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**namco**

# TANK ザタンクバリアン

アップライト・タンクバリアン 説明書

MAINTENANCE / SERVICE MANUAL

UPRIGHT TYPE

NAMCO LIMITED

2-8-5, TAMAGAWA, OHTA-KU, TOKYO, JAPAN

株式会社ナムコ 本社 〒146 東京都大田区多摩川2-8-5 ☎03(759)2311(大代)

## 1. Specifications

Power Supply:

Power Consumption: 120 W

Game Fee: 1 coin/1 play  
( operator adjustable to 2 coins/1 play, 1 coin/2 plays, or  
free play.)

Dimensions: length 630 mm  
width 800 mm  
height 1,738 mm

Weight: 91.5 kg

Coin Box Capacity: Approx. 5,200 pcs of ¥100 coins

Monitor: 20" color

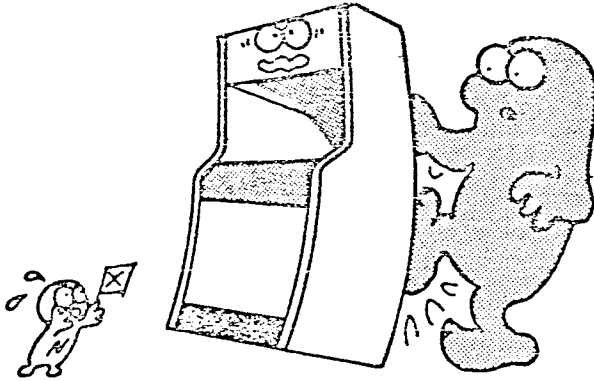
Accessories: Keys	rear door	2 pcs
	selectot door	2 "
	cash box	2 "
	Fuse 5A ( slow blow )	1 "
	1A	1 "
	Start Button Lamp 6.3 V, 0.15 A	1 "
	Instruction Manual	1 "
	Monitor Instruction Sheet	1 "

Note: Specification may change without any prior notice.

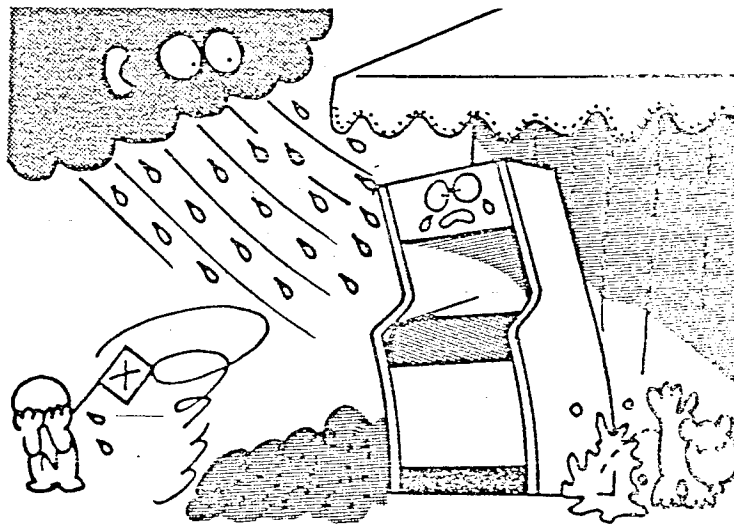
## 2. CAUTION

### (1) Transportation and Installation

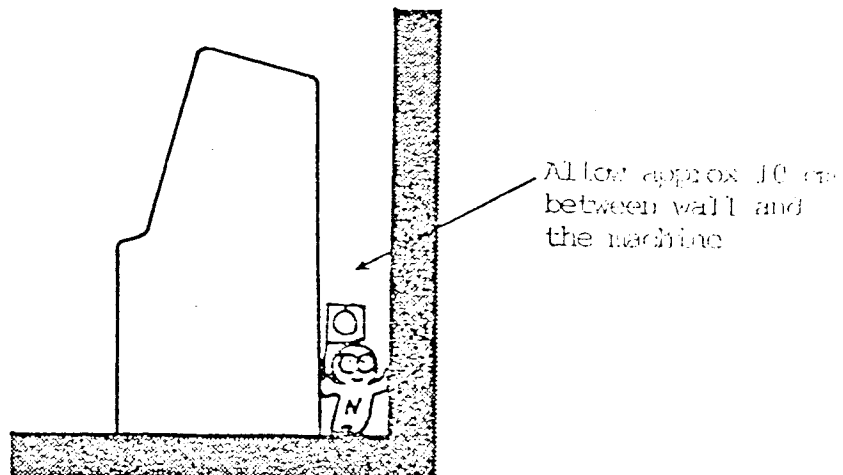
\* The picture tube is fragile, avoid rough handling in transportation.



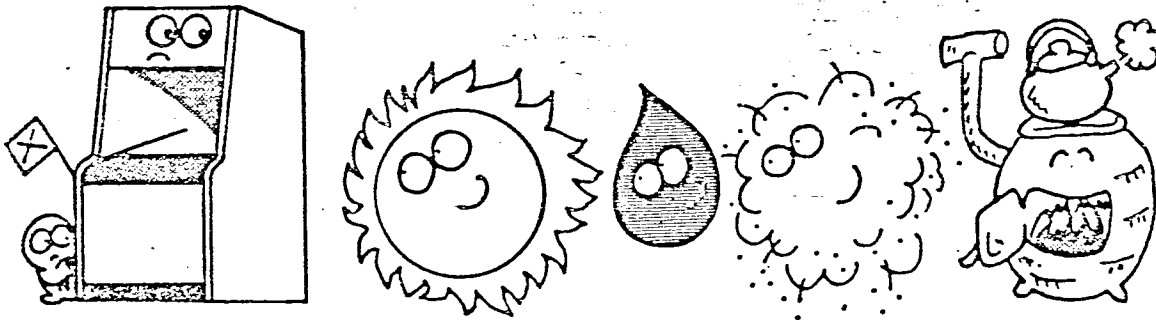
\* Namco Game is for indoor use only. Do not install the machine outdoors.



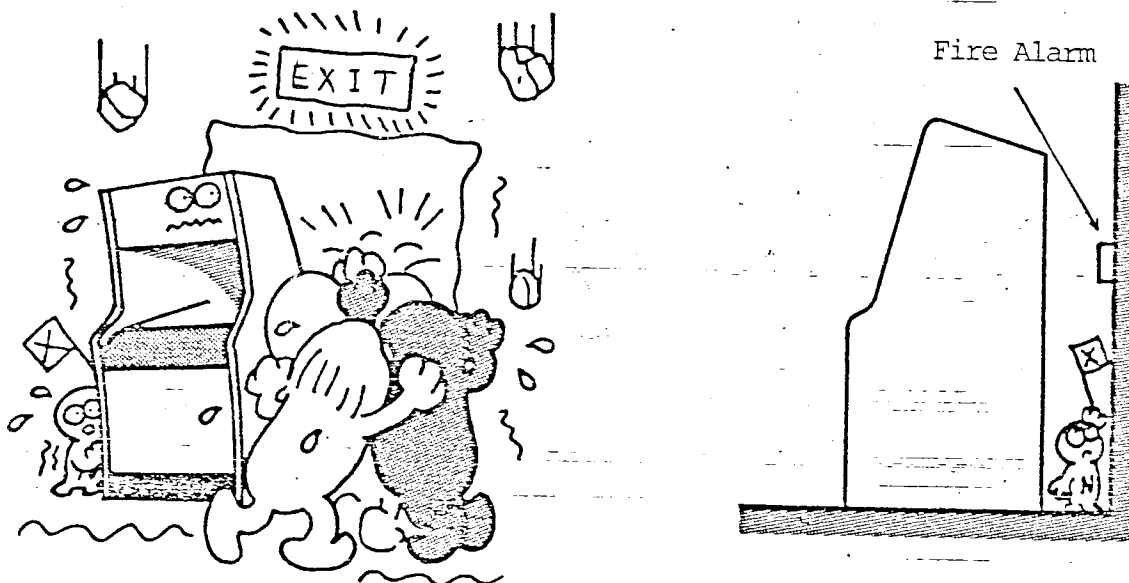
\* Install the machine on a flat-surfaced floor, do not install on un-stable or vibrating floor.



\* Do not install this game at places directly exposed to sunlight or excessive heat to prevent rising internal temperature. Also, do not install the machine at damp or dusty places.

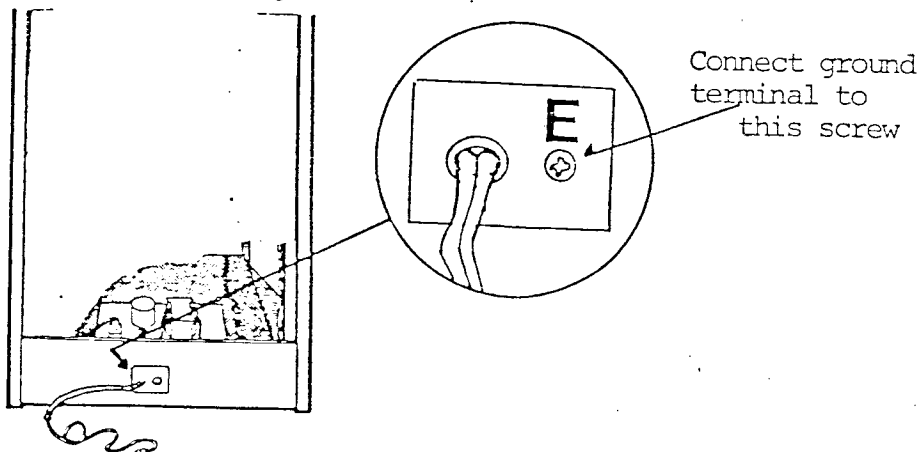


\* Do not install this game at places obstructing fire alarm or emergency exit.

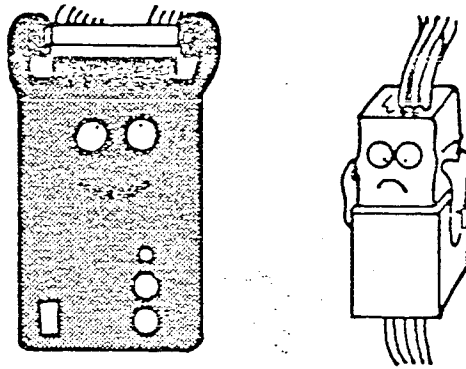


\* Make sure that no child can enter between the machine and the wall.

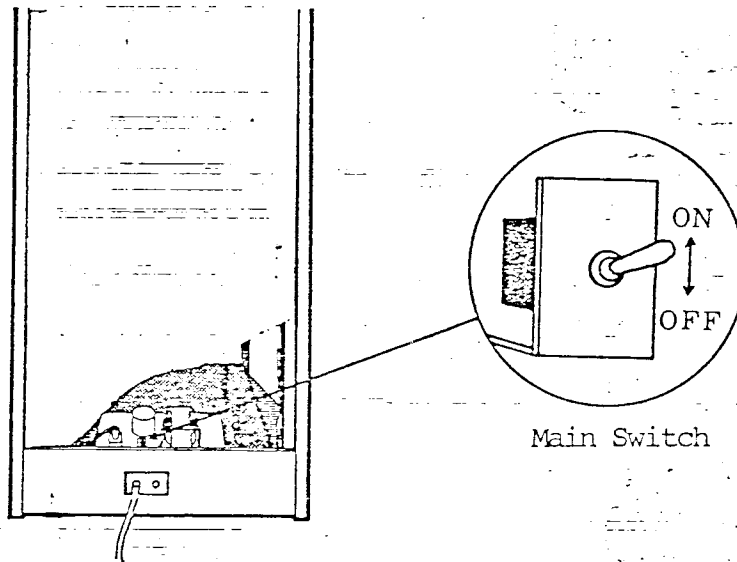
\* Make sure that the machine is grounded.



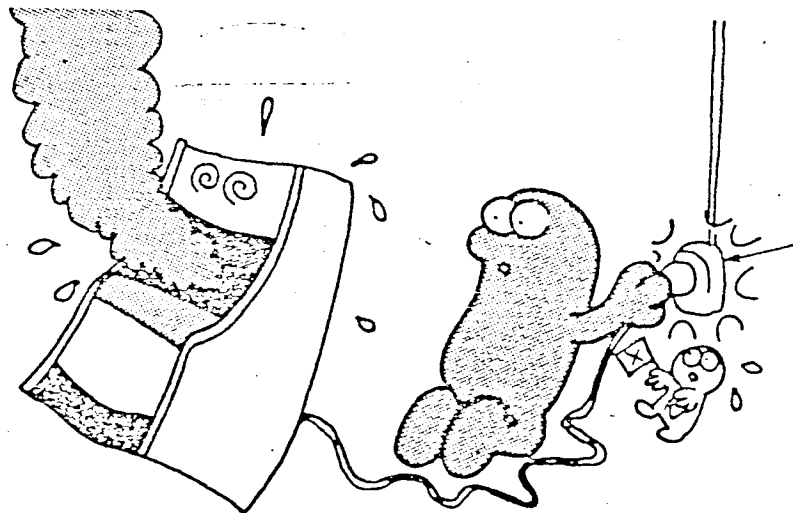
\* Make sure that PCB connectors and other connectors are firmly connected.



\* Make sure that the main switch is on.

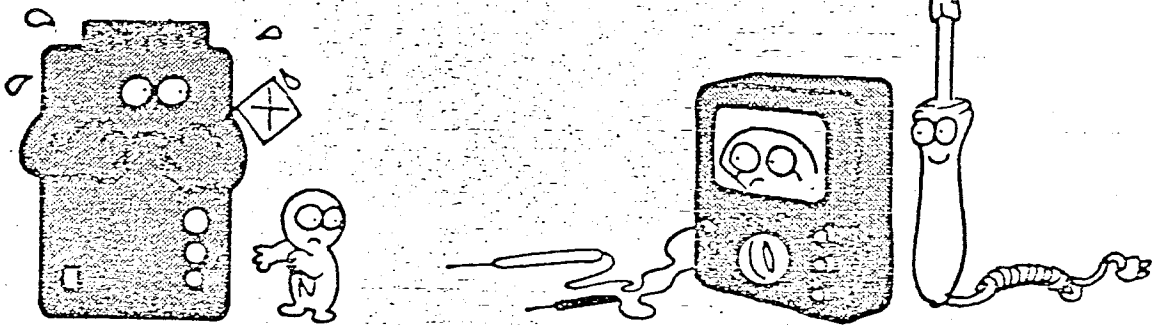


\* Connect the power cord to the appropriate power outlet check.

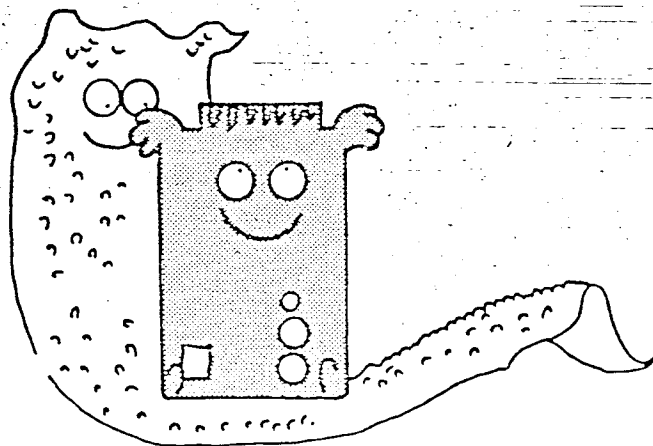


## (2) Handling Precaution

- \* High voltage electricity runs in the monitor. Therefore only person familiar with safety measures should perform the adjustment.
- \* Because of its solid-state electronic circuitry, this unit should require very little maintenance. However, since mis-handling can damage this unit, the following precaution should always be followed.
  1. Always put power off before replacing parts or disconnecting pluts.
  2. Always take the PCB to your dealer for repair, do not attempt to make any repair or test with a volt-ohmmeter or other testing equipment, since the internal voltage of the testing equipment may cause damage to the circuitry.



3. Always face connectors to the proper direction when connecting.
- \* For transportation of PCB always use adequate packing styrofoam or plastic air bags.
  - \* Do not pull the cord when un-plugging the power cord, always hold and pull the plug from the pwer outlet.



### 3. Game Play

- \* One or two players can play.
- \* Coinage & Game time operator adjustable. ( See change of Option Switch )
- \* Figure 3-1 shows the screen immediately after the machine is plugged in. This screen is called Attract Mode.

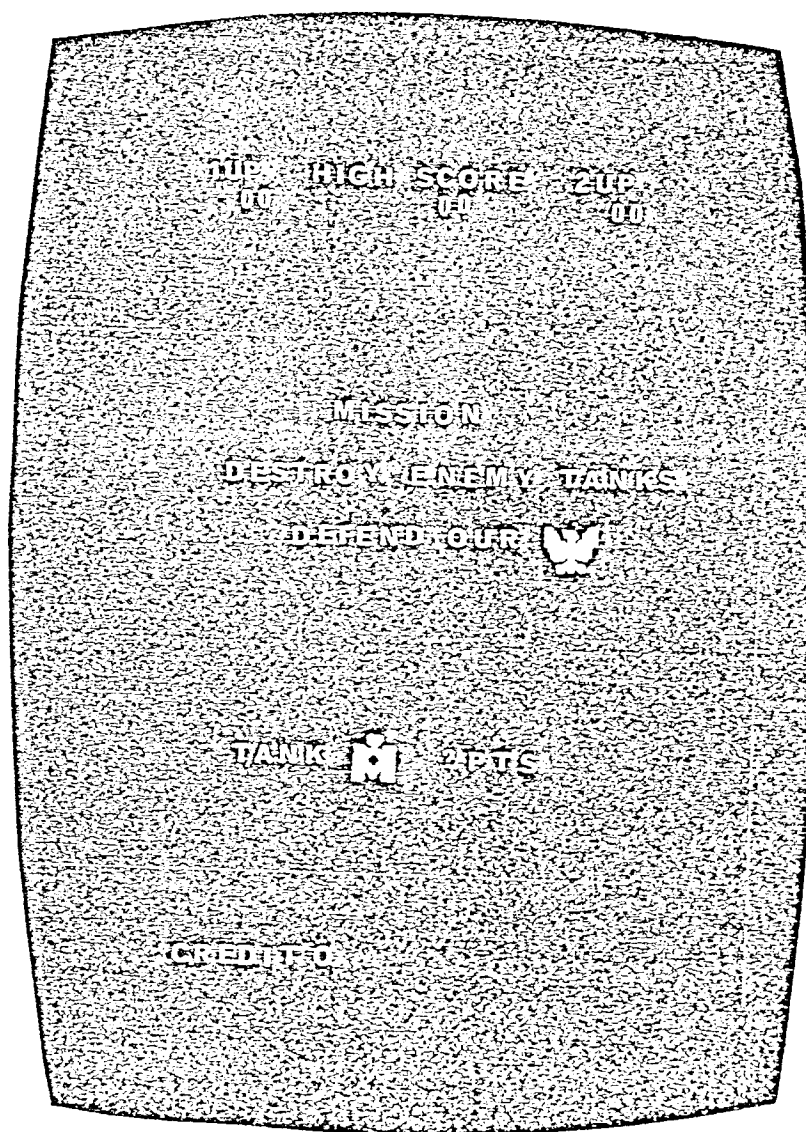


fig. 3-1 Attract Mode

\* Screen Display

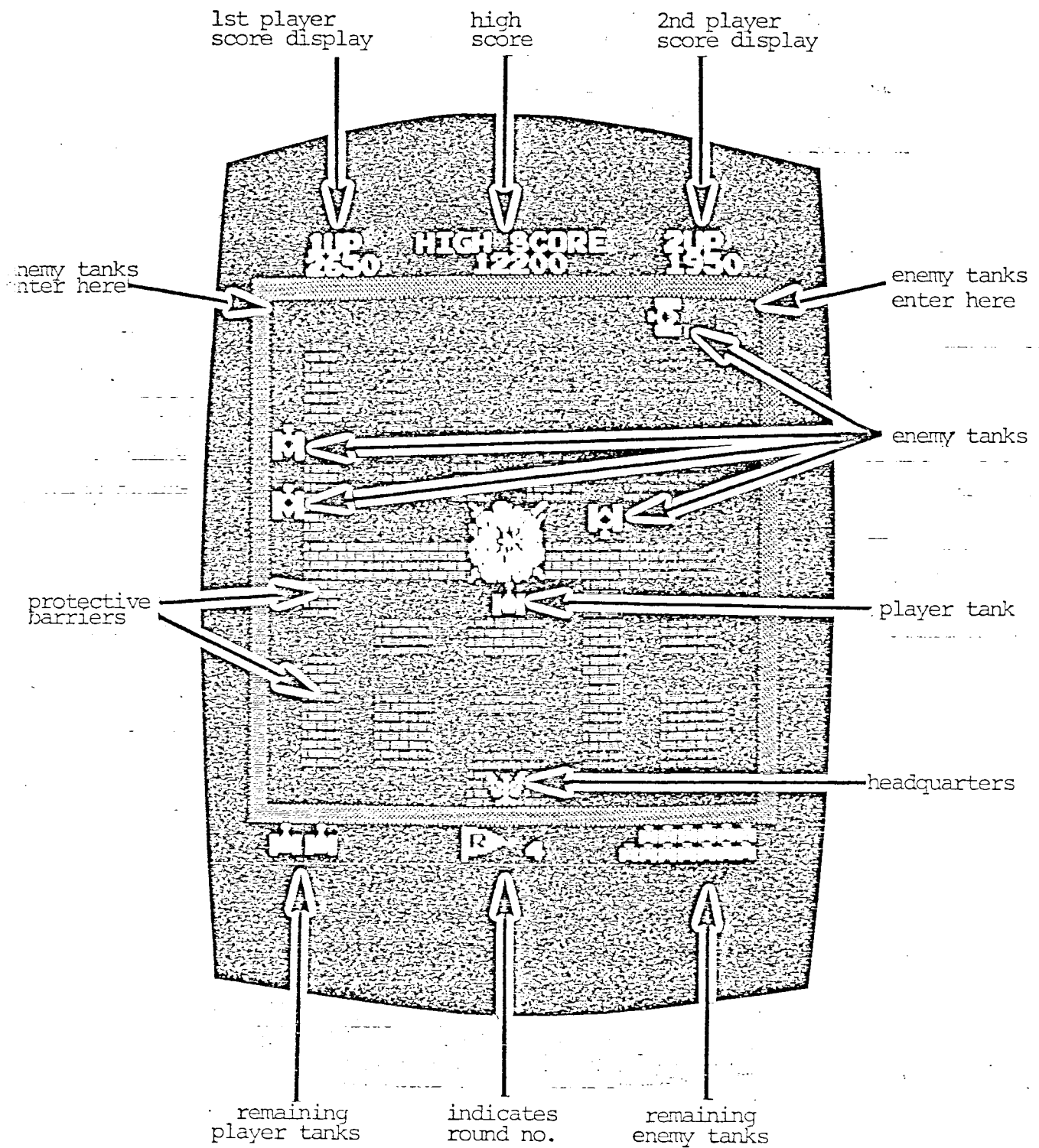


Figure 3-2



#### 4. How to Play and Score

- \* The player battles with attacking enemy tanks, defending his headquarters while destroying as many enemy tanks as he can.
- \* The player can drive his tank left, right, up, and down with the 4-way lever.
- \* The player can fire one shell at a time. He cannot fire again until the last shell is still on the screen.
- \* The player's shells stay visible on the screen until:
  - 1- they hit an enemy tank or the protective barrier, or
  - 2- they collide with an enemy shell, or
  - 3- they strike the outer wall, or
  - 4- they are absorbed in an explosion.
- \* The enemy tanks enter the screen from the upper left and right hand corners of the screen and gradually close in on the player tank and on headquarters. The enemy tanks can fire up to two shells onto the screen at a time.
- \* The fighting becomes fiercer as time goes by and as the number of remaining enemy tanks decreases.
- \* Each round is complete when 20 enemy tanks have been destroyed. The number of remaining enemy tanks is displayed in the lower right-hand corner of the playing screen.
- \* The score for destroying an enemy tank increases depending on how close the player tank is to the enemy tank --the shorter the range, the higher the score. Also, the score is higher if the player hits the enemy tank in the front.

Here are the possible scores:

- frontal hits: 800, 300, 150, or 60 points
- side or rear hits: 300, 150, 60, or 30 points.

## 5. ADJUSTMENT

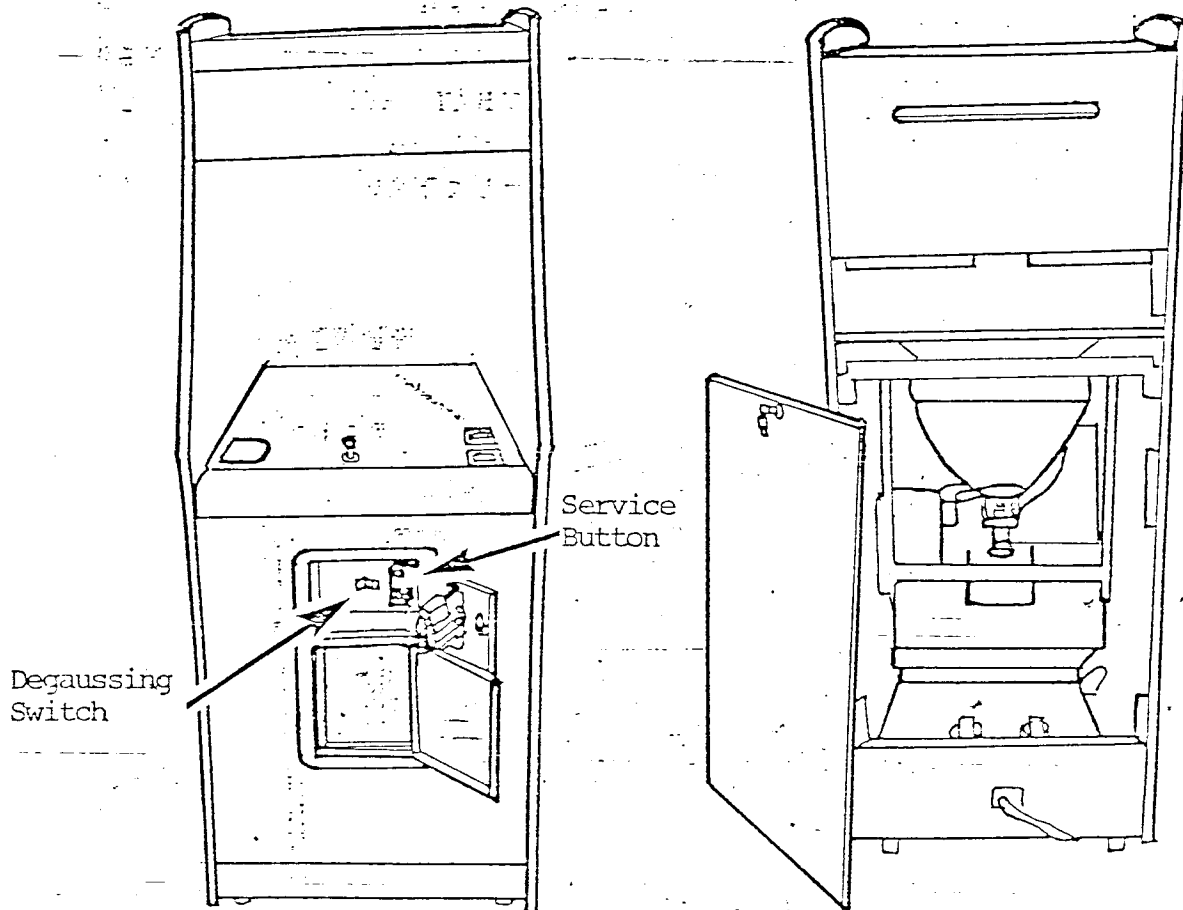


Fig. 5-1

### (1) Degaussing Switch

Because the Tank Battalion uses a color picture tube, the color registration may deteriorate when the unit is first installed or moved to a different location. The degaussing switch is provided to correct this problem; degaussing should be performed every time the unit is moved to maintain picture quality. The picture tube will be demagnetized when this switch is turned ON. Approximately 15 seconds are needed to demagnetize the picture tube. Be sure to turn the switch OFF after the time has elapsed. Wait at least 10 minutes before repeating.

### (2) Service Button

For purposes of repair or adjustment the game can be test-played without advancing the coin counter by use of this button.

### (3) SELF-TEST

A self-test function is installed in this game. Preferably, the tests should be performed every day.

#### 1) Automatic Self-Test

A test of the PCB is automatically performed every time the game's power supply is turned on. If there are no irregularities, the game goes immediately into the attract mode, but otherwise, the test repeats itself and the words "BAD ROM" or "BAD RAM" appear on the screen. As explained below, further tests should be performed for volume and on the assorted switches, etc.

\* Contact your dealer if the self-test shows any defects.

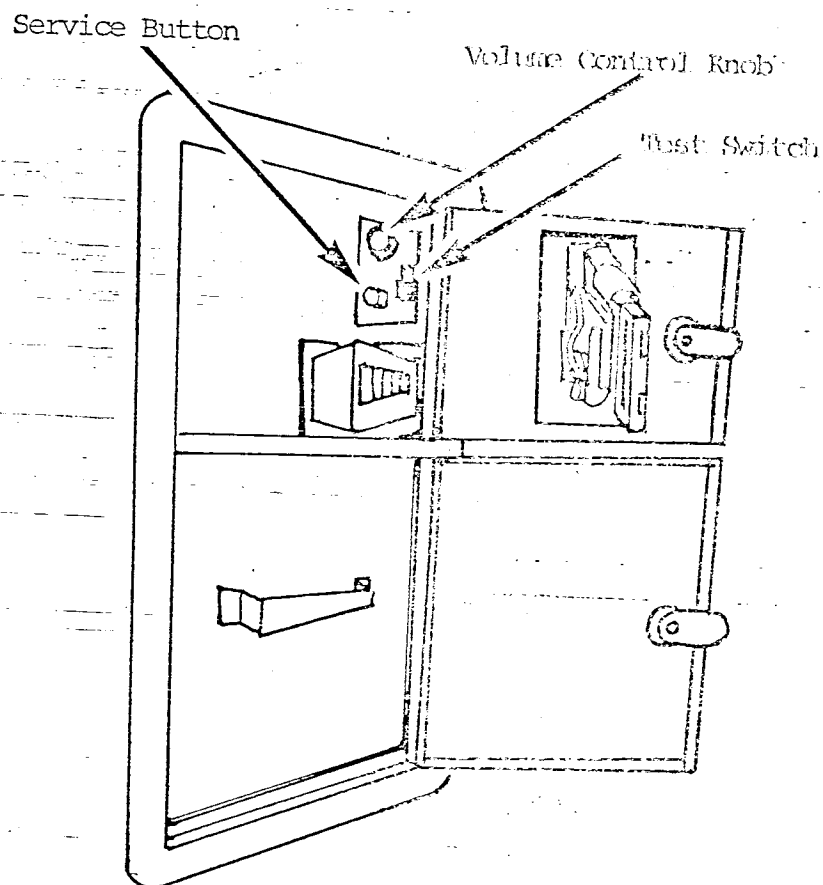


fig. 5-2

#### 2) Further Tests by Self-Test Switch

The test switch is a slide switch located behind the selector door. Self-test series begins automatically when switch is pushed to "ON".

- A. Numbers of letters will flash on the screen for approximately 3 seconds during the test mode. During this period the PCB test is being performed. if the PCB is good the following information will be displayed on the screen.

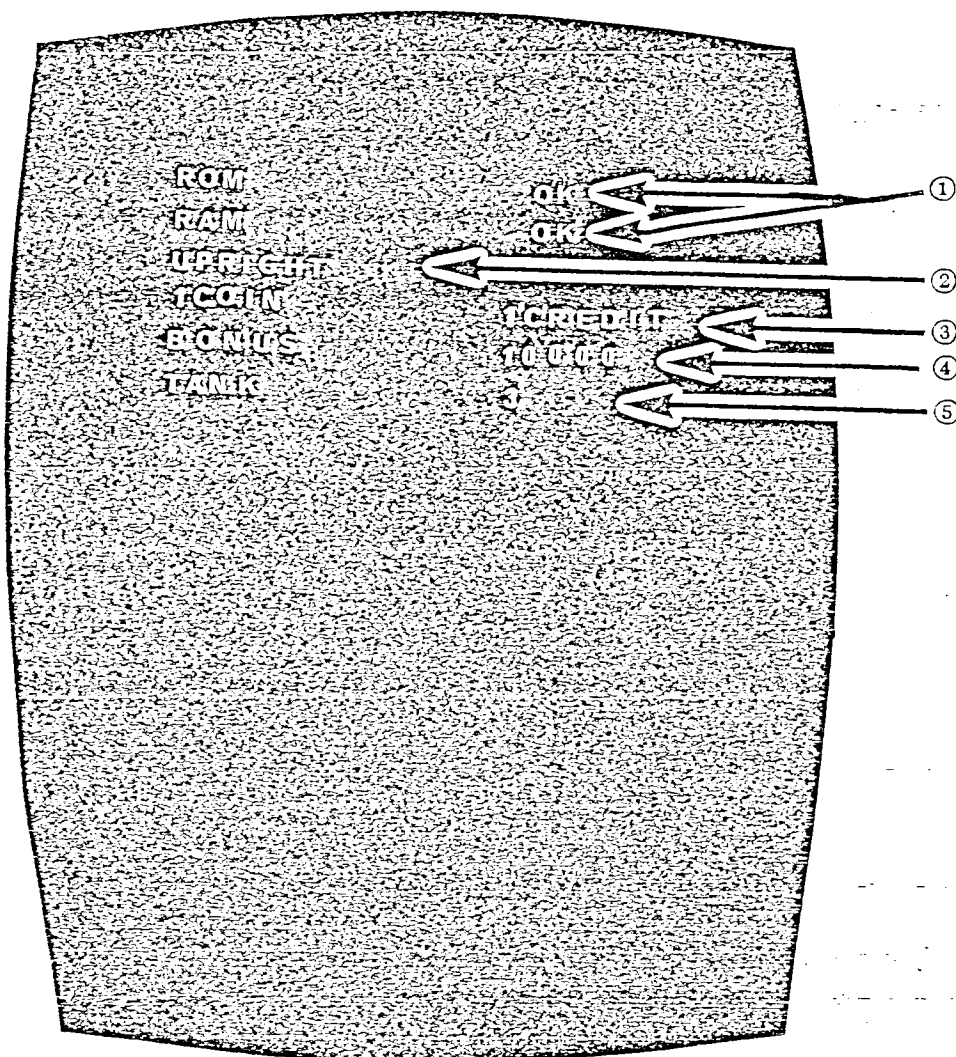


Fig. 5-3 Test Mode

① Ram/Rom Test

If the Rams and Roms are good, "OK" will be displayed on the screen, but if any of the Rams or Roms are faulty, a number indicating the faulty, a number indicating the faulty Rams or Rom will be displayed.

② UPRIGHT-type

③ Game Fee Setting

In the above, 1 coin per 1 play.

④ Bonus Adjustment

⑤ Number of Tanks per Game

NOTE: The above ②, ③, and ④ are operator-adjustable.

B. Lamp Test

Start buttons (1 player, 2 player) will blink if lamps are normal.

C. Switch Test

The lever, start buttons (1 player, 2 player), micro switch can be checked at this stage. Each switch, if normal, should produce a game sound when pressed or moved.

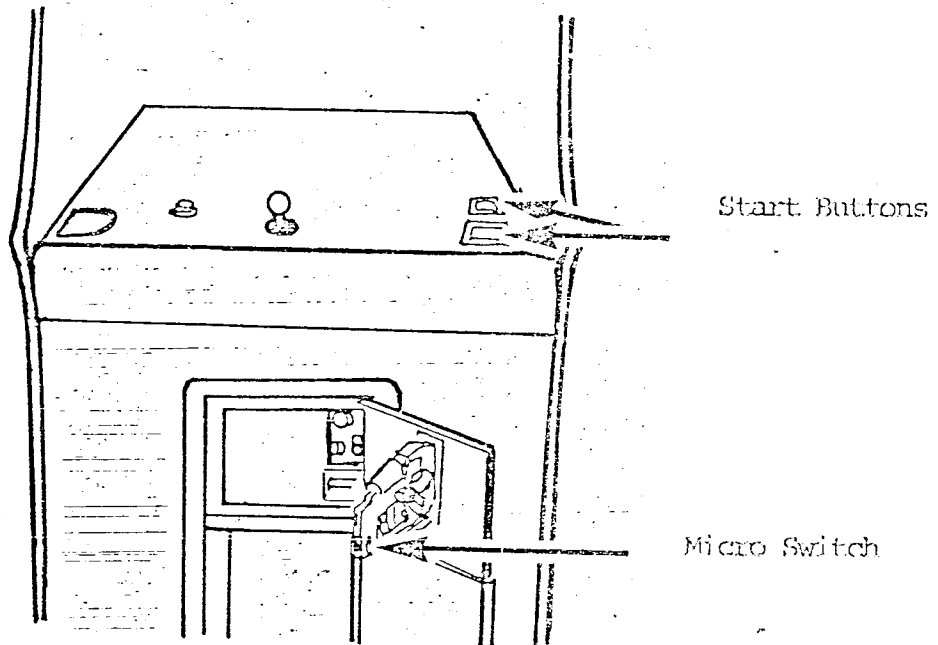


Fig. 5-4 Switch Test

Return the self-test switch to the OFF POSITION.

D. Lock-Out Coil Test

When the self-test switch is returned to the OFF position the lock-out coil should close for an instant and re-open. Also, a test pattern (Fig. 5-5) appears on the screen for approximately 1 second. This pattern can be used for adjusting the monitor and can be kept on the screen by immediately sliding the self-test switch back to ON.

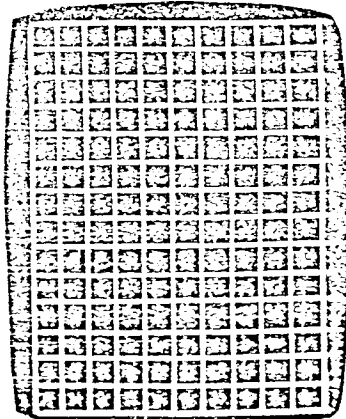


Fig. 5-5 Test Pattern

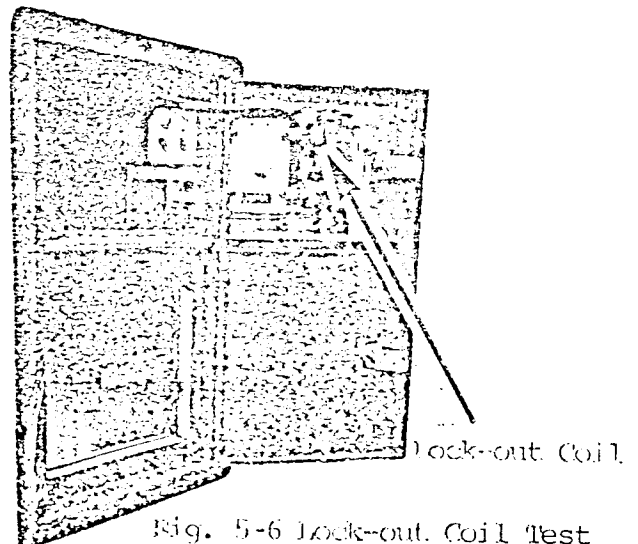


Fig. 5-6 Lock-out Coil Test

(4) Volume Adjustment (see p. 10)

Volume can be adjusted by either one of two knobs -- one on the PCB and one behind the selector door.

(5) Option Switch

The option switch is mounted on the PCB. The number of Tanks per game, the game fee, and the bonus points can be changed with this switch. This switch should not be used while the game is connected to its power source. After changing options, the test described in 3.(2) above should be performed and the changes confirmed. There is also a game-reset switch on the PCB.

Option	Position of switches					
	1	2	3	4	5	6
Game Fee						NOT USED
1 coin/1 play	OFF	OFF				
1 coin/2 play	OFF	ON				
2 coin/1 play	ON	OFF				
Free Game	ON	ON				
Bonus Points						
zero			OFF	OFF		
10,000			OFF	ON		
15,000			ON	OFF		
20,000			ON	ON		
# of TANK/Game						
2					OFF	
3					ON	
Situation at Delivery	OFF	OFF	ON	ON	ON	OFF

PCB Board

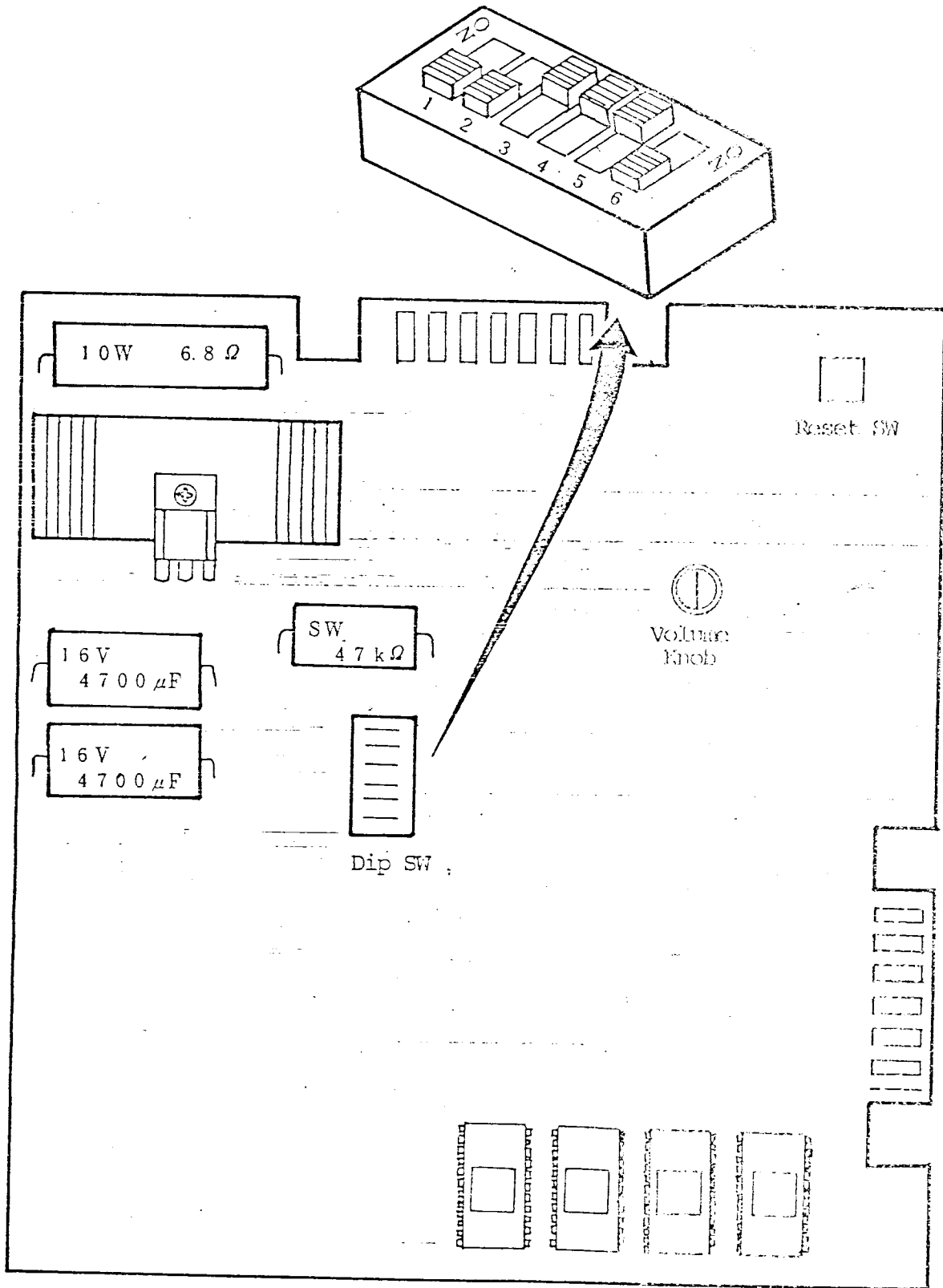


Figure 5-7 PCB

## 5. MAINTENANCE

### (1) Replacing Fluorescent Lamp for Sign Board

- 1- Disconnect game from power supply.
- 2- Loosen screws on lower retainer slightly.
- 3- Take out 3 screws from upper retainer and remove it.
- 4- Remove sign board plexiglas. Fluorescent tube (15 W) will then be accessible.

### (2) Removing Control Panel

- 1- Turn off power supply.
- 2- Open selector door and remove nylon connector (J7-I2P) attached to control panel.
- 3- Remove catch-clips from front of control panel.
- 4- Lift and pull the panel forward.

CAUTION: Be careful when removing panel not to scratch plexiglas.

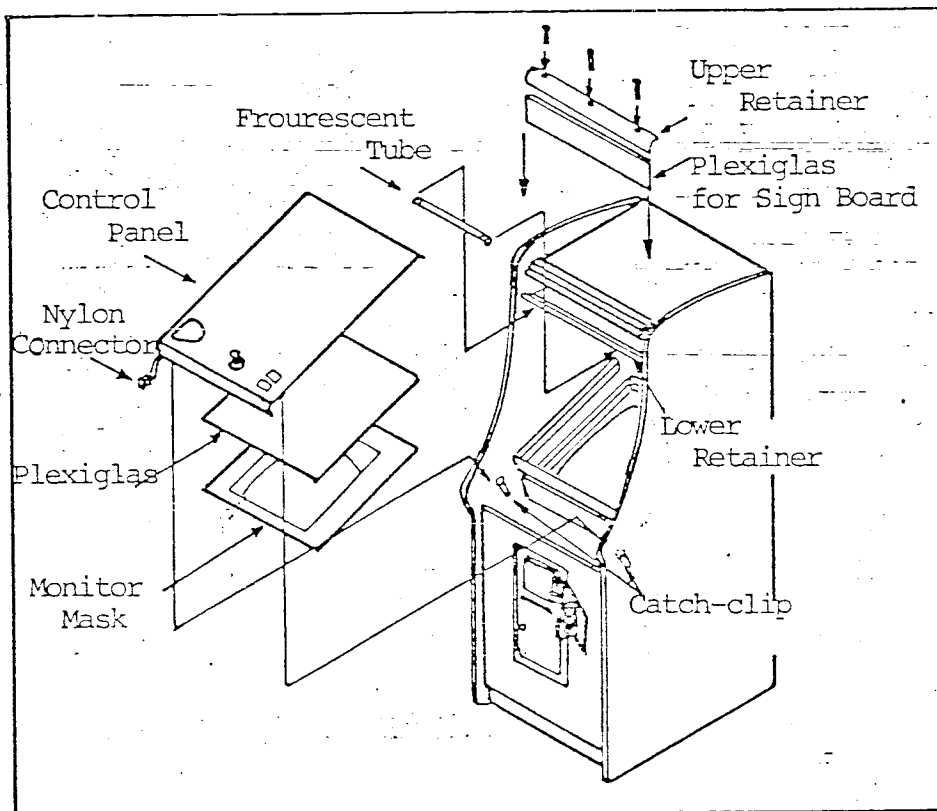


Fig. 6-1 Replacement of Fluorescent Lamp  
& Control Panel



(3) Replacing Control Lever Switches

Access to control lever switches can be gained by removing control panel. (See page 11, (2))

The screws holding the switch are M3.

Disconnect all wiring before removing switch.

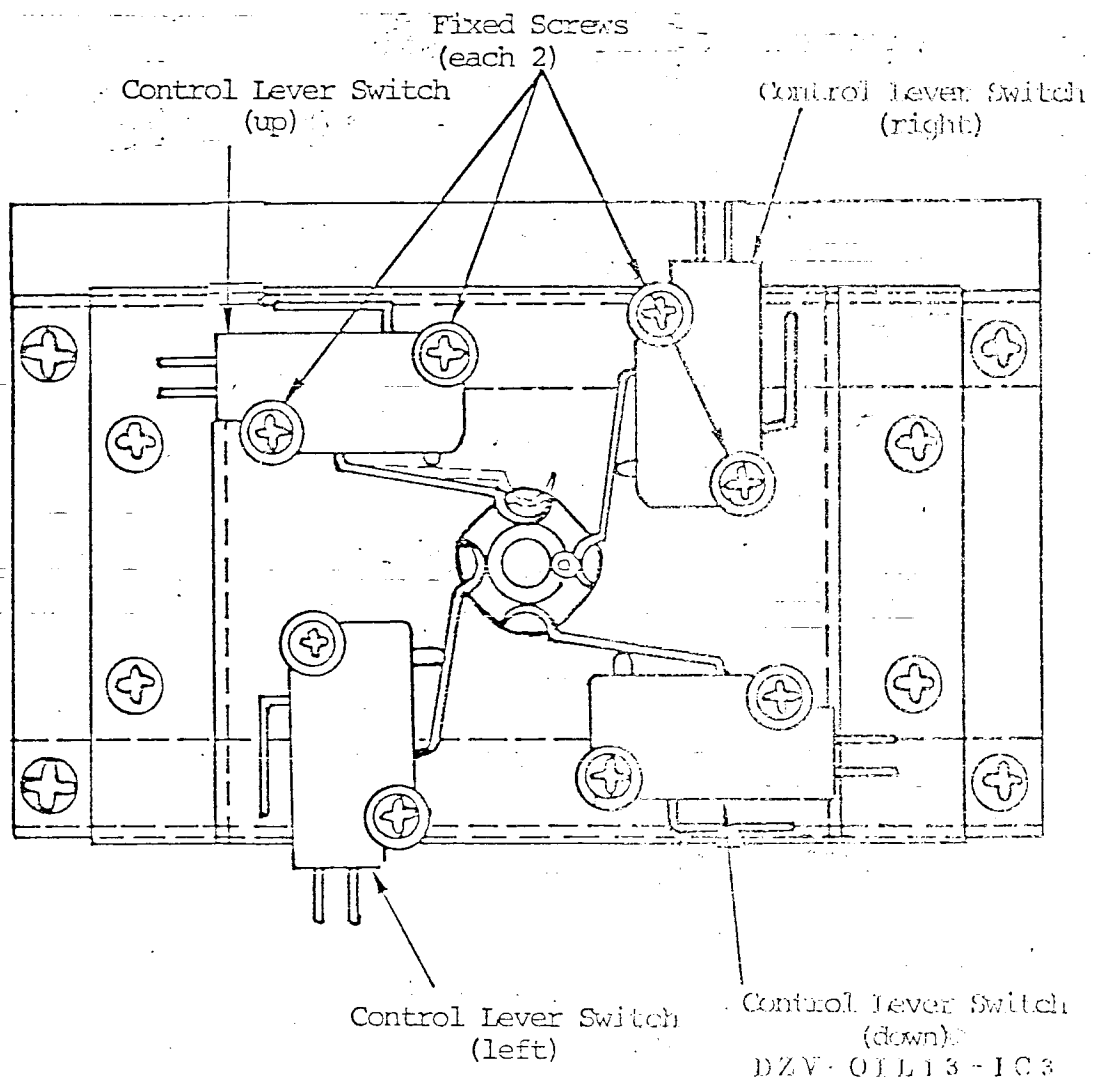


Fig. G-2 Replacement of Control Lever Switch

#### (4) Replacing Start Button Switches and Lamps

- ① Remove control panel (see page 11, (2))
- ② Remove wiring terminal
- ③ Take off 2 nuts (M4) mounted on switch bracket
- ④ To remove the switch, press the lock clip mounted on the switch.
- ⑤ To remove lamp (6.3V, 0.15A) turn clockwise and pull.

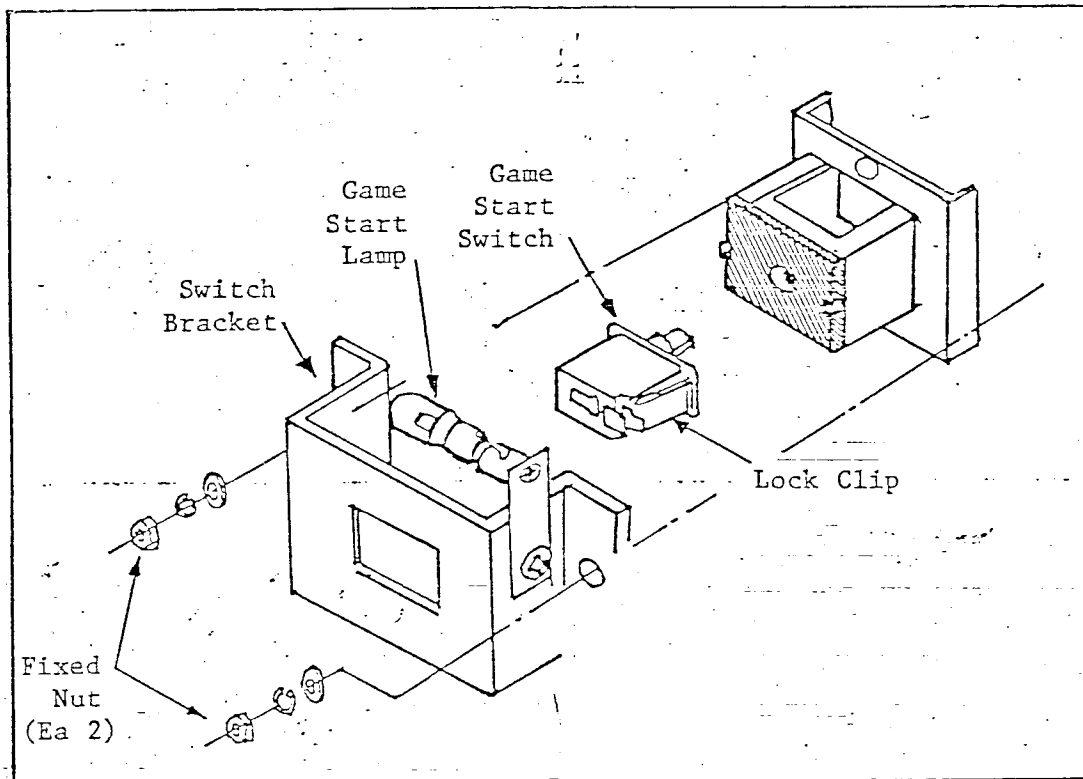


Fig. 6-3  
Replacement of Start Button Switch (Game Start Lamp)

#### (5) Removing Monitor Assembly

- ① Remove control panel (see page 15, (2))
- ② Remove smoked plexiglas and monitor mask. (Holes are provided in the ledge supporting the monitor mask. It can easily be lifted out by inserting fingers in these holes.)
- ③ Remove the 4 hex bolts (M6) mounted on assembly.
- ④ Remove the 2 nylon connectors (J4.6P, J2.9P) attached to monitor by pulling gently towards rear of machine.

CAUTION: To avoid damaging neck of picture tube in transport, pack firmly in strong box with styrofoam or similar packing material.

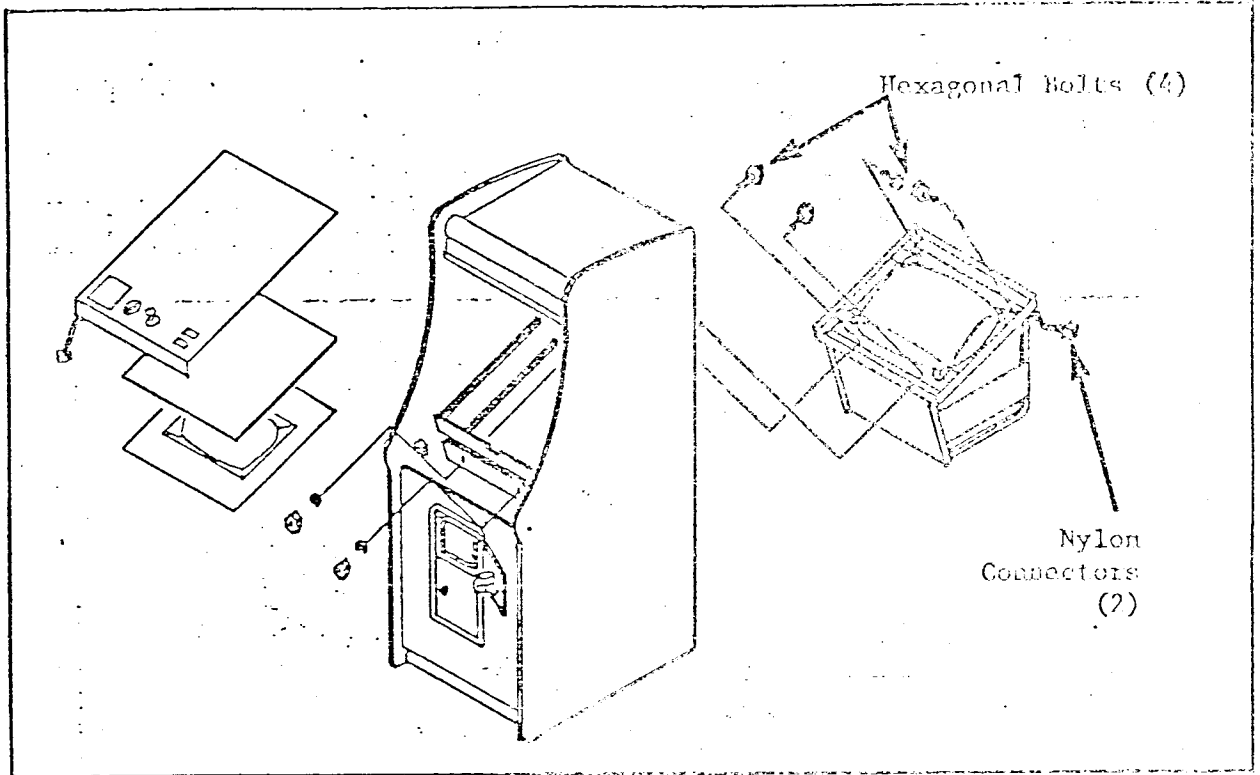


Fig. 6-4 Monitor Assembly Removal

(5) Replacing Game PC Board

- ① Open rear door and disconnect power source.
- ② Disconnect edge connector from Game PCB.
- ③ Free PCB by removing 2 tapping screws on fixed board.

CAUTION: The PCB should be packed firmly in a strong cardboard box with styrofoam or similar packing material when being shipped.

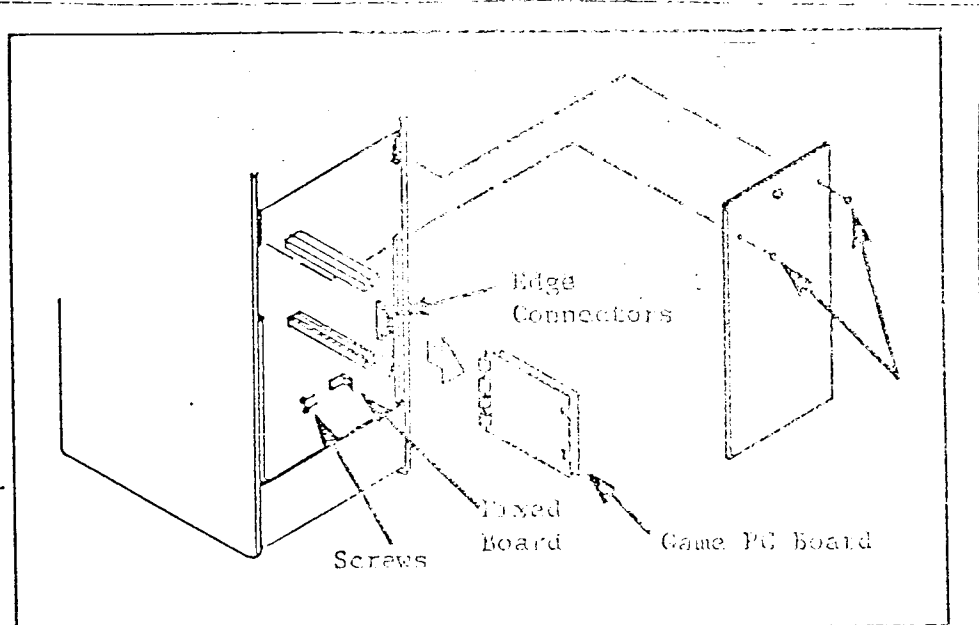


Fig. 6-5 Replacement of Game PCB

(7) Replacing Game Instruction Sheet

- 1 Remove control panel (see page 11, (2))
- 2 Remove retainer for control panel by taking off the 2 wing nuts (M5).
- 3 Instruction sheet can be slipped out from under smoked plexiglas.

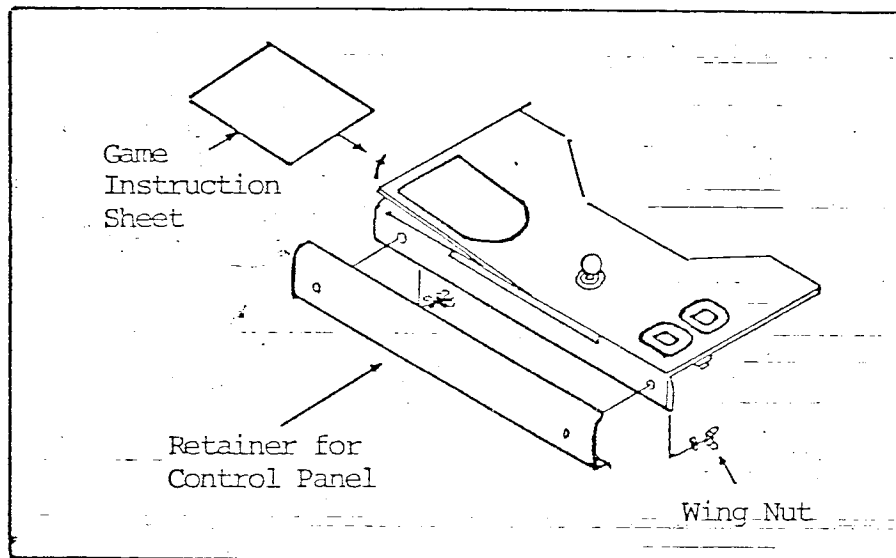
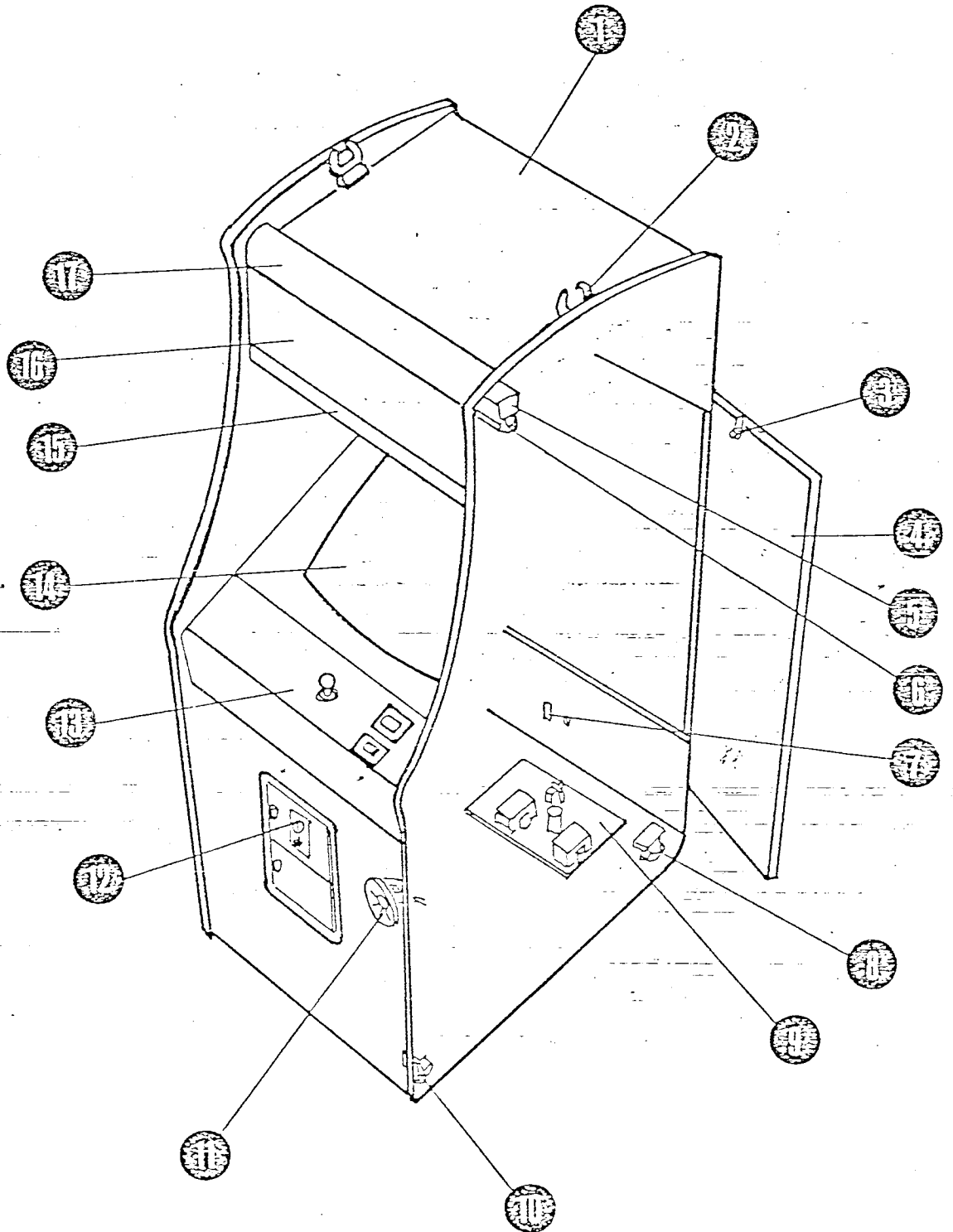


Fig. 6-6 Replacement of Game Instruction Sheet

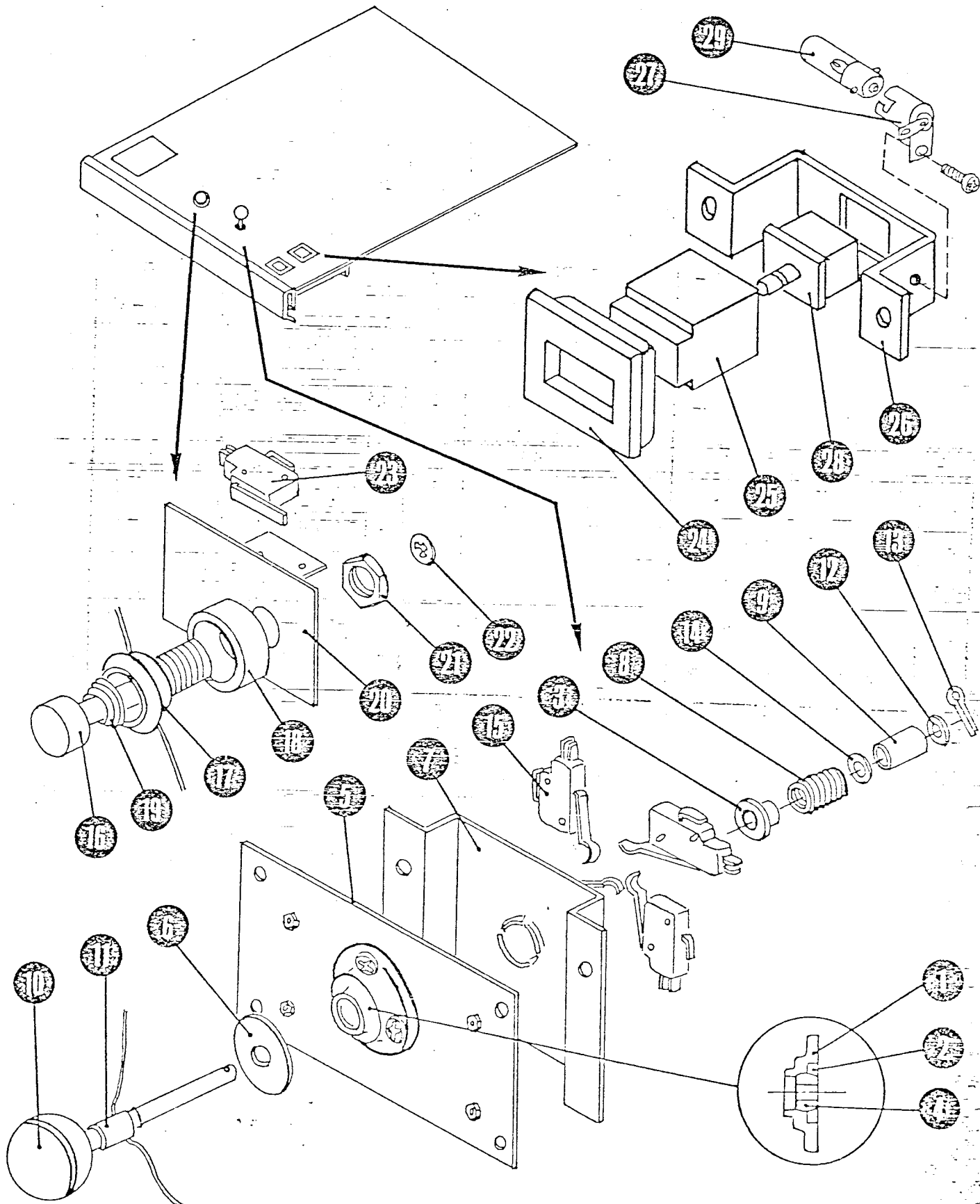
# 7. CONSTRUCTION DIAGRAM

## (1) Final Assembly



NO	DESCRIPTION	TYPE	Q'TY	PART NO.	REFERENCE
1	Cabinet		1	23081011 ①	
2	Rope Hook		2	20001004 ①	
3	Coin Lock		1	23081000 ①	
4	Rear Door		1	86021016 ①	
5	Flourescent Bracket	FT-1500	1	23089102 5/7 ③	
6	Flourescent Bulb	15W white	1	23089102 5/7 ④	
7	Ground Terminal		1	20001003 ①	
8	Caster	420R-N-ø65	2		
9	Power Supply Assembly		1	23083000	PAGE 27
10	Hight Adjuster		2	85010002	
11	Speaker	EAS - 12P83SW	1	23089102 5/7 ⑤	
12	Coin Assembly		1	81050001	
13	Control Panel Assembly		1	23082000	PAGE 15
14	Monitor Assembly		1	84061000	PAGE 17
15	Lower Retainer		1	86021011 ②	
16	Sign Board		1	86021012 ①	
17	Upper Retainer		1	86021011 ①	

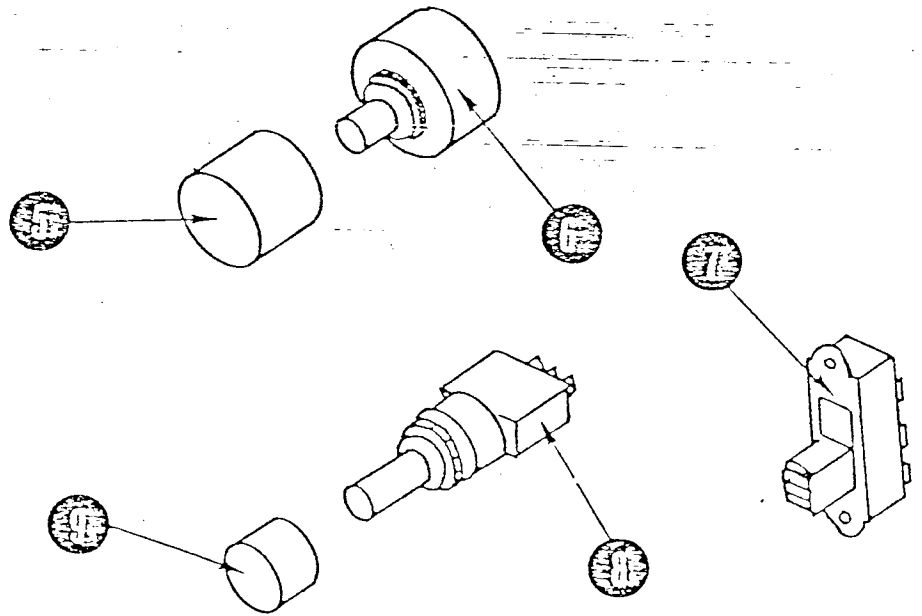
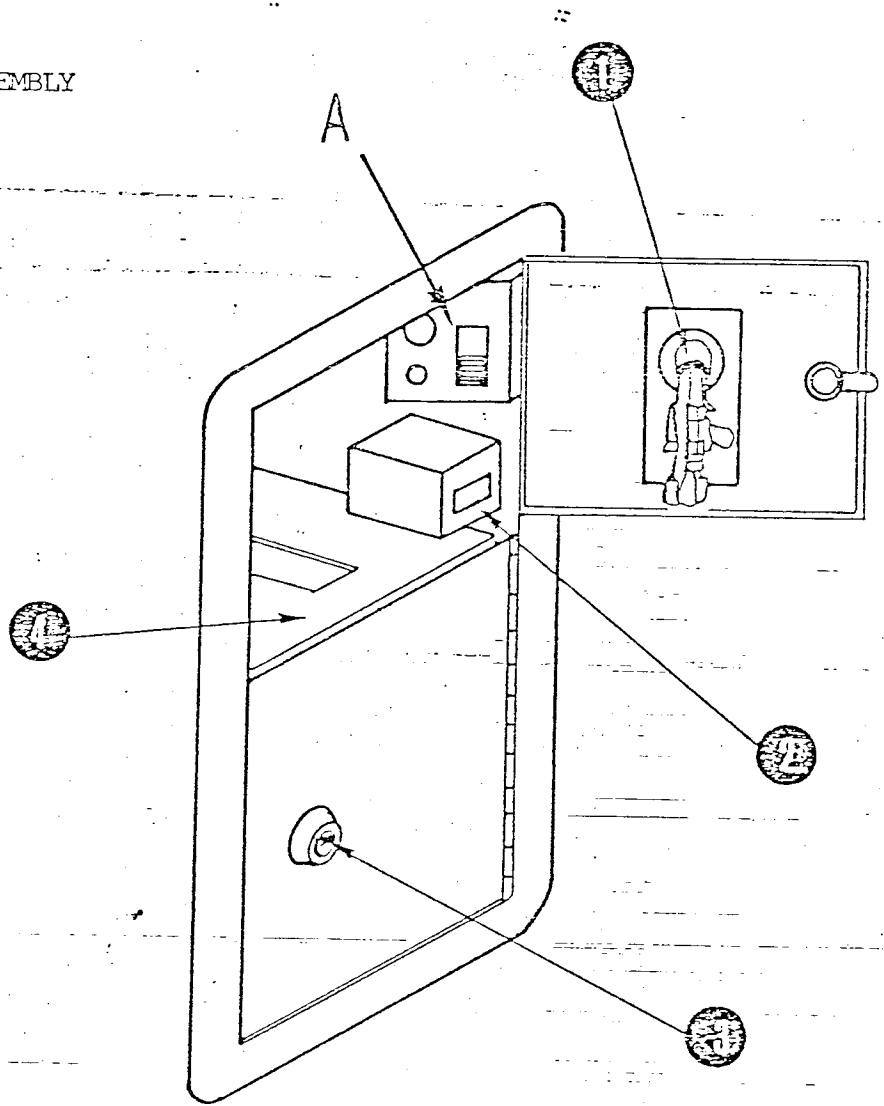
(2) Control Panel Assembly



NO	DESCRIPTION	TYPE	QTY	PART #	REFERENCE
1	Housing (A)		1	82071011	①
2	Housing (B)		1	82071011	②
3	Collar		1	82071011	③
4	Ball Bearing		1	82071011	④
5	Base Plate		1	82071012	①
6	Plate-Follower		1	82071012	②
7	Switch Bracket		1	82071013	①
8	Spring		1	82071014	①
9	Stop Collar		1	82071015	①
10	Lever (B)		1	82071017	①
11	Cover Tube		1	82071018	①
12	Washer		1	82071019	①
13	Pin	φ 2 × L 14, Stainless	1	82071000	B10
14	Washer	M 6	1	82071000	B8
15	Micro Switch	D2MV-01L13-1C3	4	23089102 3/7	④
16	Button		1	82020011	①
17	Button Housing		1	82020011	②
18	Mounting Sleeve		1	82020011	③
19	Coil Spring		1	82020012	①
20	Switch Bracket		1	82020013	①
21	6 Hexgonal Bracket	M 16	1	82020000	B6
22	E-Type Stopper	dia 6	1	82020000	B5
23	Micro Switch	D2MV-01L-1C3	1	23089102 3/7	⑤
24	Button Housing		2	82010011	①
25	Push Button		2	82010012	①
26	Switch Bracket		2	82050011	①
27	S 9 Socket		2	82050013	①
28	Panel Mount Switch	E68-50A	2	23089102 3/7	①
29	Lamp	S9, 6 ~ 8 V	2	23089102 3/7	②



(3) COIN DOOR ASSEMBLY

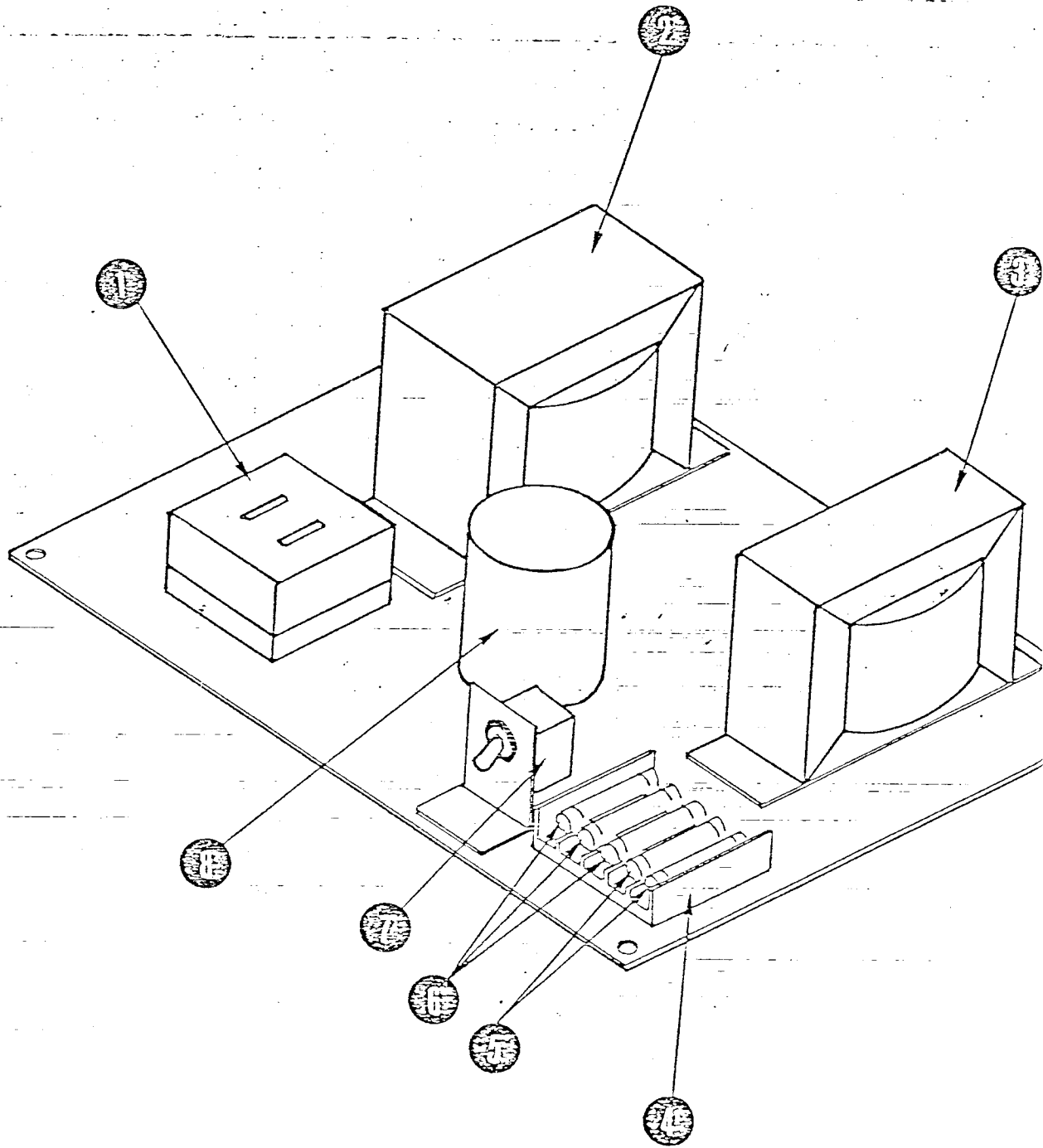


Detail of A, above

(3) COIN DOOR ASSEMBLY

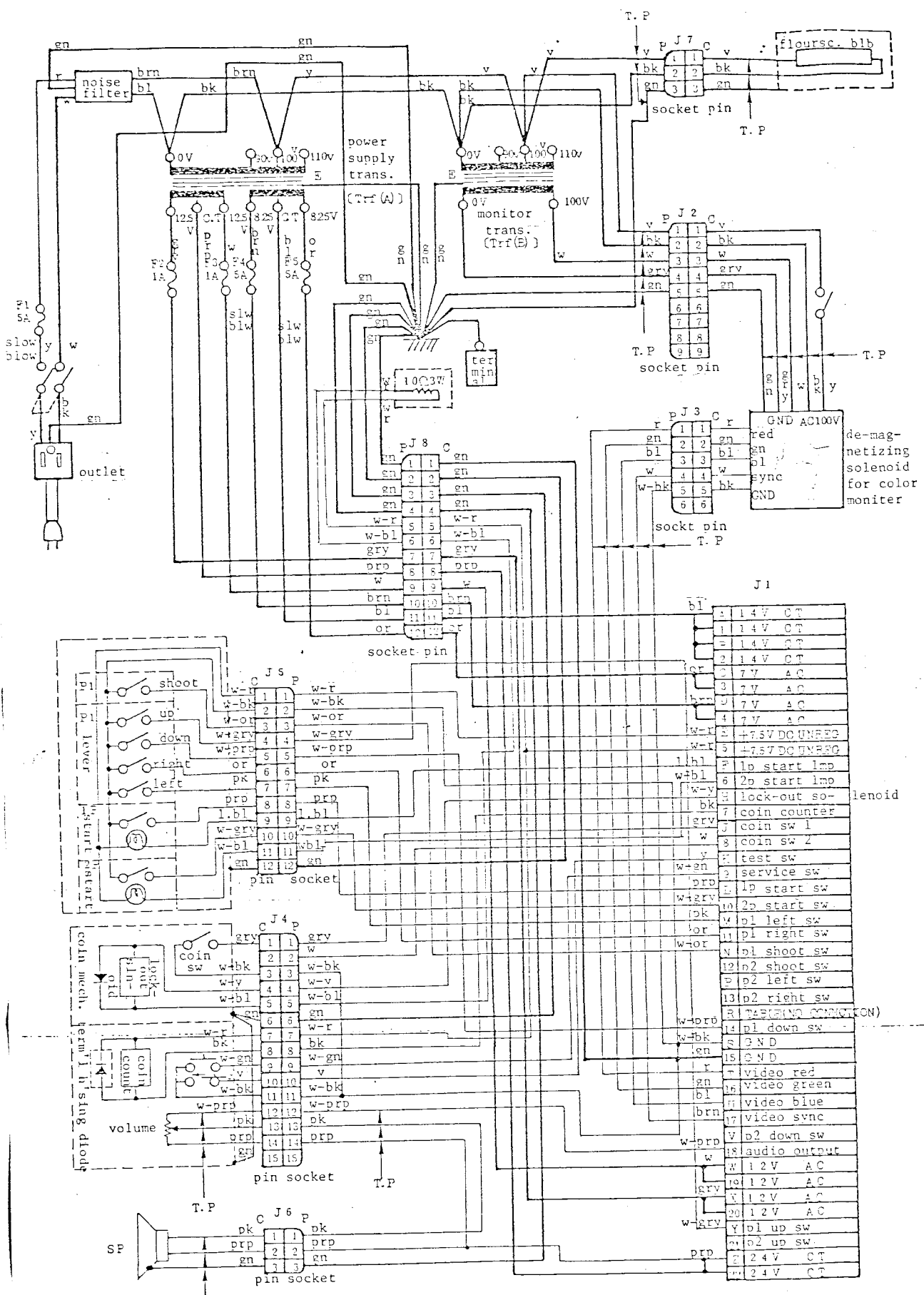
No	DESCRIPTION	TYPE	Q'TY	PART NO.
1	Coin Selector	720-D	1	81030024
2	Counter	E-607-B-10, DC6V	1	23089102 4/6 5
3	Coin Lock	Electronic Lock	1	81050001 ②
4	Cash box		1	81050015 ①
5	Volume Control Knob	K-29 3.2 φ	1	23089102 3/7 2
6	Volume	RPF10, 100Ω, 10W	1	23089102 3/7 1
7	Test Switch	SW-40S	1	23089102 3/7 16
8	Service Switch	8N1021	1	23089102 3/7 3
9	Service Button	8Z0082	1	23089102 3/7 4

(4) POWER SUPPLY ASSEMBLY



(4) POWER SUPPLY ASSEMBLY

QTY	DESCRIPTION	TYPE	QTY	DRAWING #	REF
1	A. C. Outlet	WK 3001	1	<del>23039101</del> 23089102 2/6	③
2	Monitor Transformer		1	21059613	
3	Power Supply Trans.		1	21049611	
4	Fuse Holder	F-3321 5P	1	<del>23039101</del> 23089102 2/6	⑤
5	Fuse	1A	2	<del>23039101</del> 23089102	⑥
6	Fuse	5A SB	3	<del>23039101</del> 23089102	⑦
7	Toggle Switch	ET215K12	1	<del>23039101</del> 23089102	④
8	Noise Filter	TDK ZAC2205-00	1	23089102	⑧
9	Terminal	L-590, 1L-3P	1	23089102	⑬
10	Resistor, wire-wound	10Ω 3W	1	23089102	⑭



This diagram is applicable to Thick line : AWG-22  
 Japanese domestic regulations : Thin line : AWG-18  
 only.

1	14V CT
1	14V CT
2	14V CT
3	7V AC
3	7V AC
4	7V AC
4	7V AC
5	+7.5V DC UNREG
5	+7.5V DC UNREG
6	1p start lmp
6	2p start lmp
7	lock-out solenoid
7	coin counter
8	coin sw 1
8	coin sw 2
9	test sw
9	service sw
10	1p start sw
10	2p start sw
11	p1 left sw
11	p1 right sw
12	p1 shoot sw
12	p2 shoot sw
13	p2 left sw
13	p2 right sw
14	p1 down sw
15	GND
15	GND
16	video red
16	video green
17	video blue
17	video sync
18	p2 down sw
18	audio output
19	12V AC
19	12V AC
20	12V AC
20	12V AC
21	p1 up sw
21	p2 up sw
22	24V CT
22	24V CT

9. TANK BATTALION Structure

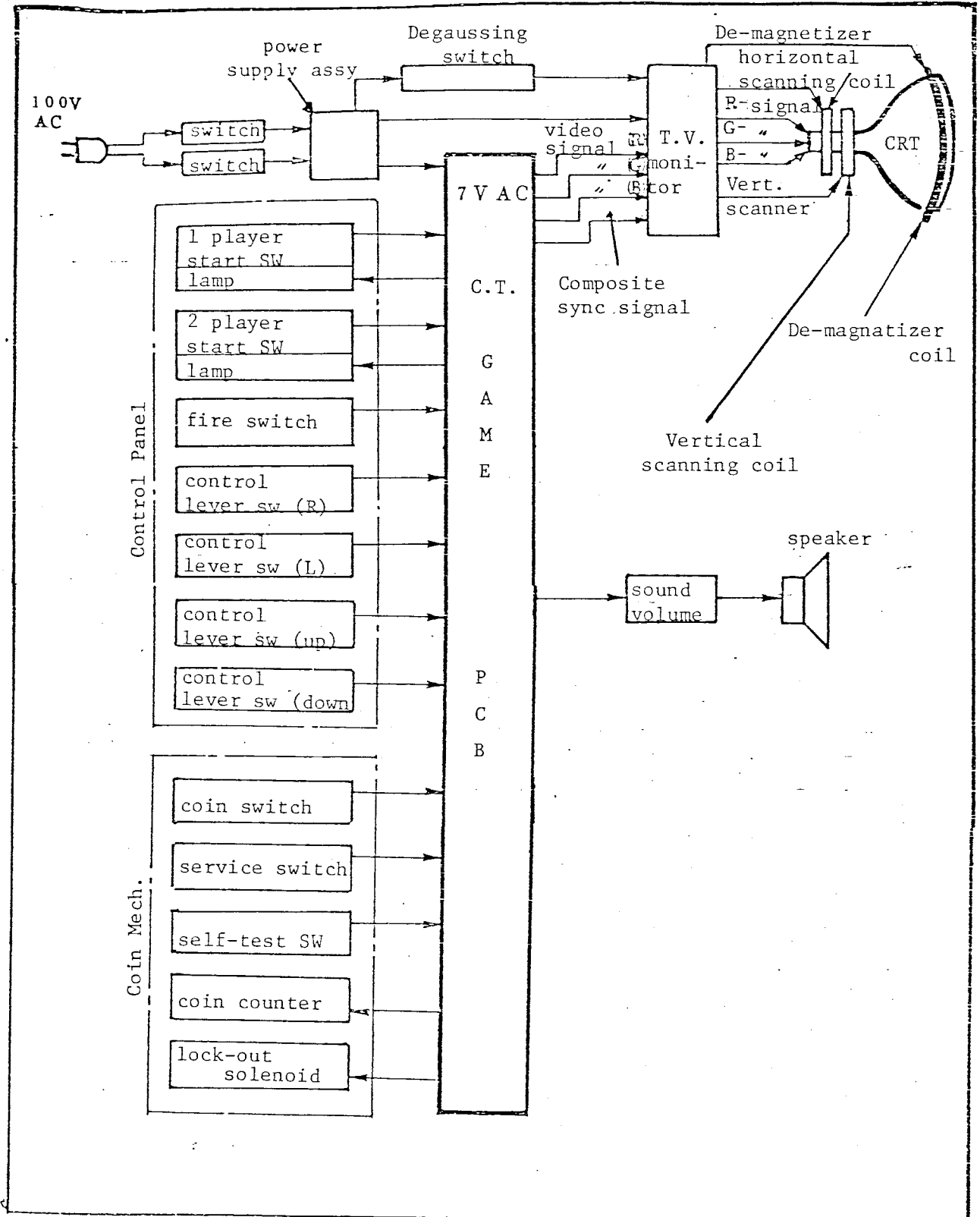


Fig. 9-1 TANK BATTALION Structure

## (1) Power Supply

Use only on 100V AC (50/60 Hz) outlet. When power supply switch is put 'ON', 100V AC passes through fuse and noise filter to transformers A & B.

Transformer A supplies 100V AC to TV monitor.

Transformer B supplies 7V AC CT to logic power and 12V AC CT to audio power.

CAUTION: Power supplied to machine must be within 90V - 110V AC. (95V - 105V AC range is the best). If other large electrical machines or appliances use the same AC outlet, game may be affected or caused to malfunction.

## (2) Game PCB

There are many ICs, semi-conductors, resistors and capacitors on the Game PCB. Also included is the picture forming circuitry, signal receiving circuitry (signal input) from all switches, lamp and solenoid driver, sound circuit, and control circuit for all circuitry listed above. Also included is the power supply circuit. This game is using a color monitor so the Game PCB sends three kinds of video signal (red, green & blue) and composite sync signal to the monitor.

## (3) Monitor

Monitor displays picture on CRT of color video signal and composite sync signal from Game PCB. Monitor makes horizontal and vertical scanning signals from composite sync signal and supplies the power to the horizontal and vertical scanning coils and scans the electric beam. The electric beam shot from CRT electric gun is controlled by color video signal and creates picture on CRT. CRT has de-magnetizing coil for stabilizing the video colors (red, green & blue) on CRT.

CAUTION: There are many detailed electronic parts on the Game PCB and monitor. Take the following precautions when handling:

### (Game PCB)

1. Power must be turned off before changing position of DIP switch and disconnecting edge connector.
2. Power must be turned off before using metal screw driver or other metal implements to adjust volume and/or re-set switch.

### (Game & Monitor PCB)

1. When shipping PCBs, pack carefully in thick card-board boxes, using styrofoam or plastic air bags within to insure minimum PCB damage.
2. If the machine is not cleaned regularly (at least once a year), the accumulated dust will cause high voltage leaks. To clean, use a soft brush or spray lightly with air.
3. Never put game where it is exposed to very high or very cold temperatures or high levels of moisture/humidity. For example, do not place game under direct sunshine, beside heaters or outdoors.
4. When electrical check of PCB is made, it should be done by an experienced electrician. Take special care when checking monitor with volt-ohmmeter, as monitor contains many high voltage parts.

## 10. TROUBLE-SHOOTING

Q: Check the following points before trouble-shooting or before contacting the distributor;

This video game consists of a monitor assembly, a game PCB assembly, control panel assembly and a power supply assembly. Each part is connected by wiring.

The game will not function normally when there is a malfunctioning part. Therefore check the game thoroughly before contacting the distributor if there is anything wrong. At that time, you may find that the machine is not set-up as per instructions, and you may be able to repair the malfunction yourself.

First of all, in the case of a malfunctioning machine, check each component when trying to locate the problem. Check all related electrical components unless you are sure that the problem is one particular part.

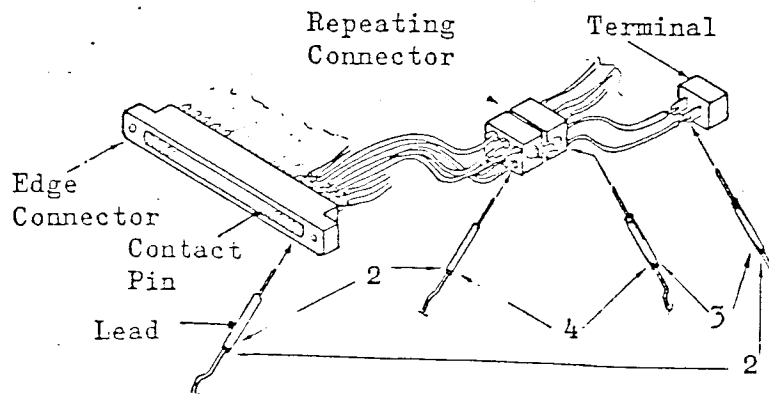
### (1) VOM or volt-ohmmeter

Check the edge connector number, the repeating connector number and the wiring color, referring to the wiring diagram or schematic. The volt-ohmmeter can be used to check line voltage, transformer secondary windings, continuity, resistance and power supply voltage.

#### A. Wiring Check

Each electric component and edge connector on the PCB is connected by wiring and repeating connectors.

1. VOM (volt-ohmmeter) should be used. (resistance range of X10, X100)
2. Measure the resistance range between the edge connector and terminal. (Range should be  $0\Omega$ )
3. Measure the resistance range between the edge connector and the repeating connector; also between the repeating connector and the terminal.
4. If the wiring is normal, the contact of the repeating connector is probably defective.





## B. Voltage Check

### 1. Measurement of AC voltage

Set switch to AC range. Attach one volt-ohmmeter lead to transformer CT and attach other volt-ohmmeter lead to the place you wish to measure. The voltage at the end of the harness must be the same as that of the transformer.

### 2. Measurement of DC voltage

Set switch to DC range. Attach black lead from volt-ohmmeter to the ground (earth) and attach red lead from volt-ohmmeter to the place you wish to measure. The voltage must be the same on both ends of the harness.

## (2) Testing Techniques

### 1. How to test control panel & coin mechanism

Self-test switch enables you to test all switches, speaker, coin counter, lock-out coil and start lamps. If there should be any problems, test further as follows:

#### (A) Switch Check

Galaxian will test itself for the following switches: coin switch, 1- or 2-player start button switch, shoot button switch and control lever switch.

Measure the VOM's resistance range (X10, X100) referring to the wiring diagram schematic.

If the self-test switch is mal-functioning, the problem will probably be found in the self-test switch, lamp, wiring, PCB or speaker.

Measure the VOM's resistance range between the contact pin which is connected to each switch and to the ground.

In switch 'ON' position resistance is about 0Ω.  
In switch 'OFF' position resistance is about ∞Ω.

Unless the above resistance rate is indicated, either the wiring or the switch is probably mal-functioning.

## (B) Speaker Check

Measure resistance (range X1) of edge connectors #18 and Z with VOM (volt-ohmmeter) referring to wiring diagram schematic.

Check the change in the resistance range between  $7\Omega$  and  $100\Omega$  by advancing pot volume.

If there is any change in the resistance range ( $7\Omega - 100\Omega$ ) the problem is most probably in the speaker, pot volume, wiring or game PCB.

## (C) Coin counter and lock-out coil check

If the coin counter and/or lock-out coil is mal-functioning, change game PCB.

If the coin counter and/or lock-out coil do not work at all, measure the resistance range of both.

Coin counter resistance range .... about  $21\Omega$   
Lock-out coil range .... about  $43\Omega$

If the resistance of coin counter and/or lock-out coil is within the normal range, the malfunction is probably to be found in the wiring, diode, coin counter, lock-out coil or PCB.

## (D) Lamp (1-player & 2-player start lamp) check

When coins are inserted in the coin slot, the 1- or 2-player start lamps should blink.

If they do not blink or are otherwise mal-functioning, check game PCB, wiring and lamp itself.

## 2. Power supply panel check

B. Refer to voltage check instructions and check each voltage as follows:

Note: Connector J1 should be connected to PCB and power supply should be turned on.

The game's PCB is electronically regulated within  $\pm 10\%$  AC in power supply variation.

If the voltage variation is not within  $\pm 10\%$ , change the transformer connection.

If fuse (F1, 5A) is broken remove edge connector J1 and plug in power supply.

If fuse (F1) still does not function, the transformer, monitor assembly or wiring is probably defective.

If fuse (F1) is not broken, the PCB is probably defective.

### 3. Game PCB check

	How to check	Description	Condition
Remove connector J8 from Game PCB	Connector J8 terminal #: A(1) -- C(3) A(1) - D(4)  Measure both terminals (7V AC)	If 6.0V - 7.0V AC is not indicated, check F2, F3 & harness.  If okay, check below	--normal play impossible  --no picture
	Connector J8 terminal #: Z(22) - X(20) Z(22) - W(19)  Measure both terminals (12V AC)	If 11V - 13V AC is not indicated, check transformer.  If okay, check below	--normal game impossible --no sound --abnormal sounds
Connect connector J8 to Game PCB	Connector J8 terminal #: A(1) - C(3) A(1) - D(4)  Measure both terminals (6.5V DC)	If 6.5V - 7.5V DC is not indicated, check PCB.  If okay, check below	--no picture --no sound --abnormal sound
	Connector J8 terminal #: Z(22) - X(20) Z(22) - W(19)  Measure both terminals (12V AC)	If 11V - 13V AC is not indicated, check PCB.  If okay, check below	--normal game impossible --no sound --abnormal sounds
	Secondary fuse(s) (F2, F3, F4, F5) are broken	Check to see if something is touching PCB and causing a short.  Check PCB  If okay, check below	--no picture
	Capacitor C37 (470 uF) Measure voltage of both leads (+5V DC)	If +4.8V - 5.2V DC is not indicated, check PCB.  If okay, check below	--no picture --normal game impossible
If PCB is found to be mal-functioning, BAD ROM or BAD RAM will appear on the screen.			