

# FREEDOM FIGHTER

**MILLENNIUM**  
GAMES PRODUCTS  
A Subsidiary of Malibu Grand Prix Corp.

FREEDOM FIGHTER™  
OPERATION and SERVICE MANUAL  
1st Edition

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## FCC NOTICE & WARNING

This equipment generates, uses and can radiate radio frequency energy and if not installed and used in accordance with the instruction manual, may cause interference to radio communications. It has been tested and found to comply within the limits for a Class A computing device pursuant to Subpart J of Part 15 of the FCC Rules which are designed to provide reasonable protection against such interference when operated in a commercial environment. 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.

## WARRANTY

The FREEDOM FIGHTER<sup>TM</sup> game parts are warrantied for a period of 90 days from the date of purchase, except for the disk player motor which is warrantied for a period of one (1) year from the date of purchase. The warranty includes the cost of labor but not the cost of shipping of any parts and/or repaired items. When calling for warranty repairs or parts you MUST have your serial number and date of purchase. Do not send any repair boards or return parts without first obtaining an RMA number from the customer service department.

## QUESTIONS

MILLENNIUM GAMES PRODUCTS asks technicians to use the customer service phone line for any questions they may have regarding the FREEDOM FIGHTER<sup>TM</sup> game. That number is (818) 340-6750.

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## I. PRELIMINARY PROCEDURES

## 1. GAME INSPECTION

All MILLENNIUM GAMES PRODUCTS equipment is packaged in well-padded cardboard containers to prevent damage during shipment. Before signing the delivery receipt, you should follow this procedure.

a. Check for obvious damage and make certain that the physical piece count of the shipment matches the piece count on the Bill of Lading. These two procedures should always be done before signing the delivery receipt.

b. Shortages and/or obvious damage to the packaging on any given shipment should be noted in writing on the delivery receipt before signing for the delivery.

c. If concealed damage is suspected on any shipment, those packages believed to contain the damaged goods should be opened in the presence of the delivery person. If the goods have sustained concealed damage, a description of said damage should be noted in writing on the delivery receipt before signing for the delivery.

d. Never apply power to any game with noticeable damage.

## 2. VISUAL INSPECTION

a. Open the rear and front access doors with the appropriate keys provided.

b. Examine each major and electrical component thoroughly for scrapes, dents, broken or missing parts and loosened screws.

c. Check for loose cable connections.

d. Visually verify that all the integrated circuit devices (IC's) are plugged into the sockets and properly seated with no broken or bent IC pins.

e. If you find any damage during this inspection, file a claim with the carrier. Send a complete report of the damage to MILLENNIUM GAMES PRODUCTS.

## 3. FILING A CLAIM

To file a claim, follow this procedure.

a. Any and all damaged freight, including the packaging, should be retained by the consignee until a physical inspection of said freight can be made by a representative of the carrier involved.

## FREEDOM FIGHTER MANUAL

b. The claims manager for the carrier involved should be notified as soon as possible after the goods are received. Preferably, the carrier's claims manager should be notified within forty-eight (48) hours of receipt of the goods by the consignee. If warrantied, a written claim must be filed with the carrier involved. A detailed description of the damages must be provided including copies of the delivery receipt, bill of lading, inspection report, and invoice. The carrier to which a claim has been filed against is required by law to respond to said claim within thirty (30) days after receiving your claim and must reach a final disposition in the matter within one hundred twenty (120) days.

#### 4. INSTALLATION

Planning the location of the game should involve both physical and electrical considerations. Such physical considerations concern the placement of the equipment with respect to these clearances:

HEIGHT 72.00 inches, 183 cm  
WIDTH 25.75 inches, 66 cm  
DEPTH 30.00 inches, 76 cm

NOTE: The game must have a 12" clearance to the rear of the game to insure proper ventilation.

An indoor, relatively dust-free environment is necessary, with proper conditions required of any electrical component. Electrical requirements are the availability of an AC outlet with the correct voltage and frequency, 120 VAC-60 HZ for U.S. installations. You should consider the working space required for technicians and operators including access to the rear of the game.

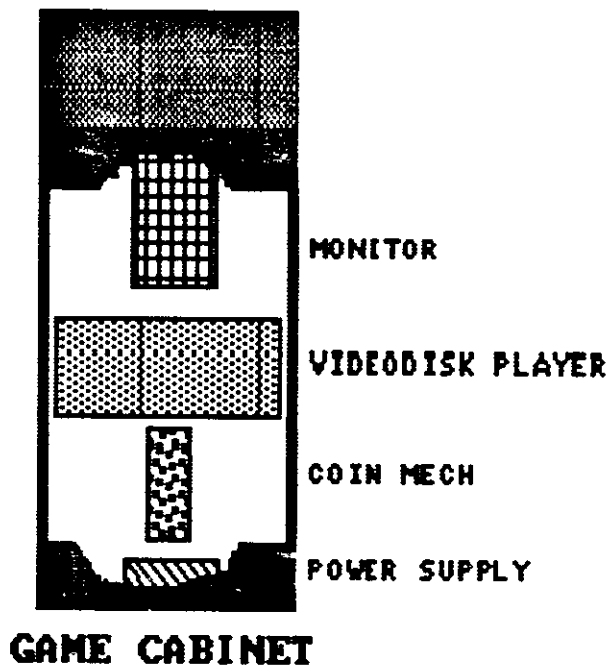
NOTE: The cabinet must be within five (5) feet of an AC outlet. Be certain that a grounding (3 wire) outlet is available.

**CAUTION: DO NOT** remove the AC ground prong from the plug as this creates a serious safety hazard. Doing so VOIDS your warranty.

5. MAJOR COMPONENTS

The FREEDOM FIGHTER™ game is a colorfully illustrated video game with high resolution digital and laser disk graphics. The major components of your game are illustrated in Fig. 1 and include the following:

- \* Control Panel & controls
- \* Coin mechanism
- \* Monitor
- \* Power Supply Assembly
- \* Speakers
- \* Laser Disk Player
- \* All PCB assemblies
  - ..... \* Game Logic PCB
  - ..... \* Digital Audio PCB
  - ..... \* Video Expander PCB



II. ADJUSTMENTS

1. POWER SUPPLY INFORMATION AND ADJUSTMENTS

All DC Power required to operate the FREEDOM FIGHTER™ is supplied by the MILLENNIUM GAMES PRODUCTS Power Supply Module. These supply outputs are as follows:

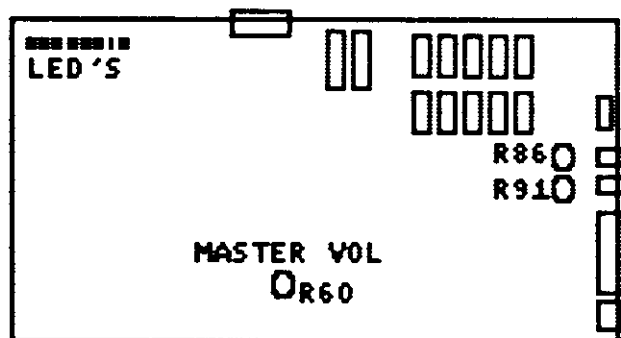
- \* +5 VDC @ 11 amps
- \* +12 VDC @ .5 amps
- \* +18 VDC @ 2 amps
- \* -18 VDC @ 2 amps

**CAUTION:** Only certified technicians should make these adjustments. Only the +5 VDC is adjustable and should be measured at the terminal block and set to +5.07 +/- .03 VDC.

2. AUDIO PCB ADJUSTMENTS

The FREEDOM FIGHTER™ game is presently set up for monaural sound both digitally and from the disk player. To provide a balanced mix of digital and disk player sounds:

1. Adjust master audio volume control R60 located at position 6M for digital volume level. Use the shoot sound during game play.
2. Adjust disk player audio volume controls R86 & R91 at location A4 for disk volume level adjusting both pots equally. The audio level should equal the digital sounds.





3. OPERATOR SELECTABLE GAME OPTIONS

This menu is selected through the manual diagnostics menu. To access the manual diagnostics, the game must be in the attract mode. At this point you press the test button located inside the coin door and the following Menu appears.

```

Test Logic Eproms
Test Ram
Test Interrupts
Test DMA
Test Disk Player
Test Video Expander
Test Internal Video
Test Internal Color
Test Sound Board
Reset High Scores
Reset Game Options
Exit
    
```

To pick the game options move the pointer with the joystick control to the - Reset Game Options - and pull the trigger button to activate the next menu. The recommended settings are listed as bold, underlined characters below.

- \* SloMo Enable ..... (ON) (off)  
This either enables slow motion (on) or disables slow motion (off) when slomo button is pressed.
- \* SloMo Speed [fraction of normal speed] ..... (.5) (.66) (.75) (.80)  
This sets the speed of slow motion in relation to normal speed (i.e. - .5 is 50% of normal speed).
- \* Max SloMo Time/game in sec. .... (8) (6) (4) (2) (0)  
The amount of slow motion time is limited in each game. The maximum amount is set here. Setting 0 is the same as disabling slow motion.
- \* Target Size [Game Difficulty] ..... (2X) (1.5X) (1.25X) (normal)  
This sets the size of the target area to shoot. The bigger the target, the easier it is to hit, therefore setting the game difficulty.
- \* Number of Lives ..... (6) (5) (4) (3)  
This sets the total number of lives for one game.
- \* Number of coins per credit ..... (1) (2) (3) (4) (5) (6)  
This sets the number of quarters per game credit. (i.e. 2 = \$.50 game)
- \* Number of extra lives on prog coin drop ... (no prog coin) (1) (2)  
Progressive coin drop enables the player to continue play starting at the previous finish point for another credit.
- \* Progressive lives to train station or ALL ..... (TRAIN) (ALL)  
This enables extra lives on a progressive coin drop for anywhere in the game if you choose (all) or enables extra lives only to the train station if you choose (train) provided (no prog coin) was NOT chosen in the previous selection.
- \* Attract mode sound ..... (Yes) (No)  
This enables (yes) or disables (nc) sounds during the attract mode.

4. VIDEODISK ASSEMBLY

a. Parts

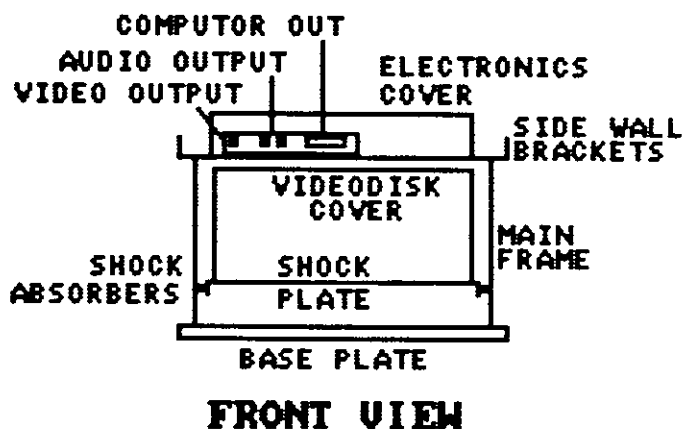
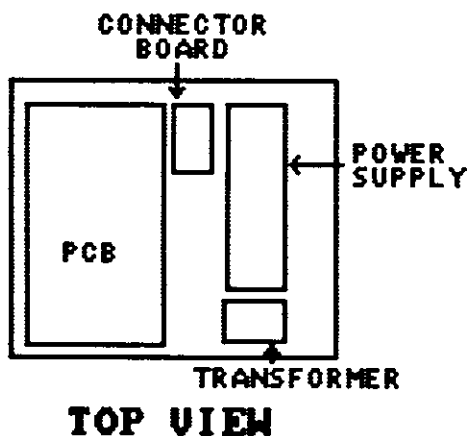
1. Main Frame
2. Shock Plate
3. Shock Absorbers
4. Electronics Cover
5. Videodisk Drive
6. Videodisk Drive Cover
7. PC Electronics and Video Boards
8. Power Supply
9. Transformer
10. Connector Board
11. Ribbon Cable
12. Video Cable
13. Power Cable

b. Removing Videodisk Player Assembly from cabinet

Disconnect all computer, video, audio and power cables. Unscrew side wall brackets (see fig 3), slide Videodisk assembly out.

c. Troubleshooting

Select "Disk Player" from the Manual Diagnostics Menu, pull the trigger to play through test scenes, color bars and centering diagrams. If first test scene does not come up or pulling the joystick trigger does not advance the test scene sequence, the videodisk player has a problem. Check to see that all power, computer, video and audio cables are securely fastened. Try test sequence again. If the player still fails to respond, call the customer service line. UNDER NO CIRCUMSTANCES REMOVE THE ELECTRONICS COVER OR THE VIDEODISK ASSEMBLY COVER.



## III. MODES OF OPERATION

## 1. AUTO DIAGNOSTICS MODE AND STARTUP

## a. STARTUP

The game may be started by switching on the power switch located toward the rear on the lower right hand side of the cabinet. The game screen will appear in approximately one to two minutes if all systems check OK. The auto diagnostics mode occurs automatically at power up. These tests are generally the same tests that can be performed in the manual diagnostics mode. No message is displayed if everything is OK. If an error is found, an error code is displayed on the LED display located on the main logic PCB. Error codes are listed in the error code listing. If the screen does not appear after two minutes an error may have been detected. Check the LED display for the code. If necessary, these power-up tests can be skipped to permit game operation by holding the trigger down before turning on the power switch and by continuing to hold the trigger down until the game screen appears. Of course, if a significant hardware problem exists, the game screen may not appear and then power-up diagnostics procedures should be followed.

The joystick is self-adjusting and should be turned all the way right, left, up and down a few times after power-up to ensure accuracy.

## b. POWER-UP DIAGNOSTICS

Each time game cabinet power is switched on, a series of diagnostic tests are performed to check the game hardware. If no errors are detected, power-up continues until the game goes into the attract mode. This usually takes one to two minutes. If an error is detected however, power-up will halt and a number indicating the error found is shown on the main logic board LED display. In this case, the operator or service person should open the rear cabinet door and write down the pattern of lights shown on the LED display on the main logic board. This pattern can be decoded and referenced as described in the Error Code Listing section. After noting the error message pattern shown on the LED display, the operator should return to the front of the cabinet and hold the game trigger down for a second or so to permit continued power-up. If an additional error is detected, power-up will again be halted and the procedure given above should be repeated. It may be necessary to repeat these steps a number of times before the attract mode screen appears, noting the error message patterns on the LED display for each occurrence.

## 2. MANUAL DIAGNOSTICS MODE

To access the manual diagnostics, the game must be in the attract mode. Press the test button located inside the coin door and the following Menu will appear:

```

Test Logic Eproms
Test Ram
Test Interrupts
Test DMA
Test Disk Player
Test Video Expander
Test Internal Video
Test Internal Color
Test Sound Board
Reset High Scores
Reset Game Options
Exit

```

To pick one of the tests move the pointer with the joystick control and pull the trigger button to activate the test. The tests are described below in more detail.

## a. TEST LOGIC EPROMS

This tests the game eproms on the main logic PCB located in rows 1 thru 11 in columns A and C. If an error is detected, a message indicating the problem eprom pair is shown on the screen. In this case, pull the trigger briefly to continue. If no errors are found, the menu screen will reappear after one or two seconds and no error will be shown.

## b. TEST LOGIC RAM

This selection tests the moving object ram and the screen ram. If an error is detected, a message will indicate the problem ram. Otherwise, the menu screen will reappear after approximately 5 seconds.

## c. TEST INTERRUPTS

This tests the video interrupt and the joystick interrupts. If an error is detected a message will indicate the error, otherwise the menu screen will immediately reappear.

## d. TEST DMA

The DMA chip (68440 at 28-C) is tested by this routine. If no error is found, the menu screen will reappear. A moving object problem may indicate a DMA when in fact the DMA is OK.

## e. TEST DISK PLAYER

Tests disk player by first going to (5) five game scenes, then advances to a crosshatch pattern. It then goes to a full screen color bar test and to a smaller color bar test. To advance thru the frames, pull the trigger. After the last frame, the menu screen will reappear.

## f. TEST VIDEO EXPANDER

This puts the screen into an expanded mode. Turn joystick full left and full right to see the full expanded screen. When this test is run without leaving manual diagnostics, all other tests will also be in expanded video mode. Pull the trigger button to return to the menu screen.

## g. TEST INTERNAL VIDEO(DIGITAL)

When this selection is made, eight pairs of vertical color bars appear against a black background, representing the sixteen colors in the background digital graphics palette. After a few seconds, 64 moving objects containing the sixteen colors will appear over the background bars so that any problems in the graphics color and priority table hardware can be observed. The lower right moving object should make a counter-clockwise circuit of the screen to demonstrate that the moving object control is OK. After the moving object has returned to the lower right position, pull the trigger to return to the menu screen.

## h. TEST INTERNAL COLOR(DIGITAL)

This selection brings up a screen for testing and setting monitor color and overscan adjustments. It consists of four columns of color blocks, with seven blocks in each column. The lefthand column is red, the next is green, the next blue, and the righthand column is white. The top blocks in each column have a very low saturation of the colors, and saturation increases equally for all colors on each vertical row down, until full saturation is reached in the bottom row. The entire block pattern is surrounded by four lines drawn in rectangles at the border of the screen. The outermost is red and appears 8 pixels inside the edge of the computer defined screen. Inside that are green, blue, and white rectangles each 4 pixels inside the other. All rectangles are drawn in low color saturation. The top blocks in each column should be adjusted so that they are barely visible. Pull the trigger to return to the menu screen.

## i. TEST SOUND BOARD

This selection tests the sound board via the communication port from the main board. If no communication can be established with the sound board this will be indicated and other sound error messages can be disregarded. Lack of communication with the sound board can be caused by lack of power to the sound board, by a bad ram chip on the sound board (2A), by a bad sound control chip (1A), or by a problem with the communication cable. If no communication problem is indicated, any errors in the ram or eproms will be displayed, along with their location. If no errors are detected, the menu screen will reappear in a few seconds.

## j. RESET HIGH SCORE TABLE

This selection resets all initials to blanks and high scores to zero in the high scores screen shown in the attract mode. The process takes about 10 seconds, after which the menu screen reappears.

## k. RESET GAME OPTIONS

Allows operator to reset game options. These options are explained in II. ADJUSTMENTS, 3. OPERATOR SELECTABLE OPTIONS.

## l. EXIT

This selection causes the power-up process to restart and returns game to the Attract Mode.

### 3. ATTRACT MODE

The attract mode appears after powerup auto diagnostics and after every game. This mode will continue to display the attract mode repeatedly until the proper amount of coins are deposited, and the trigger button is pressed. Depending on the option selected, there may or may not be sound during the attract mode.

### 4. GAME PLAY MODE

Your mission is to fight through the city and take over the train. From there you progress to the planet of the evil guardian. It is then your mission to defeat the evil guardian. The instructions for play are as follows:

- \* To choose the direction of travel or jump out of the way of oncoming threats, turn joystick to the left or right.
- \* Aim your laser pistol by positioning the cursor over the intended target.
- \* Fire your laser pistol by pulling the trigger.
- \* Action may be slowed down by pushing the "SLO-MO" buttons located left and right of the joystick. There is a limited amount of "SLO-MO" during each game. Use it wisely.
- \* If you are killed and have lives remaining, game returns to the previous path decision point and starts again.

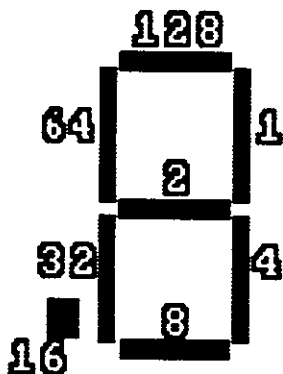
### In-Game Error Detection

In addition to the power-up diagnostics, features have been built into the game that permit it to detect minor hardware errors yet permit continued normal game operation. If such an error is detected in the course of the game, error lights will be lit on the main board LEDs, (See Error Code Listing On Next Page).

IV. ERROR CODE LISTING

1. Error Messages

The main game board contains a 7 Segment LED with decimal point that is used to show errors detected upon power-up or during game operation. The 8 leds represent 8 bits of a binary error message number. It is interpreted by adding the number represented by each LED that's ON. NOTE: All LEDs OFF indicate no error.



For example, if leds 1,16, and 32 were ON, this would be indicating error number 49, (1+16+32=49). If leds 2,4,8, and 64 were ON, error 78 would be indicated. (2+4+8+64=78).

Error messages are shown below.

Error #	Message
1	Error in logic board eprom pair 10/11A &/or 10/11C
2	Error in logic board eprom pair 9A &/or 9C
3	Error in logic board eprom pair 8A &/or 8C
4	Error in logic board eprom pair 7A &/or 7C
5	Bad system ram
6	Bad moving object ram
7	Bad screen ram
8	DMA error
9	A to D interrupt error
10	Video vertical interrupt error
11	Timer interrupt error
12	Video disk player not responding
13	No video disk player initialization
14	Error in main game control logic eproms 4-5/A &/or 4-5/C
15	Unidentified video disk error
16	Invalid video disk read
17	No video disk raster pulse
18	Multiple video disk raster pulses missing
19	Video disk GOTO timeout
20	Invalid video disk control command
21	Incomplete video disk comand
22	No sound board communication
23	No sound board communication
24	Sound board ram error - 2A
25	Sound control eprom error - 1A
26	Sound eprom error - 1FG
27	Sound eprom error - 1E
28	Sound eprom error - 1D

2/2/82

- 29 Sound eprom error - 1BC
- 30 Sound eprom error - 2FG
- 31 Sound eprom error - 2E
- 32 Sound eprom error - 2D
- 33 Sound eprom error - 2BC
- ref 2/6* 34 Bus error accessing system ram (0 - 3FFF)
- 35 Bus error accessing I/O (4000 - 402F)
- 36 Bus error accessing A to D conversion hardware (4030 - 05F)
- 37 Bus error accessing LED (4060 - 406F)
- 38 Bus error accessing unassigned address space (4070 - 7FFF)
- 39 Bus error accessing moving object ram (8000 - FFFF)
- 40 Bus error accessing video lookup tables (10000 - 107FF)
- 41 Bus error accessing unassigned address space (10800 - 13FFF)
- 42 Bus error accessing DMA (14000 - 140FF)
- 43 Bus error accessing unassigned address space (14100 - 1BFFF)
- 44 Bus error accessing E square storage chip (1C000 - 1C3FF)
- 45 Bus error accessing unassigned address space (1C400 - 100000)
- 46 Bus error accessing video chip (100001 - 1000FF)
- 47 Bus error accessing unassigned address space (100100 - 1BFFFF)
- 48 Bus error accessing screen ram (1C0000 - 1DFFFF)
- 49 Bus error accessing unassigned address space (1E0000 - 1FFFFFF)
- 50 Bus error accessing logic board eproms (200000 - 25FFFF)
- 51 Bus error accessing unassigned address space (260000 - FFFFFFFF)
- 52 Address error accessing system ram (0 - 3FFF)
- 53 Address error accessing I/O (4000 - 402F)
- 54 Address error accessing A to D conversion hardware (4030 - 405F)
- 55 Address error accessing LED (4060 - 406F)
- 56 Address error accessing unassigned address space (4070 - 7FFF)
- 57 Address error accessing moving object ram (8000 - FFFF)
- 58 Address error accessing video lookup tables (10000 - 107FF)
- 59 Address error accessing unassigned address space (10800 - 13FFF)
- 60 Address error accessing DMA (14000 - 140FF)
- 61 Address error accessing unassigned address space (14100 - 1BFFF)
- 62 Address error accessing E square storage chip (1C000 - 1C3FF)
- 63 Address err accessing unassigned address space (1C400 - 100000)
- 64 Address error accessing video chip (100001 - 1000FF)
- 65 Address err accessing unassigned address space (100100 - 1BFFFF)
- 66 Address error accessing screen ram (1C0000 - 1DFFFF)
- 67 Address err accessing unassigned address space (1E0000 - 1FFFFFF)
- 68 Address error accessing logic board eproms (200000 - 25FFFF)
- 69 Address err accessing unassigned address space (260000 - FFFFFFFF)
- 70 Illegal instruction error
- 71 Divide by zero error
- 72 Chk instruction
- 73 Trapv instruction
- 74 Privilege violation
- 75 Trace
- 76 Op code 1010
- 77 Op code 1111
- 78 Unexpected trap encountered
- 79 Unused
- 2/24/82* 80 No video disk interrupt
- 81 Video disk Davnot line inactive
- 82 Video disk busy line not responding
- 83 Error in Table Driven Game Logic



## GENERAL OVERVIEW

The hardware is composed of eight (8) separate subsystems and when connected together, they form an integrated game system. The different subsystems are as follows:

### 1. POWER SUPPLY ASS'Y

The power supply ass'y supplies the necessary voltages required by the different subsystems of the game.

The input voltage is: 115V/220V AC 60 HZ AT 5 AMPS MAX.

The output voltages are: 115 VAC for the fan and logo lamps  
115 VAC isolated @ 1.5 Amps for monitor  
+18 VDC @ 3 Amps; -18 VDC @ 3 Amps; +5 VDC @ 10 Amps

### 2. COLOR MONITOR ASS'Y

The color monitor is a standard raster display monitor with a horizontal frequency of 15.75 khz and a vertical refresh of 60 hz. The color input is analog RGB at 2 Volts peak to peak. The sync input is TTL with separate horizontal and vertical drives.

### 3. VIDEO DISK PLAYER

The video disk player is a ruggedized version of a commercial player and provides the animated video for the game. Standard NTSC composite video is output by the player. The main logic pcb provides the control of the output video by determining on a frame by frame basis which video to output.

### 4. MAIN LOGIC PCB

The main logic pcb contains the game program and functions to control the other subsystems in the game. This pcb is responsible for the generation of digital video, accepting player inputs, controlling the disk player, controlling the video expander pcb, and controlling the audio pcb. The main logic also contains the output drivers for the color monitor.

### 5. VIDEO EXPANDER PCB

The video expander pcb converts the analog RGB signals from the NTSC pcb to 5 bit digital information, which allows the digital expansion of video data.

### 6. NTSC TO RGB CONVERTER

The NTSC to RGB converter pcb converts the composite video signal from the disk player to individual analog signals -- Red, Green, and Blue to be used in the video expander pcb.

### 7. AUDIO PCB

The audio pcb generates all transit or player generated sounds for the game. This pcb also contains the audio power amplifier to drive the two speakers. In addition, external inputs to the pcb allow audio generated by the disk player to be amplified by the power amplifier.

### 8. CONTROL PANEL ASS'Y

The control panel is the interface between the player and the game. Player movement is controlled by the joystick, and weapons are fired by the joystick trigger. Game speed can also be controlled by the player by using the slow motion button.