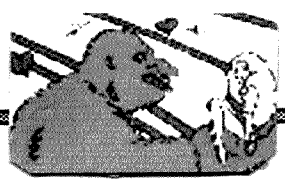
SEGA®

COLUMNS KIT

Installation/Owners Manual

100% JAMMA COMPATIBLE



PN 999-0032

COLUMNS CONVERSION

by:

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A Kit for
Upright Cabinet with Horizontal Monitor

The Federal Communication Commission requires the verification of game kits. This game kit will meet these requirements when installed in accordance with the instructions in this Manual and using only components and materials supplied with this kit.

This SEGA product has the copy right notice as follows: SEGA 1990
This signifies that this product was disclosed in 1990 and is the property of SEGA Enterprises.

Table of Contents

Introduction 3
Handling and Installation Precautions 3
Prevention of Counterfeiting and Conversion Labeling 3
Precautions Concerning the Place of Installation 3
System Requirements 4
Tools Required 5
Cabinet Preparation 5
Kit Component Verification 6
Installation Procedure 7
Monitor Bezel 7
License Seal 7
Side Decal 7
Marquee Plex 7
Control Panel 7
Service Switch Assembly 8
Harness Installation 8
Cabinet 115 VAC System Grounding 9
Cabinet System Checkout 9
Printed Circuit Board Installation 9
Logic Board and Complete System Checkout 9
In Case of Difficulty 11
Figure 1 12
Figure 2 12
Figure 3 13
Figure 4 13
Figure 5 14
Figure 6 14
Figure 7 15
Figure 8 15
Figure 9 Switch Setting Sheet..... 16
Figure 10 Schematic Diagram..... 17
Cocktail Table Information 18

Introduction

SEGA ENTERPRISES. LTD., supported by its high electronic technology of Large Scale Integration, microprocessors, etc. and a wealth of experience, has for more than 30 years been supplying various innovative and popular game machines to the world market. This OWNER'S AND KIT INSTALLATION manual is intended to provide detailed comments together with all the necessary information covering the operation and installation of electronic assemblies, electro-mechanical assemblies, control assemblies, and spare or replacement parts for coin operated games. This manual is intended for those who have knowledge of electricity and technical expertise in video games. Carefully read the enclosed information before starting the kit installation or troubleshooting procedures.

Handling and Installation Precautions

During Installation:

1. Be sure to remove power plug when working on the machine.
2. Be sure all connections and harness routing are secure.
3. Make sure all grounding connections are secure and properly affixed.
4. Do not use any fuse that does not meet the specified rating.

Prevention of Counterfeiting and Conversion Labeling

To prevent counterfeit and unauthorized conversions, the following label is supplied with all authorized SEGA kit products. When handling such goods, be sure to locate and confirm the label. It is used to prevent illegal acts such as the unauthorized copying of the products and the printed circuit boards.

Precautions Concerning the Place of Installation

The CONVERSION KIT is intended to be installed in an indoor game cabinet. Absolutely do not install it outdoors. When installed indoors the following places mentioned below should be avoided to ensure proper operation and usage:

- Places subject to rain or water leakage, or condensation due to humidity
- In the proximity of an indoor swimming pool and/or shower
- Places subject to direct sunlight
- Places subject to heat sources from heating units, hot air, etc.
- Vicinity of highly flammable/volatile chemicals or hazardous materials
- Sloped surfaces
- Vicinity of anti-disaster facilities such as fire exits and fire extinguishers
- Places subject to any type of violent impact
- Dusty environment

System Requirements

Power Supply:

- Input voltage 90 VAC to 13 5 VAC 60 Hz
- + 5 volts at 6 amps
- + 12 volts at 2 amps
- Over-voltage protected at + 5.8 volts
- Current limit set at 8 amps

RFI Line Filter:

1. If a switching power supply is used:
   - Current rating of 6 amps
   - Frequency attenuation of the following:

0.15 MHz	40db
0.5 MHz	65db
1.0 MHz	65db
5.0 MHz	55db
10.0 MHz	50db
30.0 MHz	50db

2. If a linear power supply is used:
   - Current rating of 5 amps
   - Frequency attenuation of the following:

0.15 MHz	6db
0.5 MHz	1 9db
1.0 MHz	28db
5 .0 MHz	42db
10.0 MHz	45db
30.0 MHz	50db

Miscellaneous:

Line Fuse:	4 amp 120 VAC
Speaker:	8 ohms 10 watt
On/Off Switch:	6 amp 120 VAC
Isolation Transformer:	115 VAC primary, 115 VAC secondary, 100 Watts
Coin Door:	Dual coin acceptors
Coin Meter:	+ 5 Volt DC
Power Cord:	Three conductor with ground

Color Monitor:

- Video input 1 volt to 5 volt peak-to~peak positive polarity
- Sync TTL negative polarity separate horizontal and vertical
- Horizontal frequency 15.7 50 KHz
- Vertical frequency 60 Hz
- Video bandwidth 12 MHz or greater
- Horizontal mounted
- Recommended size 19 inch

Tools Required

- Drill
- Hole cutter 1-3/16 "
- Phillips screw driver
- Flat blade screw driver
- Small flat blade screw driver
- Scissors
- Sand paper
- Paint
- Xacto knife
- Wood patch

Cabinet Preparation

1. Remove old PCB, and all existing game harnesses.
2. Remove and disassemble the control panel.
3. Remove any side decals, monitor bezel, and marquee.
4. Using sandpaper and/or paint thinner, clean and smooth the cabinet for paint preparation. Use wood patch to fill any nicks or flaws in the cabinet.
5. Paint cabinet if required.
6. Wipe down and vacuum cabinet as necessary.

NOTE: You are building a new game, not just changing an old one. A nice, clean, and new looking conversion not only earns better, but lasts longer.

Kit Component Verification

Verify each component with the kit list provided to assure your kit is complete. If any part is missing after the inventory is taken, please contact your distributor and provide to them the following information:

1. Kit serial number
2. Part number and description of missing item/s
3. Date received

Kit List

Part Number	Quantity	Description
0002-0000	2	#6 x 3/8 P/H Phil Tek
0002-0001	4	#6 x 3/4 P/H Phil "AB" SMS
0312-0024	8	#10-24 x 1 3/4 Carr/Bolt Black
0502-0024	8	#10-24 Hexnut
0612-0024	8	#10 Split Lock Washer
0692-0024	8	#10 Flat Washer 1/2 OD
2112-0000	2	Wire Nut #18 x 2
999-0034	1	COLUMNS Monitor Bezel
999-0032	1	COLUMNS Manual
421-5801-109	1	COLUMNS License Seal
421-7659	1	COLUMNS Switch Setting Sheet
4212-0001	1	(Kit) Serial # Sticker
999-0008	2	SEGA Side Decal
999-0033	1	COLUMNS Control Panel Overlay
423-0008-01	1	Control Panel Clear Plex
999-0035	1	COLUMNS Marquee sheet
999-0036	1	COLUMNS Label Sheet (See List) (1) Test, Service, Volume Sticker (2) Joystick Stickers (2) Button labels (1) FCC Sticker (Kit)
4750-0049	1	Volume Control 100 Ohm 10 Watt
5090-5028	2	PB Spst Switch Momentary
6010-0043	1	Knob, 1/8 " Shaft
5091-0001-01	2	Joy Stick 8 Way (Spring Type)
5091-0004-01	2	PB Spst Control Panel (Red)
5091-0004-02	2	PB Spst Control Panel (White)
5091-0015-01	4	Pan Nut
5091-0015-02	4	Leaf Switch
5091-0015-03	4	Universal Adaptor
JAM-0000	1	Jamma Harness
9992-0000	6	4" Tie Wraps
834-7401-02	1	COLUMNS Game PCB
KR0-1721	1	Service Switch Bracket

Installation Procedure

Monitor Bezel

1. Locate the MONITOR BEZEL and measure the size of existing monitor bezel or the required size to fit, then cut the cardboard monitor bezel to size. (see figure 1)

License Seal

2. Locate the LICENSE SEAL and place seal as shown in figure 1. Install Monitor Bezel on game cabinet. Note: Verify that the License Seal will be visible when the bezel is installed on game cabinet.

Side Decal

3. Locate the SIDE ART and install on the left and right side panels of the cabinet (see figure 1). Note: A mixture of slightly soapy water can be used on the cabinet to position the artwork as desired. A squeegee may be used to remove any wrinkles in the artwork if soapy water is used.

Marquee Plex

4. Locate the MARQUEE PLEX and measure the size of existing marquee plex or required size to fit and trim the marquee plex to size. Install on cabinet. (see figure 1)

Control Panel

5. Locate the CONTROL PANEL OVERLAY and measure the size required and cut the control panel overlay to fit the existing control panel.

6. Define the location of the player push buttons and joystick(s) on the control panel. (see figure 2)

7. Cut holes in control panel to locate buttons and joystick(s). See template for button and joystick. (see figure 3)

8. Install the "ONE PLAYER START" label and the "TWO PLAYER START" label on the control panel overlay if applicable (see figure 2)

9. Install player control button labels on the control panel overlay (see figure 2)

10. Install the JOYSTICK label(s) on the control panel overlay (see figure 2)

11. Locate the CONTROL PANEL CLEAR PLEX and cut holes into the plex to match the holes cut into the control panel. Then trim as required to protect the control panel overlay and labels.
    Note: This clear plex overlay can be used to protect unused holes in the control panel from player punctures.(see figure 2)

12. Install player pushbutton/s as required.(see figure 2)

NOTE: When buttons are securely placed and tightened in the control panel assembly, a small amount of clear RTV Silicone may be placed on two or three areas of the lock-nut to keep the switches from being unscrewed from the top of the panel. (see figure 3)

13. Install player/s JOYSTICK/S as required. (see figure 2)

Service Switch Assembly

14. Locate SERVICE SWITCH BRACKET and install two PUSH BUTTON SPST SWITCH MOMENTARY into bracket as shown in figure 4.

15. Locate VOLUME CONTROL 100 OHM 10 WATT and install into service switch bracket as shown in figure 4.

16. Locate TEST, SERVICE, VOLUME STICKER and place on the service switch bracket as shown in figure 4.

17. Locate KNOB 1/8" SHAFT and install on shaft of volume control 100 ohm 10 watt as shown in figure 4.

18. Install the Service Switch Assembly using 2 ea screws in the cabinet at either of the following locations (see figure 5):
    - On top of the steel enclosure for the Cash Box, inside the coin door.
    - Inside to the left of the coin door, mounted to the wood cabinet.

Harness Installation

19. The COLUMNS PCB is Jamma compatible. Modification of an existing Jamma harness inside the game cabinet should not be necessary. CAUTION SHOULD BE OBSERVED TO ASSURE THAT THE PIN OUTPUTS ARE CORRECT.

20. Connect the Player/s controls and buttons to the PCB as defined in figure 9.

21. Connect the T.V Monitor as shown in figure 6.

22. Connect the routed speaker wires to the speaker. Check the routing for security.

23. Connect the SERVICE SWITCH ASSEMBLY as follows: (see figure 4.)

FOR REMOTE VOLUME CONTROL OPERATION PERFORM THE FOLLOWING STEPS:

a. Locate the 2 speaker wires which connect to pins L and 10 of the Jamma connector.
b. Connect the wire from Pin L of the Jamma connector and one side of the speaker to one side of the volume control.
c. Connect the wire from Pin 10 of the Jamma connector to the other side of the volume control.
d. Connect the other side of the speaker to the center terminal of the volume control.

FOR REMOTE TEST OPERATION PERFORM THE FOLLOWING STEP:

Connect the wire from Pin 15 of the Jamma harness to one side of the Test pushbutton and connect ground to the other terminal of the pushbutton.

FOR REMOTE SERVICE OPERATION PERFORM THE FOLLOWING STEP:

Connect the wire from Pin R of the Jamma harness to one side of the Service pushbutton and then connect ground to the other terminal of the pushbutton.

Cabinet 115 VAC System Grounding

24. Locate the GROUND lead (green) of the 115 volt input power Line (see figure 7). This must be connected to all components of the game system. This is a safety requirement for the players protection. This AC GROUND must be of # 18 AWG wire or larger. (see figure 7 for the proper routing of the wire)

Cabinet System Checkout

25. Apply power to cabinet system and check for the following voltages. If any voltage is incorrect, remove power and correct problem before proceeding any further.
    a. + 5 Volts on pins 3,4,C, and D of the 56 pin PCB connector. (Interface Connector)
    b. + 12 Volts on pins 6 and F of the 56 pin PCB connector.
    c. No voltage present on any other pins of the 56 pin PCB connector.

26. Check that the monitor has power. This can be accomplished by observing the glow of the filament inside the neck of the picture tube.

27. Check that the Marquee lamp has power.

28. Check that the system ON/OFF switch functions properly.

WARNING: PROCEED ONLY IF THE ABOVE CHECKS ARE CORRECT

PCB Installation

29. Locate the GAME and install the logic PCB inside the cabinet (see figure 5). Use wood screws to secure the PCB through its' mounting feet.

30. Locate the Switch Setting Sheet. Place this sheet on the inside of the game so that it is visible when the back door is removed or opened. This will allow the DIP SWITCH OPTIONS to be handy when service or changes in options are required.

31. Connect the 56 pin Jamma connector to the PCB.

NOTE: The proper orientation of the connector (see figure 8). If not connected properly, the system will not function and damage can occur to the PCB.

Logic Board and Complete System Checkout

32. Apply power to the system and observe that the logic PCB functions. If a video picture is not present proceed to "IN CASE OF DIFFICULTY" portion of this manual. When corrected, return to this point and continue.

33. Press the TEST BUTTON to enter the test menu. Individual tests can be entered by following the instructions on the Test screen.

34. Set up game options as shown in figure 9.
    a. DIP SWITCH 1 on PCB sets up the number of coins per credit
    b. DIP SWITCH 2 on PCB sets up specific game options

35. Functionally test the game by:
    a. VERIFY that coin drops register proper credit/s and the COIN METER OPERATES
    b. VERIFY that the proper number of lives is given for each CREDIT
    c. VERIFY that all player controls operate properly

36. Locate the Kit SERIAL NUMBER STICKER and FCC STICKER. Install these stickers on the rear of the game cabinet. (see figure 1)

In Case of Difficulty

No Raster/No Video
- -Check A.C. line cord
- -Check line fuse
- -Check monitor brightness
- -Check power switch and/or interlock switch
- -Check all solder connections on line filter and transformer
- -Check for proper orientation of the 56 pin PCB connector

Raster/No Video
- -Check all PCB to monitor connections
- -Check power supply voltage on PCB

No Video/ Game sounds can be heard
- -Check monitor brightness
- -Check all PCB to monitor connections

Incorrect Colors
- -Monitor needs degaussing
- -Check for proper wiring between PCB and monitor
- -Check monitor adjustment and adjust if necessary

Wavy Picture
- -Check monitor ground is properly connected to monitor
- -Be certain sync inputs are properly connected to monitor
- -Check horizontal hold adjustment

Vertical Roll/Horizontal Tear
- -Check horizontal and/or vertical hold adjustments
- -Check for proper wiring of sync from PCB to monitor

No Sound
- -Check volume control potentiometer adjustment
- -Check for + 12 volts on edge connector of PCB
- -Check wiring from PCB to speaker
- -Check speaker for low resistance between the " + " and " - " tabs

Bad Sound
- -Check wiring to speaker for bad solder connections
- -Check sound with another speaker

No Switch Input
- -Check ground connection to switch/es
- -Check wiring between PCB and switch/es for proper connection
- -Check switch/es with an ohm meter to verify proper operation

Switch Operates Incorrect Function
- -Check wiring between PCB and switches for proper orientation
- -Check wiring for shorts between switch inputs

No Coin Meter
- -Check wiring to coin meter
- -Check that + 5 volts is on + side of meter
- -Verify a + 5 volt meter is used

When coin switch is made and meter pulses, the screen blanks out and/or game resets
- -Verify that a meter with a diode is used
- -If no diode is built in meter a 1N4004 can be used across the meter. Cathode to "+" side of meter and anode to "-"side of meter.

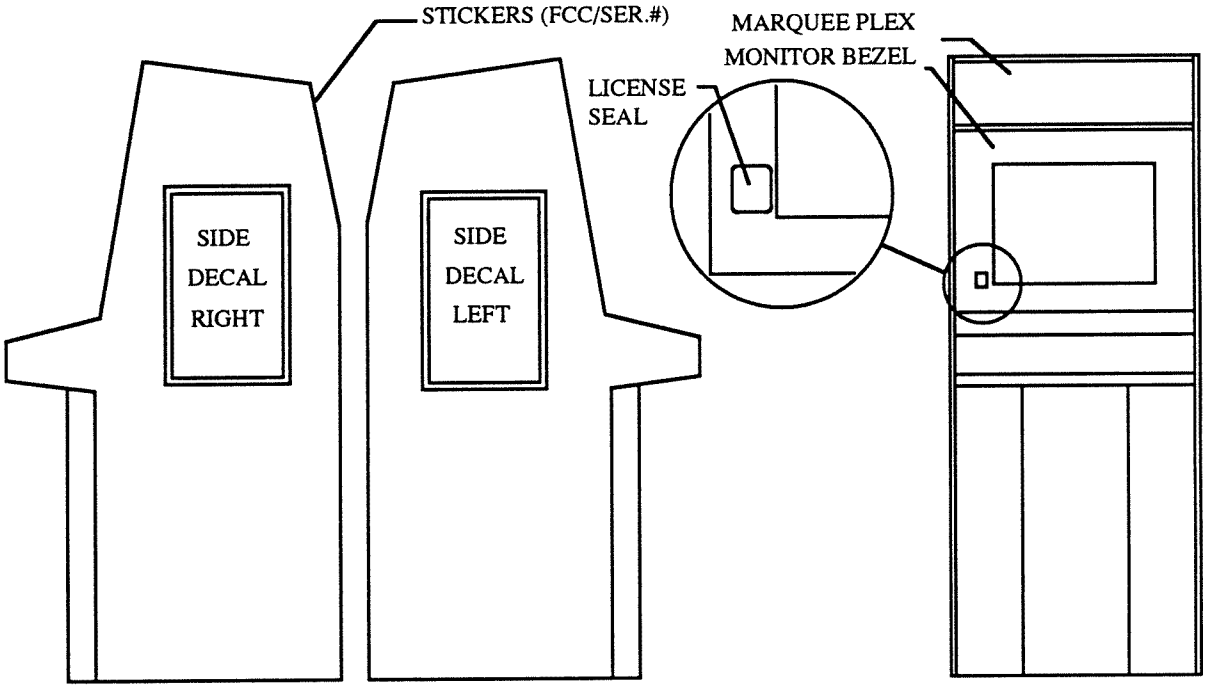


Figure 1

CONTROL PANEL TOP VIEW

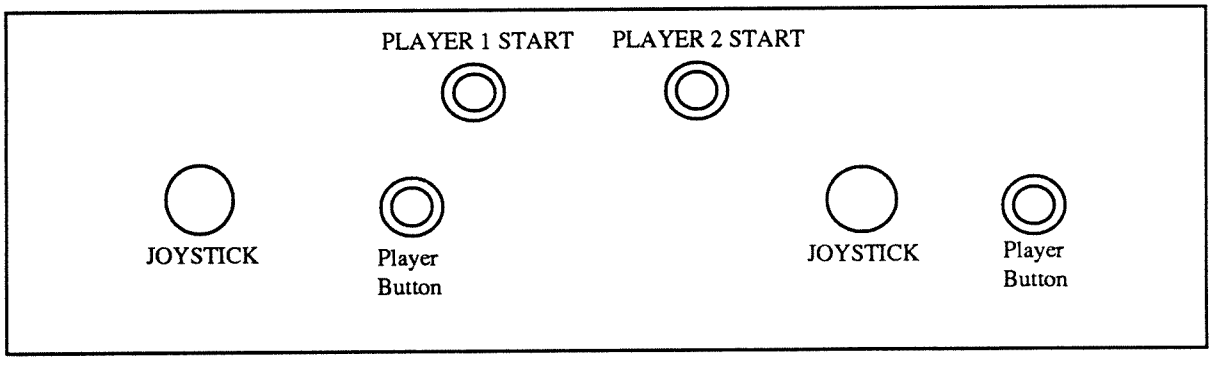


Figure 2

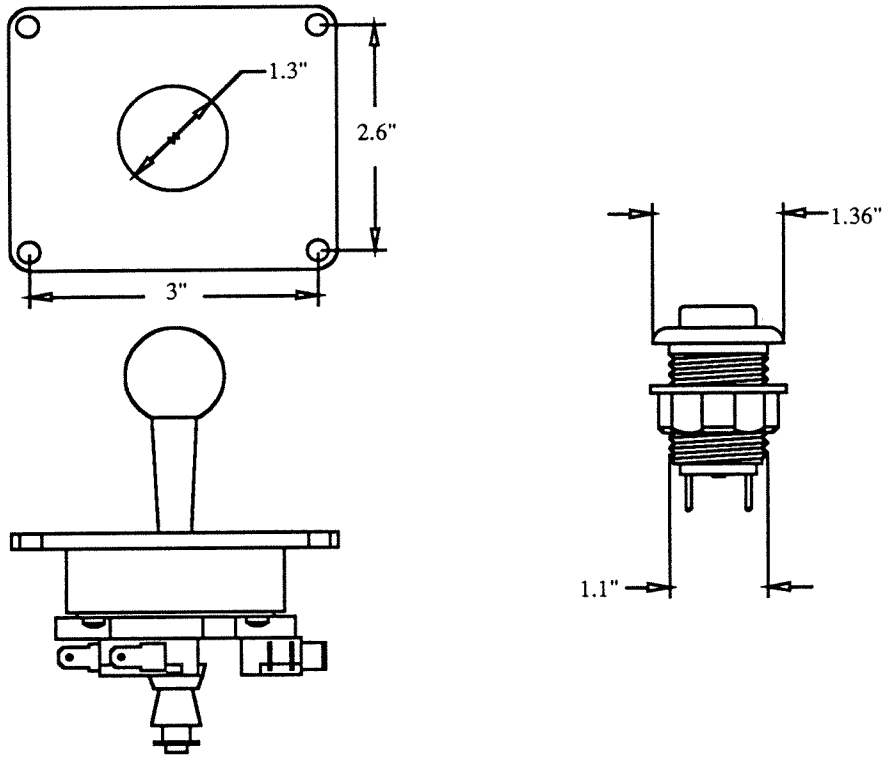
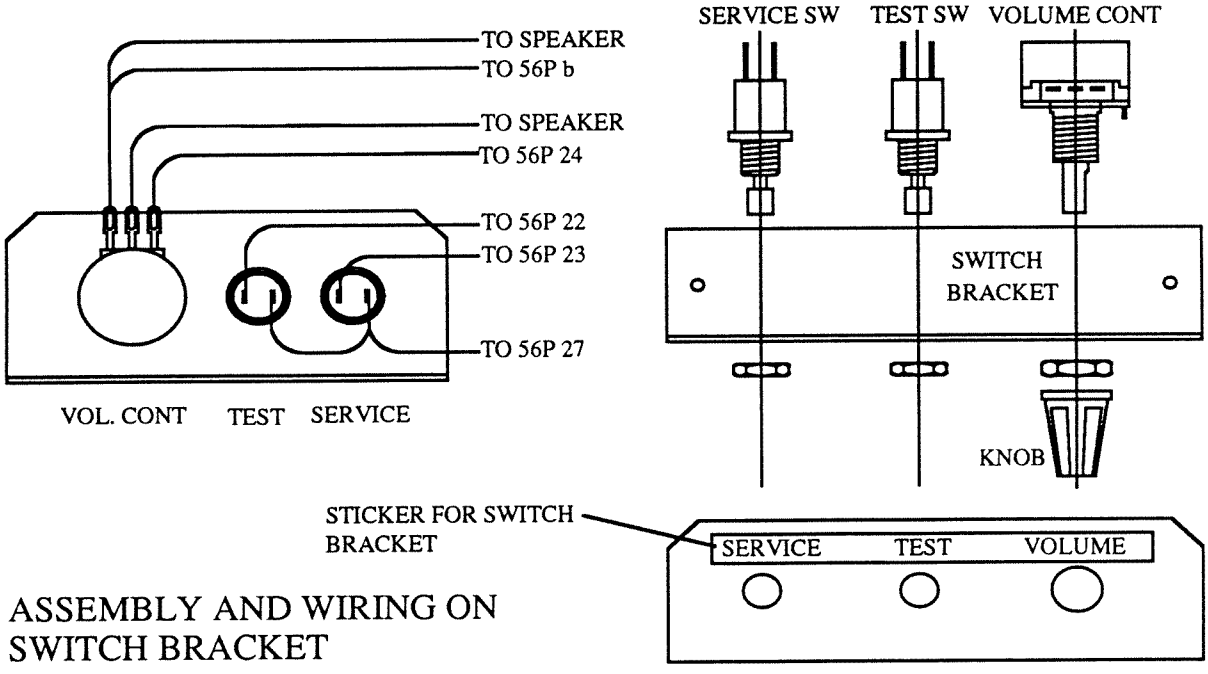


FIGURE 3



ASSEMBLY AND WIRING ON SWITCH BRACKET

FIGURE 4

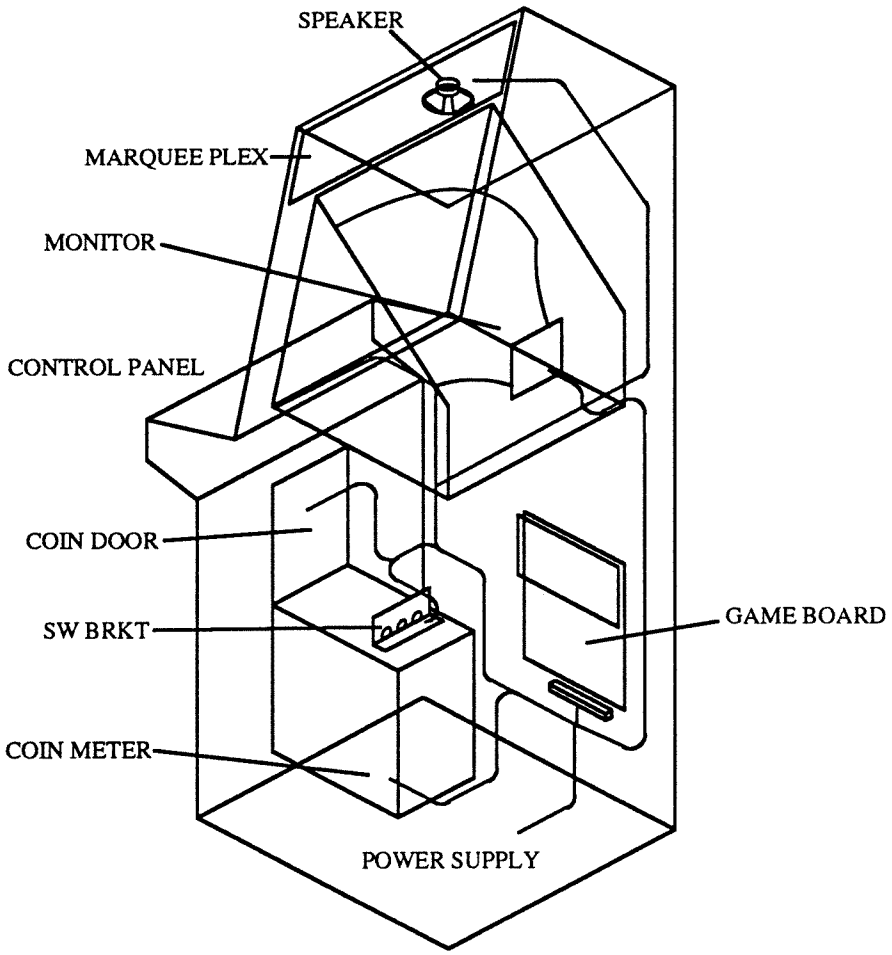


FIGURE 5

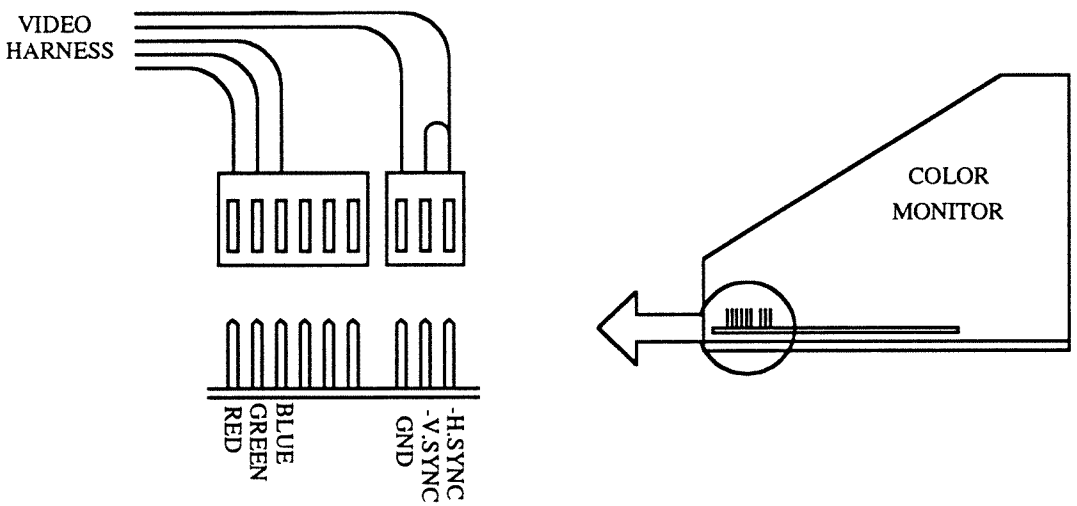


FIGURE 6

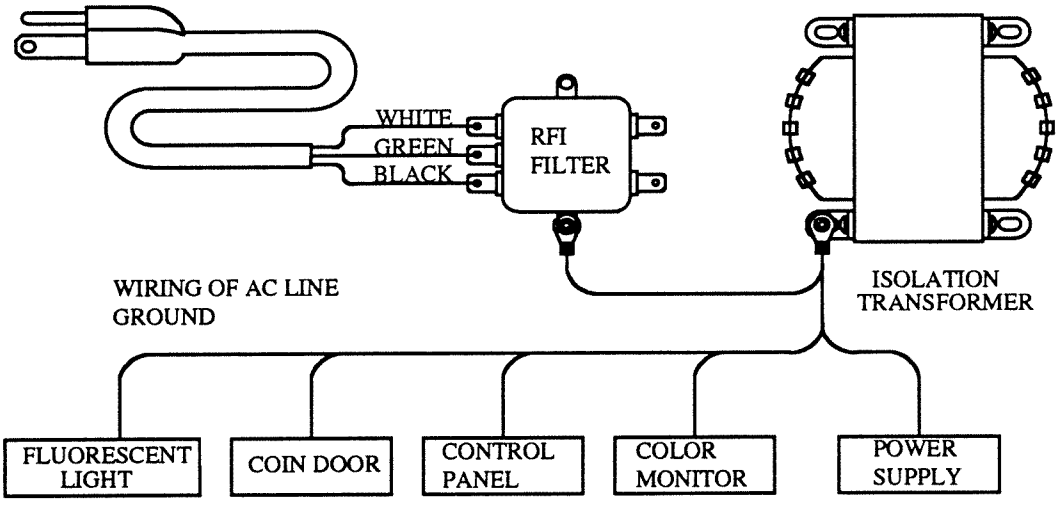


Figure 7

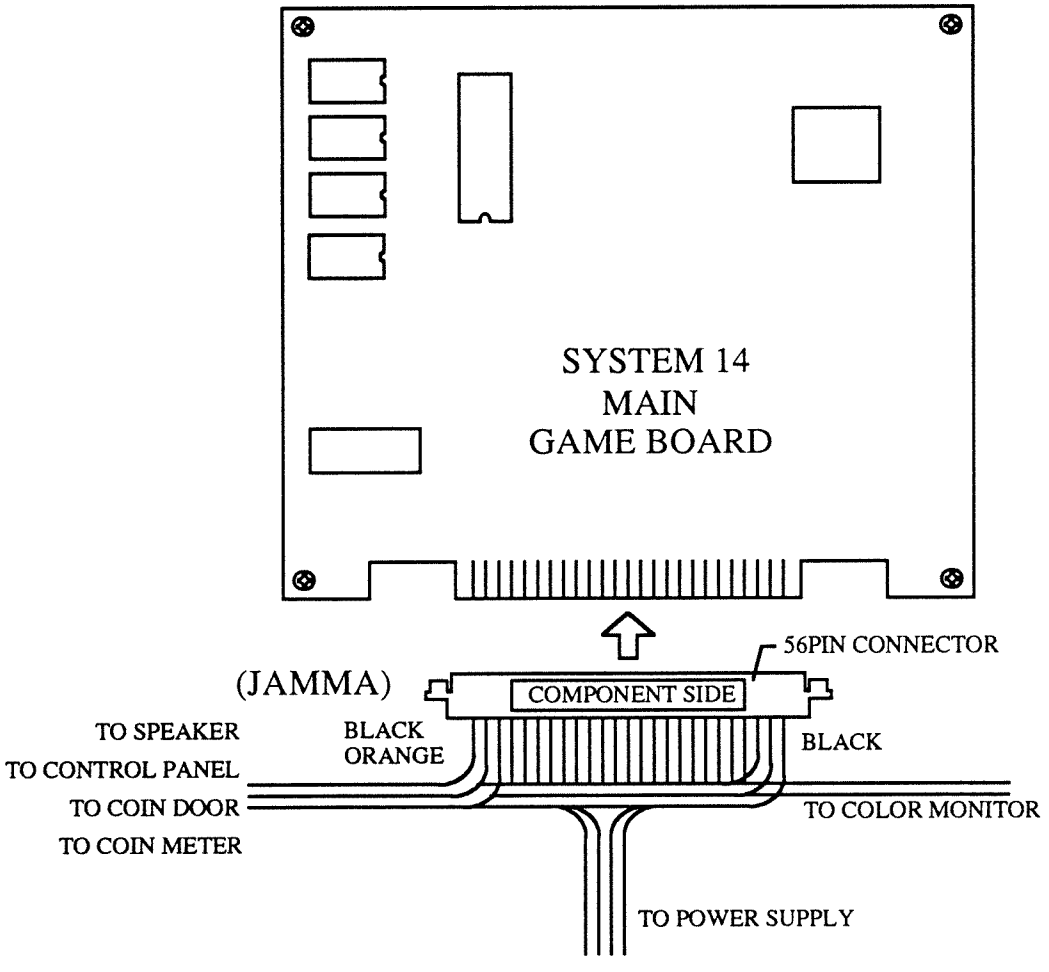


FIGURE 8

COLUMNS

SWITCH SETTINGS

COIN / CREDIT OPTION SWITCH SETTING

OPTION		DIP SW #1 1	2	3	4	5	6	7	8
1 COIN	1 CREDIT	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
1 COIN	2 CREDITS	ON	OFF	OFF	OFF	ON	OFF	OFF	OFF
1 COIN	3 CREDITS	OFF	ON	OFF	OFF	OFF	ON	OFF	OFF
1 COIN	4 CREDITS	ON	ON	OFF	OFF	ON	ON	OFF	OFF
1 COIN	5 CREDITS	OFF	OFF	ON	OFF	OFF	OFF	ON	OFF
1 COIN	6 CREDITS	ON	OFF	ON	OFF	ON	OFF	ON	OFF
2 COINS	1 CREDIT	OFF	ON	ON	OFF	OFF	ON	ON	OFF
3 COINS	1 CREDIT	ON	ON	ON	OFF	ON	ON	ON	OFF
4 COINS	1 CREDIT	OFF	OFF	OFF	ON	OFF	OFF	OFF	ON
2 COINS	3 CREDITS	ON	OFF	OFF	ON	ON	OFF	OFF	ON
2 COINS 4 COINS 5 COINS 6 COINS	1 CREDIT 2 CREDITS 3 CREDITS 4 CREDITS	OFF	ON	OFF	ON	OFF	ON	OFF	ON
2 COINS 4 COINS	1 CREDIT 3 CREDITS	ON	ON	OFF	ON	ON	ON	OFF	ON
1 COIN 2 COINS 3 COINS 4 COINS 5 COINS	1 CREDIT 2 CREDITS 3 CREDITS 4 CREDITS 6 CREDITS	OFF	OFF	ON	ON	OFF	OFF	ON	ON
1 COIN 2 COIN 3 COINS 4 COINS	1 CREDIT 2 CREDITS 3 CREDITS 5 CREDITS	ON	OFF	ON	ON	ON	OFF	ON	ON
1 COIN 2 COINS	1 CREDIT 3 CREDITS	OFF	ON	ON	ON	OFF	ON	ON	ON
FREE PLAY		ON	ON	ON	ON	ON	ON	ON	ON
		COIN SW #1				COIN SW #2			

GAME OPTION SWITCH SETTINGS

DIP SW #2

DIP SWITCH #2			1	2	3	4	5	6	7	8
2ND PLAYER POSITION	PARALLEL		OFF							
	AGAINST		ON							
ADVERTISE SOUND	OFF			OFF						
	ON			ON						
MUSIC #2 / MUSIC #1	BGM2				ON					
	BGM1				OFF					
GAME DIFFICULTY	NORMAL	35 JEWELS / LEVEL					OFF	OFF		
	HARD	25 JEWELS / LEVEL					ON	OFF		
	EASY	40 JEWELS / LEVEL					OFF	ON		
	EASIEST	50 JEWELS / LEVEL					ON	ON		
NOT USED									OFF	OFF

PIN ASSIGNMENTS

COMPONENT SIDE	(JAMMA)		SOLDER SIDE
GND	1	A	GND
GND	2	B	GND
+5V	3	C	+5V
+5V	4	D	+5V
(NOT USED)	5	E	(NOT USED)
+12V	6	F	+12V
(NOT USED)	7	H	(NOT USED)
COIN METER 1	8	J	COIN METER 2
(NOT USED)	9	K	(NOT USED)
SPEAKER (+)	10	L	SPEAKER (-)
(NOT USED)	11	M	(NOT USED)
RED	12	N	GREEN
BLUE	13	P	SYNC
GND(SYNC)	14	R	SERVICE
TEST	15	S	(NOT USED)
COIN 1	16	T	COIN 2
1P START	17	U	2P START
(NOT USED , 1P UP)	18	V	(2P UP, NOT USED)
1P DOWN	19	W	2P DOWN
1P LEFT	20	X	2P LEFT
1P RIGHT	21	Y	2P RIGHT
1P BUTTON	22	Z	2P BUTTON
(NOT USED)	23	a	(NOT USED)
(NOT USED)	24	b	(NOT USED)
(NOT USED)	25	c	(NOT USED)
(NOT USED)	26	d	(NOT USED)
GND	27	e	GND
GND	28	f	GND

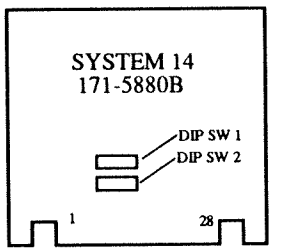


FIGURE 9

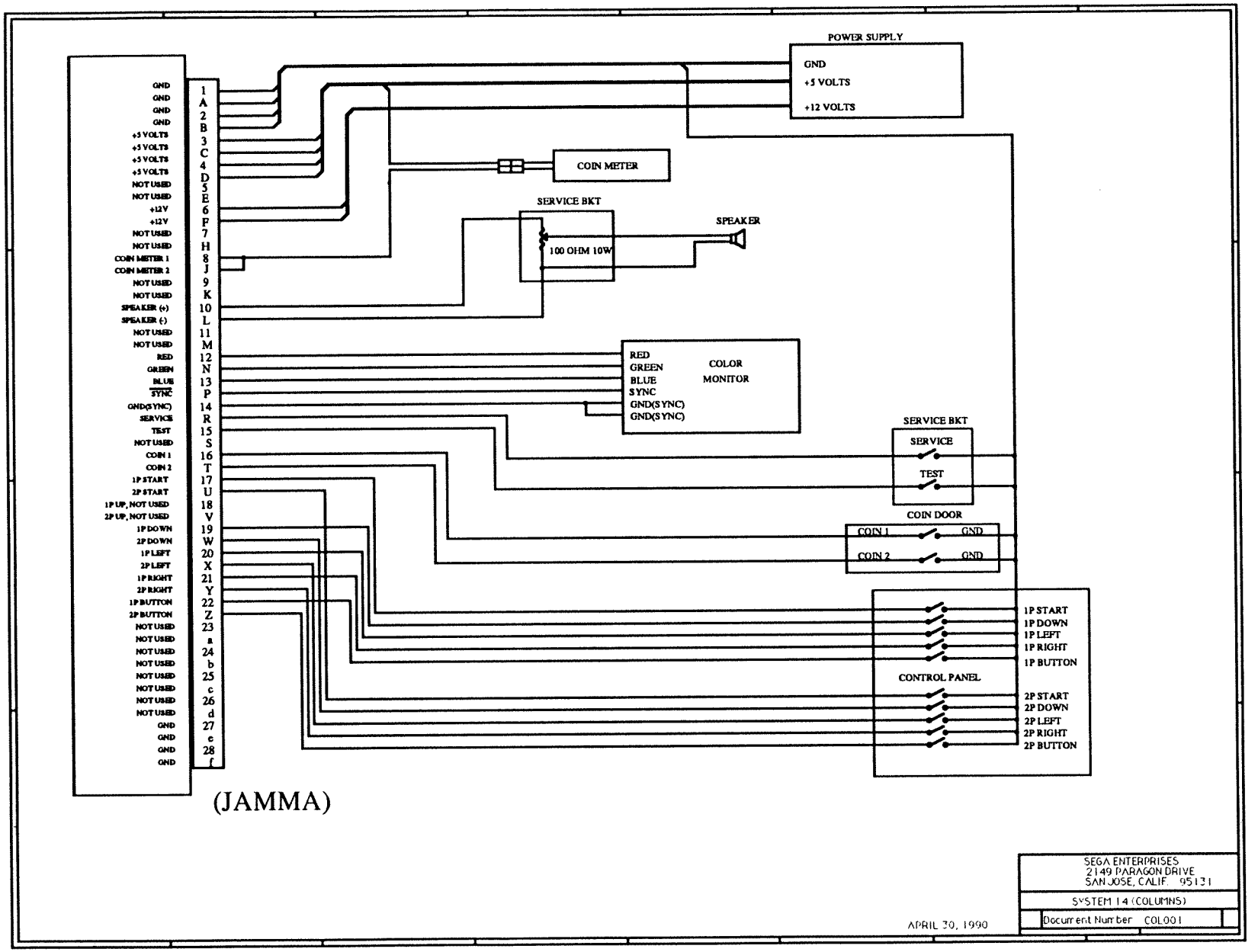

POWER SUPPLY
GND
+5 VOLTS
+12 VOLTS
COIN METER
SERVICE BKT
100 OHM 10W
SPEAKER
RED
GREEN
BLUE
SYNC
GND(SYNC)
GND(SYNC)
COLOR MONITOR
SERVICE BKT
SERVICE
TEST
COIN DOOR
COIN 1
COIN 2
GND
GND
1P START
1P DOWN
1P LEFT
1P RIGHT
1P BUTTON
CONTROL PANEL
2P START
2P DOWN
2P LEFT
2P RIGHT
2P BUTTON
(JAMMA)
SEGA ENTERPRISES
2149 PARAGON DRIVE
SAN JOSE, CALIF. 95131
SYSTEM 14 (COLUMNS)
Document Number COL001
APRIL 30, 1990

FIGURE 10

Special Note For Cocktail Table

In addition to upright type machines, the Columns Conversion Kit may also be installed into a cocktail table by adjustment of dip switches. (See Figure 9).

Due to the wide variety of cocktail tables, placement of the harness and player control locations must be determined by the installer. All electrical and harness connections may be installed as normal.(See Figure 10 for proper card edge connector to electrical components)

The Dip Switch Setting for the cocktail table (See Figure 9) will invert player #2 view of the display screen. This inversion of player #2 allows the game to be played from opposite sides of the cocktail table.