irem

IREM AMERICA
CORPORATION

SKINS

OWNERS MANUAL

VIDEO GAME OPERATOR:

Don't Get Involved In A Federal Crime. Don't Buy Or <u>Operate</u> Copy Or Unauthorized Boards In Your Games.

Warning

Every operator who buys or <u>operates</u> a counterfeit or unauthorized board (imported or domestic) is contributing to the end of our industry and committing a <u>FEDERAL CRIME</u>.

New criminal laws have recently been enacted that provide for maximum penalties of $250,000 or five years in prison or both, per offense. <u>EACH GAME IS A SEPARATE OFFENSE</u>.

DON'T GET INVOLVED IN THIS CRIMINAL ACT.
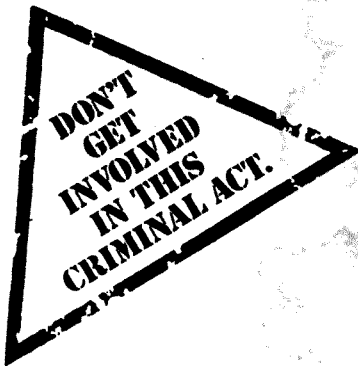
FBI WARNING
Federal law provides severe civil and criminal penalties for the unauthorized reproduction, distribution, or exhibition of copyrighted audiovisual works and video games.

The Federal Bureau of Investigation investigates allegations of criminal copyright infringement.

If you have any information about any unauthorized games in the United States, contact your local FBI or,

American Amusement Machine Association

205 The Strand
Suite 3
Alexandria, Virginia 22314
(703) 548-8044

All information will be treated in confidence.

SAFETY

The following topics should be carefully studied to insure maximum reliability and safety for both serviceman and customer. Shock Hazard: The high voltage on the monitor may be very dangerous. Extreme caution must be used when working with or around the monitors. Be certain that the grounding strap is attached to the monitor frame. The picture tube in the monitor is also a hazard and should be handled with care. Do not strike, scratch, or subject the tube to more than moderate pressure as it may implode serious injury from flying glass. Be certain that the control panel, power supply monitor, and coin door are all properly grounded to the ground wire inside the line cord. Do not remove ground prong off plug end.

PARTS LIST

1-Manual
1- 3rd & 4th Player Cables
1 - Marquee Art
1 - Skins PCB
1 - Side Graphic
1 - FCC Label

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Your authorized Irem America Corporation® Distributor
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SUMMIT SERVICE
2274 University Avenue
St. Paul, MN 55114
(612) 645-9077

WARRANTY REPAIRS

Irem America Corporation PCB have a 90 day warranty from date of shipment. This includes all failures except those caused by the installer such as miswiring.

All PCB must be returned by an authorized Irem America Corporation distributor. A Return Material Authorization must be obtained from Summit Service prior to returning material. A Purchase Order must also be given to Summit Service at this time. The package must be clearly marked with the RMA number.

IMPORTANT F.C.C. WARNING

THIS EQUIPMENT COMPLIES WITH THE REQUIREMENTS IN PART 15 OF FCC RULES FOR A CLASS A COMPUTING DEVICE. OPERATION OF THIS EQUIPMENT IN A RESIDENTIAL AREA MAY CAUSE UNACCEPTABLE INTERFERENCE OF RADIO AND TV RECEPTION REQUIRING THE OPERATOR TO TAKE WHATEVER STEPS ARE NECESSARY TO CORRECT THE INTERFERENCE. YOUR FCC COMPLIANCE LABEL IS ENCLOSED IN YOUR KIT AND MUST BE ATTACHED TO YOUR GAME PRIOR TO PLACING ON LOCATION. THIS LABEL INDICATES YOUR GAME WAS DESIGNED TO MEET FCC STANDARDS 47CFR15.19. WE ADVISE USING STAPLES IF NECESSARY TO MAKE SURE THE LABEL STAYS ON.

DANGER

The isolation transformer must be used with the monitor and power supply.

This game must be equipped with a three wire 110 volt plug for safety. Under no circumstance remove the ground plug.

DANGER

This game is designed with a JAMMA 56 pin connector. This plug is one of the finest operator friendly features in our industry today. What this means to you is that:

1)   1, 2, A, B, 27, 28, e and f are grounded
2)   3, 4, C and D are +5 volts
3)   5 and E are -5 volts
4)   6 and F are +12 volts

Also, all video and joystick functions are always in the same place. Once a cabinet is wired for JAMMA, it is easily changed from game to game.

Many older games such as Pac Man®, etc., have the power supply on the board. This will not work!! Only a JAMMA connector with proper voltage will work. Irem America Corporation® recommends using an 11 or 15 amp switching power supply with **Skins**®.

MONITORS

Skins® is designed to be operated with a horizontal raster scan monitor with negative sync (RGB). This means **Skins**® will not work with any X-Y (Tempest, Space Dual, Star Trec), etc. An isolation transformer must be used in conjunction with the monitor. This is for your safety. The monitor also utilizes extremely high voltages. The monitor may also retain a charge for an extended period of time. Safety goggles must be worn while removing or replacing the monitor.

It is highly recommended that the monitor is verified good before the new **Skins**® kit is installed in your new and or rebuilt cabinet.

INSTALLATION OF KIT
IN USED CABINET

To Disassemble:

1. Open back door and remove old board set and power supply, if you are using a new switching power supply.

2. Remove marquee glass and monitor glass.

3. Remove control panel and set aside.

4. Remove old wire harness, leaving 110 volt wiring intact. Also, leave the grounding straps to the monitor, coin door, control panel, and power supply intact.

Installation:

1. Mount the board set on the side panel of the cabinet as close to the middle of the game as possible (approximately 10-12" off bottom).

   NOTE: Do not mount board directly below control or any vents or cracks so that liquids may seep on to the board. Do not forget about coins that may drop on to the board. Also, mount the board with edge connector facing up.

2. Mount the power supply on the bottom of the cabinet with connectors facing the rear of the cabinet. An optional mounting might be on the side panel just below the board set, connector to rear.

3. If the game does not have an isolation transformer, you must protect your customers and your game. Install one between the 110 volt line and your monitor/power supply.

4. Place the provided JAMMA wiring harness on the board. Connect the +5, +12, -5, and ground wires to the corresponding lugs on the power supply, connecting all the wires. If you don't, you will probably burn the board connector.

5. Run a wire from +12 volts to the coin door lights. Run a wire from +12 volts to the coin counters. This completes the power requirements.

6. Connect the Audio (+) and Audio (-) to the speaker.

7. Connect the video red, green, blue, ground, and sync to the corresponding wires on the monitor. If the monitor is not a negative composite sync, see sync modifications chart.

8. Cut the marquee to size. Replace the marquee lamp, if needed. Install the marquee panel.

9. Connect the coin 1 and coin 2 wires to the coin switch. Connect the coin counter 1 and coin counter 2 wires to the coin counters.

   NOTE: If you only have one coin counter, see coin counter diagram. It will not matter if the coin counters are only rated at 6 volts, as the pulse is not long enough to burn out the counter.

10. Disassemble the control panel of all the hardware. Do not remove the old panel overlay. Determine where to place the new joystick and buttons if they must be repositioned. Then, cut new holes.

NOTE: If you are going to use plexiglass over the control panel, we suggest that you use a good 1/8" polycarbonate with a scratch resistant coating. We recommend GENERAL ELECTRIC LEXAN MR5 with margard or TUFFAK CM-2. These do not crack or break with abuse.

Cut and drill plex as needed. Remove the old control panel overlay carefully and apply the new overlay on top of the old glue. Use an **Exacto** knife to cut out any button or bolt holes. Apply necessary decals over appropriate buttons. Now assemble the control panel.

11. Bolt the control panel to the cabinet. Now connect the appropriate wires to the correct switches. Connect the 1 player and 2 player start wires.

12. Be sure to install the FCC stickers on the back of the cabinet.

13. Power up the game. Look over your installation for errors, and then apply power, listening for unusual sounds. Check for smoke or sparks. If everything is okay, wire tie all wires to form a nice, neat wiring harness. Clean the cabinet inside and out. Measure the +5 volts on the furthest point from the edge connector and adjust 5 volts to 5.05 volts. Use a tinted plex over the monitor is there are burns in the screen. We suggest bronze or grey tinted plex. Touch up the cabinet with fresh paint, and then repair all cabinet dents or chips, using an auto body product called **Duraglass.** This is similar to bondo. You can consult your local auto body shop or auto parts supplier for this product, as well as advice on how to use it.

14. Be sure your ground plug is good. All metal exposed to the player must be grounded (coin door, control panel, etc.) including all metal inside exposed.
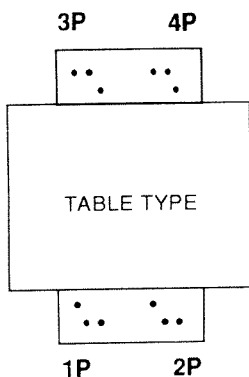
SKINS®

Irem America Corporation recommends installing your new **SKINS** kit in only a new or refurbished cabinet. Installing **SKINS** in an older cabinet will result in lower earnings. The cabinet should be as follows:

1. horizontal monitor
2. 11 amp or larger power supply
3. monitor not laying down flat.
4. **Game uses only right/left joystick switches.**

PLEASE NOTE: SW 2-3 for Coin Switches
SW 2 for Upright/Table
SW 1-5 for 2 or 4 Joysticks

*CABINET 9 (DIP 2-2) & CONTROL PANEL (DIP 1-5)

Both Sides (Table Type):
4 Joysticks
DIP 2-2 • ON, 1-5 • ON

One Side (Upright Type):
2 Joysticks
DIP 2-2 • OFF, 1-5 • OFF
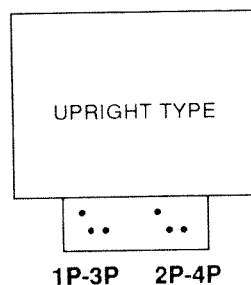
One Side (Upright Type):
4 Joysticks
DIP 2-2 • OFF, 1-5 • ON
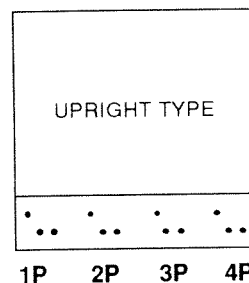
Both Sides (Table Type):
2 Joysticks
DIP 2-2 • ON, 1-5 • OFF

3P   4P

TABLE TYPE

1P   2P

UPRIGHT TYPE

1P-3P   2P-4P

UPRIGHT TYPE

1P   2P   3P   4P

2P • 4P

NOT USABLE

1P • 3P

*This game is not programmed to be played with 1 joystick only on the control panel.

SKINS®
JAMMA EDGE CONNECTOR CABLE

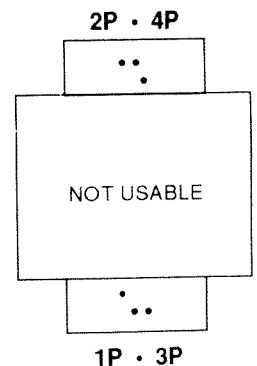| COMPONENT SIDE			SOLDER SIDE		
FUNCTION	COLOR	POS	POS	COLOR	FUNCTION
GROUND	BLK	1	A	BLK	GROUND
GROUND	BLK	2	B	BLK	GROUND
+5 VOLTS	RED	3	C	RED	+5 VOLTS
+5 VOLTS	RED	4	D	RED	+5 VOLTS
-5 VOLTS	BRN	5	E	BRN	-5 VOLTS
+12 VOLTS	BLU	6	F	BLU	+12 VOLTS
		7	H		
COIN 1	BLU/BRN	8	J	WHT/PUR	COIN 2
N.C.		9	K		N.C.
AUDIO POS +	WHT/BLK	10	L	BLK	AUDIO NEG -
N.C.		11	M		N.C.
VIDEO RED	RED	12	N	GRN	VIDEO GRN
VIDEO BLU	BLU	13	P	WHT	VIDEO SYNC*
VIDEO GND	BLK	14	R	BRN/WHT	SERV. SW.
N.C.	YEL	15	S	WHT/BRN	N.C.
COIN INPUT 1	WHT/YEL	16	T	GRN/YEL	COIN INPUT 2
START 1	PNK/BLK	17	U	RED/BLK	START 2
1 P UP	ORG/BLU	18	V	BRN/BLU	2 P UP
1 P DOWN	GRN/ORG	19	W	ORG/WHT	2 P DOWN
1 P LEFT	GRN/BLU	20	X	ORG/GRN	2 P LEFT
1 P RIGHT	RED/YEL	21	Y	WHT/ORG	2 P RIGHT
1 P SHOT	RED/WHT	22	Z	BRN/BLK	2 P SHOT
1 P MODE SELECT	WHT/RED	23	a	YEL/WHT	2 P MODE SELECT
N.C.	YEL/BLK	24	b	BRN/GRN	N.C.
N.C.		25	c		N.C.
N.C.		26	d		N.C.
GROUND	BLK	27	e	BLK	GROUND
GROUND	BLK	28	f	BLK	GROUND

* Video sync composite negative
* Game uses only right/left joystick switches

KD/DYNAMO — UNIVERSAL VIDEO WIRING
56 PIN EDGE CONN. PIN-OUT CHART
(JAMMA COMPATIBLE)

COMPONENT SIDE			SOLDER SIDE		
FUNCTION	COLOR	POS	POS	COLOR	FUNCTION
GROUND	BLK	1	A	BLK	GROUND
GROUND	BLK	2	B	BLK	GROUND
+5 VOLTS	RED	3	C	RED	+5 VOLTS
+5 VOLTS	RED	4	D	RED	+5 VOLTS
-5 VOLTS	WHITE	5	E	WHITE	-5 VOLTS
+12 VOLTS	YELLOW	6	F	YELLOW	+12 VOLTS
KEY		7	H		KEY
COIN 1	BRN	8	J		COIN 2
COIN LOCK 1	RED	9	K		COIN LOCK 2
SP (+)	WHT	10	L	WHT/BLK	SP (-)
N.C.	BLUE-OPTION	11	M	OP. BLU/BLK	N.C.
VIDEO RED	RED	12	N	GRN	VIDEO GRN
VIDEO BLU	BLU	13	P	GRAY	VIDEO SYNC*
VIDEO GND	BLK	14	R	RED/BLACK	SERV. SW.
TEST SW.	BROWN	15	S	OP. BRN/BLK	TILT SW.
COIN SW. 1	WHITE	16	T		COIN SW. 2
START 1	GRAY	17	U	WHITE/GRAY	START 2
1 P UP	VIOLET	18	V	WHITE/VIOLET	2 P UP
1 P DOWN	BLUE	19	W	WHITE/BLUE	2 P DOWN
1 P LEFT	GREEN	20	X	WHITE/GREEN	2 P LEFT
1 P RIGHT	YELLOW	21	Y	WHT/YELLOW	2 P RIGHT
1 P PUSH 1	ORANGE	22	Z	WHT/ORANGE	2 P PUSH 1
1 P PUSH 2	RED	23	a	WHITE/RED	2 P PUSH 2
1 P PUSH 3	BROWN	24	b	WHT/BROWN	2 P PUSH 3
N.C.	BLUE/WHT	25	c	GREEN/WHT	N.C.
N.C.	RED/WHT	26	d	YELLOW/WHT	N.C.
GROUND	BLK	27	e	BLK	GROUND
GROUND	BLK-OPTION	28	f	BLK-OPTION	GROUND

* Video sync composite negative

SKINS® DIP SWITCH SPECIFICATIONS

DIP SWITCH 1

		1	2	3	4	5	6	7	8
GIVEN HOLES (STROKE PLAY)	2	OFF							
	1	ON							
GIVEN HOLES (MATCH PLAY, SKINS GAME)	2		ON						
	1		OFF						
DIFFICULTY	NORMAL			OFF					
	HARD			ON					
CONTROL PANEL (SEE BELOW)	2 JOYSTICKS					OFF			
	4 JOYSTICKS					ON			
ANY BUTTON STARTS GAME	NO						OFF		
	YES						ON		
SOUND IN ATTRACTING MODE	NO							OFF	
	YES							ON	
DIAGNOSTIC TEST	NO								OFF
	YES								ON

DIP SWITCH 2

			1	2	3	4	5	6	7	8
FLIP PICTURE		NO	OFF							
		YES	ON							
CABINET TYPE		UPRIGHT		OFF						
		TABLE		ON						
COIN CHUTES		SHARED			OFF					
		SEPARATE			ON					
COIN MODE 1		1 COIN / 1 PLAY				OFF	OFF	OFF	OFF	OFF
		2 COINS / 1 PLAY				OFF	ON	OFF	OFF	OFF
		3 COINS / 1 PLAY				OFF	OFF	ON	OFF	OFF
		4 COINS / 1 PLAY				OFF	ON	ON	OFF	OFF
		5 COINS / 1 PLAY				OFF	OFF	OFF	ON	OFF
		6 COINS / 1 PLAY				OFF	ON	OFF	ON	OFF
		1 COIN / 2 PLAYS				OFF	OFF	ON	ON	OFF
		1 COIN / 3 PLAYS				OFF	ON	ON	ON	OFF
		1 COIN / 4 PLAYS				OFF	OFF	OFF	OFF	ON
		1 COIN / 5 PLAYS				OFF	ON	OFF	OFF	ON
		1 COIN / 6 PLAYS				OFF	OFF	ON	OFF	ON
		2 COINS / 3 PLAYS				OFF	ON	ON	OFF	ON
		3 COINS / 2 PLAYS				OFF	OFF	OFF	ON	ON
		4 COINS / 3 PLAYS				OFF	ON	OFF	ON	ON
		1 COIN CONTINUE				OFF	OFF	ON	ON	ON
		FREE PLAY				OFF	ON	ON	ON	ON
COIN MODE 2	* A	1 COIN / 1 PLAY				ON	OFF	OFF		
		2 COINS / 1 PLAY				ON	ON	OFF		
		3 COINS / 1 PLAY				ON	OFF	ON		
		5 COINS / 1 PLAY				ON	ON	ON		
	** B	1 COIN / 2 PLAYS				ON			OFF	OFF
		1 COIN / 3 PLAYS				ON			ON	OFF
		1 COIN / 5 PLAYS				ON			OFF	ON
		1 COIN / 6 PLAYS				ON			ON	ON

* COIN CHUTE A   **COIN CHUTE B

- Please turn off the power switch before changing the DIP SW setting, or the change may not take effect.
- Continue Coin is the mode which starts the game with 2 coins, but continues it with 1 coin alone. When this mode is set, no other coin modes can be set.

- 4-way joysticks, each with two buttons, and a horizontally positioned monitor are required.

- When the game is set 4P UPRIGHT A (No. 2 and No. 3 of DIP SW 2 OFF), only the coin Mode 1 (No. 4 of DIP SW 2 OFF) can be used.

- When the game is set 4P UPRIGHT B (No. 2 of DIP SW 2 OFF and No. 3 of DIP SW 2 ON), 2P UPRIGHT (No. 2 of DIP SW 2 ON and No. 3 of DIP SW 3 OFF) or 2P TABLE TYPE (No. 2 and No. 3 of DIP SW 2 ON), either Coin Mode 1 (No. 4 of DIP SW 2 OFF) or Coin Mode 2 (No. 4 of DIP SW 2 ON) can be used.

- 1-COIN CONTINUE is the mode which starts the game with 2 coins but continues it with 1 coin alone. When this mode is set, no other coin modes can be set. For two players, 4 coins to start, 2 coins to continue.

- When the game is set 4P UPRIGHT A, each coin selector can be used independently.

- When the game is set 4P UPRIGHT B, a coin selector can be used as a mutual.

CN 3

1	GROUND
2	3P RIGHT
3	3P LEFT
4	3P DOWN
5	3P UP
6	3P START/COIN
7	
8	MODE SELECTION
9	SHOT

CN 4

1	GROUND
2	4P RIGHT
3	4P LEFT
4	4P DOWN
5	4P UP
6	4P START/COIN
7	
8	MODE SELECTION
9	SHOT

DIP SWITCH 3

			1	2	3	4	5	6	7	8
TICKET DISPENSER	YES		OFF							
	NO		ON							
CONVERSION RATE FOR TICKET	1 POINT-1 TICKET			OFF	OFF					
	2 POINTS-1 TICKET			ON	OFF					
	5 POINTS-1 TICKET			OFF	ON					
	10 POINTS-1 TICKET			ON	ON					
DELTRONICS MODEL	DL 1275									OFF
	DL 4SS									ON

CN 6

1	TICKET SIGNAL DETECTING SWITCH
2	GROUND
3	MOTOR ON
4	+12 VOLTS

4 PIN CONNECTOR

* To fit CN 6, use socket MOLEX 5045-04A.

"THE IREM SKINS GAME" Ticket Dispenser Program

This program operates ticket dispensers, when connected and turned on, to issue tickets, exchangeable with prizes, in accordance with the total points which respective players have won by fulfilling specific conditions in the stroke play mode and saved.

Specific conditions (Good score, birdie, etc.) fulfilled — Points Won — Point Total — Tickets Issued

This program functions only with DIP Switch 3-1 turned on.

WHEN TURNING POWER ON:

Make sure of the status of DIP SW 3-1.

WITH DIP SW 3-1 TURNED ON:

Stored data is shown on the screen as follows:

```
** CUMULATIVE DATA **

        TOTAL GAMES PLAYED              00000
        TOTAL COINS DEPOSITED           00000
        TOTAL POINTS SCORED             00000
        TOTAL TICKETS ISSUED            00000
              DO YOU WANT TO CLEAR DATA?
                   YES        NO
```

The data is saved in a back-up memory. In order to clear the data, move the cursor to "YES" and press any button switch on the control panel. Then the data is initialized before the game starts. In order to start the game with one saved data uncleared, press any button switch with the cursor on "NO".

The set exchange rate between points and tickets is shown as under:

```
X_POINTS_FOR_1_TICKET
ONLY STROKE PLAY
```


WITH DIP SW 3-1 TURNED OFF:

A message "Ticket payout function is not working now" is shown on the screen for a few seconds before the game begins.

POINTS GIVEN

Points are given in the stroke play mode as follows:

Birdie .... 1 Point
Eagle .... 3 Points
Hole in One or Albatross .... 5 Points
Victory in Driving/Closest to the Pin Contest .... 3 Points
Total score of 0 _____-2 .... 1 Point
Total score of -3 _____-5 .... 2 Points
Total score of -6 _____-8 .... 3 Points
Total score of -9 _____-12 .... 5 Points
Total score of -13_____ .... 7 Points

The above data is neither shown while playing the game nor when points are won. The players, therefore, cannot learn how many points they have gained until the tickets are issued.

TICKET ISSUANCE

As soon as the game including the ending scenes are completed, the tickets to be given out are shown to each player. In other words, tickets are issued only for those who completed the 18 holes.

```
+-----------------------------------------------------------------+
|       +-------------------------------------------------+        |
|       |            POINTS YOU SCORED                    |        |
|       +-------------------------------------------------+        |
|  +--------------+   BIRDIES 5 x 1 ............ 5                  |
|  |              |   EAGLES 1 x 3 ............ 3       Details     |
|  |              |                                                 |
|  |              |   SCORE    -3 ............ 2                    |
|  |              |   TOTAL..................... 10                 |
|  +--------------+                                                 |
|                     YOUR GET 2 TICKETS                           |
+-----------------------------------------------------------------+
          |                    |
   Golfers Picture    The amount of earned tickets
```


DETAILS OF STROKES

BIRDIES	0 X 1	....	00
EAGLES	0 X 3	....	00
ALBATROSSES	0 X 5	....	00
HOLES IN ONE	0 X 5	....	00
CONTEST WON	0 X 3	....	00
SCORE	-0	....	00

Adding up all of the subtotals, the point total is computed out and shown on the screen. Tickets are issued according to the total points.

The exchange rate between points and tickets can be adjusted with DIP SW 3 - 2 and 3-3 as follows:

1 POINT	............................1 TICKET
2 POINTS	............................1 TICKET
5 POINTS	............................1 TICKET
10 POINTS	............................1 TICKET

Odd points are lost and cannot be carried over to the next game.

In order to test the ticket dispenser, select "OPTION" out of the test items in the diagnostic test mode (with DIP switch 1-8 turned on.) "MOTOR TEST OFF" is shown then initially on the screen. Press here button A for 1P. And then the motor test begins while the message changes into "MOTOR TEST ON."

In case 5 tickets come out of the ticket dispenser, it is the proof that the designation of ticket dispenser model has been made correctly (with DIP SW 3-8), and "OK" is then shown on the screen.

In case 5 tickets do not come out from the dispenser for reasons such as designation of a wrong dispenser model, ticket shortage, non or misconnection of the dispenser, "NO" appears on the screen.

1. Monitor Sync

If your monitor does not have dual polarity positions for sync, you may use on of the following methods to get your game going.

CURE 1: Install a simple one I.C. Circuit on your logic board. This I.C. may be "piggy backed" on to another 7404 series chip for power by bending up all but the two power pins so that they are parallel to the top surface of the new I.C. and then connecting the power pins only to the existing chip. *(See Fig. 1)* Next connect the sync wires as shown in Fig. 2. *(Note: Figure 2 shows a hookup for either composite or separate syncs.)*

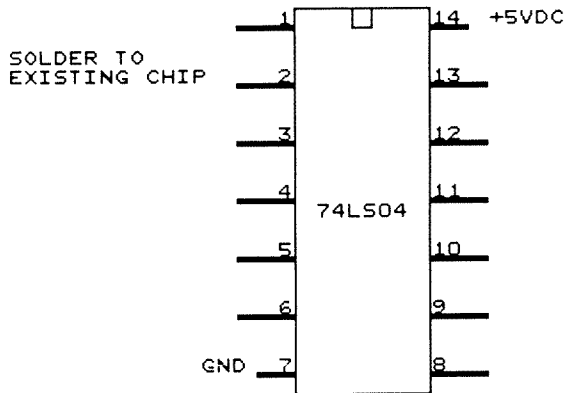SOLDER TO EXISTING CHIP

```
        1        14   +5VDC
        2        13
        3        12
        4  74LS04 11
        5        10
        6         9
 GND    7         8
```

FIG. 1

```
HORIZONTAL SYNC INPUT FROM P.C.B.    1        14   +5VDC
(OR COMPOSITE SYNC INPUT)
HORIZONTAL SYNC OUTPUT TO MONITOR    2        13   NC.
(OR COMPOSITE SYNC OUTPUT)
VERTICAL SYNC INPUT FROM P.C.B.      3        12   NC.
VERTICAL SYNC OUTPUT TO MONITOR      4        11   NC.
                                       74LS04
                              NC.    5        10   NC.
                              NC.    6         9   NC.
                           GROUND    7         8   NC.
```

FIG. 2

```
            BENT PINS
        +---------------------+
        |   +-----------+     |
        |   |  NEW I.C. |     |
   >    |   +-----------+     |   <
   >    |   +-----------+     |   <
        |   | EXISTING  |     |
  - - - | - |   I.C.    | - - | - - -  P.C.B.
        |   +-----------+     |
        |                     |
        +---------------------+
            SOLDER
```
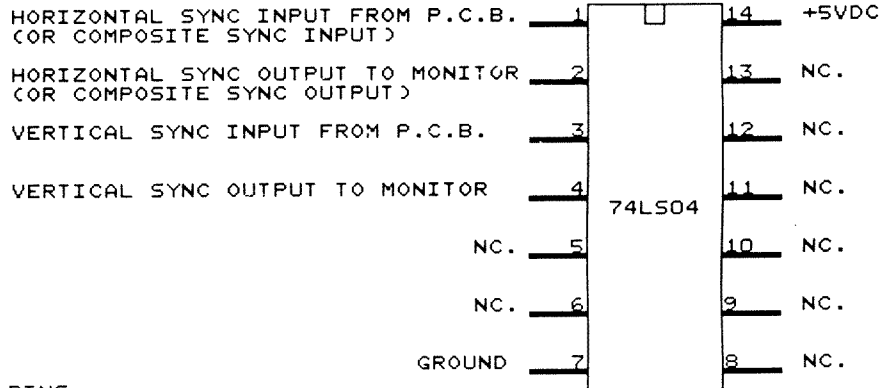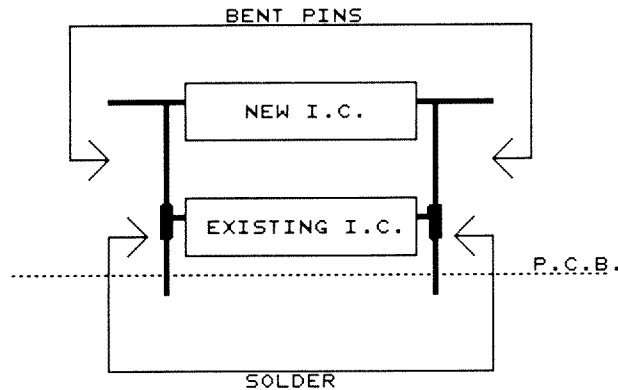
CURE 2: Used for Wells-Gardner Video-Sync boards with positive sync connections only. *(Vertical mount board 85x14 OB.)*

Cut the traces on the solder side of the board between input pins 5 & 6 to the unbanded *(anode)* ends of diodes X201 & X202.
Add MPSA 56 transistor as follows:
  Collector to anode leads of diodes X201 & X202. Base pins 5 & 6 of the video input connector. Emitter to cathode *(banded)* lead of zener diode ZD201.
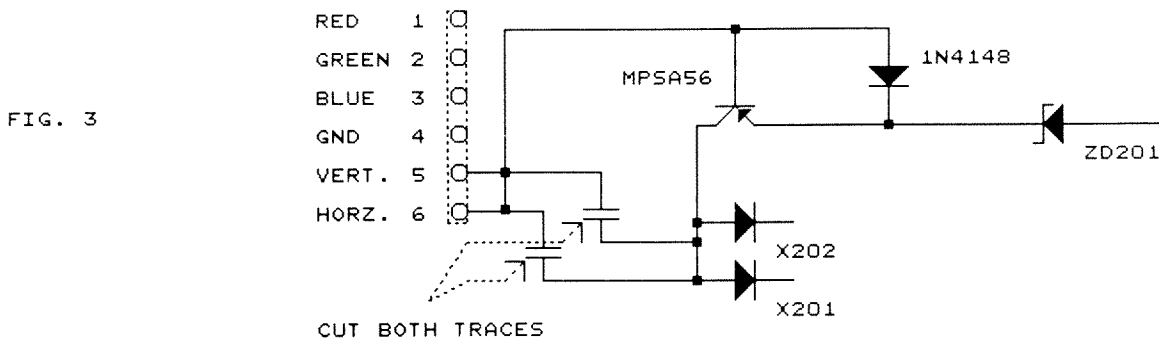Insert a 1N4148 diode - cathode to the emitter of the MPSA56 and anode to the base. *(See Fig. 3)*

FIG. 3

```
RED   1
GREEN 2
BLUE  3          MPSA56        1N4148
GND   4
VERT. 5                              ZD201
HORZ. 6
                         X202
                         X201
    CUT BOTH TRACES
```

2. Horizontal Tearing

CAUSE: The negative sync signal of most logic sets are slightly different than the GO7-CBO monitor negative sync inputs. The result of this mismatch is a horizontal "wave" or "curl".

CURE 1: On the monitor deflection board, replace C303 with a 10uf 25V radial lead capacitor with the positive lead towards the collector of X305. *(CAUTION: be sure to check this step as the original cap is not polarized.)* Then replace C501 with the cap removed from the C303 location.

CURE 2: Connect 1N4148 fast-switching diodes across both the positive and negative sync inputs to the monitor. *(See Fig. 4)* NOTE: Both diodes must be installed or you will not have vertical stability.
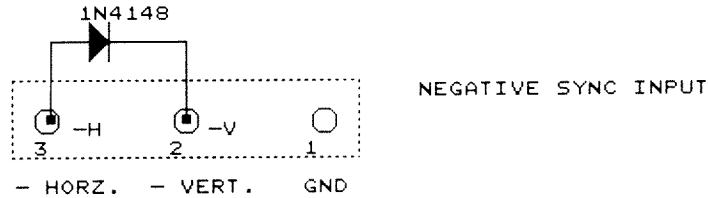

FIG. 4
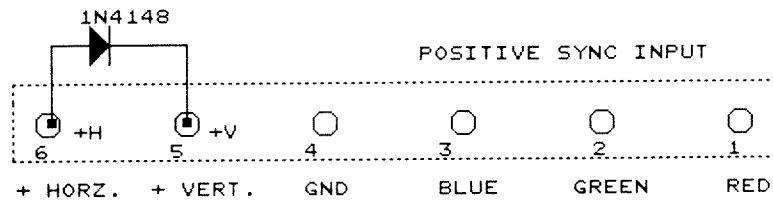
CURE 3: Join negative sync inputs J2 and J3 together with a jumper. Locate W102 and install a jumper from W102 to either J2 or J3.

CURE 4: For Wells-Gardner K4600 series monitors.
Replace C356 (4 7uf 25V) on the Horizontal/vertical board *(vertically mounted board nearest the flyback transformer)* and center the horizontal hold pot. Turn L351 for the best horizontal stability and fine-tune with the horizontal width pot.

COIN COUNTER DIAGRAM

If only one coin counter is to be used install two diodes in the following manner:
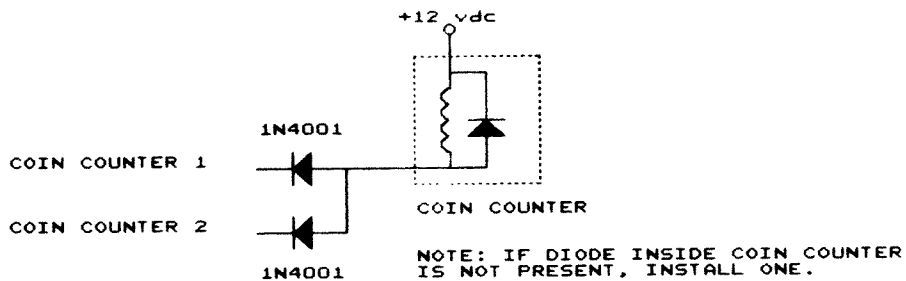
Diagnostic Test

(1) Test Items

The following tests are made:

1	RAM Test	5	SOUND Test
2	ROM Test	6	CHARACTER Test
3	I/O PORT Test	7	COLOR Test
4	DIP Switch Test	8	CROSS HATCH Test

As soon as the number 8 of the DIP Switch 1 is turned "ON" and the Power Switch is switched on, the Test 1 and 2 are started.

To finish the Tests, turn off the Power Switch and then the number 8 of the DIP Switch 1 to "OFF".

(2) Test Procedures
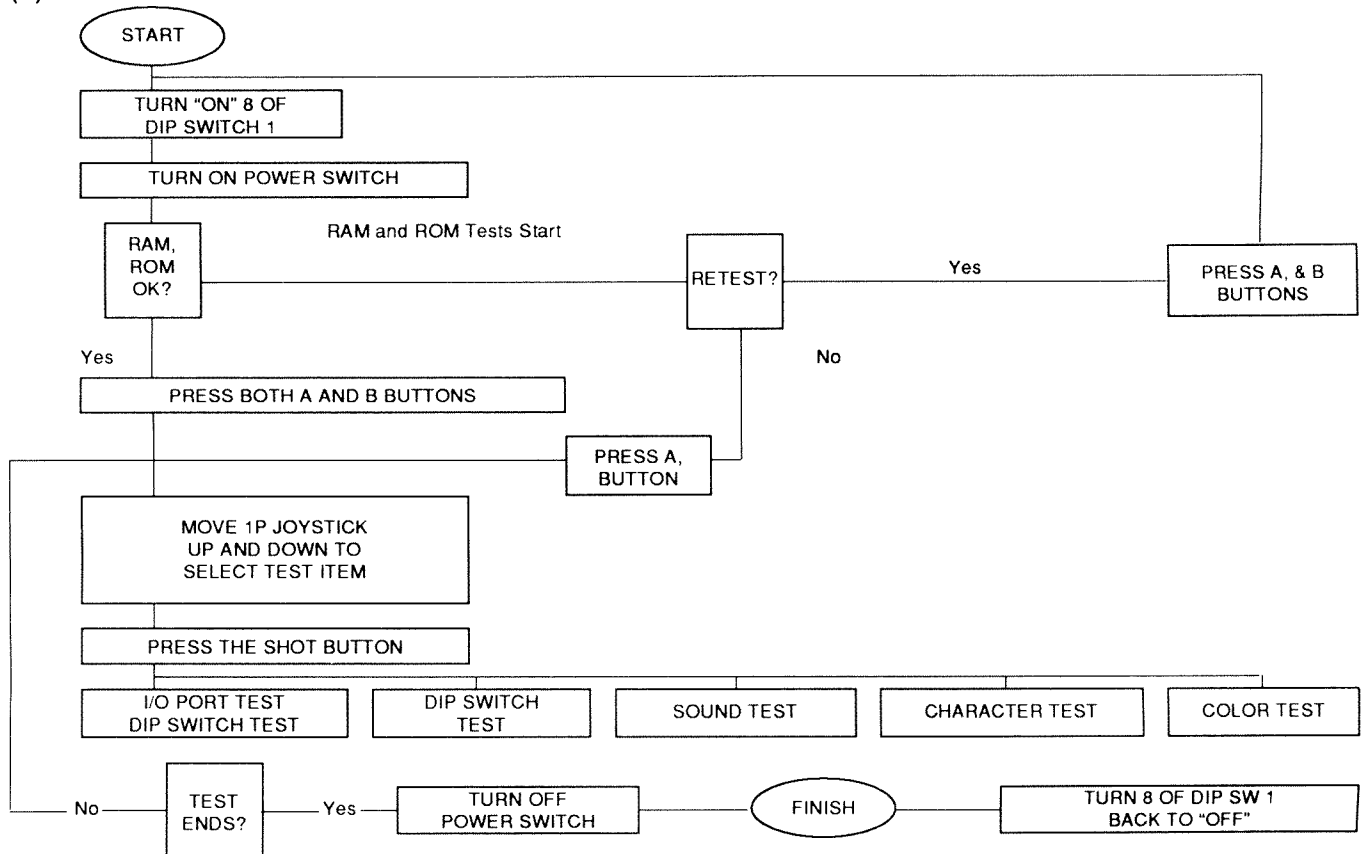
(3) RAM and ROM TEST

Although the picture does not appear on the screen and only verious patterns appear on it for a while after turning on the power switch, RAM's for the picture are being tested during this time. If RAM's are found OK by the test, "RAM OK" and "ROM OK" will be displayed on the screen.

If RAM(s) is (are) not good, "RAM NG □" will appear on the screen.

The figure following the "RAM NG" indicates the location of the defective RAM.

00	WORK RAM (BYTE)	09	PALLETE BUFFER BANK 0 (WORD)
01	WORK RAM (WORD)	10	PALLETE BUFFER BANK 1 (WORD)
02	V_RAM A (WORD)	11	PALLETE BUFFER BANK 2 (WORD)
03	V_RAM B (WORD)	12	PALLETE BUFFER BANK 3 (WORD)
04	V_RAM C (WORD)	13	OBJECT BUFFER BANK 0 (WORD)
05	V_RAM D (WORD)	14	OBJECT BUFFER BANK 1 (WORD)
06	RASTER SCROLL RAM A (WORD)	15	PALLETE RAM BANK 0 (WORD)
07	RASTER SCROLL RAM B (WORD)	22	PALLETE RAM BANK 7
08	RASTER SCROLL RAM C (WORD)	23	OBJECT RAM (WORD)

If ROM(s) is(are) defective, "ROM NG ☐" will appear on the screen.

When RAM's and ROM's are found all good after completing this RAM and ROM TEST, you can move over to the next test item by pressing the 1P and 2P start buttons.

In case any RAM(s) or ROM(s) is(are) found faulty after completing the RAM and ROM TEST, press the 1P start button to repeat the test. Press the 2P start button to go to the next test.

(4) **Display of the Test Items**

The following test items are shown so that you may select a test item you want by moving the 1P joystick up and down:

1. I/O
2. SOUND
3. CHARACTER
4. COLOR
5. CROSS HATCH
6. OPTION
7. EXIT

Press the Shot button to get the test indicated in red started. Press the 1P and 2P start buttons to end the same test. Press the 1P start button to start "OPTION" test.

(5) **I/O Port Test**

The status when each joystick button, and coin is turned "ON" is shown.

```
            8 7 6 5 4 3 2 1 8 7 6 5 4 3 2 1
IN PORT 1   0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
IN PORT 2   0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
IN PORT 3   0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
DIP SWITCH  0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0
            (0-OFF, 1-ON)
```
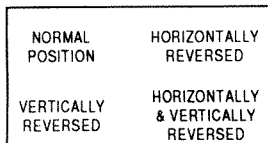
(6) **Sound Test**

The screen shows the number of each sound and the test is made about whether the corresponding sound is given. Push down the 1P joystick to move over to the next sound's test.

(7) **Character Test**

The player character is displayed in the center of the screen.

|	
NORMAL POSITION	HORIZONTALLY REVERSED
VERTICALLY REVERSED	HORIZONTALLY & VERTICALLY REVERSED

Make sure that the character is shown in four different positions, each vertically and horizontally reversed, as shown on the left.
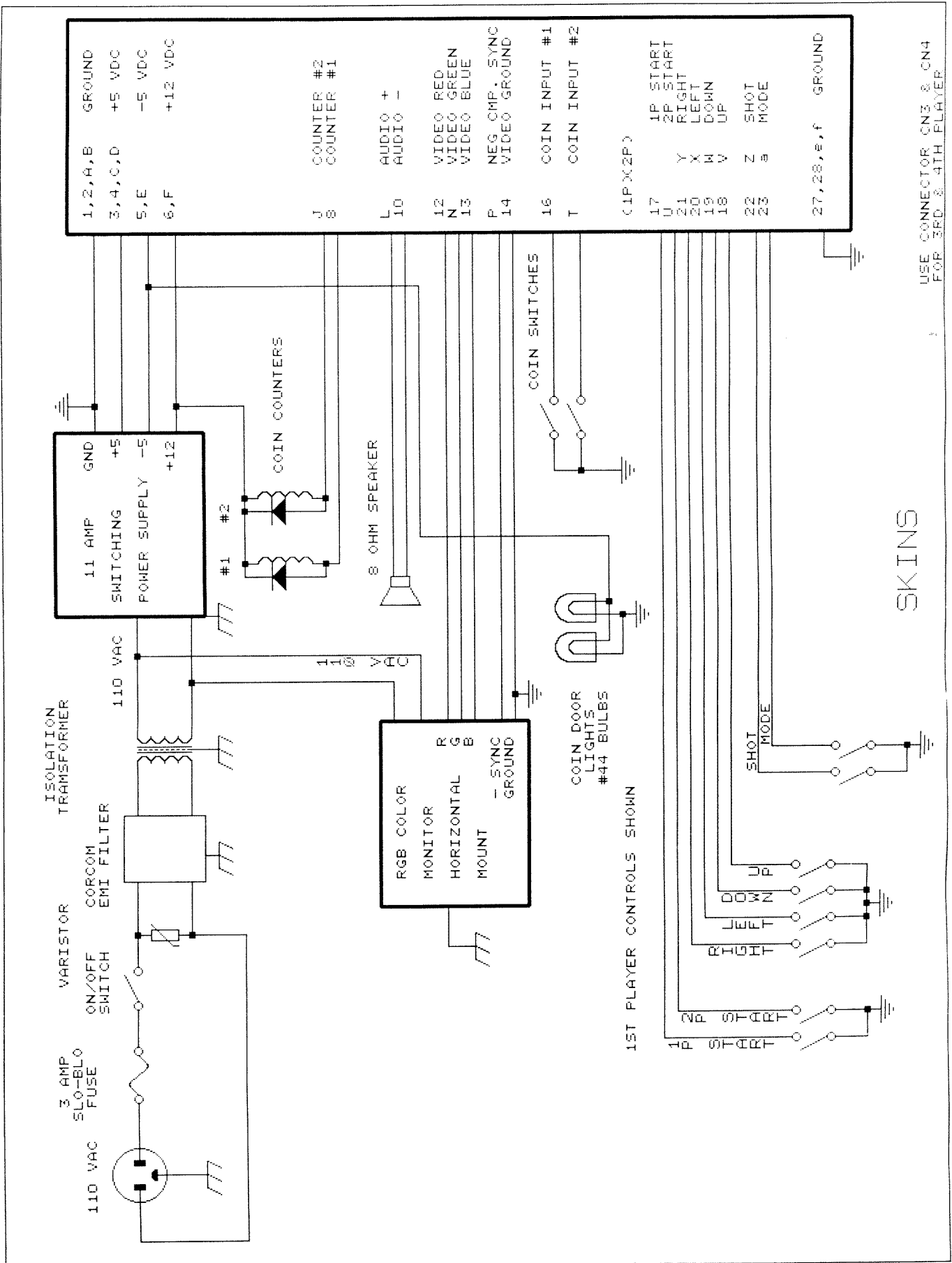
(8) **Color Test**

By moving down the 1P joystick, the test can be advanced like
1—2—3—4—5—6—7—8—9—10—1, test of colors, balance and distortion on the monitor screen.

1 The whole screen shows only blue color.
2 The whole screen shows only red color.
3 The whole screen shows only magenta color.
4 The whole screen shows only green color.
5 The whole screen shows only cyan color.
6 The whole screen shows only yellow color.
7 The whole screen shows only white color.
8 Figure A is displayed on the screen.
9. Figure B is displayed on the screen.
10. Figure C is displayed on the screen.

BLUE	RED	MAGENTA	GREEN	CYAN	YELLOW	WHITE

BLACK
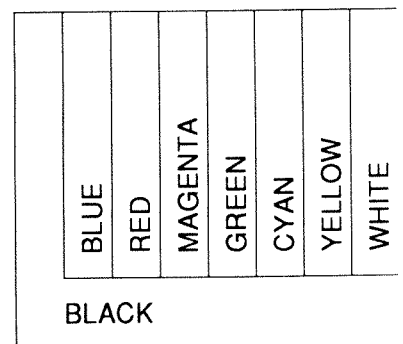
(9) **Cross Hatch Test**

The white lines represent CROSS HATCH PATTERN on the screen.

SKINS

USE CONNECTOR CN3 & CN4
FOR 3RD & 4TH PLAYER

Pin	Signal
1,2,A,B	GROUND
3,4,C,D	+5 VDC
5,E	-5 VDC
6,F	+12 VDC
J	COUNTER #2
8	COUNTER #1
L	AUDIO +
10	AUDIO -
12	VIDEO RED
N	VIDEO GREEN
13	VIDEO BLUE
P	NEG CMP. SYNC
14	VIDEO GROUND
16	COIN INPUT #1
T	COIN INPUT #2
(1P X 2P)	
17	1P START
U	2P START
21	RIGHT
Y	LEFT
20	DOWN
X	UP
19	
V	
18	
W	
22	SHOT
Z	MODE
23	
9	
27,28,e,f	GROUND

11 AMP
SWITCHING
POWER SUPPLY

GND
+5
-5
+12

ISOLATION
TRANSFORMER

CORCOM
EMI FILTER

VARISTOR

ON/OFF
SWITCH

3 AMP
SLO-BLO
FUSE

110 VAC

110 VAC

COIN COUNTERS
#1 #2

8 OHM SPEAKER

COIN SWITCHES

COIN DOOR
LIGHTS
#44 BULBS

RGB COLOR
MONITOR
HORIZONTAL
MOUNT

R
G
B
-SYNC
GROUND

1
10
V
A
C

1ST PLAYER CONTROLS SHOWN

SHOT
MODE

UP
DOWN
LEFT
RIGHT

1P
2P
START
START

SKINS PCB