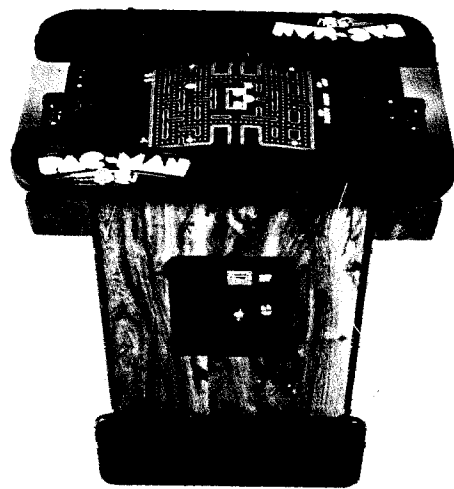
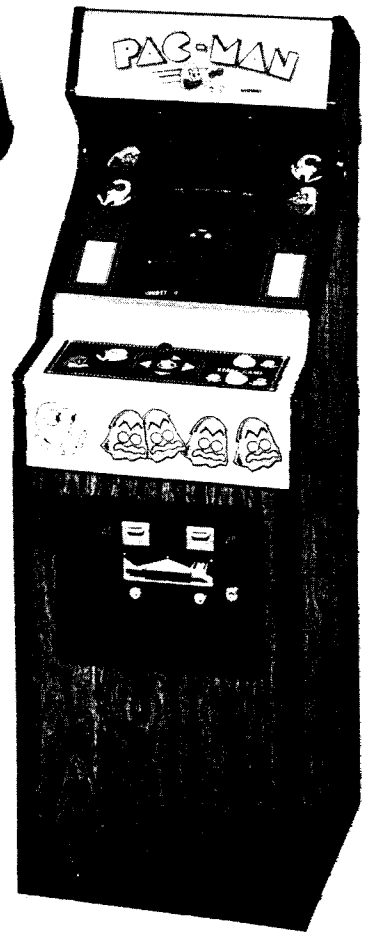


MIDWAY'S PAC-MAN

TROUBLE SHOOTING LOGIC BOARD PART I



COCKTAIL #933



MINI #934

UP-RIGHT #932

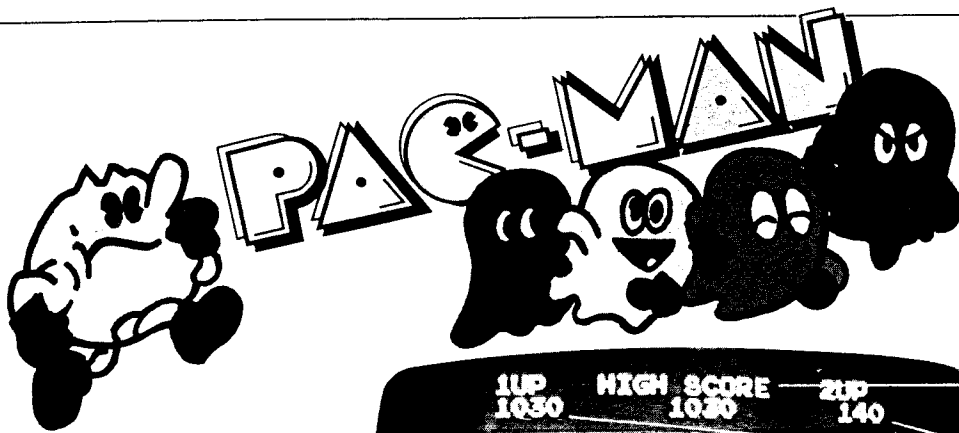
PHONE:
(312) 452-5200

FORM-00238-8012



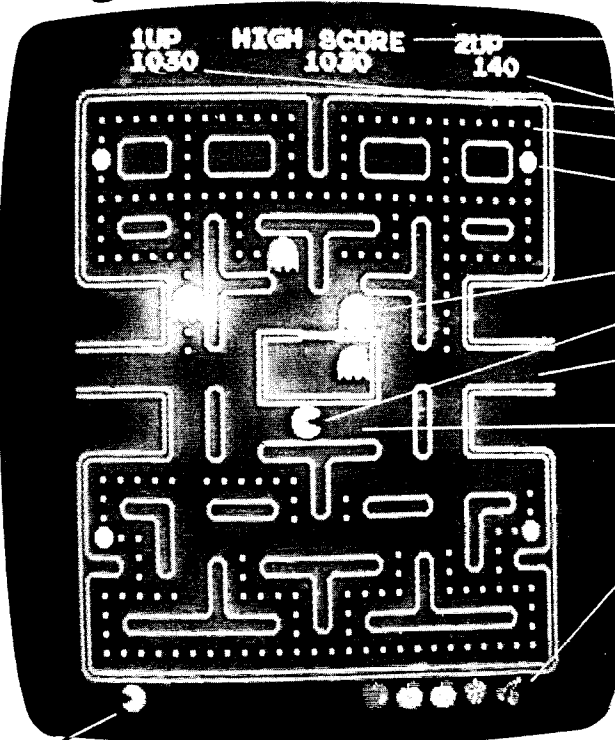
MIDWAY MFG. CO.
A BALLY COMPANY
10750 WEST GRAND AVENUE
FRANKLIN PARK, ILLINOIS 60131
U.S.A.

PHONE:
TOLL FREE
800-323-7182



A sensational, full color video game for 1 or 2 players that tickles vision and challenges reflexes. Adding to the fun are musical refrains, chomping and action sounds along with amusing cartoon shows between racks.

The player, using a single handle control guides the PAC-MAN about the maze, scoring points by munching up the Dots in his path. Four Ghost Monsters—Inky, Blinky, Pinky and Clyde— chase after the PAC-MAN trying to capture and deflate him. The PAC-MAN can counterattack by eating the big, Power Capsule that enables him to overpower the Monsters for additional score. After all the Dots are gobbled up, the screen is cleared, and PAC-MAN continues for another round. Each rack features a special Fruit Target in the maze, which if eaten, earns Bonus Points. Players start with three PAC-MEN. An additional PAC-MAN is awarded for 10,000 points.



- HIGH SCORE** — Retained and displayed daily.
- PLAYERS' SCORE**
- DOTS** — 10 Points Each.
- POWER CAPSULE** — 50 Points Each.
- GHOST MONSTERS**
- PAC-MAN** — The 'main' man.
- ESCAPE 'Warp' TUNNEL** — Out one side— reappear on other.
- BONUS FRUIT TARGET** — Appear below Monster's Den twice during each rack.
- NUMBER OF SCREENS CLEARED** — Fruit indicates how many times player has cleared the screen of dots.
 - ☉ Screen cleared once.
 - ☪ Screen cleared twice.
 - ☉ Screen cleared 3 times.
 - ? Screen cleared 4 times.
 - ? Screen cleared 5 times.
 - etc. —

PAC-MAN REMAINING

1 Quick, eat the flashing Power Capsule.

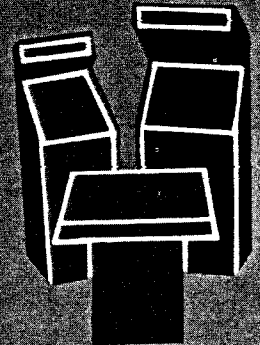
Inky Blinky Pinky Clyde

2 When the PAC-MAN powers up, the Monsters start to run away.

3 Points double for each Monster caught.

1600 800 400 200

PAC-MAN is available in 3 Midway models: New Mini-Myre, Cocktail Table and Standard Arcade.



HEIGHT	WIDTH	DEPTH
58 1/2" 149 cm	19 1/2" 49.5 cm	24" 61 cm
29" 74 cm	32" 81.25 cm	22" 56 cm
73" 185.5 cm	26 1/2" 67.25 cm	34" 86.25 cm

DISTRIBUTED BY:



MIDWAY MFG. CO.

A BALLY COMPANY
10750 West Grand Avenue
Franklin Park, Illinois 60131

For service information—call toll free 800-323-7182

GENERAL INSTRUCTIONS FOR "PAC-MAN"

INSTALLATION

1. Remove shipping cleats located on bottom of cabinet.
2. Install four (4) provided leg levelers to bottom of cabinet and level cabinet.
3. The power is controlled by a switch located on top of the cabinet. Additional taps have been provided on the transformer to compensate for fluctuating line voltage.

LINE VOLTAGE SAFETY SWITCH

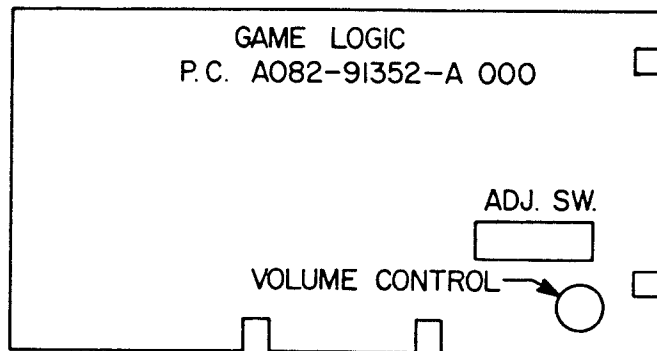
A line voltage safety switch has been provided for your protection. It is located on the right rear side of the cabinet in the back door area. When the back door is removed, it opens the circuit to the line voltage. To restore power (when servicing), pull switch fully out.

VOLUME CONTROL

The volume control pot is located on the Game Logic Board (P.C. A082-91352-A000). This pot controls the volume of all sounds and may be varied as desired by rotating pot control.

ADJUSTMENT SWITCHES

Located on Game Logic Board (P.C. A082-91352-A000) and may be adjusted as indicated on separate instruction card in back box area.



TO REMOVE CONTROL PANEL AND MONITOR DISPLAY GLASS

1. Open coin door.
2. Release two (2) clamps located below Control Panel on each side of cabinet.
3. Disconnect control panel jack.
4. Remove control panel.
5. Remove monitor display glass.

CREDIT PUSH BUTTON SWITCH

Located in cash box area and is readily accessible by opening coin door. This switch is provided as a test aid and awards one credit without advancing coin meter.

M051-00932-A003

WARNING: This equipment Generates, Uses and can Radiate Radio Frequency Energy and if not installed and used in accordance with the Instructions Manual, may cause interference to Radio Communications. As temporarily permitted by Regulation it has not been tested for compliance to Subpart J or Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference. 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.

METHOD OF PLAY

SW. #1	SW. #2		
OFF	ON	1 COIN	1 PLAY
ON	OFF	1 COIN	2 PLAY
OFF	OFF	2 COINS	1 PLAY
ON	ON		FREEPLAY

NUMBER OF PACKMEN PER GAME

SW. #3	SW. #4	
ON	ON	1 PACKMAN
OFF	ON	2 PACKMEN
ON	OFF	3 PACKMEN
OFF	OFF	5 PACKMEN

BONUS PACKMEN

SW. #5	SW. #6	
ON	ON	BONUS PACKMAN AT 10,000
OFF	ON	BONUS PACKMAN AT 15,000
ON	OFF	BONUS PACKMAN AT 20,000
OFF	OFF	NO BONUS

SW. #7	SW. #8	
OFF	OFF	PLAY MODE
ON	OFF	RACK TEST
OFF	ON	LOCKS PICTURE

MO51 -00932-A035

ELECTRICAL BULLETIN: FOR ALL APPARATUS COVERED BY THE CANADIAN STANDARDS ASSOCIATION (CSA) STANDARD C22.2 NO. 1, WHICH EMPLOYS A SUPPLY CORD TERMINATED WITH A POLARIZED 2-PRONG ATTACHMENT PLUG.

CAUTION: TO PREVENT ELECTRIC SHOCK DO NOT USE THIS (POLARIZED)PLUG WITH AN EXTENSION CORD, RECEPTACLE OR OTHER OUTLET UNLESS THE BLADES CAN BE FULLY INSERTED TO PREVENT BLADE EXPOSURE.

ATTENTION: POUR PREVENIR LES CHOCS ELECTRIQUES NE PAS UTILISER CETTE FICHE POLARISEE AVEC UN PROLONGATEUR. UNE PRISE DE COURANT OU UNE AUTRE SORTIE DE COURANT, SAUF SI LES LAMES PEUVENT ETRE INSEREES A FOND SANS EN LAISSER AUCUNE PARTIE A DECOUVERT.

GAME BOARD TEST

Place test slide switch in "ON" position. If game board is good, the following information will be displayed on the screen:

OK
Coin Adjustment Setting
Bonus Adjustment Setting
Number of PAC-MAN Per Game Setting
Game Version

RAM/ROM TEST

If any of the Rams or Roms are faulty, the following information will be displayed on the screen:

BAD ROM LOCATION CODE

Display	Location
M-Rom-0	6E
M-Rom-1	6F
M-Rom-2	6H
M-Rom-3	6J

BAD RAM LOCATION CODE

Display	Location
Bad V Ram-0	4K
Bad V Ram-1	4N
Bad C Ram-0	4L
Bad C Ram-1	4P
Bad W Ram-0	4M
Bad W Ram-1	4R

CONTROL PANEL AND COIN SWITCH TEST

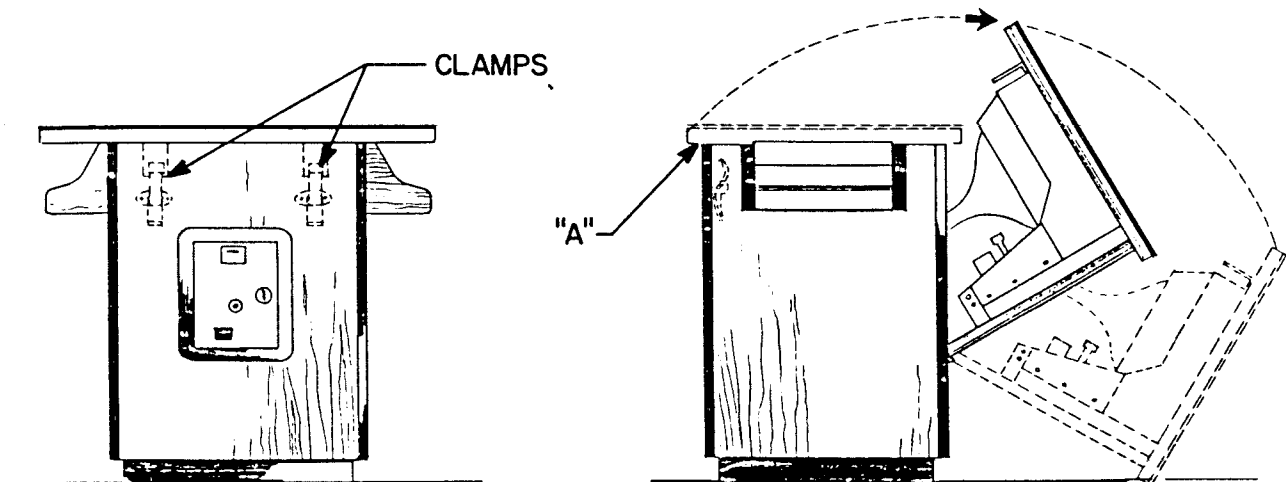
To verify operation of any switch, close switch in question. If switch is operating properly, a game sound will emit when closure is made.

Caution: Be sure to return test switch to game mode when all tests are completed.

TO SERVICE MONITOR, GAME BOARD AND TRANSFORMER ASSY.

1. Open coin box door and release two (2) clamps indicated on sketch below.
2. Grasp monitor mounting panel at "A" and open as indicated in sketch below.

Caution: Due to the weight of the monitor extreme care must be exercised when opening cabinet for service.



PAC – MAN

TROUBLE SHOOTING LOGIC BOARD PC A082-91375-A000

1. CHECK +5VDC AT CPU AND ROMS.
2. RESET LINE PIN #26 OF CPU NORMALLY HIGH AND GOES LOW WITH RESET.
3. 6MHZ CLOCK FREQUENCY AT PIN #13 OF 8-B AND 3MHZ AT PIN #6 OF CPU.
4. CHECK ROM TEST FOR A MEMORY FAILURE.
5. CHECK ALL ADDRESS AND DATA LINES AT CPU.
6. CHECK ALL ADDRESS AND DATA LINES AT 4-A AND 7-F COLOR PROMS.
7. CHECK ALL ADDRESS AND DATA LINES AT 5-E AND 5-F CHARACTER ROMS.
8. WHEN CHARACTER ROM 5-E IS REMOVED GAME PLAYS BUT MAZE IS MISSING.
9. WHEN CHARACTER ROM 5-F IS REMOVED GAME PLAYS BUT PAC – MAN AND GHOST MONSTERS ARE BLOCKS OF COLOR.
10. WHEN ALL PROGRAM ROMS ARE REMOVED THE SCREEN WILL BE ROWS OF BLUE DIAGONAL LINES.
11. CHECK SOUNDS AND SWITCHES USING TESTSWITCH.
12. SWITCHES #7 AND #8 MUST BE OFF FOR NORMAL GAME PLAY.
13. SWITCH #7 ON WILL TEST RACKS.
14. GOOD LUCK!

PAC – MAN

TROUBLE SHOOTING PC A082-91375-A000

NOTE: All I.C. trouble shooting information is with the I.C. removed from circuit.

POSITION	CHIP	POSSIBLE TROUBLE
1-E	74LS161	All Characters are at top of screen - Characters move horizontally only.
1-F	74LS283	Lines and Squares entire screen - Effects Self Test.
1-H	74LS283	Horizontal lines across screen in color.
1-K	74LS283	No Sounds - Game plays normal.
1-L	74LS174	Same as 1-K
1-M	5623 (Prom)	Same as 1 –K
1-N	CD 4066	Same as 1 –K
2-A	93415 (Ram)	Effects Color of all Characters - Game plays.
2-B	93415 (Ram)	Same as 2-A
2-B	93415 (Ram)	Same as 2-A
2-D	93415 (Ram)	Effects Color of the Characters - Eyes only two Characters.
2-E	74LS161	Characters top of screen - Characters move horizontally-Effects Game Play-Color 8. Sound OK.
2-F	74LS283	Effects Self Test - Row of Characters horizontally across screen. Effects Game Play-Color & Sound OK.
2-H	74LS86	All Characters are Squares - Effects Self Test – Horizontal Color Bars across screen.
2-K	74LS89	Effects all Sounds - Game plays & color OK.
2-L	74LS89	Same as 2-K
2-M	74LS273	Same as 2-K
2-P	74LSO2	Effects Sync - No Video - No Sound – Moving Diagonal Lines.
2-R	74LS161	Vertical short lines in color - Effects Game Play.
2-S	74LS161	Horizontal Color Bars across screen - Effects Game Play.

POSITION	CHIP	POSSIBLE TROUBLE
3-A	74LS158	No Characters in maze.
3-B	74LS157	No Video (Dead)
3-D	74LS75	Characters missing in maze - Game plays without seeing Characters.
3-E	74LS20	No Video (Dead)
3-F	74LS89	Same as 3-D
3-H	74LS89	All Characters move jerking - Characters do not stay in maze.
3-K	74LS158	No Sounds - Game Plays.
3-L	74LS157	No Sounds - Game Plays.
3-M	1M5623	No Sounds - Game Plays.
3-N	74LS74	Effects Sync - Color Diagonal Lines.
3-P	74LS10	No Video (Dead)
3-R	74LS161	No Video (Dead)
3-S	74LS161	Effects Sync - Diagonal Lines.
4-A	1M5623 (Prom)	No Video (Dead)
4-B	74LS377	Distorted Letters - No Color - Maze is White –Effects Game Play.
4-C	74LS00	No Video (Dead)
4-D	74LS273	No Maze - Screen covered with Number Fives – No Letters - Characters moving about.
4-E	74LS157	Distorted Maze - Letters Upside Down – Characters Distorted.
4-F	74LS86	Distorted Characters - Letters and Sound.
4-H	74LS245	Flashing White Dots - No Color.
4-K	2114 (Ram)	All White Zeros on screen.
4-L	2114 (Ram)	Flashing Numbers and Letters in Color.
4-M	2114 (Ram)	Blank screen with a Single Zero at top of screen –Two Red Characters Only.
4-N	2114 (Ram)	All White Zeros on screen.
4-P	2114 (Ram)	Flashing Self Test - Flashes continuous.

POSITION	CHIP	POSSIBLE TROUBLE
4-R	2114 (Ram)	Screen is blank with a Number One flashing – A single Character can be seen.
5-A	74LS157	Blue Screen - All Characters are Squares – No Letters or Numbers.
5-B	74LS194	Color Squares around each Character - All maze dots are blue.
5-C	74LS194	Effects Maze - Characters have Squares around them - Self Test in Red.
5-E	9332 (Prom)	Blue screen with Horizontal Squares - No Maze – No Letters or Numbers random Characters.
5-F	9332 (Prom)	Effects Characters in Maze which are Squares – Everything else normal.
5-L	74LS139	Red screen flashing with all Letter F's.
5-M	74LS74	Screen covered with Garbage in Color.
5-N	74LS08	Effects Sync - Moving Diagonal Lines in Color.
5-S	NVC 284 (Custom)	Flashing White Dots - Game plays.
6-B	Z80 CPU	Screen covered with Garbage in Color.
6-D	NVC 285 (Custom)	Same as 6-B
6-E	9332-B (Prom)	Flashing blue Zeros and Garbage – Continuous Meter Pulses.
6-F	9332-B (Prom)	Blank screen with a Flashing Number One – Bad Rom
6-H	9332-B (Prom)	Screen covered with Garbage.
6-J	9332-B (Prom)	Blank screen with random Characters.
6-R	74LS367	Screen flashing with Garbage in Color.
6-S	74LS367	Same as 6-R
7-F	7603	No Video (Dead)
7-H	74LS08	Eleven Horizontal rows of Zeros across screen.
7-J	74LS138	No Video (Dead)
7-K	74LS138	No Video (Dead)
7-L	74LS02	Same as 7-J
7-M	74LS139	Screen covered with Garbage in Color.
7-N	74LS42	Same as 7-J

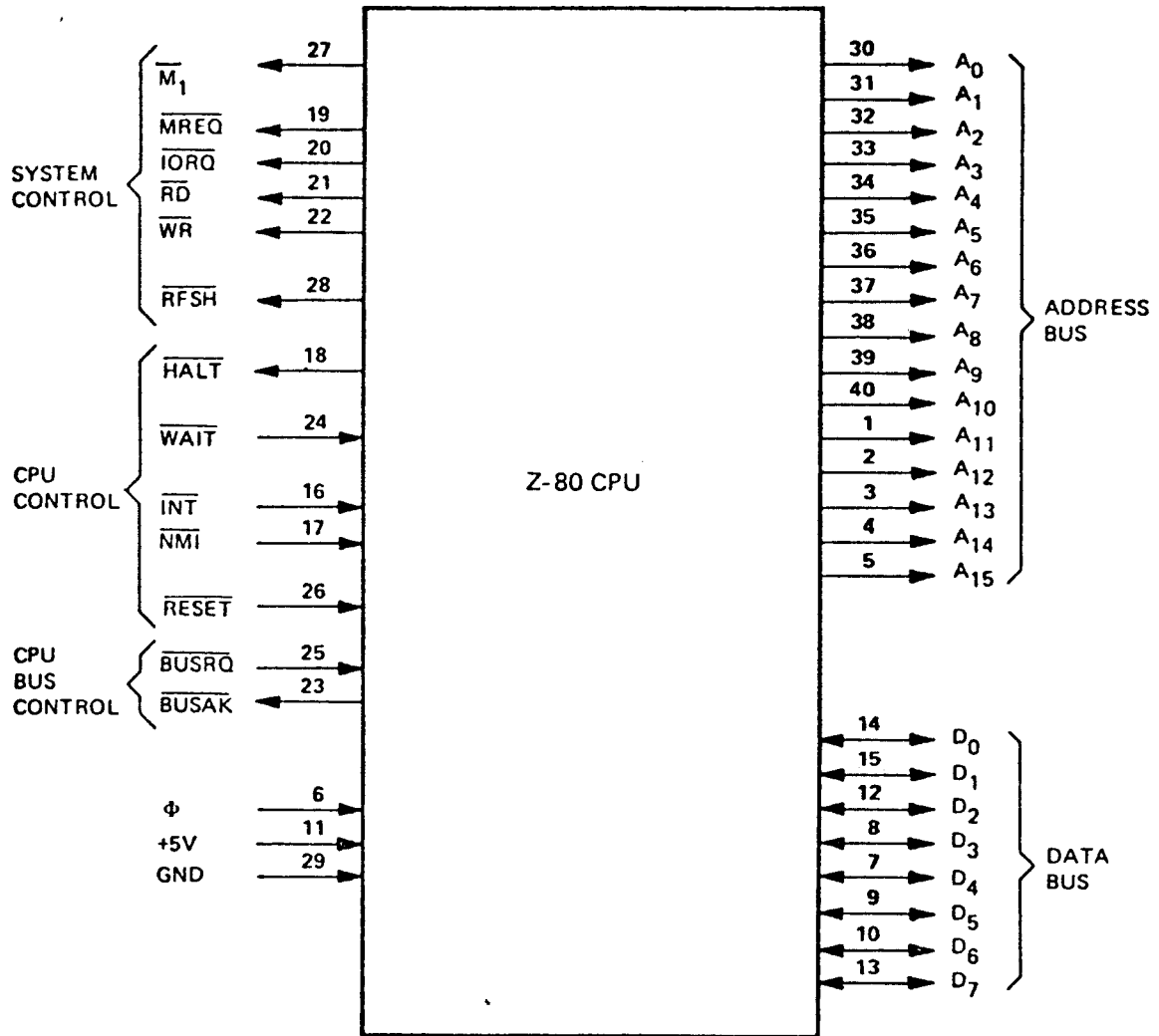
POSITION	CHIP	POSSIBLE TROUBLE
8-A	74LS107	No Video (Dead)
8-B	74LS368	Same as 8-A
8-C	74LS74	Effects Sync - Diagonal Lines flashing.
8-D	74LS367	Effects Dip Switch settings.
8-E	74LS367	No Coin - No Up & Down Controls - 1st Player.
8-F	74LS367	No Controls - 2nd Player.
8-H	74LS367	No Test Switch - 1 & 2 Player Select.
8-K	74LS259	Stays in Self Test-Shows Memory OK.
9-C	74LS161	Screen covered with Garbage in Color.
10-A	LM377 - LM1877	No Sounds.

ADDITIONAL DEVICES

10-A	Dip Switch	Effects Coin Play - Number of Pat-Man Bonus Pac-Man.
B-7	Crystal (18.432)	No Video (Dead)
P-8 (IR1)	78GVIC (Regulator	Effects + 5 VDC
R-9	D44VM4	Pass Transistor - Effects + 5 VDC
L-9	D40K1	Transistor - Effects Coin Counter
C-9	2N3391	Transistor - Effects Power Reset

Z-80 CPU PIN DESCRIPTION

The Z-80 CPU is packaged in an industry standard 40 pin Dual In-Line Package. The I/O pins are shown in figure 3.0-1 and the function of each is described below.



Z-80 PIN CONFIGURATION
FIGURE 3.0-1

PAC – MAN PC A082-91375-A000

CHIP NUMBER	FUNCTION
74LS00	Quad 2 Input Nand
74LS02	Quad 2 Input Nor
74LS08	Quad 2 Input And
74LS10	Triple 3 Input Nand
74LS20	Dual 4 Input Nand
74LS42	BCD to Decimal Decoder
74LS74	Dual "D" Flip-Flop
74LS75	Quad Latch
74LS86	Quad 2 Input Exclusive or
74S89	64 Bit Ram 16 x 4
74LS107	Dual "JK" Flip-Flop
74LS138	3 to 8 Line Decoder
74LS139	Dual 2 to 4 Line Decoder
74LS157	Quad 2 to 1 Line Multiplexer
74LS158	Quad 2 to 1 Line Multiplexer Inverting
74LS161	4 Bit Binary Counter
74LS174	Hex "D" Flip-Flop
74LS194	8 Bit Shift Register
74LS245	Octal Bus Transceiver
74LS259	8 Bit Addressable Latch
74LS273	Octal "D" Flip-Flop
74LS283	4 Bit Full Adder
74LS367	Hex Bus Driver
74LS368	Hex Bus Driver Inverting
74LS377	Octal "D" Flip-Flop
Z80	CPU
LM377 - LM1877	Dual Audio Amplifier
NVC284	Custom V Ram Addresser
NVC285	Custom Z80 Sync Buss Controller
CD4066	Quad Bilateral Switch

PAC – MAN PC A082-91375-A000

CHIP NUMBER	FUNCTION
2114	Ram 1K X 4
1M5623	Prom 256 x 4
7603	Prom 32 x 8
MCM 2532	Prom 4K x 8
SL 4239	Ram1K x 1
93415	Ram1K x 1
27LS00	Ram1K x 1
MB 8125	Ram1K x 1
CD 4099	8 Bit Addressable Latch
N8T245	Octal Bus Transceiver
54LS174	Hex "D" Flip-Flop
MB7052	Prom 256 x 4
MB7051	Prom 32 x 8
8304	Octal Bus Transceiver

ADDITIONAL DEVICES

18.4320	Crystal
78GVIC	Voltage Regulator
D44VM4	Transistor NPN
D40K1	Transistor NPN
2N3391	Transistor NPN
1N 4004	Diode
A15	Diode
1N914B	Diode
1N4737	6.2V Zener Diode

SERVICE BULLETIN

GAME: PAC-MAN

SUBJECT: Custom Chips 6-D and 5-S

When the custom chips are not available due to a supply problem the following alternate plug in units will be used.

1. At location 6-D PC 082-91383-B000 280 sync buss controller.
2. At location 5-S PC 082-91384-B000 V-Ram Addresser.

PAC - MAN

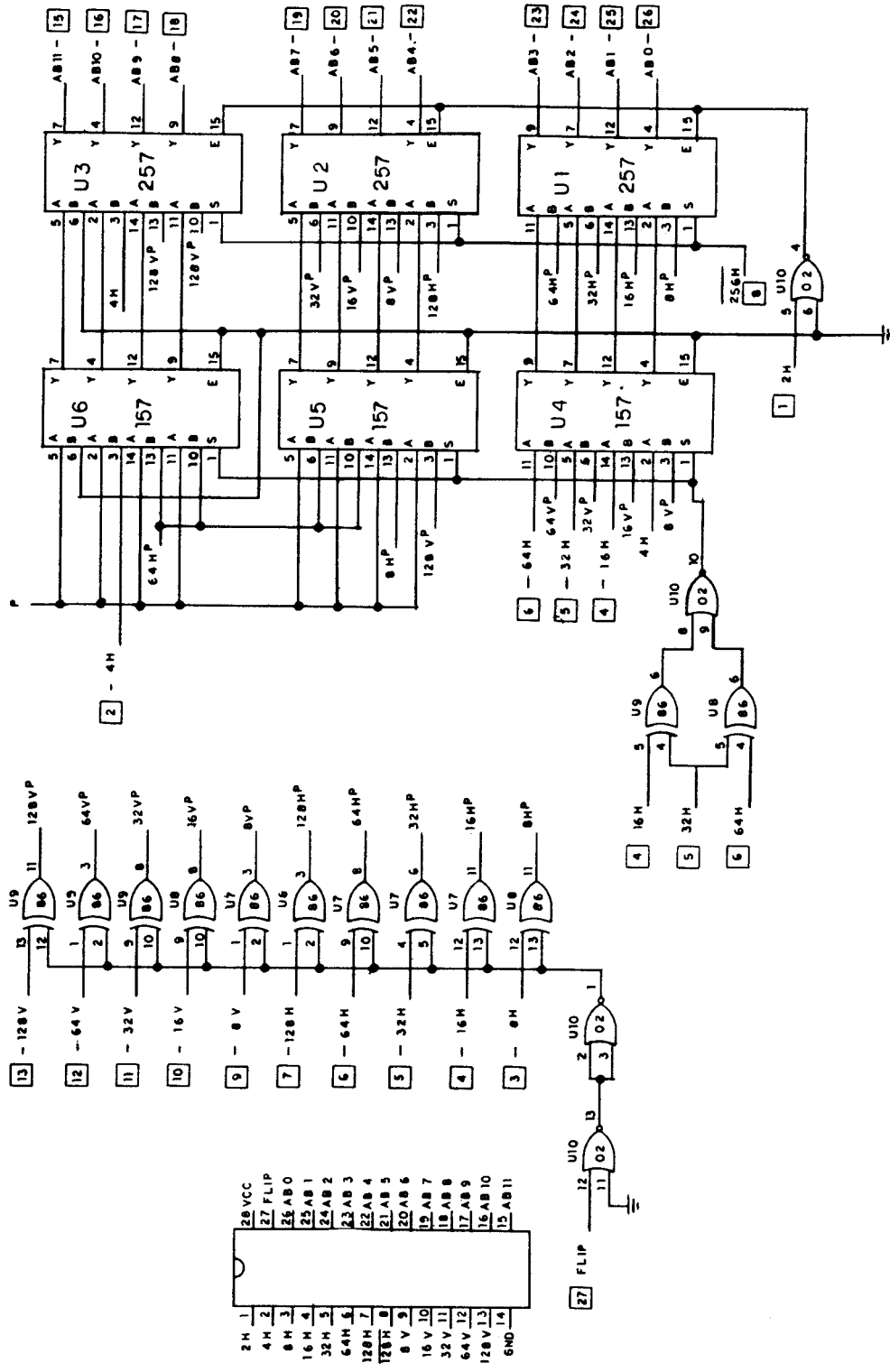
V - RAM ADDRESSER (284) # A082-91384-B000

CHIP NUMBER	FUNCTION
74LS02	Quad 2 Input Nor
74LS86	Quad 2 Input Exclusive or
74LS157	Quad 2 to 1 Line Multiplexer
74LS257	Quad 2 to 1 Line Multiplexer-Tri State

Z - 80 SYNC BUSS CONTROLLER (285)

A082-91383-B000

74LS02	Quad 2 Input Nor
74LS74	Dual "D" Flip-Flop
74LS139	Dual 2 to 4 Line Decoder
74LS244	Octal Buffers - Tri State
74LS374	Octal "D" Flip-Flop-Tri State

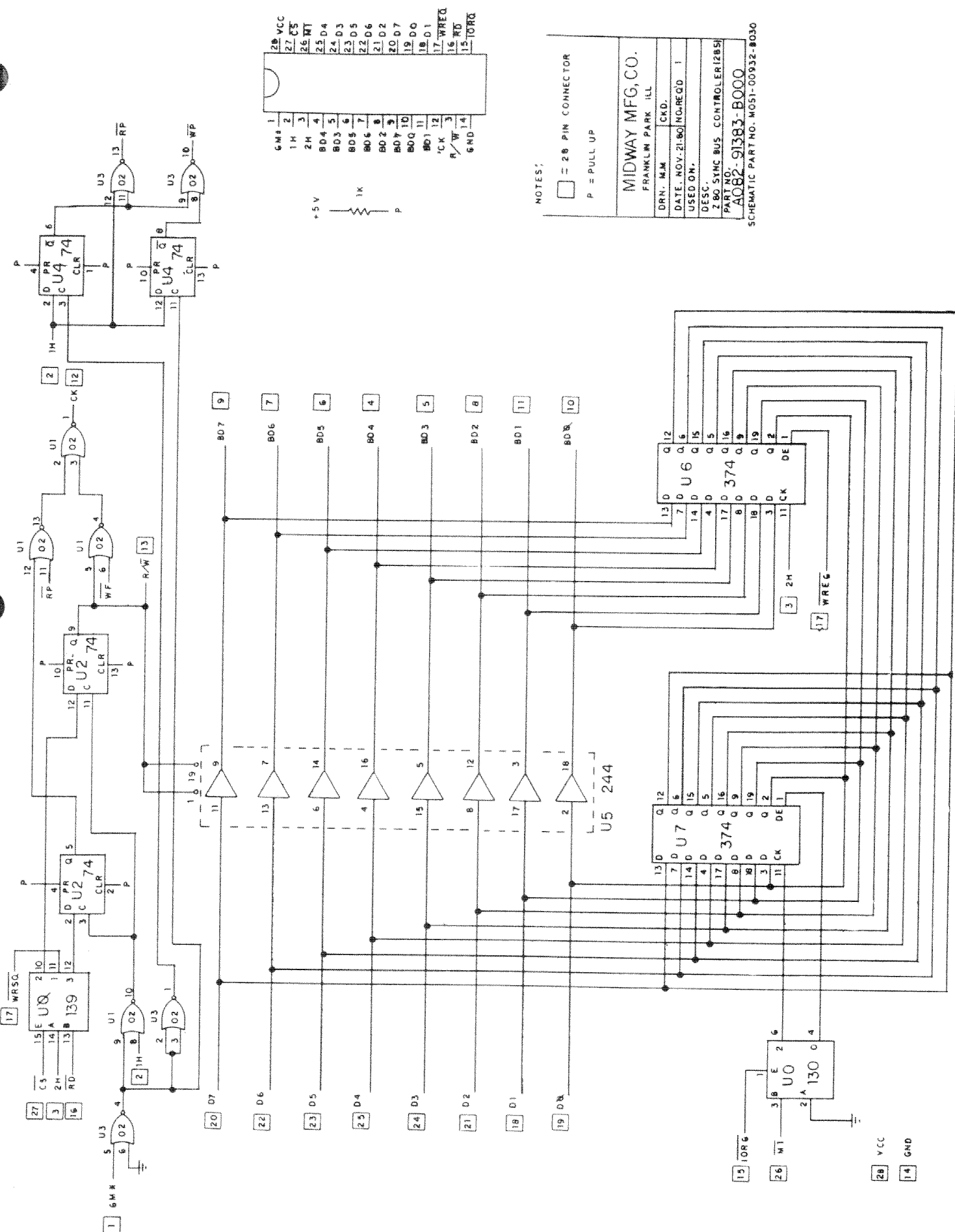


□ = 28 PIN CONNECTOR	
P = PULL UP	
MIDWAY MFG. CO FRANKLIN PARK ILL	
DRN. M.M.	CKD
DATE NOV 25 80	NO. RECD 1
USED ON	PAC - MAN
DESC.	
V RAM ADDRESSER INVC-284	
PART NO. AQ82-91384-8000	

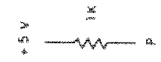
SCHEMATIC PART NO. M051 00932 B032

NOTES

This Space is provided for personal notes



1	GM#	2	27 VCC
2	1K	3	27 CS
3	2H	4	26 WT
4	8D4	5	25 D4
5	8D3	6	24 D3
6	8D5	7	23 D5
7	8D6	8	22 D6
8	8D2	9	21 D2
9	8D7	10	20 D7
10	8DQ	11	19 DQ
11	8D1	12	18 D1
12	CK	13	17 WREG
13	R/W	14	16 RD
14	GND	15	15 WRQ



NOTES:

- = 28 PIN CONNECTOR
- P = PULL UP

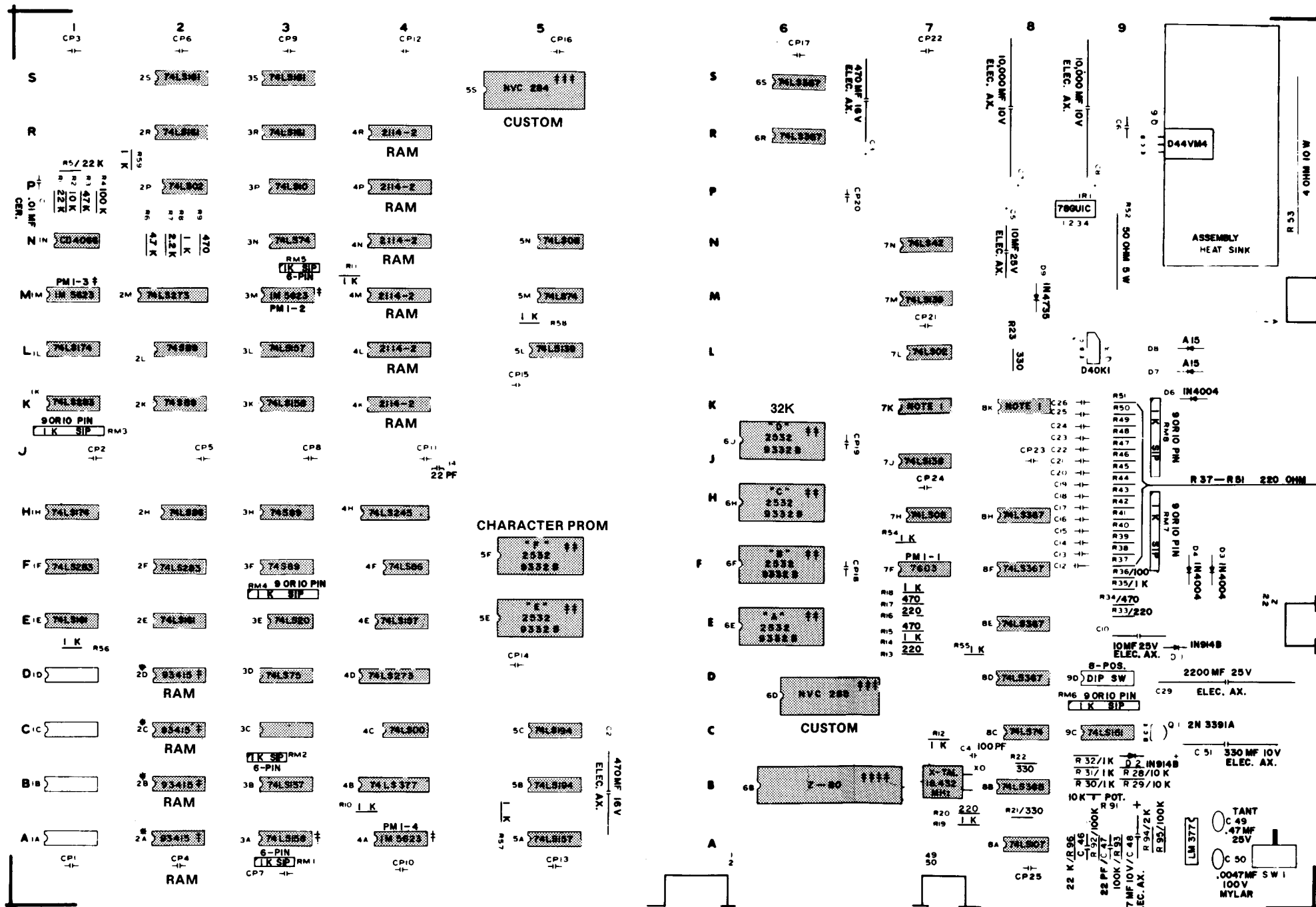
MIDWAY MFG. CO.
FRANKLIN PARK ILL.

DRN. MM	CKD.
DATE. NOV. 21. 80	ING. REQ'D 1
USED ON.	
DESC.	
780 SYNC BUS CONTROLLER (285)	
PART NO.	
AO82-91383-B000	

SCHEMATIC PART NO. M051-00932-B030

NOTES

This Space is provided for personal notes



* RAM HEAT SINK ASSEMBLY

NOTE 1: PLACE EITHER 74LS259 IN LOC. 8 K
OR CD4099 IN LOC. 7 K

UNMARKED CAPS ARE .1MF CER. AX.
RESISTOR UNIT = Ohm

- ‡ - 16 PIN SOCKET (9 PER)
- ‡‡ - 24 PIN SOCKET (6 PER)
- ‡‡‡ - 28 PIN SOCKET (2 PER)
- ‡‡‡‡ - 40 PIN SOCKET (1 PER)

M051-00932-A026

DO NOT SCALE DWG		HEAT TREAT	SCALE
DIM TOLERANCES UNLESS SPECIFIED	DATE 10/9/80	MAT'L	FINISH
DESIGNED BY	DATE	APPROVED BY	DATE

ASSEMBLY DRAWING
PAC-MAN

USED ON PAC-MAN "A"
NO REQD 1 PER

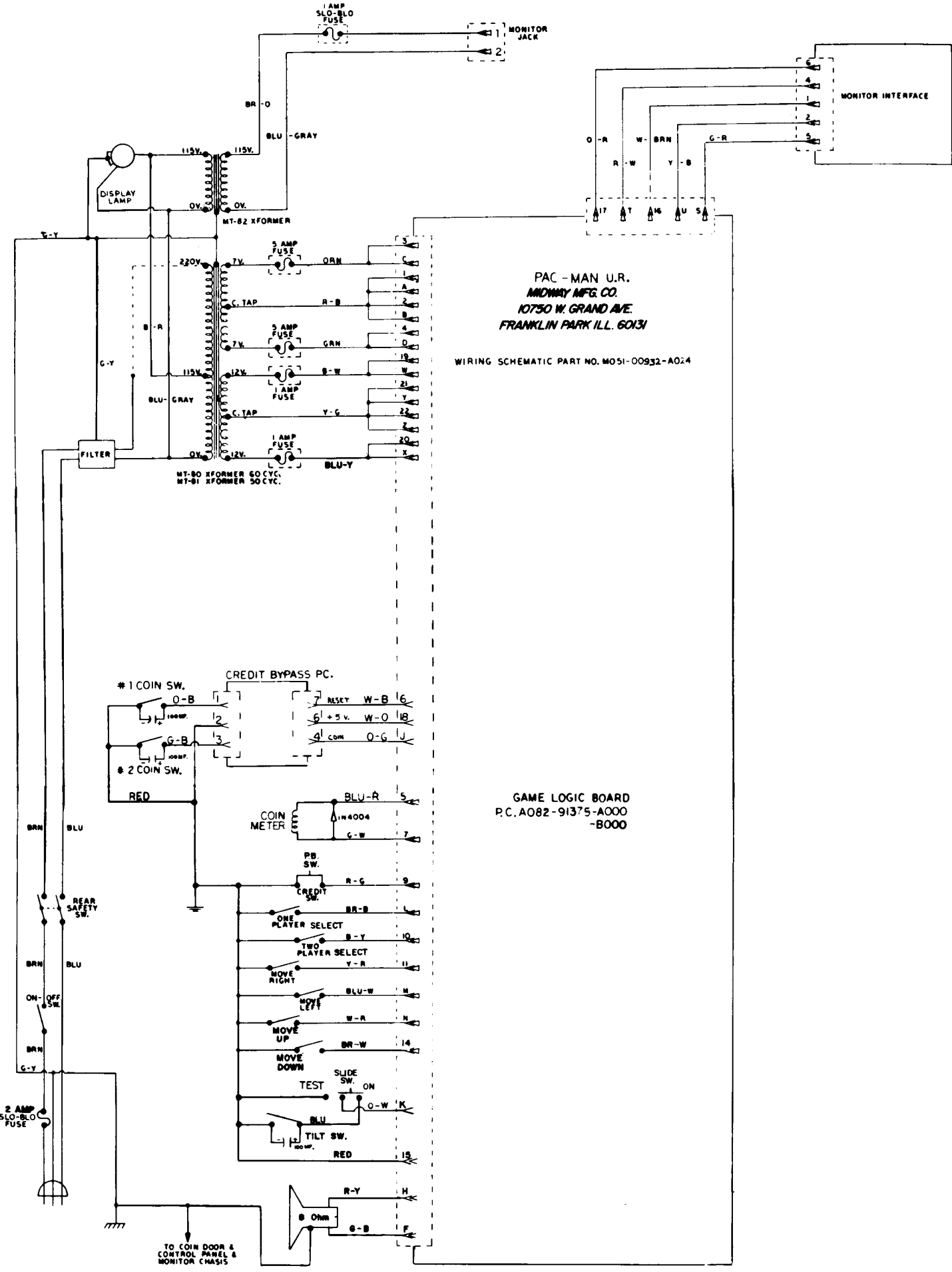
MIDWAY MFG. CO.
FRANKLIN PK ILL

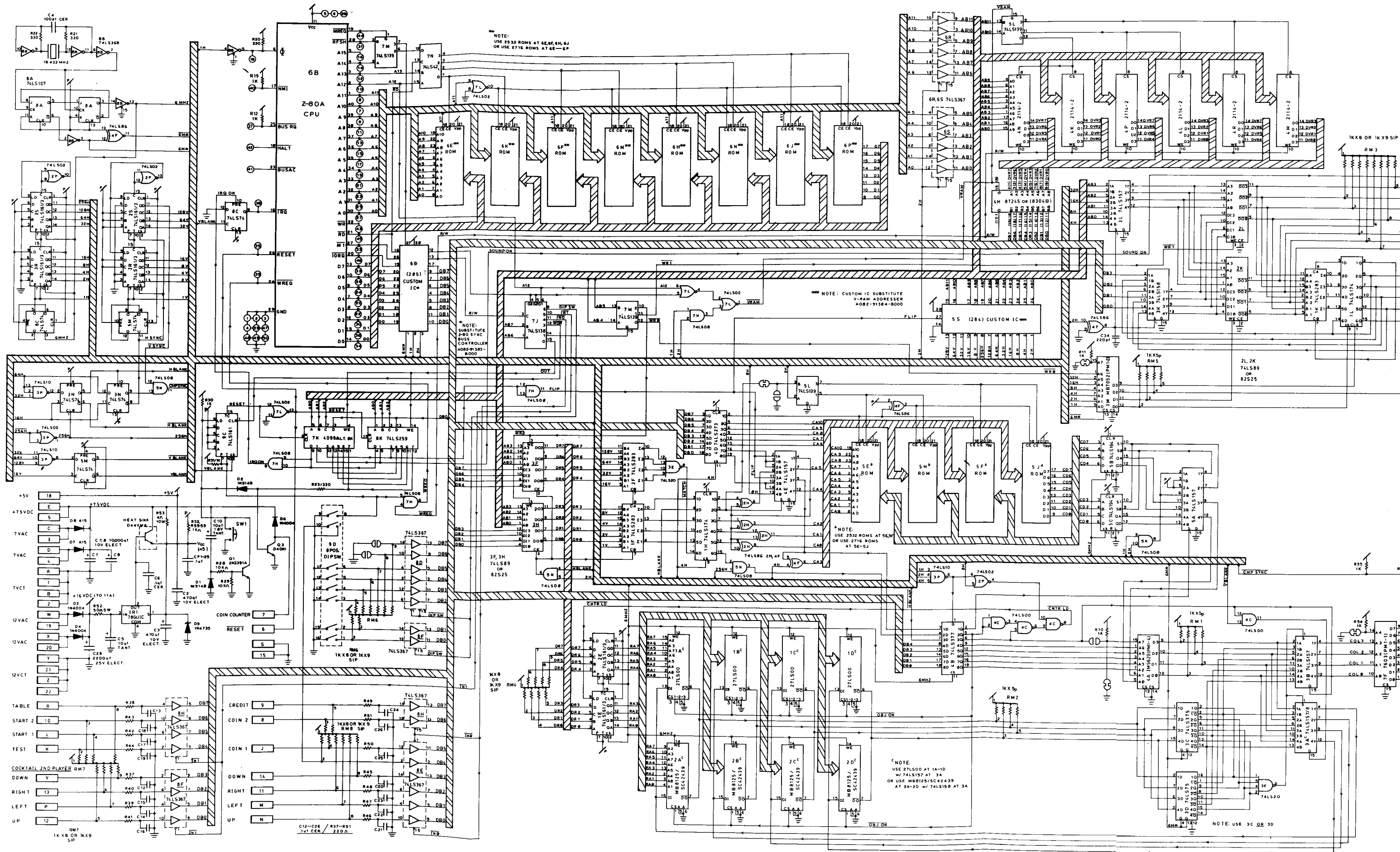
PART NO.
A082-91375-A000

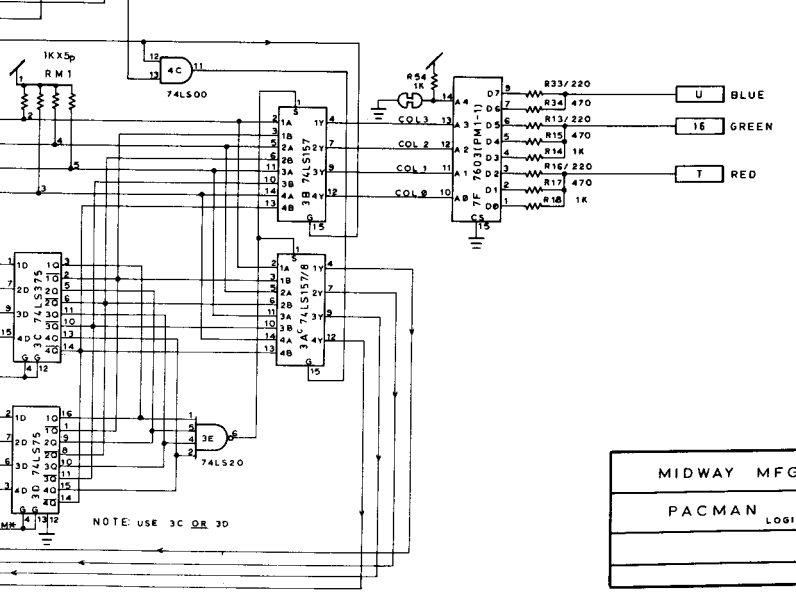
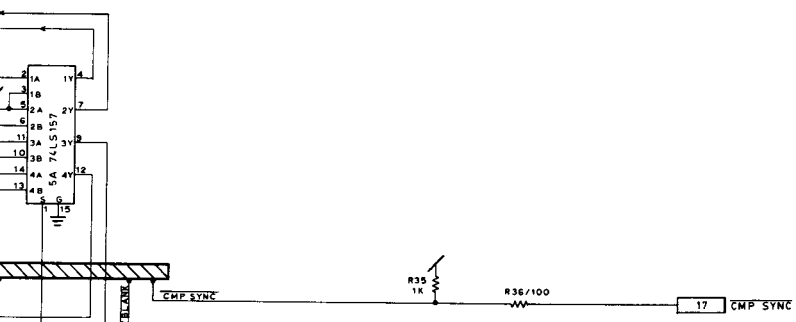
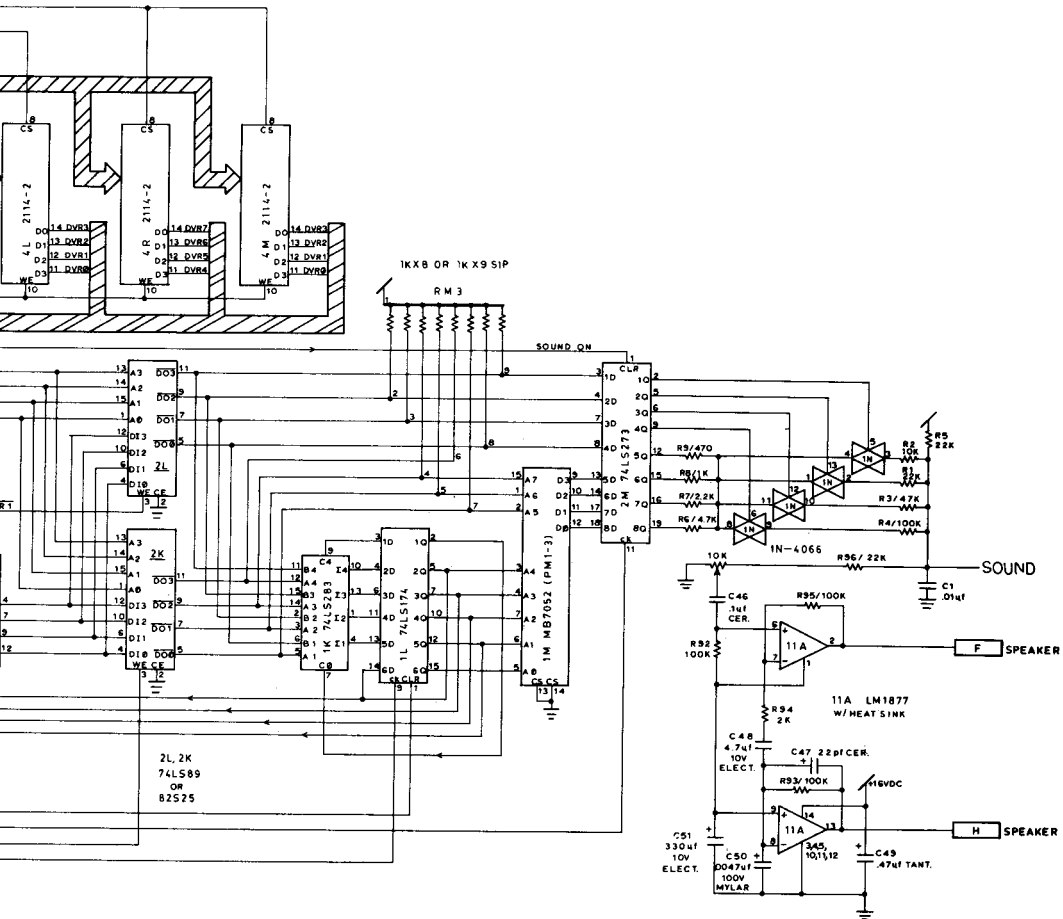
REVISIONS

NOTES

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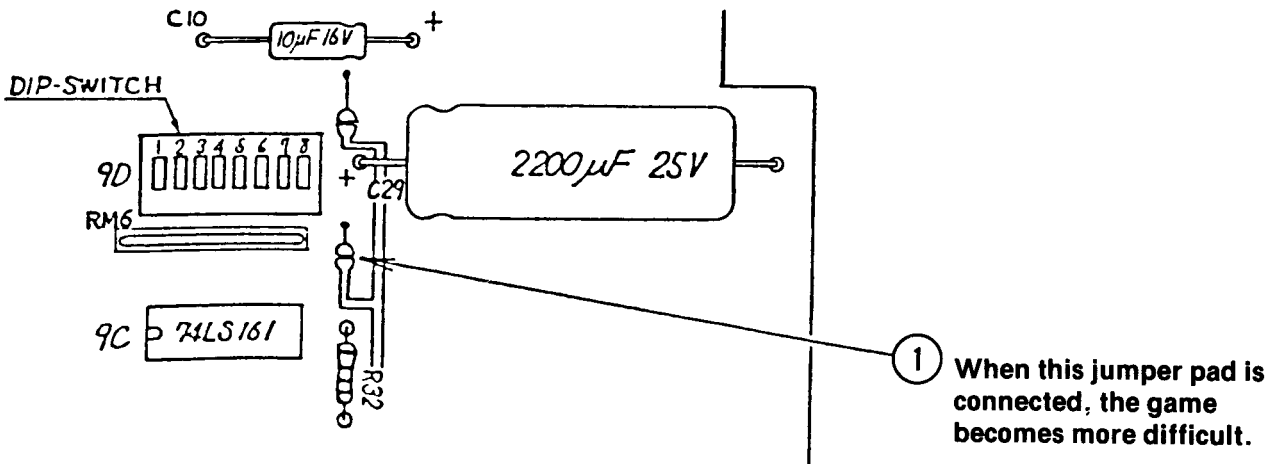
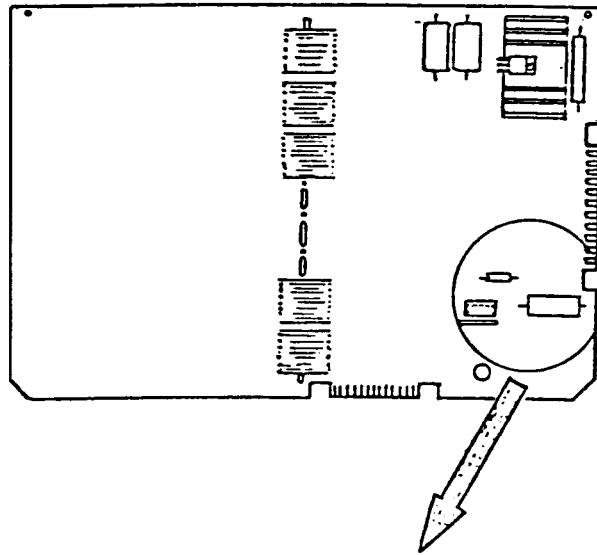
MIDWAY MFG. CO. FRANKLIN PR. ILL.

PACMAN B VERSION LOGIC BOARD CIRCUITRY

DRAWN BY *Bob Jensen* 12-9-80

INSTRUCTIONS FOR MODIFICATION OF PAC-MAN GAME PCB

THE FOLLOWING ARE INSTRUCTIONS FOR MODIFYING PAC-MAN PCB SUCH THAT ① THE DEGREE OF DIFFICULTY OF THE GAME IS INCREASED.



December 3,1980

SERVICE BULLETIN

GAME: PAC - MAN

SUBJECT: STATIC CONDITION CAUSING A FALSE RAM AND ROM TEST.

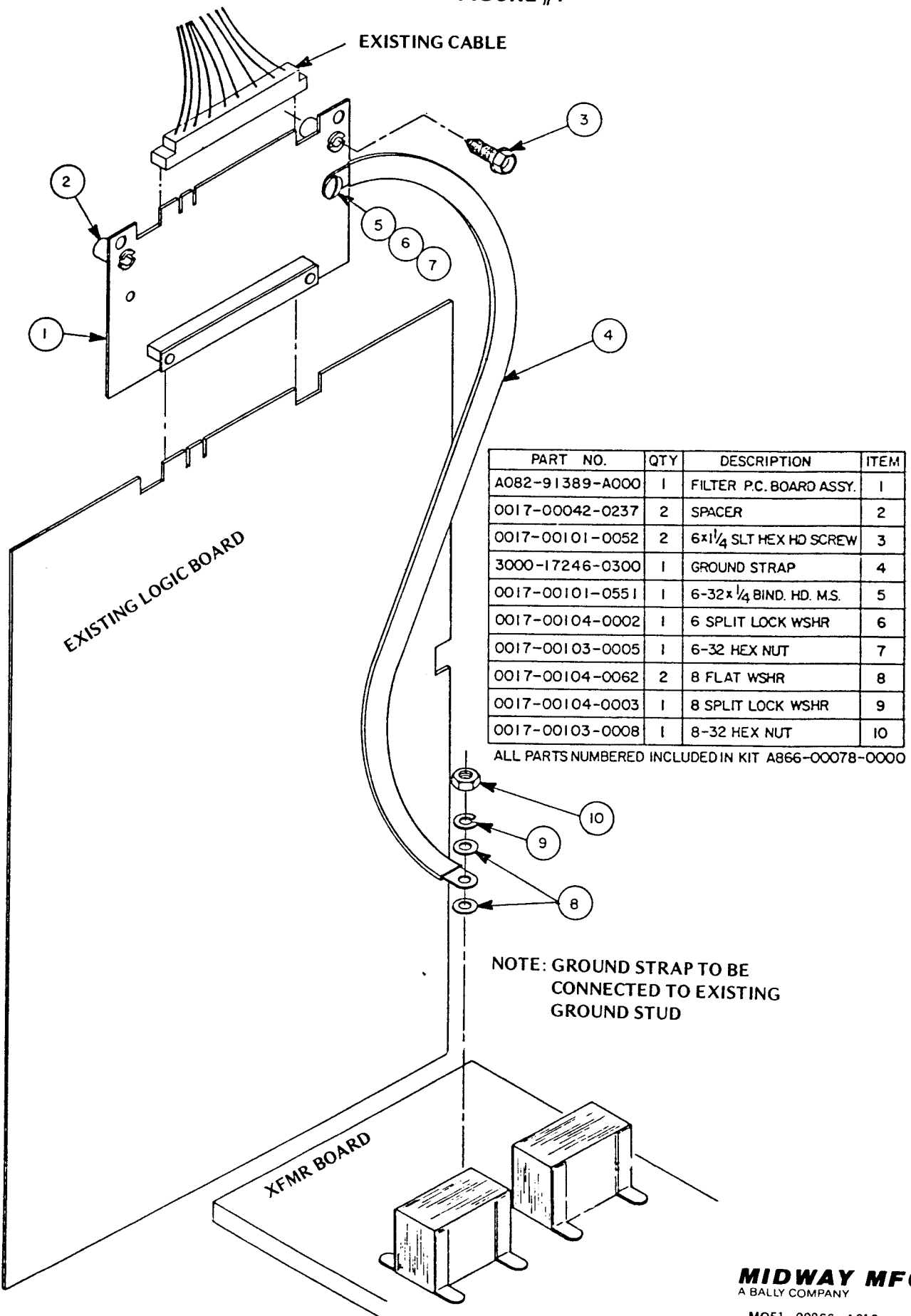
MODIFICATION:

1. ORDER FROM MIDWAY'S SERVICE DEPARTMENT A ANTI-STATIC KIT
PC A082-91389-A000 AND INSTALL AS SHOWN IN INSTRUCTION DIAGRAM.
(FIGURE #1).
2. CHECK GAME OUT ELECTRICALLY.

ANDY DUCAY
SERVICE MANAGER

ANTI-STATIC INSTALLATION INSTRUCTIONS

FIGURE #1



MIDWAY MFG. CO.
A BALLY COMPANY

MO51-00866-A019

NOTES

This Space is provided for personal notes