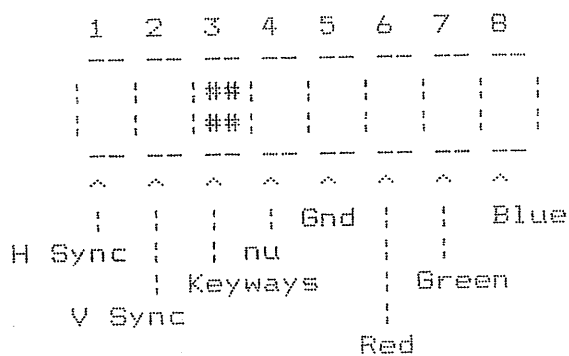
Function	Wire Color	Pins	Wire Colors	Function
Stand Sw.	Brown	- A 1	- N/U	
Cancel Sw.	Blue	- B 2	- N/U	
Deal Sw.	Grey	- C 3	- N/U	
Discard #5 Sw.	Yellow	- D 4	- W/Green	Bet Lamp
Discard #4 Sw.	White	- E 5	- W/Grey	Card #1 Lamp
Discard #3 Sw.	Red	- F 6	- W/Purple	Card #2 Lamp
Discard #2 Sw.	Violet	- H 7	- W/Red	Card #3 Lamp
Discard #1 Sw.	Grey	- J 8	- W/Brown	Stand Lamp
	N/U	- K 9	- W/Blue	Cancel Lamp
	N/U	- L 10	- W/Grey	Deal Lamp
	N/U	- M 11	- W/Yellow	Card #5 Lamp
	N/U	- N 12	- W/Black	Card #4 Lamp
Coin Sw. #1	Blue	- P 13	- N/U	
	N/U	- R 14	- N/U	
	N/U	- S 15	- N/U	
Total Sw.	Brown	- T 16	- N/U	
	N/U	- U 17	- N/U	
	N/U	- V 18	- N/U	
	N/U	- W 19	- N/U	
Bet Sw.	Green	- X 20	- N/U	
	N/U	- Y 21	- Red	Coin Lockout
Ground	Black	- Z 22	- Black	Ground

Power Connector P2



Panic - Loss of Power Detector

Video Connector P3



ROM CONNECTOR P4

B NOVR -	1	2	- STORE
A NOVR -	3	4	- NRST
GND -	5	6	- GND
+5v -	7	8	- +5v
D7 -	9	10	- ROM0
D6 -	11	12	- ROM1
D5 -	13	14	- ROM2
D4 -	15	16	- ROM3
D3 -	17	18	- ROM4
D2 -	19	20	- ROM5
D1 -	21	22	- ROM6
D0 -	23	24	- ROM7
4 MHZ -	25	26	- PRST
EX-STORE -	27	28	- ACE
READ -	29	30	- WRITE
N/U -	31	32	- N/U
A15 -	33	34	- A7
A14 -	35	36	- A6
A13 -	37	38	- A5
A12 -	39	40	- A4
A11 -	41	42	- A3
A10 -	43	44	- A2
A9 -	45	46	- A1
A8 -	47	48	- A0
N/U -	49	50	-N/U