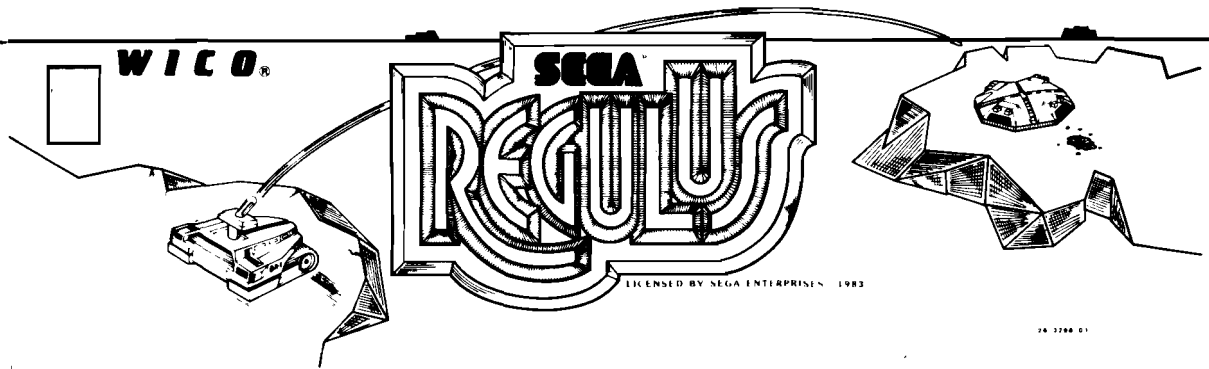


TECHNICAL MANUAL



CONVERSION KIT 72-393500

PART NO. 28-081300

W I C O®
· THE · SOURCE ·_{T.M.}

CONVERSION KIT PARTS LIST

REGULUS CONVERSION KIT PARTS LIST 72-393500

QTY	DESCRIPTION	PART NO.
1	P.C. Board	23-521600
1	P.C. Board R.F. Cage (top)	55-169600
1	P.C. Board R.F. Cage (bottom)	55-169700
1	Graphics Package Ass't (marquee, control panel & cabinet sides)	26-329800
1	Power Grip Control	98-001204
2	Pushbuttons Long-(white)	15-921001
2	Pushbutton Holders & Switches	15-098101
2	PAL Nuts	19-025400
1	Cable Ass't	97-006400
1	Installation Manual	28-081300
2	#6 x 3/4" Round Head Phillips Sheet Metal Screws	30-156900
4	#6 x 1" Pan Head Phillips Sheet Metal Screws	30-161300
1	#6 x 3/8" Oval Head Phillips Sheet Metal Screws	30-158800
8	#10-24 x 1/4" Carriage Bolt	30-220200
8	Washers, flat	30-178600
8	Hex Nut. 10-24	30-123300
1	Momentary Switch (self-test)	23-135600

WARNING

NEVER replace any components with anything other than exact replacement parts.

NEVER remove circuit board connections while power is on.

DO NOT replace fuses with anything other than the proper value. A blown fuse indicates an overload condition within the game. Replacing fuses with a higher value can cause severe damage to internal components if an overload occurs.

ALWAYS consult this manual before attempting repair or replacement of components.

USER INFORMATION

WARNING

F.C.C. REGULATION COMPLIANCE

The P.C. Board Cage supplied with this Conversion Kit must be utilized and terminated to ground at the time of installation.

This is to avoid radio frequency radiation and comply with the limits for a Class "A" computing device pursuant to Sub-Part "J" of Part 15 of F.C.C. Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment.

1 Operation of this equipment in a residential area is likely to cause interference — in which case the user, at his own expense, will be required to take whatever measures may be required to correct the interference.

INTRODUCTION

This manual will provide you with adequate information to convert your old game as simply and as quickly as possible. For proper conversion the existing game monitor must be **VERTICAL** mounted; be **RGB Raster Scan**; have provisions for **negative composite sync**.

This manual is intended for the use of **SERVICE TECHNICIANS** who possess a general working knowledge of solid-state circuitry and video monitor theory. Anyone **NOT** knowledgeable in these areas **SHOULD NOT** attempt to mount this conversion kit.

To install this kit you will need the following tools:

Large Drill Bits

Counterbore Bit

Adjustable Hole Cutter

Power Drill

Nut Drivers

Channel-Lock Pliers

X-Acto Knife

Tape Measure

Diagonal Pliers

Soldering Iron, Solder, etc.

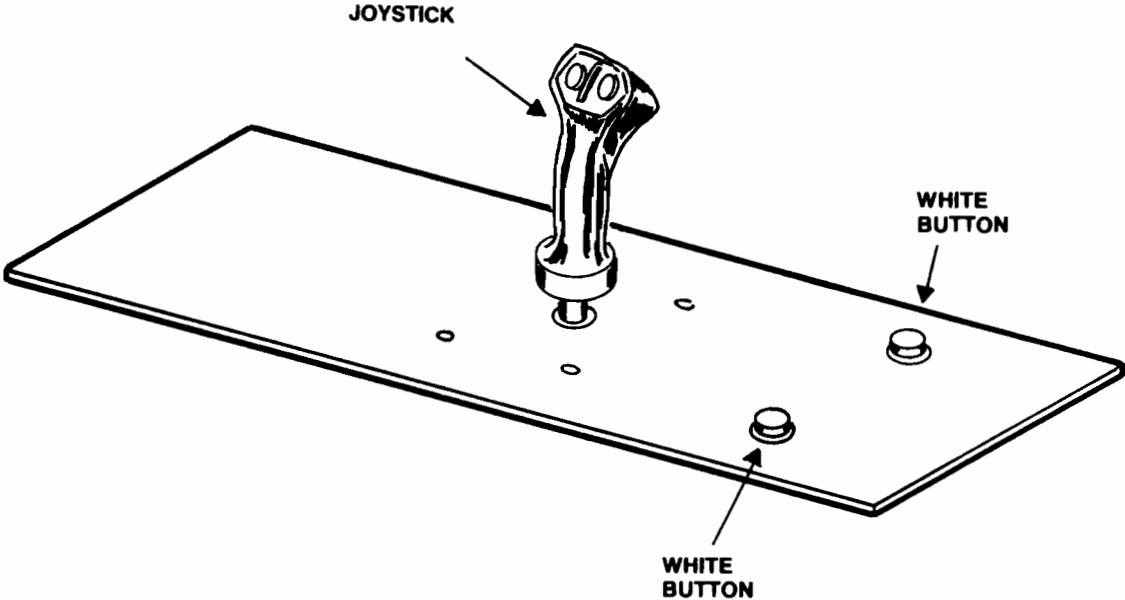
Suggested order of game modification:

1. Disconnect power from game.
2. Remove present game boards.
3. Remove all cabling to control panel (check game schematic).
4. Remove old logic cards.
5. Remove control panel, old pushbuttons and controls. Mount new pushbuttons, joystick and control panel cover.
6. Mount new P.C. board cage and P.C. board.
7. Wire coin door, monitor plug, power supply, control panel and speakers.

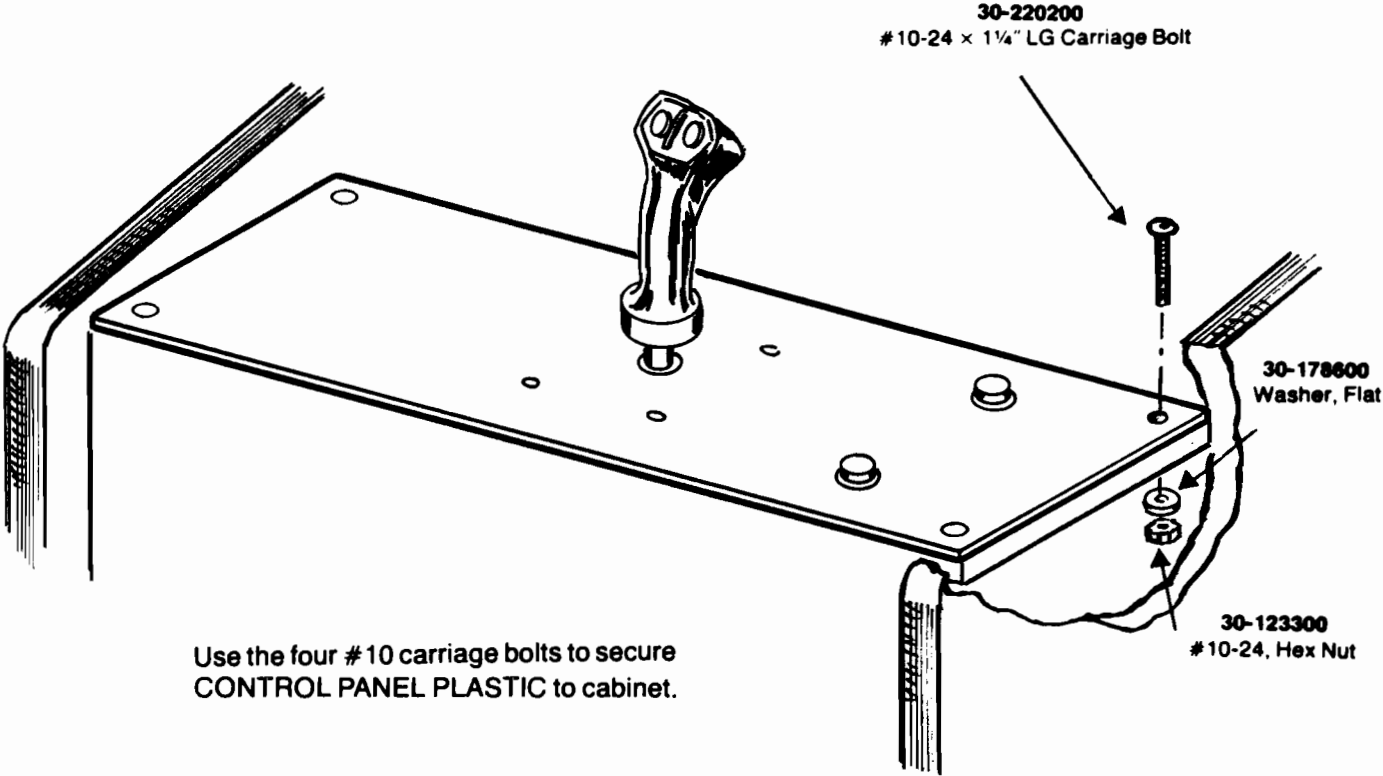
CABINET PREPARATION HINTS:

1. Old stick-on graphics can be removed with the aid of a hair dryer. The heat will "rubberize" the adhesive so most of the material will peel off. A mild solvent may be used to remove any remaining adhesive. A local paint dealer can recommend one. **(CAUTION: ALWAYS USE A PAINT SOLVENT IN A WELL VENTILATED AREA.)**
2. If the cabinet has screened on or stencil graphics, the sides may be sprayed with the basic cabinet color. A light sanding and washing with a mild detergent should prepare the surface for spraying. **(CAUTION: YOU CAN SPRAY ENAMEL OVER A LACQUER FINISH, BUT YOU CANNOT SPRAY A LACQUER OVER ENAMEL, DO THE SPRAYING IN A WELL VENTILATED AREA.)**
3. The decals supplied with your kit will be easier to apply and bond better if you; spray the area where the decal is to applied with windex or other brand of liquid window cleaner. Remove the decal backing and place the decal in position. If enough window cleaner is used you can slide the decal slightly to position it properly. Use a damp soft sponge, begin at the center and work toward the edges to remove any bubbles behind the decal. If any small bubbles remain, pierce them with a needle and press down on the area with the sponge. Be sure to work out all the excess liquid from behind the decal. The decal should dry for 24 hours.

CONTROL PANEL LAYOUT

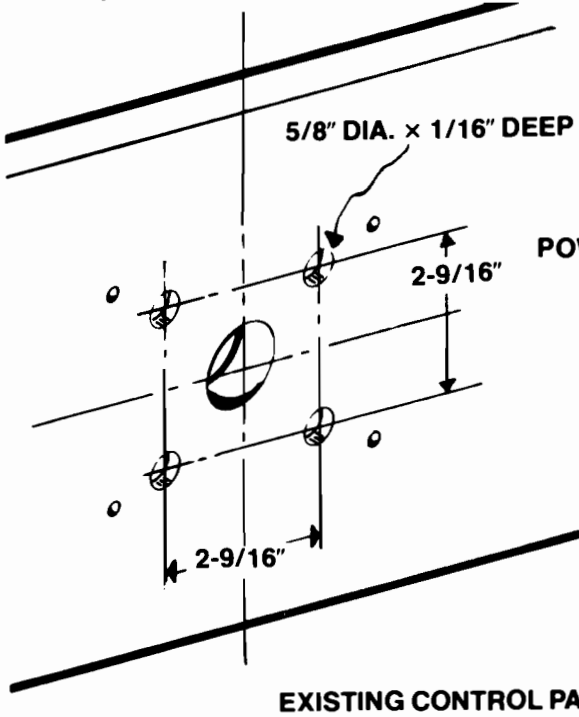


CONTROL PANEL SECURING

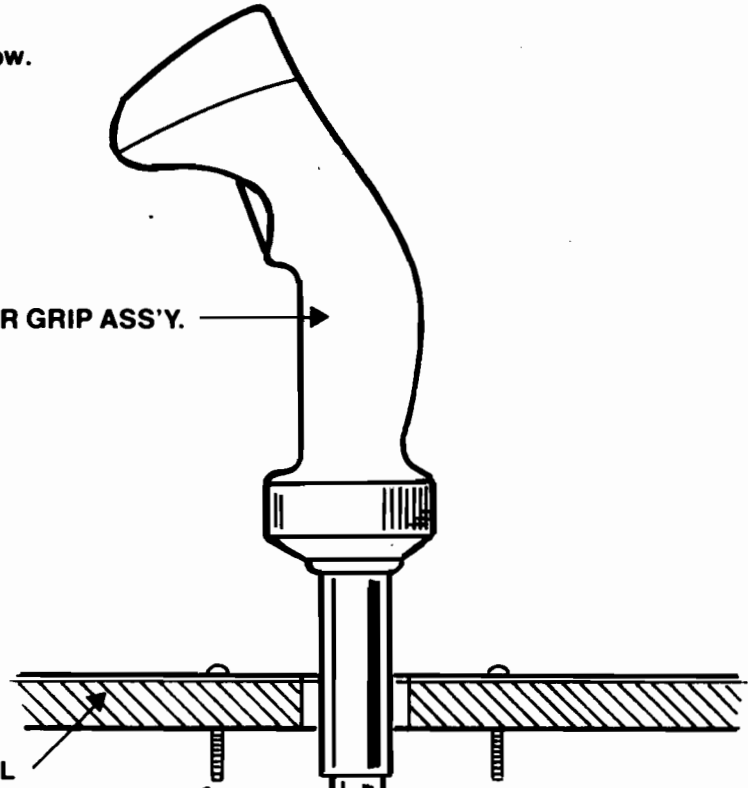


POWER GRIP MOUNTING

Drill present CONTROL PANEL as shown below.



POWER GRIP ASS'Y.



SHIELD WASHER

LEADS

Connect LEADS as follows:

GREEN to GROUND

BLUE is TRIGGER to IP FIRE: Yellow/Red

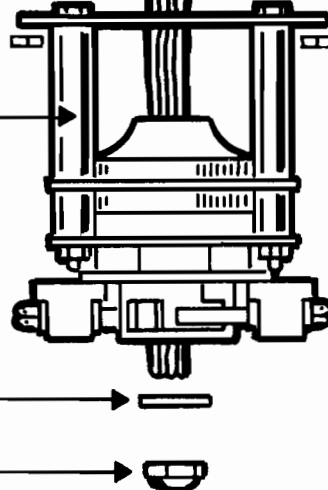
YELLOW & ORANGE both go to IP BOMB: Yellow/Blue

NUTS

BASE ASS'Y.

SHAFT WASHER

LOCK NUT

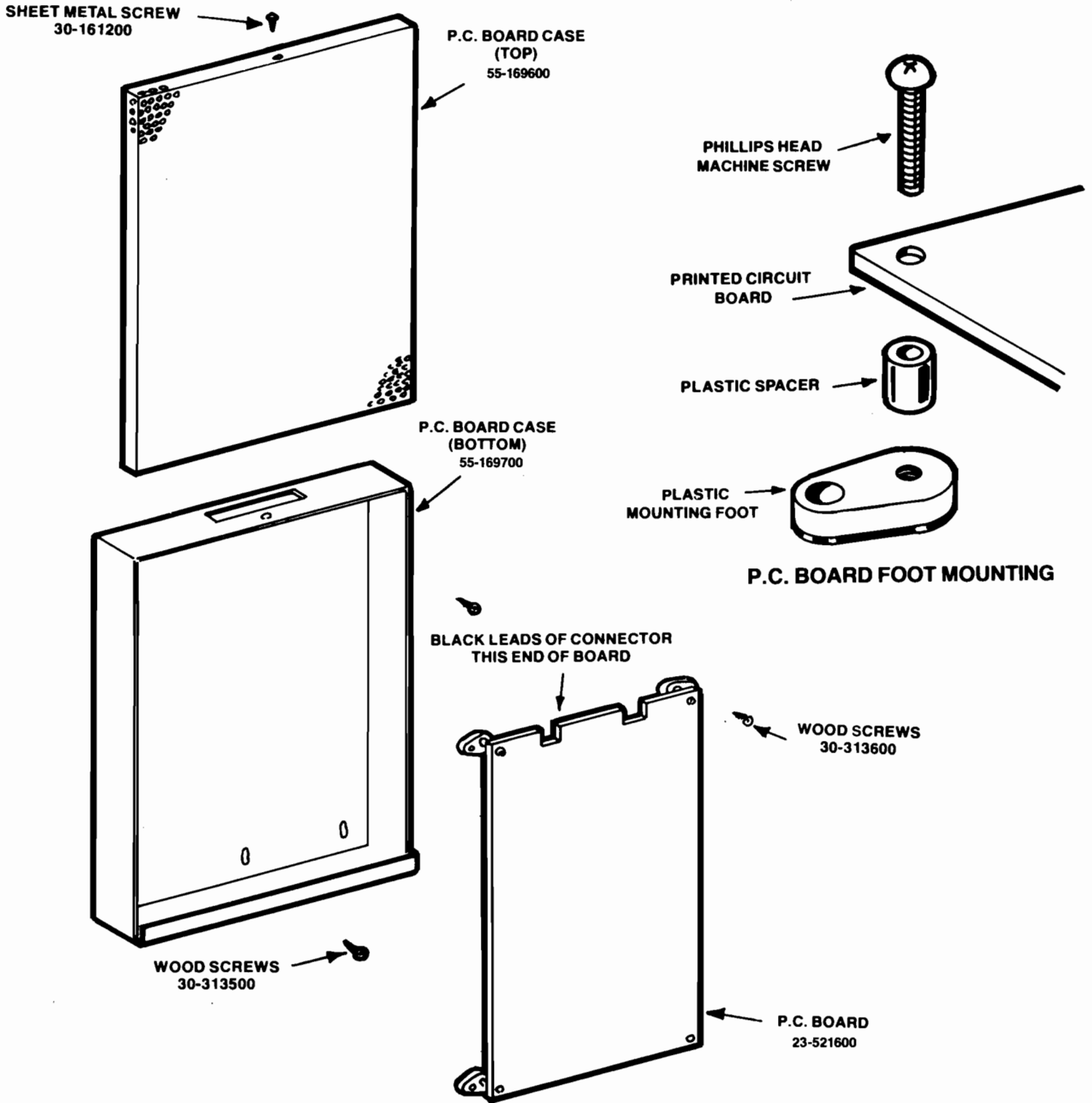


Make sure 5/8" Dia. counterbores are only 1/16" deep, so that SHIELD WASHER has room to move between bottom of CONTROL PANEL and top of BASE ASS'Y.

Feed POWER GRIP LEADS thru BASE ASS'Y. & insert POWER GRIP into BASE ASS'Y.

Slip SHAFT WASHER over end of SHAFT and screw on LOCK NUT

P.C. BOARD MOUNTING



- A. Mount P.C. Board Case (bottom) to cabinet using two #6 × ¾" pan head Phillips wood screws 30-313500.
- B. Mount P.C. Board Set into P.C. Board Case (bottom) **55-169700** using four #6 × 1" pan head Phillips wood screws 30-313600.
- C. Slip bottom edge of P.C. Board Case (top) **55-169600** under bottom lip of P.C. Board Case (bottom) **55-169700**, use one #6 × ¾" pan head Phillips sheet metal screw 30-161200, to secure.
- D. This unit may be mounted either vertically or horizontally, depending on the availability of space in your game cabinet.

EDGE-CONNECTOR "PIN-OUTS"

COIN - CREDIT OPTION SWITCH

DIP SWITCH A

OPTION		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
BONUS SWITCH SETTINGS									
2 COINS	1 CREDIT	OFF	ON	OFF	ON	OFF	ON	OFF	ON
4 COINS	2 CREDITS								
5 COINS	3 CREDITS								
6 COINS	4 CREDITS								
2 COINS	1 CREDIT	ON	ON	OFF	ON	ON	ON	OFF	ON
4 COINS	3 CREDITS								
1 COIN	1 CREDIT	OFF	OFF	ON	ON	OFF	OFF	ON	ON
2 COINS	2 CREDITS								
3 COINS	3 CREDITS								
4 COINS	4 CREDITS								
5 COINS	6 CREDITS								
1 COIN	1 CREDIT	ON	OFF	ON	ON	ON	OFF	ON	ON
2 COINS	2 CREDITS								
3 COINS	3 CREDITS								
4 COINS	5 CREDITS								
1 COIN	1 CREDIT	OFF	ON	ON	ON	OFF	ON	ON	ON
2 COINS	3 CREDITS								
1 COIN	2 CREDITS								
2 COINS	4 CREDITS								
3 COINS	6 CREDITS								
4 COINS	8 CREDITS								
5 COINS	11 CREDITS								
					COIN SWITCH 1				
					COIN SWITCH 2				

COMPONENT SIDE

SOLDER SIDE

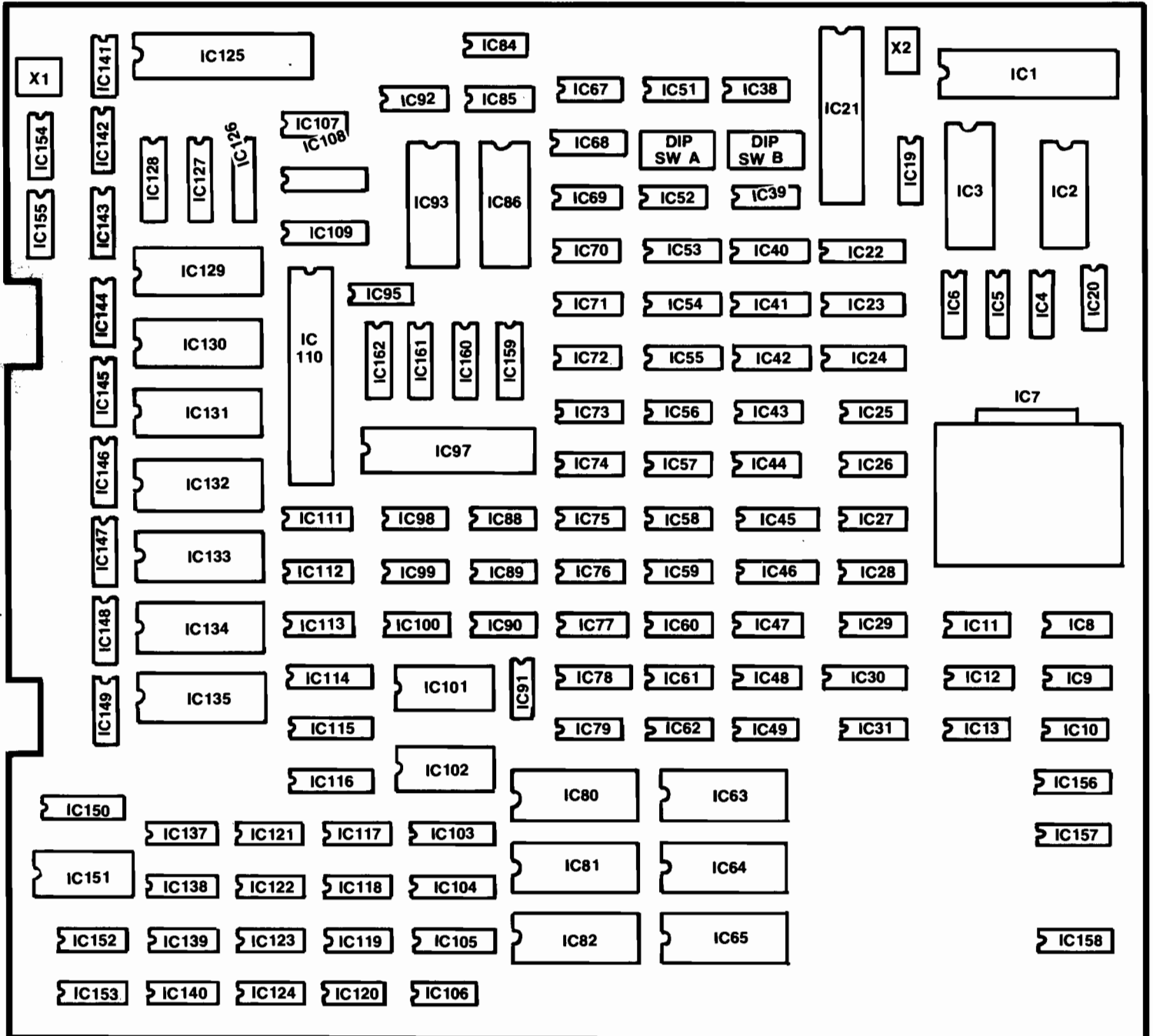
MON. GND.	1A	1B	GND.
MON. BLUE	2A	2B	SYNC
MON. RED	3A	3B	MON. GRN.
SPKR.	4A	4B	SPKR.
SERV. SW.	5A	5B	
TEST SW.	6A	6B	
COIN SW. 2	7A	7B	2P START
COIN SW. 1	8A	8B	1P START
1P LEFT	9A	9B	2P LEFT
1P RIGHT	10A	10B	2P RIGHT
1P UP	11A	11B	2P UP
1P DOWN	12A	12B	2P DOWN
	13A	13B	
1P FIRE	14A	14B	2P FIRE
1P BOMB	15A	15B	2P BOMB
	16A	16B	
+12V	17A	17B	
COIN METER 1	18A	18B	COIN METER 2
+5V	19A	19B	+5V
+5V	20A	20B	+5V
GND.	21A	21B	GND.
GND.	22A	22B	GND.

OPTION SWITCH SETTINGS

DIP SWITCH B

OPTION		1	2	3	4	5	6	7	8
COCKTAIL UPRIGHT		OFF							
		ON							
PLAYERS	3	NOT USED		OFF	OFF	NOT USED			
SHIPS	4			ON	OFF				
	5			OFF	ON				
FREE				ON	ON				
GAME DIFFICULTY	EASY							OFF	
	HARD							ON	
GAME CONTINUE									ON
GAME END									OFF

GAME BOARD



REGULUS

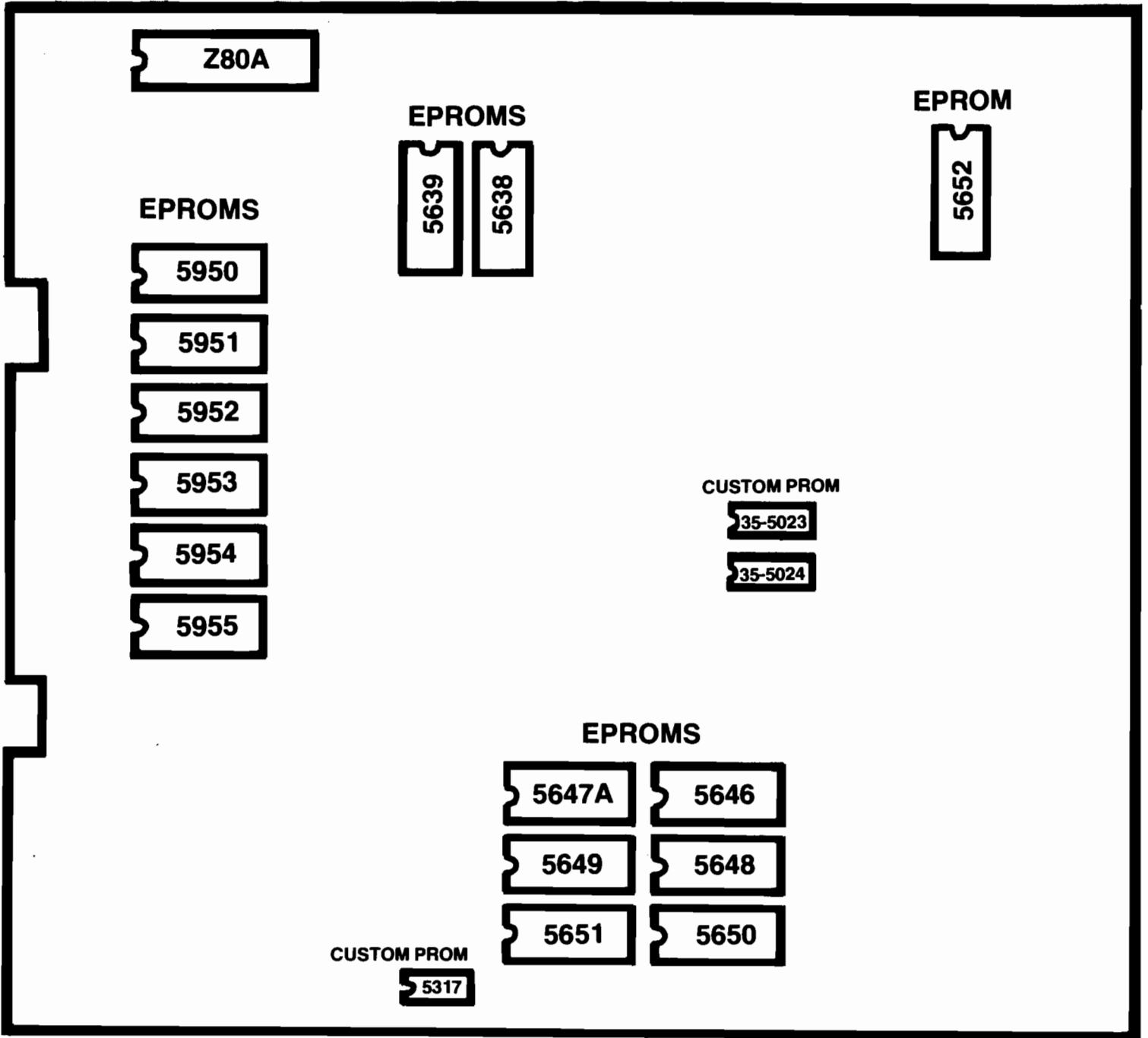
REVISED GAME BOARD PARTS LIST

IC1: Z80A
IC2: TMM2009P-B
IC3: EPROM 5652
IC4,5: 76489
IC6: 74LS138
IC7: LA4460
IC8,9: 74LS174
IC10: 74LS04
IC11: 74LS132
IC12: 74LS109
IC13: 74LS125
IC20: 74LS107
IC21: 8255
IC22,23: 74LS244
IC24: AM25LS2519PC
IC25,26,27,28,29: 74LS399
IC30: 74LS273
IC31: 74LS155
IC38: 74LS257
IC39: 74LS157
IC40,41,42: MBM2148L-55
IC43,44: 74LS157
IC45,46: CUSTOM PAL16R4
IC47,48: 74LS157
IC49: 74LS164
IC51: 74LS257
IC52: 74LS32
IC53,54,55: MBM2148L-55
IC56,57: 74LS157
IC58,59: 74LS669
IC60,61: 74LS157
IC62: 74S201
IC63: EPROM 5646
IC64: EPROM 5648
IC65: EPROM 5650
IC67: 74S175
IC68: 74LS273
IC69: 74LS157
IC70: 7425
IC71: 74LS174
IC72: 74LS20
IC73,74,75,76: 74LS669
IC77: 74LS157
IC78: MBM2147E
IC79: 74LS04
IC80: EPROM 5647
IC81: EPROM 5649
IC82: EPROM 5651
IC84: 74LS107
IC85: 74LS139
IC86: EPROM 5638
IC88: 74LS85
IC89,90: 74LS157
IC92: 74LS123
IC93: EPROM 5639
IC95: 74LS04
IC97: CUSTOM 315-5011
IC98: 74LS283
IC99: 74LS157
IC100: 74157
IC101,102: MB8128-15
IC103,104: 74LS273
IC105: 74LS377
IC106: PROM 5317
IC107: 74LS138
IC108,109: 74LS245
IC110: PROM 315-5012
IC111: 74LS283
IC112,113: 74LS157
IC114,115: 74LS245
IC116: 74LS273
IC117: 74LS368
IC118: 74LS155
IC119: 74LS100
IC120: 74LS27
IC121: 74LS153
IC122: 74LS174
IC123: 74LS153
IC124: 74LS157
IC125: Z80A
IC126: 74LS245
IC127,128: 74LS244
IC129: EPROM 5950
IC130: EPROM 5951
IC131: EPROM 5952
IC132: EPROM 5953
IC133: EPROM 5954
IC134: EPROM 5955
IC135: TC5533P-B
IC137: 74LS153
IC138: 74LS174
IC139,140: 74LS153
IC141: 74LS161
IC142: 74S04
IC143: 74LS145
IC150: 74LS245
IC151: MB8128-10
IC152: 74S145
IC153: 74S175
IC154: 74LS32
IC155: M54523
IC156,157,158: CUSTOM 315-5025
IC159,160,161,162: 2148L-55

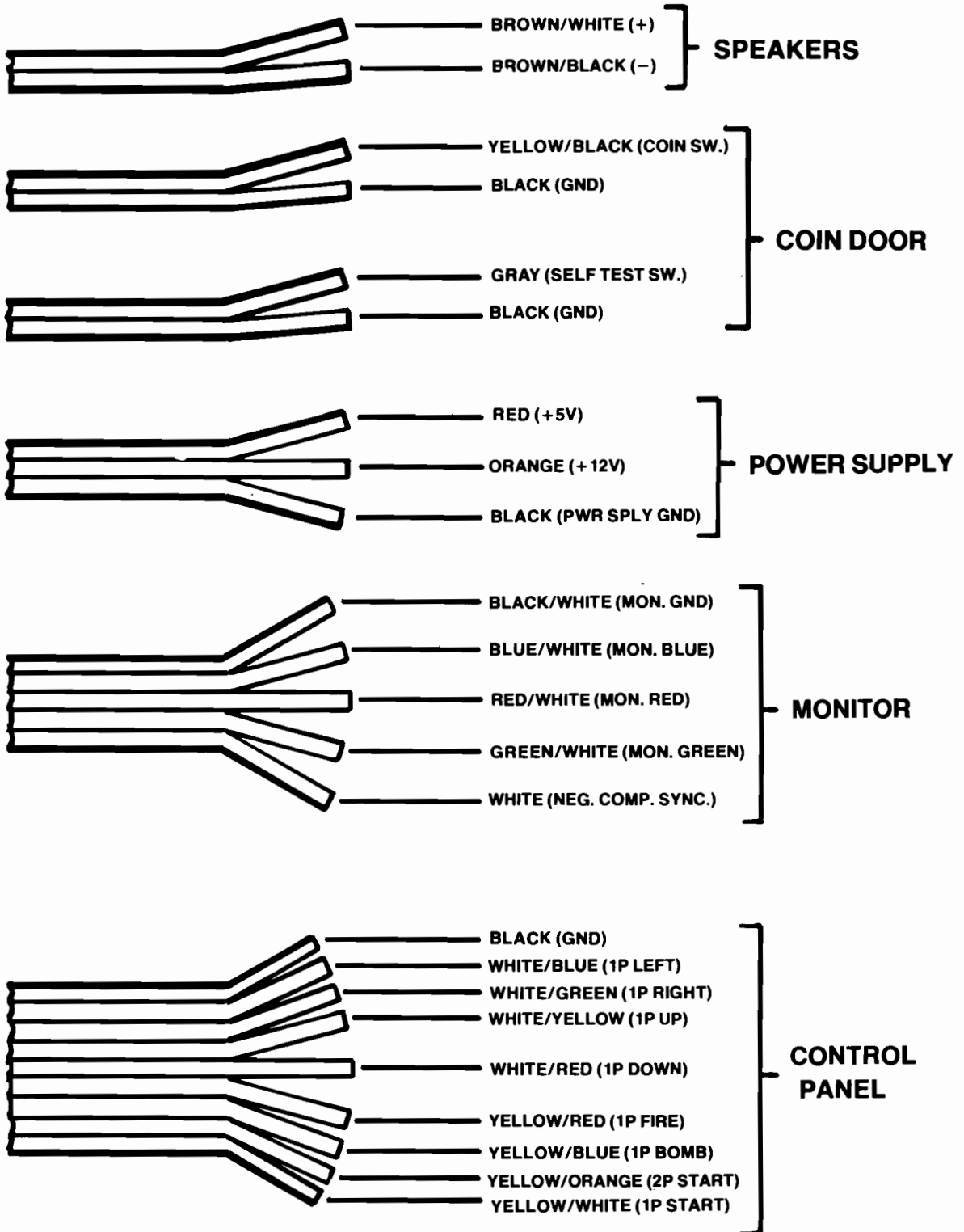
GAME BOARD

IC1 --Z80A
IC2 --TMMZ009P-B
IC3 --MBM2764-30
IC4 --SN76489AN
IC5 --SN76489AN
IC6 --SN74LS138J-K
IC7 --LA4460
IC8 --74LS174NA
IC9 --74LS174NA
IC10 --SN74LS04N
IC11 --74LS132PC
IC12 --74LS109PC
IC13 --74LS125AN K8404
IC19 --SN74LS321N
IC20 --MB74LS107
IC21 --TMP8255AP-5
IC22 --MB74LS244 8401
IC23 --MB74LS244 8401
IC24 --AM25LS2519PC
IC25 --SN74LS399N
IC26 --SN74LS399N
IC27 --SN74LS399N
IC28 --SN74LS399N
IC29 --SN74LS399N
IC30 --M74LS273P
IC31 --MB74LS155 8407
IC38 --M74LS257AP
IC39 --74LS157N 8150
IC40 --MBM2148L-55 8405
IC41 --MBM2148L-55 8352
IC42 --MBM2148L-55 8405
IC43 --74LS157N 8150
IC44 --74LS157N 8150
IC45 --DMPAL16R4JC
IC46 --DMPAL16R4JC
IC47 --74LS157N 8150
IC48 --74LS157N 8150
IC49 --74LS164N 8149
IC51 --M74LS257AP
IC51 --M74LS257AP
IC52 --74LS32PC
IC53 --MBM2148L-55 8351
IC54 --MBM2148L-55 8351
IC55 --MBM2148L-55 8405
IC56 --74LS157N 8150
IC57 --74LS157N 8150
IC58 --SN74LS669N
IC59 --SN74LS669N
IC60 --74LS157N 8148
IC61 --74LS157N 8148
IC62 --SN74S201N
IC63 --MBM2764-30
IC64 --MBM2764-30
IC65 --MBM2764-30
IC67 --HD74S175
IC68 --M74LS273P
IC69 --74LS157N 8150
IC70 --M53225P
IC71 --74LS174NA
IC72 --MB74LS20
IC73 --SN74LS669N
IC74 --SN74LS669N
IC75 --SN74LS669N
IC76 --SN74LS669N
IC77 --74LS157N 8148
IC78 --MBM2147E
IC79 --SN74LS04N
IC80 --M5L2764K
IC81 --MBM2764-30
IC82 --MBM2764-30
IC84 --MB74LS107
IC85 --MB74LS139
IC86 --HN4827128G-25
IC88 --SN74LS85N
IC89 --74LS157N 8148
IC90 --74LS157N 8148
IC91 --74LS86
IC92 --M74LS123P
IC93 --HN4827128G-25
IC95 --SN74LS04N
IC97 --315-5011
IC98 --MB74LS283
IC99 --74LS157N 8148
IC100--74LS157N 8148
IC101--MB8128-15
IC102--MB8128-15
IC103--M74LS273P
IC104--M74LS273P
IC105--M74LS377P
IC106--PR-5317
IC107--SN74LS138J-K
IC108--MB74LS245
IC109--MB74LS245
IC110--8351P5
IC111--MB74LS283
IC112--74LS157N 8148
IC113--74LS157N 8148
IC114--MB74LS245
IC115--MB74LS245
IC116--M74LS273P
IC117--M74LS368AP
IC118--MB74LS155
IC119--74LS109PC
IC120--M74LS27P
IC121--SN74LS153N
IC122--74LS174NA
IC123--SN74LS153N
IC124--74LS157N
IC124--74LS157N
IC125--Z80A
IC126--MB74LS245
IC127--MB74LS244
IC128--MB74LS244
IC129--M5L2764K
IC130--M5L2764K
IC131--D2764D
IC132--HN482764G
IC133--MBM2764-30
IC134--MBM2764-30
IC135--TC5533P-B
IC137--SN74LS153N
IC138--74LS174NA
IC139--SN74LS153N
IC140--SN74LS153N
IC141--M74LS161P
IC142--SN74S04N
IC143--DM74145N
IC144--5102 406J
IC145--5102 406J
IC146--5102 406J
IC147--5102 406J
IC148--5102 406J
IC149--5102 406J
IC150--MB74LS245
IC151--MB8128-10
IC152--HD74S175
IC153--HD74S175
IC154--SN74LS321N
IC155--54523P
IC156--315-5025
IC157--315-5025
IC158--315-5025

EPROM LOCATIONS



CABLE HARNESS TERMINATIONS



SELF—TEST

You have an optional SELF-TEST feature by wiring the 23-135600 MOMENTARY SWITCH to PIN 17 of the P.C. BOARD EDGE CONNECTOR and to GROUND.

To initiate the SELF-TEST, press the BUTTON. As you do, the games steps thru its SELF-TEST.

1ST: RAM TEST

2ND: ROM TEST

3RD: INPUT TEST (push all CONTROL PANEL and POWER GRIP switches game will indicate if they are functioning). GAME will indicate DIP SWITCH settings.

4TH: SOUND TEST (Push 1 or 2 PLAYER BUTTON, GAME will step thru all the GAME SOUNDS).

5TH: MONITOR ADJUSTMENT (screen shows COLOR BARS, GREY BARS and WHITE FRAME, for CONVERGENCE ALIGNMENT and CENTERING OF PICTURE

6TH: Returns to GAME ATTARCT MODE.

See

WICO®

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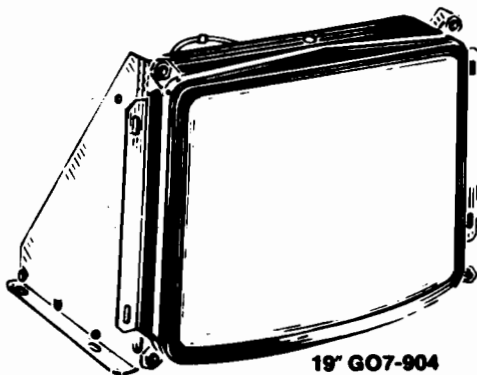
6400 W. GROSS POINT ROAD • NILES, ILLINOIS 60648

For Replacement Parts

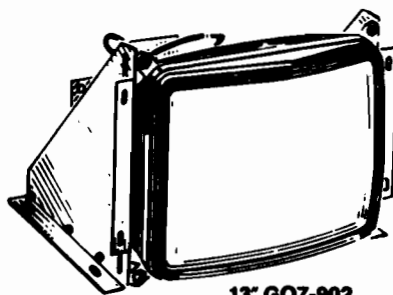
ELECTROHOME DISPLAY MONITORS

GO7 SERIES 13" & 19" R.G.B. COLOR

The GO7 Series of Color Display Monitors is available with precision in-line 13-inch and 19-inch CRT formats. Each is designed to meet the high reliability and performance standards common to the video games industry.



19" GO7-904
Wico No. 36-0124



13" GO7-902
Wico No. 36-0123

HORIZONTAL MOUNTING ONLY

Ref. No.	Description	Wico No.
38-GO7-902-00	13" R.G.B. Color	36-0123
38-GO7-904-00	19" R.G.B. Color	36-0124

ISOLATION TRANSFORMER

ISOLATION TRANSFORMER

Isolates monitor from AC line to reduce shock hazard.
Protects equipment.

Input Volts: 115VAC

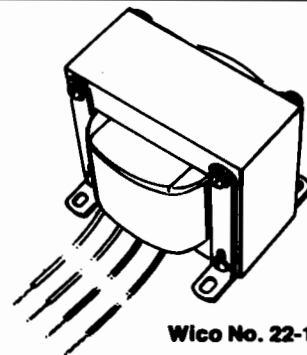
Output Volts: 115VAC

150 VA Rated.

2 Primary & 2 Secondary wire leads, 6½" long.

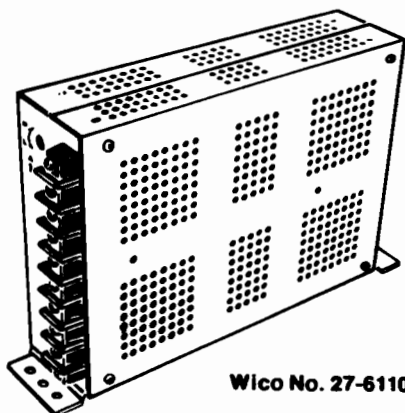
Mounting Centers: 3-1/8" x 2-3/4."

Four Mounting Slots: 7/32" x 3/8"



Wico No. 22-1022

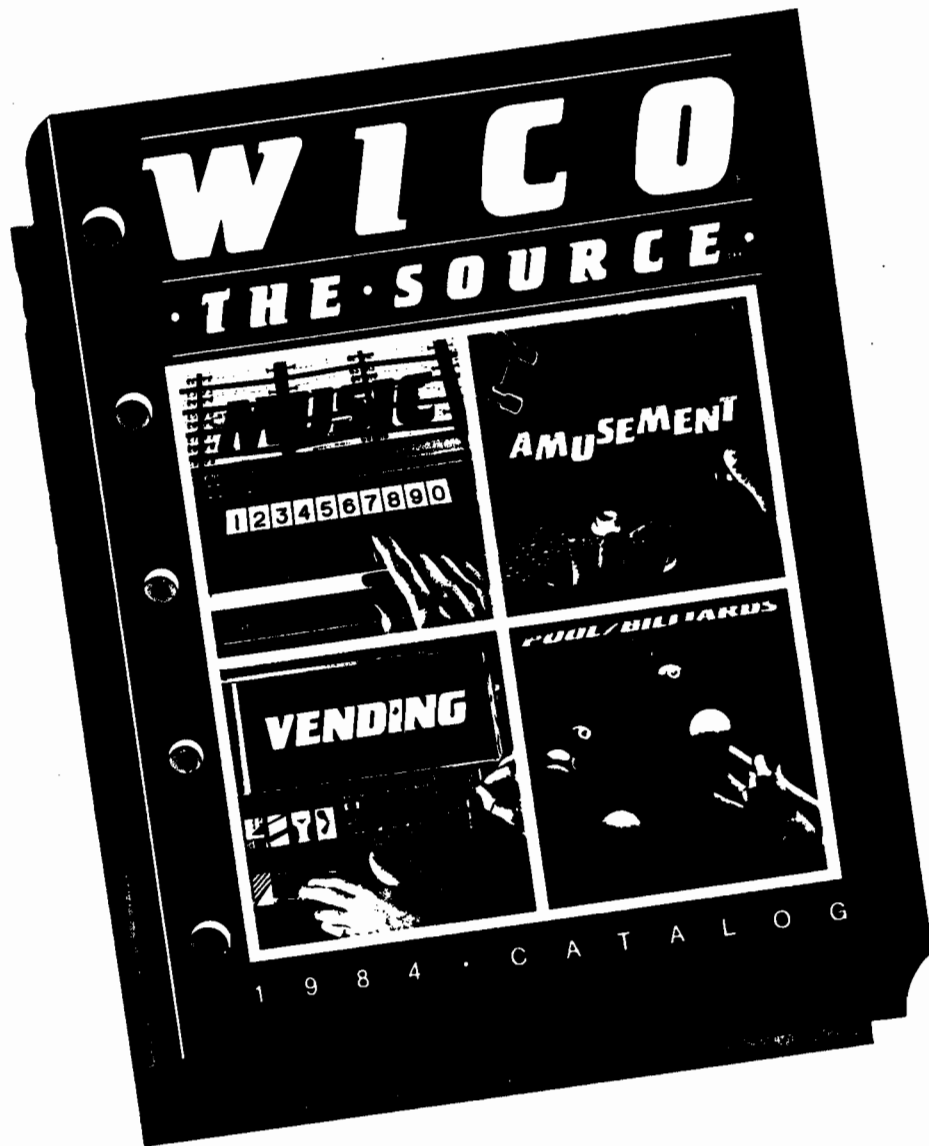
3-OUTPUT SWITCHING D.C. POWER SUPPLY



Wico No. 27-6110

3-Output Switch-Mode D.C. Power Supply Designed for Video Game/Microprocessor Use
+5V/5A (Max. 7A), -5V/1A, +12V/1A. Input A.C. Voltage 90-130VAC

- U.L. Listed
- Steps down AC voltage from 110V to operate within specified range.
- High Efficiency/Low Cost
- Latest PWM IC regulated design.
- Fully enclosed packaging — All aluminum cover.
- Soft-start.
- Foldback current limit on 5V main output.
- Auxiliary output short-circuit protection.
- 4 hours burn-in.
- **Compact & lightweight:** Mounting centers 7½" approx. size 4¾"H x 7¾"W x 1-13/16"D (plus Mounting Bracket). Wt. 1 lb. 6 oz.



WICO'S GOT IT ALL!
(All the parts you need, anytime you need them.)

WICO®
THE SOURCE