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SECTION 1. DESCRIPTION

1.1. JPATS FLIGHT TRAINING DEVICE

The Joint Primary Aircraft Training System (JPATS) Ground Based Training System (GBTS) is designed for initial and recurrent pilot training in the operation of systems employed on the aircraft. The Operational Flight Trainer (OFT), Instrument Flight Trainer (IFT), and Unit Training Device (UTD) flight training devices are state-of-the-art training systems. The trainers feature a realistic cockpit or student station, an onboard instructor operator's station or instructor station, sound and realistic control feel of the aircraft. The OFT and IFT also provide the visual modeling images simulating sight.

The trainers are designed for testing and supporting troubleshooting and repair to the module level. They incorporate designed-in modularity with expansion enhancement through the use of Peripheral Component Interface (PCI) bus technology and incorporating sufficient cooling to enable use in a normal business environment with conditioned air. The Flight Training Devices (FTDs) are made up of several major systems. These major systems function together to provide the environment and cues from which learning can occur.

The major systems comprising the FTDs are:

Power Distribution System (PDS)

Host Computer

Aural Cue System (ACS)

Electric Control Loading System (ECLS)

Flight Deck I/O System (FDKIO)

Instructor Operating Station (IOS)

Student Station

Visual Image Generator System (VIS) (Not used in the UTD)

Fire Detection System

Equipment Cooling

Figure 1-1 is a simplified block diagram of the FTD. Section 4, Principles of Operation, contains a more detailed view of this diagram including control, command, and communication lines.

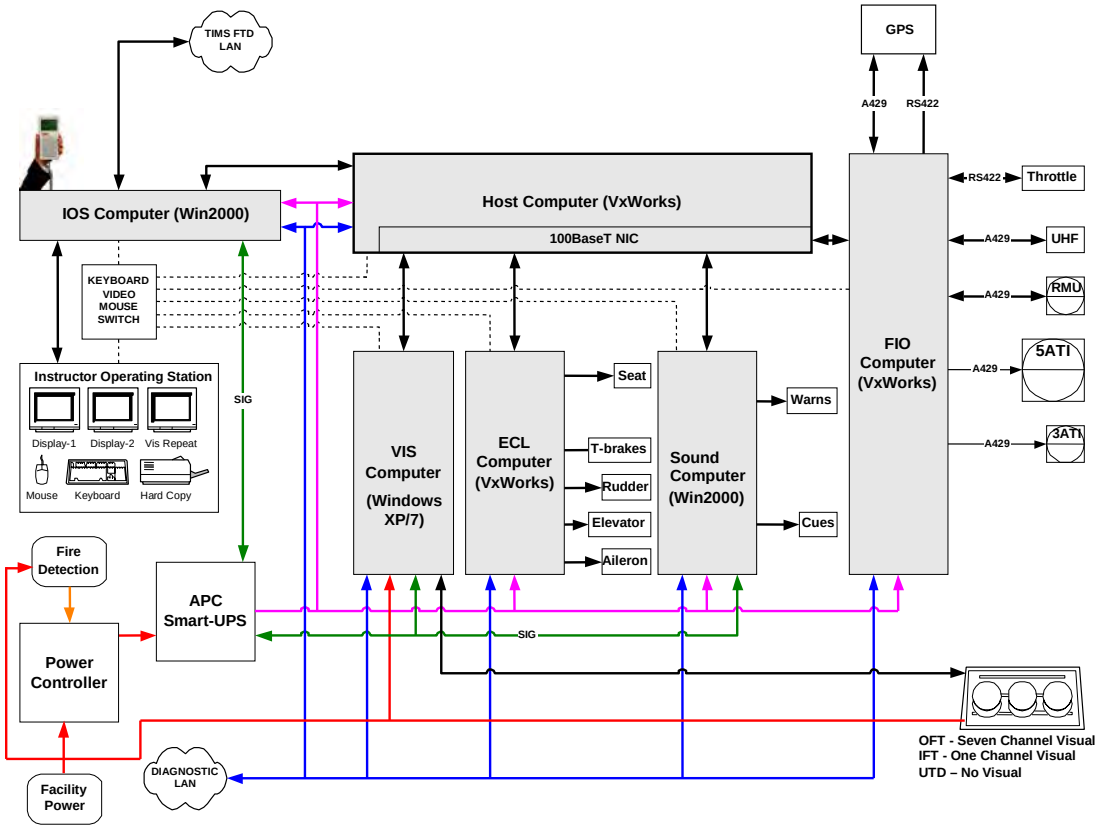


Figure 1-1. FTD Block Diagram

There are four major areas in the OFT and IFT trainers:

- Central Training complex – Comprised of the student station and the trainer frame
- Instructor Operator Station
- Equipment Cabinets
- Visual System – Comprised of Image Generator and Display Systems

The UTD has three major areas:

- Central Training complex – Comprised of the student station and the trainer frame
- Instructor Operator Station
- Equipment Cabinets

Figure 1-2 shows the three flight training devices illustrating these areas in each device.

Boom assemblies are no longer present.

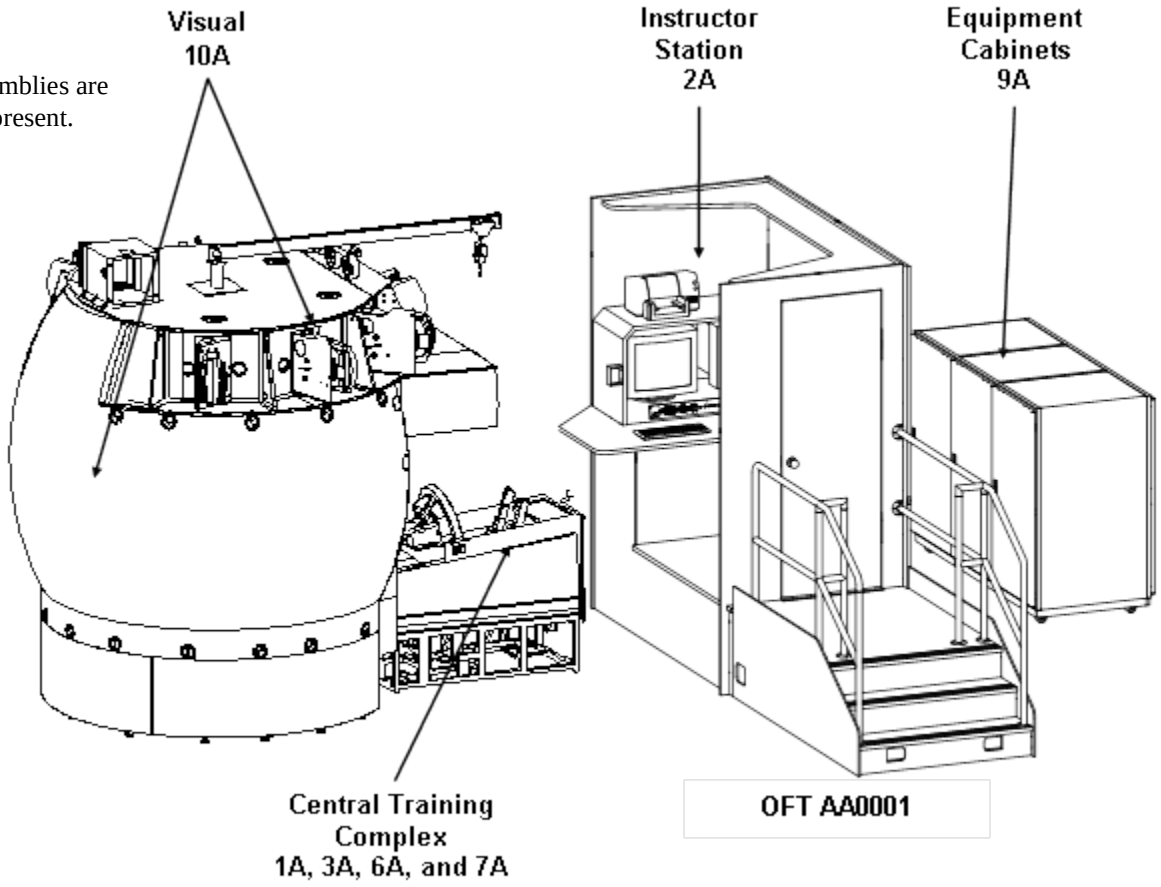


Figure 1-2 Flight Training Devices

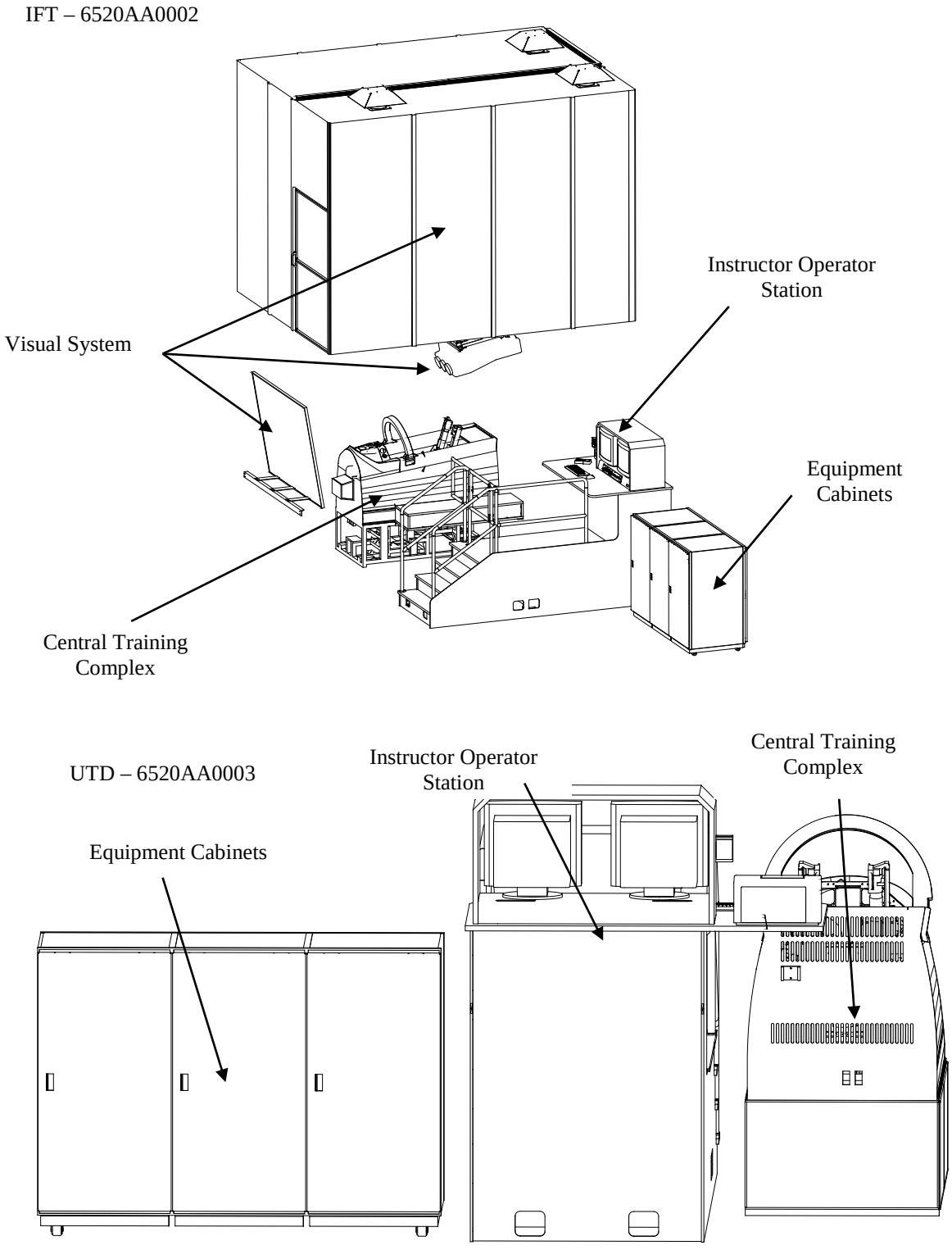


Figure 1-2. Flight Training Devices

1.1.1. FTD Power Requirements

The power required from the site source is 12000VA (240V x 50A). The designed load limit for the FTD is 9600VA (12000VA x 80%). The predicted load is 8170VA. The allowable input voltage range is 230 VAC +/- 10%. This allows the use of two phases of the three-phase, 208 VAC source.

The power requirements of major power related items are shown in Table 1-1.

Table 1-1. Power Distribution System Characteristics

Component	Specifications
Site Power	240/120 VAC, 60 Hz, 3 Phase, 200 Amp
Site Power	120 VAC, 60 Hz, Single Phase, 20 Amp
AC Power Controller Assembly	208/120 VAC, 60 Hz, 3 Phase, 50 Amp
Digital Servo Remote Power Controller	208/120 VAC, 60 Hz, 3 Phase, 80 Amp
Fire Detection Master Control Panel	120 VAC, 60 Hz, Single Phase, 15 Amp
Visual No. 1 Channel	208/120 VAC, 60 Hz, 3 Phase, 40 Amp
Visual No. 2 Channel	208/120 VAC, 60 Hz, 3 Phase, 40 Amp
Projector Remote Power Controller	208/120 VAC, 60 Hz, 3 Phase, 20 Amp

An optional piece of facility hardware is a surge protection device installed between the facility power and the fire alarm control panel. An illuminated green LED indicates the surge protector is operational; a dark LED signifies a surge event has occurred. The surge protector can stop only one power surge. Subsequent power surges will pass through unimpeded.

The power ground distribution system is shown in Table 1-2. Visual Cabinets 10A1 and 10A2 are not used on UTD. Visual Cabinet 10A2 is not used on IFT.

Table 1-2. Ground Distribution System

From	To	Comments
9A1A2 GND-5	9A1 Cabinet	Cabinet 9A1 GND
7A2 BBLG	7A1CLS-2 BBLG	DRI CLS-2 Platform (DRI equipped)
7A2 BBLG	7A1CLS-1 BBLG	DRI CLS-1 Platform (DRI equipped)
7A2 BBLG	7A1UTL-1 BBLG	DRI Utility Platform (DRI equipped)
9A2 Cabinet	9A3 Cabinet	Equipment Cabinets
10A1 Visual Cabinet	10A2 Visual Cabinet	Visual Cabinet (OFT only)
9A1A2 GND-6	9A2 Cabinet	9A2 Equipment Cabinet
9A1A2 GND-5	2A1 Frame	Instructors Station
9A1A2 GND-4	7A2 GND-1	Control Loading
9A1A2 GND-3	10A1 GND	Visual Cabinet (Not on UTD)
9A1A2 GND-2	Facility Earth	Facility Earth GND
9A1A2 GND-1	6A2 Frame	System Patch to Frame

1.1.2. FTD Physical Requirements

Table 1-3 lists the physical characteristics of each flight-training device. The OFT and IFT graphics are for the BARCO system but the basic dimensions are the same.

Table 1-3. FTD Physical Characteristics

	OFT	IFT	UTD
Height	15 feet 0 inches	10 feet 8 inches	10 feet 8 inches (minimum ceiling height)
Width	18 feet 6 inches	15 feet 10 inches	13 feet 10 inches
Length	20 feet 6 inches	14 feet 6 inches	11 feet 8 inches
Area req'd	649 ft^2	448 ft^2	350 ft^2
Weight	16,650 pounds	10,200 pounds	7,650 pounds
Power	27,500 watts	24,250 watts	19,650 watts

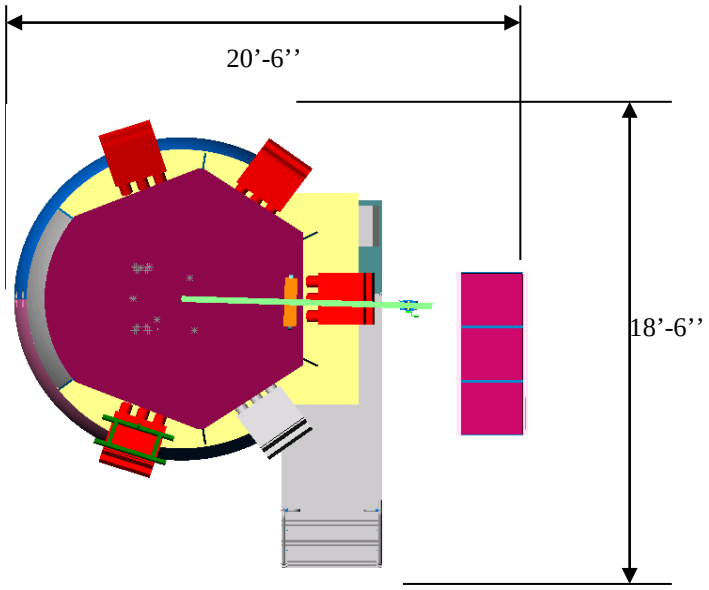


Figure 1-3. OFT Plan View

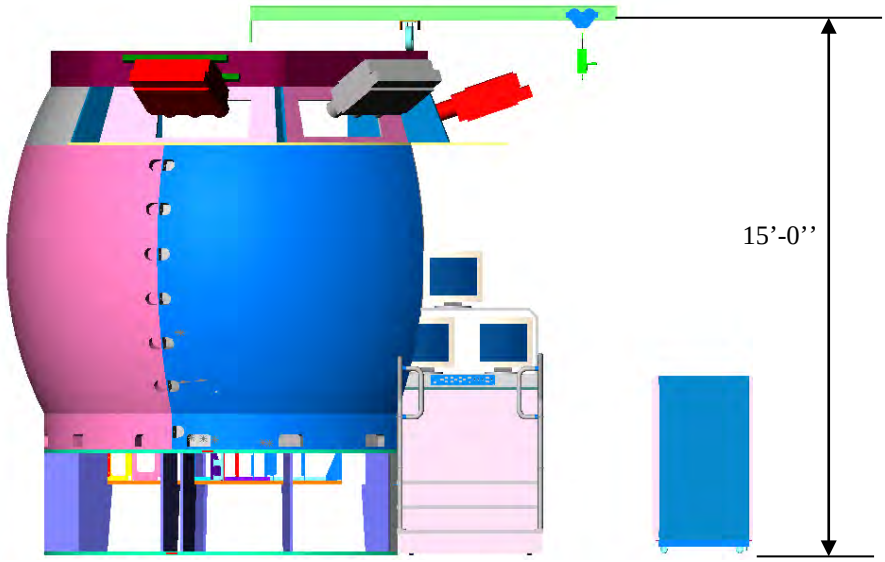


Figure 1-4. OFT Side View

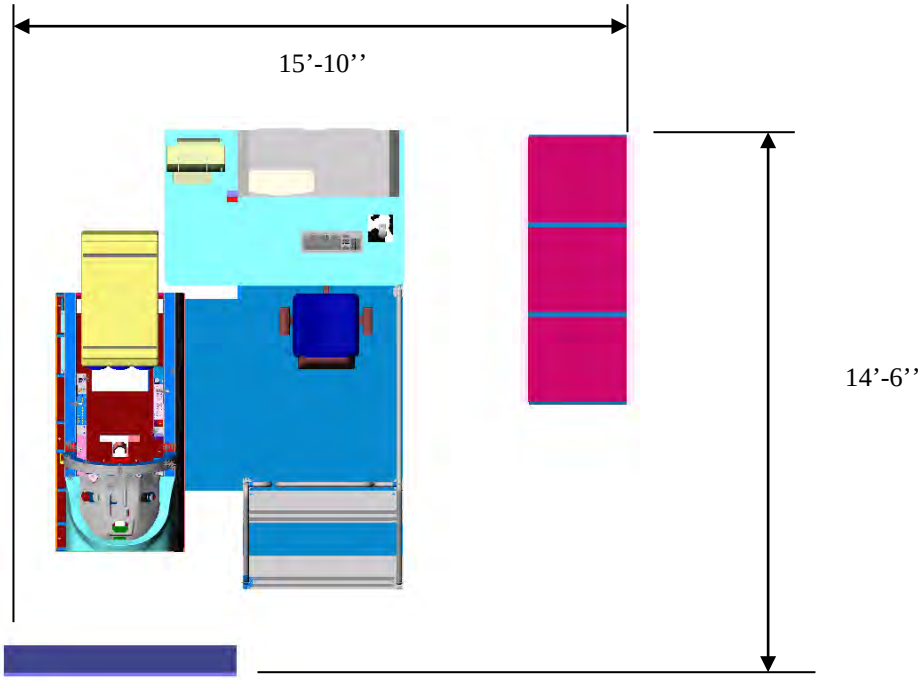


Figure 1-5. IFT Plan View

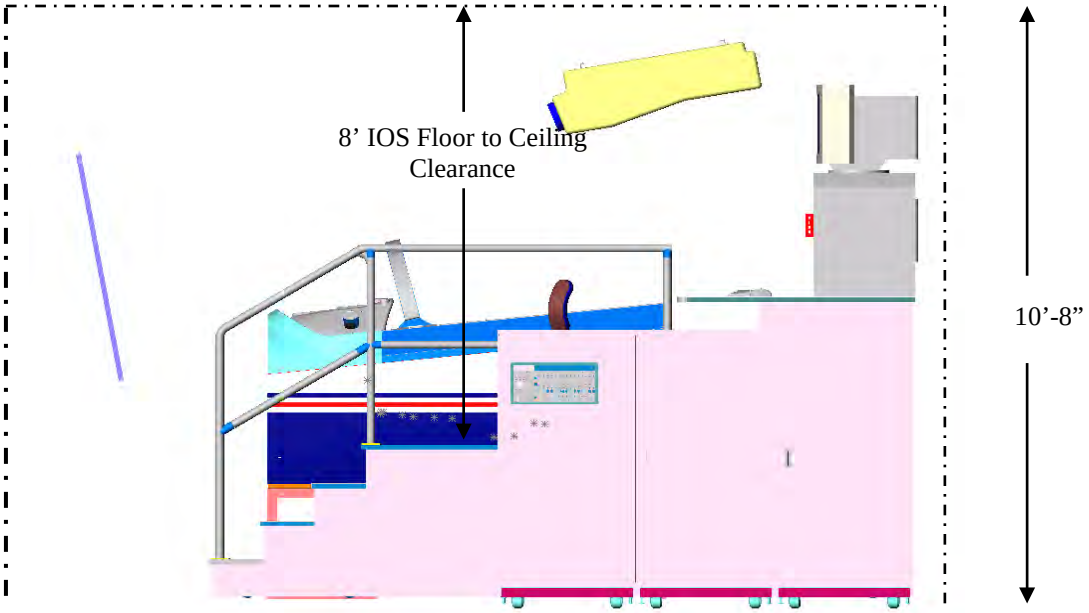


Figure 1-6. IFT Elevation

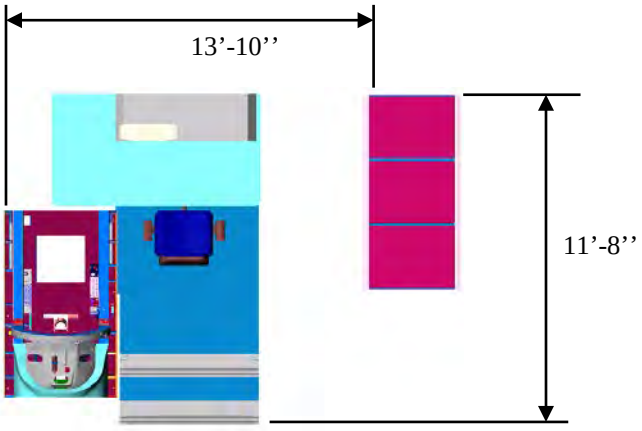


Figure 1-7. UTD Plan View

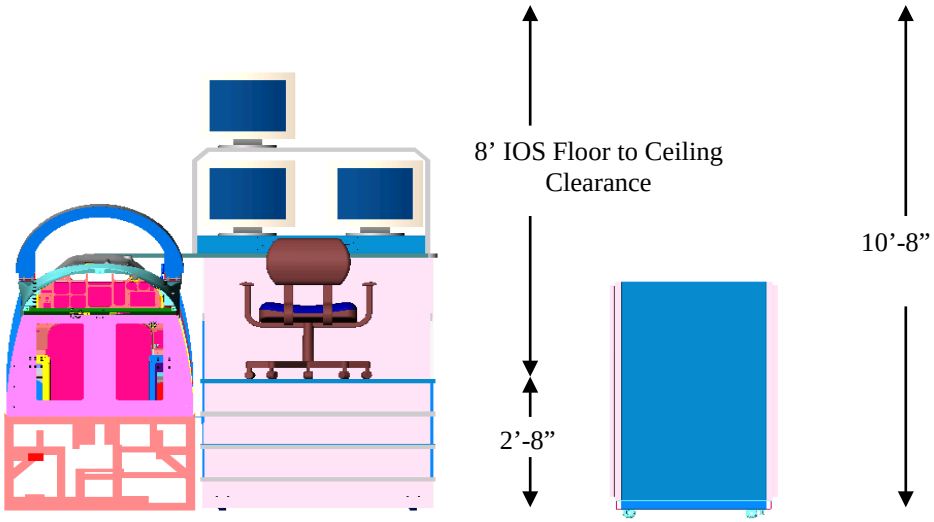


Figure 1-8. UTD Elevation

1.1.3. FTD Environmental Requirements

Environmental requirements for the FTD are:

OFT and IFT: Temperature range of a normal office type environment typically between 59 and 89°F (15 and 32°C) with 20 to 80 percent relative humidity, non-condensing.

UTD: The flight room environment shall be between 32 and 95°F and 20 to 80 percent non-condensing relative humidity.

Operation at the high end of the temperature range will result in increasing rates of failure.

Operation at the high end of the humidity range near large bodies of salt water may cause corrosion, pitting, and poor connectivity.

Operation at the low end of the humidity range increases the potential for arcing.

1.2. FTD MAJOR SYSTEM COMPONENT DESCRIPTIONS

The FTD major system components are distributed in four areas. Figure 1-9 shows the major areas and subsystem component locations. Table 1-4 shows the reference designators for these components.

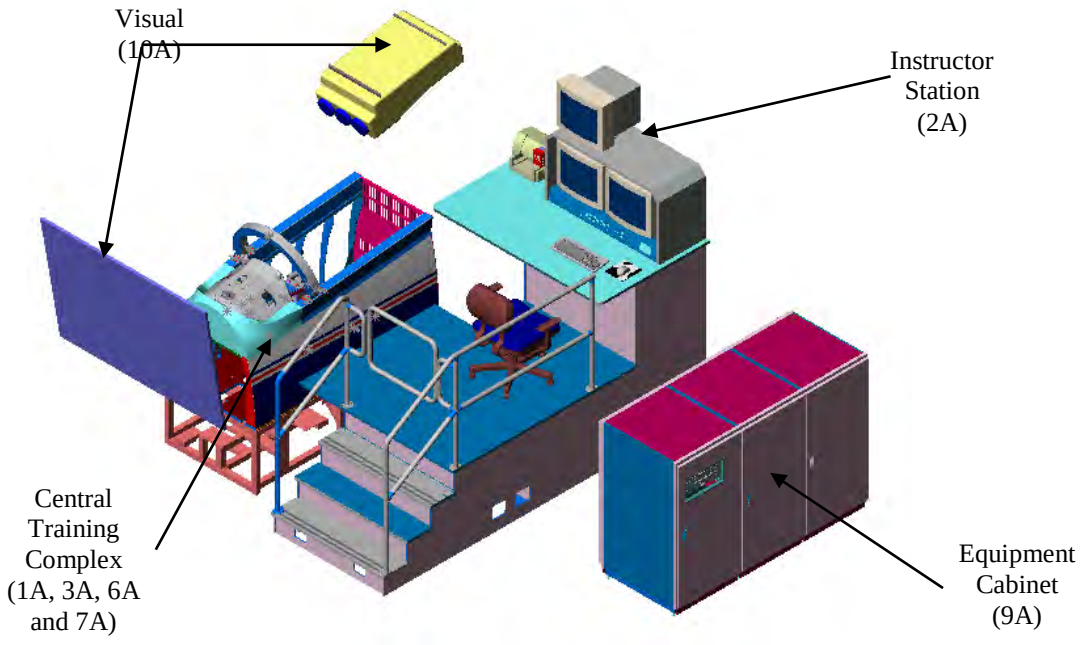


Figure 1-9. FTD Component Locations

Table 1-4. FTD Reference Designator List

Component	Reference Designator
Student Station	
Instrument Panel	1A1
Glareshield	1A1A1
Engine Fire Annunciator	1A1A1DS1
Master Warning	1A1A1SDS1
Master Caution	1A1A1SDS2
GPS Panel	1A1A2
Radio Management Unit	1A1A3
Emergency Locator Transmitter Control Panel	1A1A4
TAS Standby/Norm/Test Switch	1A1A5S1
TAS Power Switch	1A1A5SDS1
TAS Light Plate	1A1A5
AHRS Panel	1A1A6
Pilot Audio Control Panel	1A1A7
Annunciator Panel	1A1A8
EFIS Control Panel	1A1A9
UHF Backup Control Panel	1A1A10M10
Landing Gear Panel	1A1A11
Landing Gear Handle	1A1A11A1
Limitations Light Plate	1A1A12
Parking Brake Light Plate	1A1A13
Gust Lock Lever	1A1A14
NWS Annunciator	1A1DS1
Speed Brake Annunciator	1A1DS2
Forward Cockpit Speaker	1A1LS1
AOA Indexer	1A1M1
Standby Compass	1A1M2
AOA Indicator	1A1M3
Airspeed Indicator Display	1A1M4
ADI Display	1A1M5
Inclinometer	1A1M5A1
Altitude Indicator Display	1A1M6
Clock	1A1M7
Accelerometer	1A1M8
HSI Display	1A1M9
TA/VVI Display	1A1M10
Primary EDI	1A1M11
Secondary EDI	1A1M12
Engine Fluid	1A1M13
Standby Airspeed Indicator	1A1M14
Standby Horizon Indicator	1A1M15
Standby Altimeter Indicator	1A1M16
Turn and Slip Indicator	1A1M17
Flap Position Indicator	1A1M18
Left Side Console	1A5
Forward Left-Hand Switch Control Panel	1A5A1
Throttle Grip	1A5A2

Component	Reference Designator
Student Station (continued)	
Seat Adjust Panel	1A5A3
Canopy Fracture Switch	1A5A4
System Test Panel	1A5A5
Left Circuit Breaker Panel	1A5A6
Maintenance Anti-G Panel	1A5A7
Circuit Breaker Panel Circuit Card	1A5A8
Left Forward Flood Light	1A5A9
Left Mid Flood Light	1A5A10
Trim Position Indicator	1A5A1M1
Canopy Handle Lock	1A5A11
Control Loading Rest Switch	1A5SDS1
Right Side Console	1A6
Forward Right-Hand Switch Control Panel	1A6A1
Environmental Control Panel	1A6A2
Oxygen Regulator	1A6A3
Blank	1A6A4
Right Circuit Breaker Panel	1A6A5
Phone Jack/Oxygen Panel	1A6A6
Right Forward Flood Light	1A6A9
Utility Light	1A6A6DS1
Phone Jack	1A6A6J1
Anti-suffocation Switch	1A6A6S1
Circuit Breaker Panel Circuit Card	1A6A7
Side Console	1A6A8
Emergency Power Off Switch	1A6A8SDS1
Control Stick	1A8
Stick Shaker	1A8A1B1
Aileron/Elevator Trim Switch	1A8A1S1
Trim Interrupt Switch	1A8A1S3
TAS Function Switch	1A8A1S4
Nose Wheel Steering Switch	1A8A1S5
Seat Assembly	1A9A1
Seat Actuator Controller (Frame)	1A9A1A1 OFT & IFT only
Seat Actuator (Backside Seat)	1A9A1B1 OFT & IFT only
Seat Accelerometer	7A19 OFT & IFT only
S1 Limit Extend	1A9A1 OFT & IFT only
S2 Limit Retract	1A9A1 OFT & IFT only

Component	Reference Designator
Instructors Station	
Monitor #1	2A2A1
Monitor #2	2A2A2
Monitor #3	2A2A3
IOS Control Panel	2A2A4
Console Spot Dim/Bright	2A2A4R1
Console El Dim/Bright	2A2A4R2
Simulator Sound	2A2A4R3
Interphone Volume Control	2A2A4R4
UHF Volume	2A2A4R5
VHF Volume	2A2A4R6
NAV Volume	2A2A4R7
Marker Volume	2A2A4R8
DME Volume	2A2A4R9
Radio Selector	2A2A4S1
Interphone Selector	2A2A4S2
Audio Selector	2A2A4S3
Emergency Power Off	2A2A4SDS1
Master Power	2A2A4SDS2
Control Loading Arm	2A2A4SDS3
Dynamic Seat Arm	2A2A4SDS4
Parameter Freeze	2A2A4SDS5
Total Freeze	2A2A4SDS6
Crash Override	2A2A4SDS7
T/O Point	2A2A4SDS8
Approach IAF	2A2A4SDS9
System Reset	2A2A4SDS10
Microphone Key	2A2A4SDS12
Audio Jack Panel	2A2A5
Printer	2A2A6
IOS Alarm Pull	2A2A7
Accelerometer	3A10
Accelerometer Transducer	3A10MT1
Frame	
AC Power Distribution Box	6A2A1
Throttle Control Assembly	6A5A1
Driver Module	6A5A1A1
Converter	6A5A1A2
Magnetic Brake	6A5A1L1
Servo Platform Assembly	7A1 OFT & IFT only
Seat Motion PSSCB (DRI-equipped; only 1 PSSCB w/DAS; none for DAS II)	7A1A1 OFT & IFT only
Seat Motion Platform	7A1A2
DRI Control #1 (DRI-equipped only)	7A1CLS1

Component	Reference Designator
Frame (continued)	
Control Loading Patch	7A2
Power Supply 24 VDC	7A2PS1
Elevator Motor	7A5
Power Amplifier	7A5A1
Pilot Load Cell	7A5MT1
Motor Shaft Encoder	7A5M1
Aileron Motor	7A6
Power Amplifier	7A6A1
Pilot Load Cell	7A6MT1
Motor Shaft Encoder	7A6M1
Rudder Motor	7A7
Power Amplifier	7A7A1
Pilot Load Cell	7A7MT1
Motor Shaft Encoder	7A7M1
Left Toe Brake Motor	7A12
Power Amplifier	7A12A1
Pilot Load Cell	7A12MT1
Motor Shaft Encoder	7A12M1
Right Toe Brake Motor	7A13
Power Amplifier	7A13A1
Pilot Load Cell	7A13MT1
Motor Shaft Encoder	7A13M1
Seat Secondary Motion Frame	7A19 OFT & IFT only
Seat Power Amplifier	7A19A1 OFT & IFT only
Seat Encoder Unit	7A19M1 OFT & IFT only
Seat Brake	7A19B11 OFT & IFT only

Component	Reference Designator
Equipment Cabinet	
Equipment Cabinet	9A1
Power Controller Assembly	9A1A1
System Patch	9A1A2
Main Panel Lighting Supply	9A1A2A1
Side Panel Lighting Supply	9A1A2A2
Emergency Lighting Control Panel	9A1A2A3
Battery Bus Bright/Dim Control	9A1A2A4
Flood Lighting Dimmer	9A1A2A5
Dimming Heat sink	9A1A2A6
UHF DC-DC Converter	9A1A2A7
Power Supply	9A1A2PS1
Equipment Cabinet	9A2
Electric Control Loading Computer	9A2A1
Uninterruptible Power Supply	9A2A2
Flight Deck I/O Computer	9A2A3
Remote Power Controller-Digital Servo	9A2A5
Radio Management Unit Power Supply	9A2A6A1
System Power Supply 28VDC	9A2A6PS1
Power Supply +/- 15VDC	9A2A6PS2
Microphone Pre-Amp Power Supply	9A2A6PS3
AC Power Distribution Box	9A2B1
Equipment Cabinet	9A3
Host Computer	9A3A1
Instructor Operating Station Computer	9A3A2
Sound System Computer	9A3A3
Amplifier	9A3A4
Compuswitch	9A3A5
Audio Processing System Unit	9A3A7
DAS/DAS II Chassis	9A3A6
AC Power Distribution Box	9A3B1
Visual-OFT only	
Visual Remote Power Controller	10A0A1
Visual Channel Processor	10A0A2
Visual Channel Processor	10A0A3
Visual Channel Processor	10A0A4
Visual Channel Processor	10A0A5
Visual Channel Processor	10A0A6
Equipment Cabinet	10A1
Equipment Cabinet	10A2
Visual-IFT only	
Visual Channel Processor	10A0A2
Equipment Cabinet	10A1
NO Visual on the UTD	

Component	Reference Designator
Fire Detection	
Thermal Sensor T1-1 Behind Main Instrument Panel	1A25
Thermal Sensor T2-1 Behind Main Instrument Panel	1A25
Thermal Sensor T1-2 Control Loading Equipment	7A1A1
Thermal Sensor T2-2 Control Loading Equipment	7A1A1
Smoke Detector S3-1 Overhead Dome	10A0A2 (OFT & IFT only)
Manual Alarm Switch Station S1 IOS	2A2A7
Thermal Sensor T1-4 Equipment Cabinet	9A2
Thermal Sensor T1-3 Equipment Cabinet	9A3
Thermal Sensor T1-5 Visual Cabinet 1	10A1 (OFT & IFT only)
Thermal Sensor T1-6 Visual Cabinet 2	10A2 (OFT only)
Thermal Sensor T2-4 Equipment Cabinet	9A2
Thermal Sensor T2-3 Equipment Cabinet	9A3
Thermal Sensor T2-5 Visual Cabinet 1	10A1 (OFT & IFT only)
Thermal Sensor T2-6 Visual Cabinet 2	10A2 (OFT only)
Master Control Panel	9A7A1 (Facility Wall)
Alarm Strobe Light DS1 Fire Protection Indication	9A7A2
High Temp/Smoke Alarm Horn LS1 Fire Indication Equipment	9A7A2
Thermal Sensor T1-7 Overhead Dome	10A0A7 (OFT only)
Thermal Sensor T2-7 Overhead Dome	10A0A7 (OFT only)
Emergency Light	9A9A2 (OFT, IFT only)
Fans	
Visual Top Cap Dome Structure	10A0 (OFT only)
Visual Structure	9A12 (IFT only)
Student Station	6A2
Equipment Cabinet	9A2
Equipment Cabinet	9A3

1.2.1. Power Distribution System

The power distribution system (PDS) distributes controls and conditions AC power to the trainer. It also distributes low voltage AC and DC power for the power control circuit, temperature monitoring circuits and provides an interface for operation, maintenance, and troubleshooting. In the event of an emergency, the PDS provides a means of rapidly removing simulator power.

The power distribution system has major and subsystem areas of AC and DC power as listed below.

The trainer requires 208/120 VAC, 60-Hz, three-phase site power in six major areas:

50 amps for the AC Power Controller Assembly. See Figure 1-10.
80 amps for the Remote Digital Servo Power Controller. See Figure 1-10.
20 amps for the Image Generator Equipment (IGE)1 PD1 — See Figure 1-10
20 amps for the IGE1 PD2
15 amps* for the Fire Detection Master Control Panel. See Figure 1-10.

* 6520A0001E specifies 15 amps but some devices arrived with 20-amp circuit breakers installed.

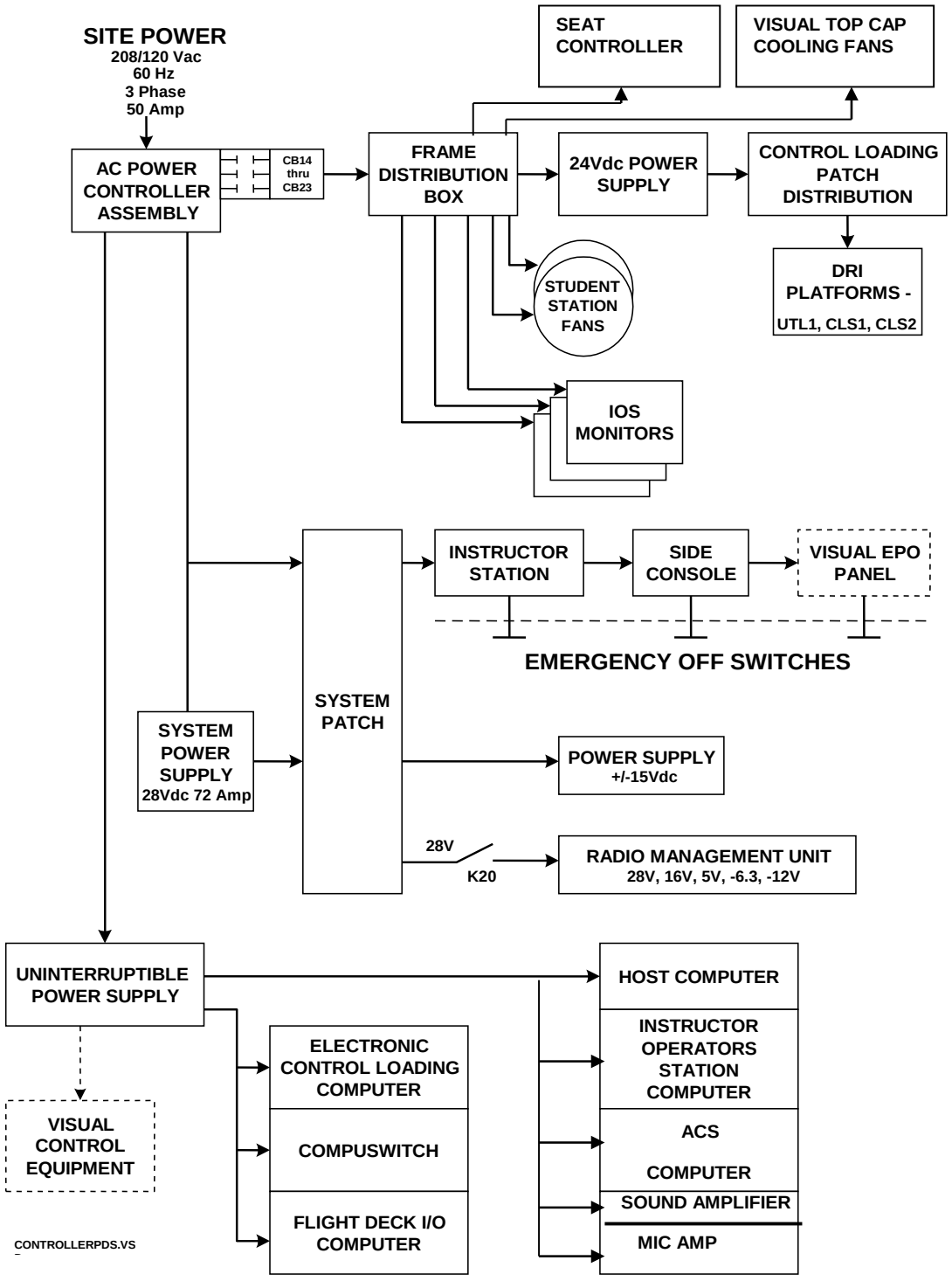
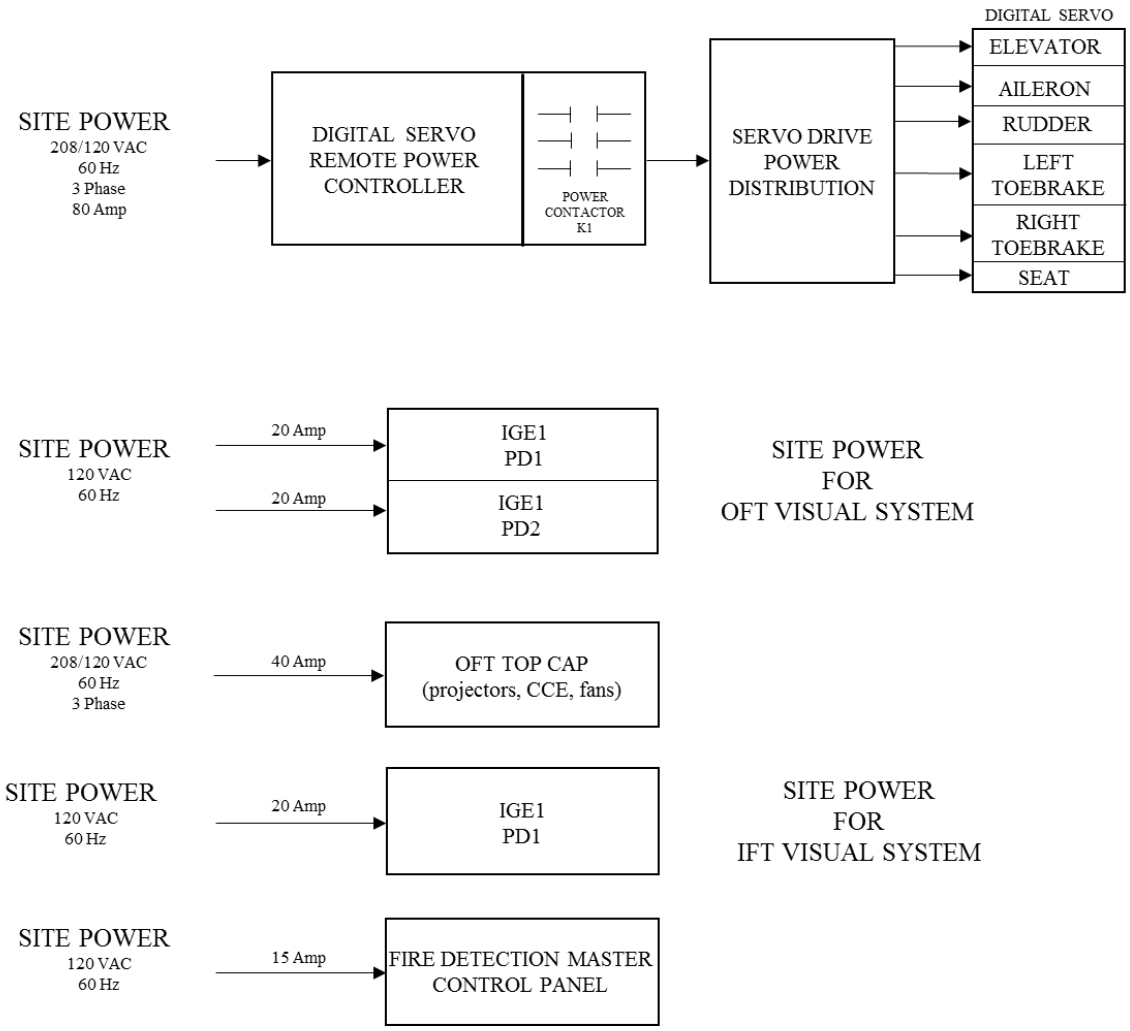


Figure 1-10. PDS Block Diagram (DRI Only) (Sheet 1 of 2)



1-10. PDS Block Diagram (DRI Only) (Sheet 2 of 2)

The Power Distribution Components include: (For DAS- and DAS II-equipped systems, remove the DRI Platforms UTL1, CLS1 box and add a block below MIC AMP for DAS/DAS II in Figure 1-10, Sheet 1 of 2.)

AC Power Controller (9A1A1)
AC Power Distribution Box (6A2A1)-Frame
AC Power Distribution Boxes (9A2B1, 9A3B1)-Equipment Cabinets
Uninterruptible Power Supply (9A2A2)
Digital Servo Remote Power Controller (9A2A5)
DC Power Supplies:
- 24VDC (7A2PS1)
- 28VDC (9A2A6PS1)
- 10VDC (9A1A2PS1)
- 15VDC (9A2A6PS2)
- Mic Amp (9A2A6PS3)
- RMU (9A2A6A1)
- UHF (9A1A2A7)

See Figure 1-11 and Figure 1-12 for the PDS Component locations.

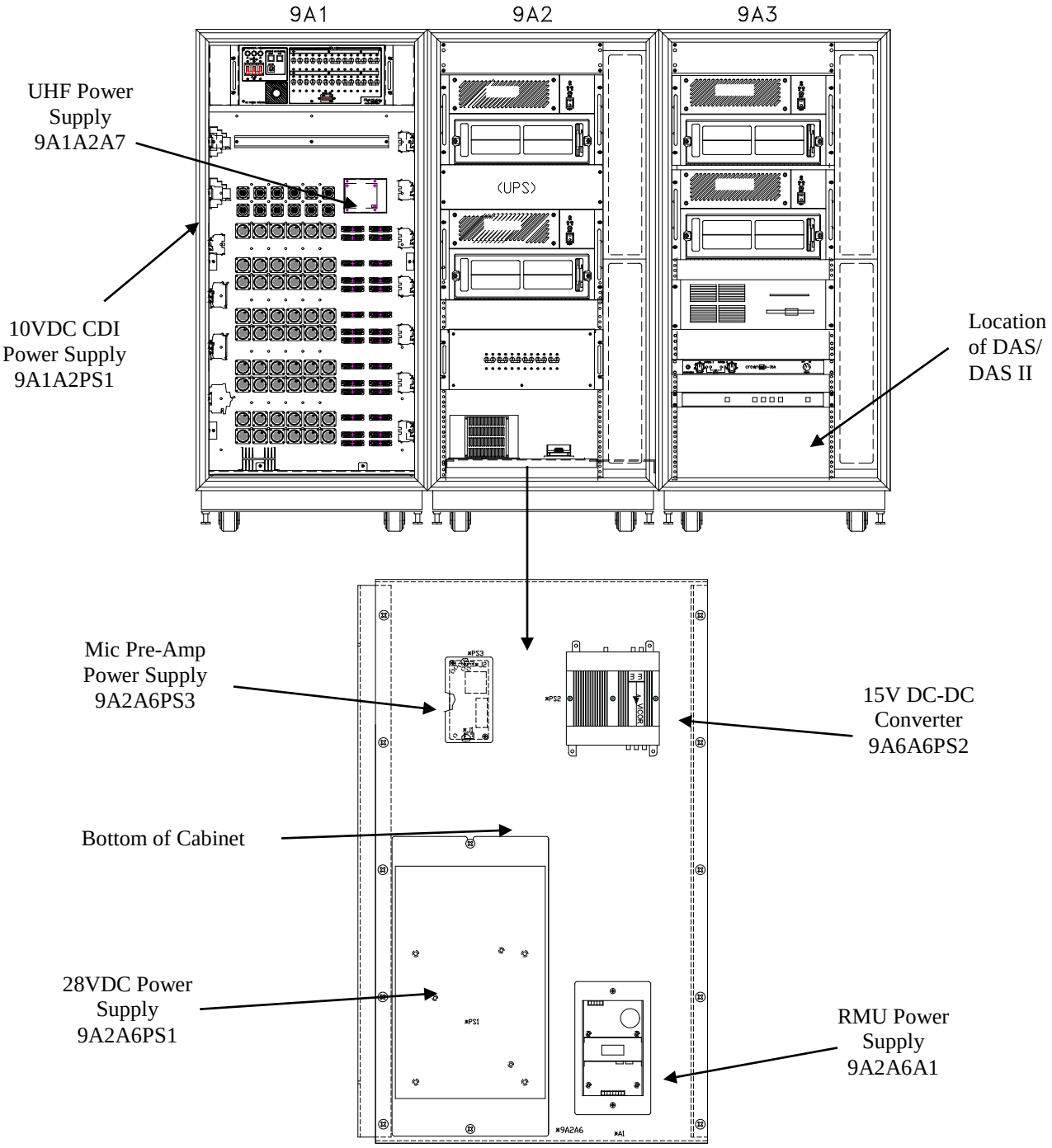


Figure 1-11. Subsystem Power Supplies

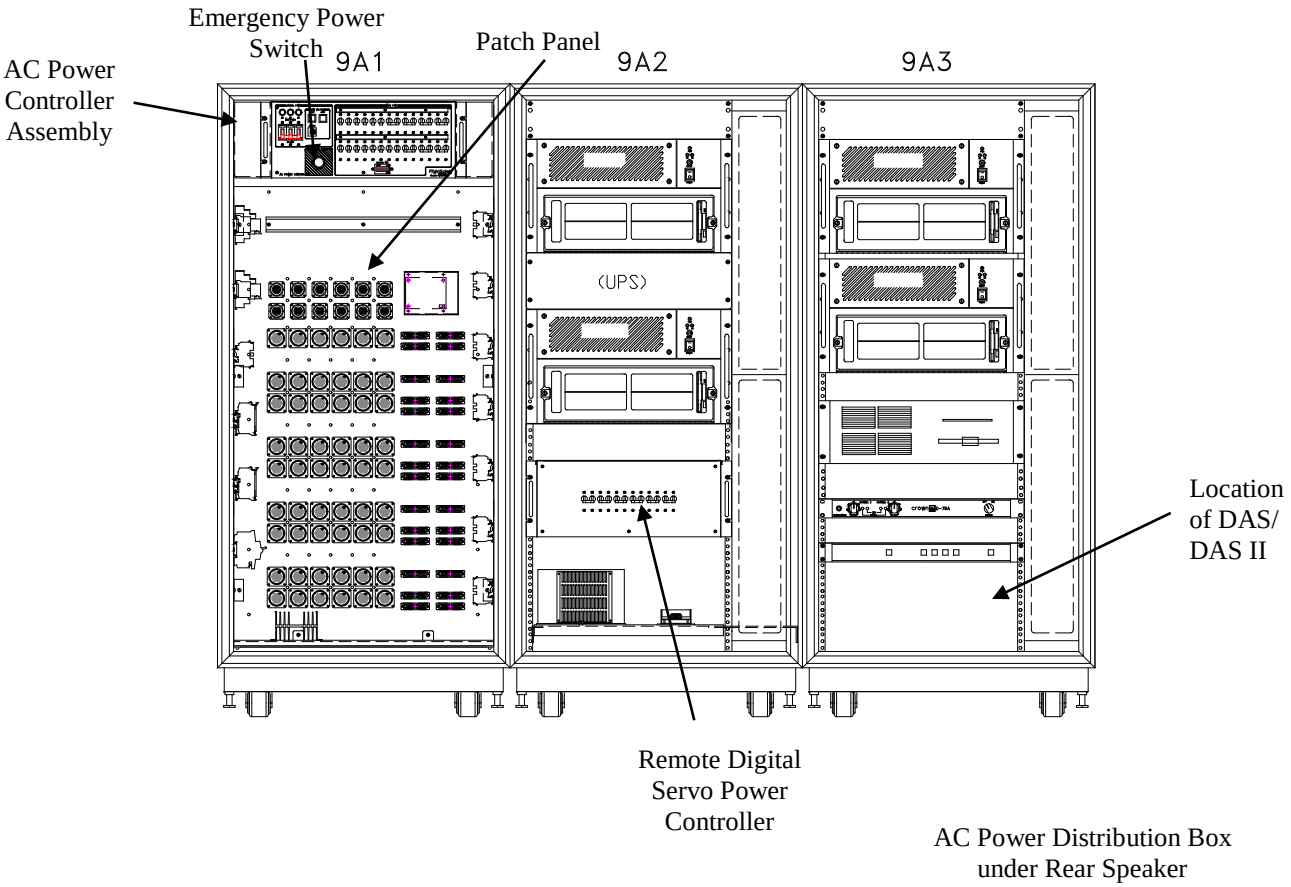


Figure 1-12. PDS Component Locations

1.2.1.1. AC Power Controller Assembly (9A1A1)

The AC Power Controller Assembly (see Figure 1-12) provides power to the Emergency OFF switches, Emergency Lighting system, UPS, 24VDC and the 28VDC System Power Supply, IOS monitors, student station fans, utility lights, and AC Power Distribution Boxes.

The AC Power Controller Assembly contains the circuitry to accomplish an orderly startup and shutdown of simulator power with the Main Control Start and Stop switches. See Figure 1-13.

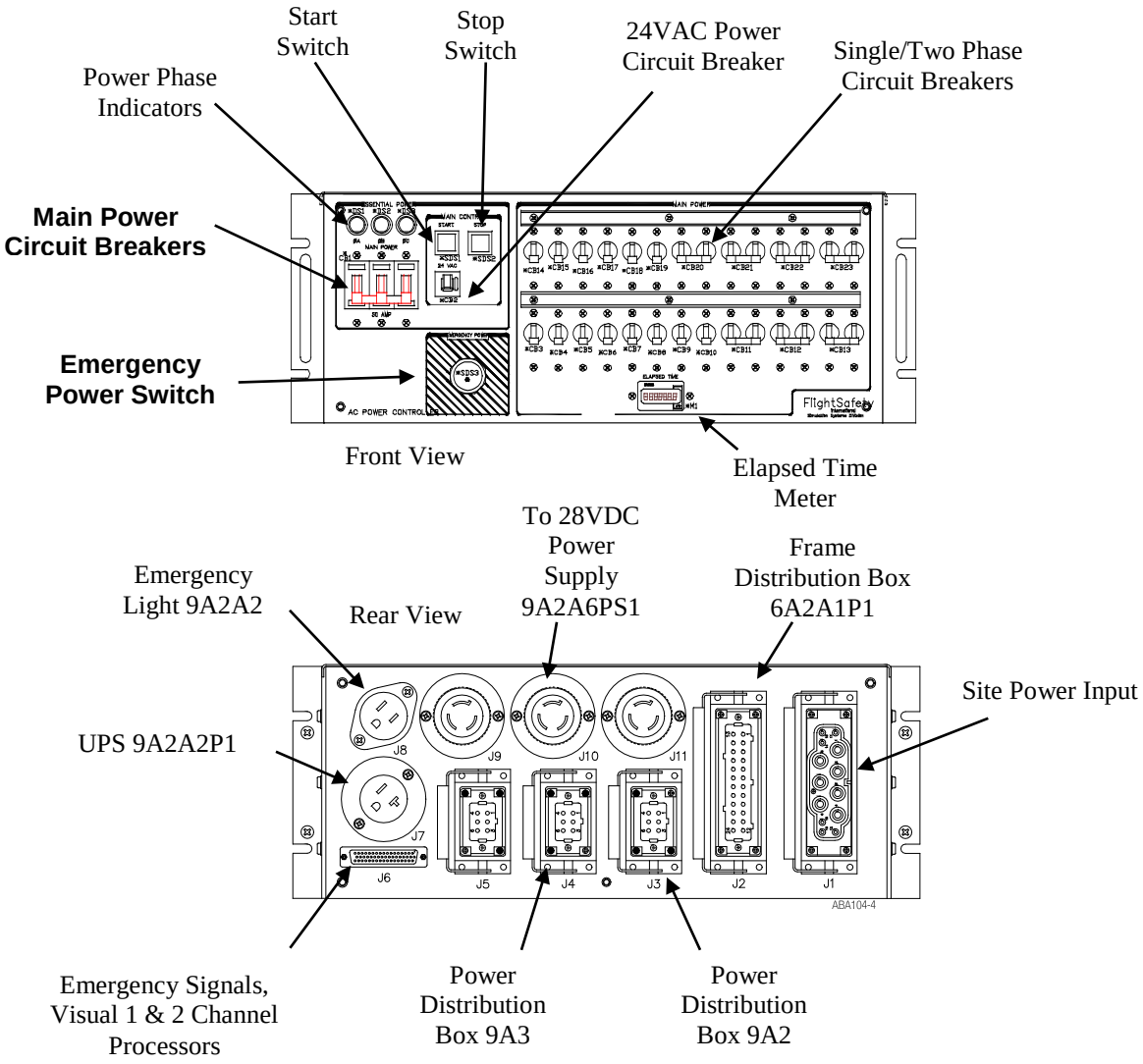


Figure 1-13. AC Power Controller

1.2.1.2. Frame Distribution Box (6A2A1)

The Frame Distribution Box, located in the rear frame of the Student Station, receives AC power from the Power Controller Assembly (9A1A1) through J1 and distributes AC power to the IOS monitors, fans in the pilot frame, compartment lighting utility box, seat motor controller, and 24VDC power supply. See Figure 1-14.

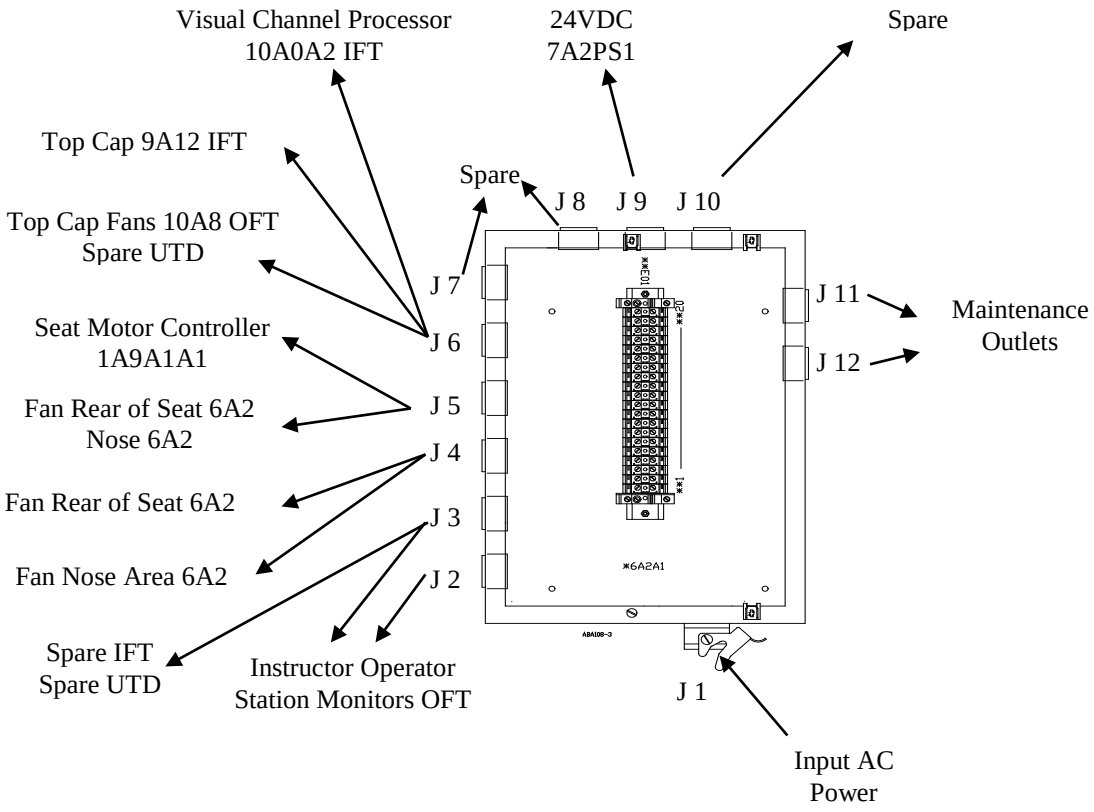


Figure 1-14. AC Power Frame Distribution Box

1.2.1.3. AC Power Distribution Boxes (9A2 and 9A3)

The AC Power Distribution Boxes receive AC power from the Power Controller Assembly (9A1A1) for distribution of power to equipment cabinet blower assemblies (9A2B1) and (9A3B1). These blowers cool the equipment in each of their cabinets. See Figure 1-15.

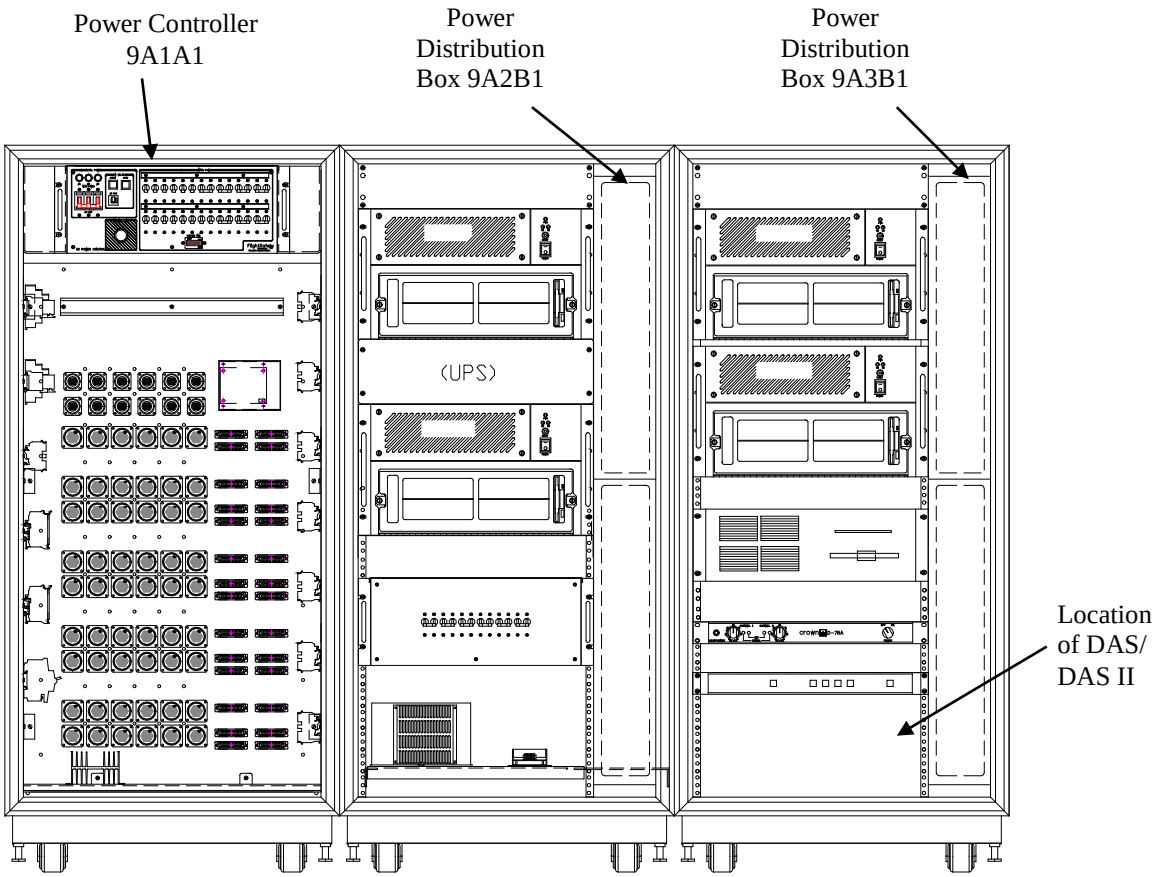


Figure 1-15. Equipment Cabinets

1.2.1.4. Uninterruptible Power Supply (9A2A2)

The Uninterruptible Power Supply (UPS) receives power from the AC Power Controller Assembly (9A1A1) and supplies power to the ECL Computer, FDK I/O Computer, Host Computer, IOS Computer, Aural Cue System Computer, Sound Amplifier, CompuSwitch, and DAS/DAS II (if equipped).

If there is site power failure, the UPS will maintain power to these components for 5 to 15 minutes. This allows proper shutdown through the Instructor Operator System computer to save required simulator data. See Figure 1-16. Table 1-5 lists the power requirements, environmental requirements, and physical characteristics of the UPS chassis.

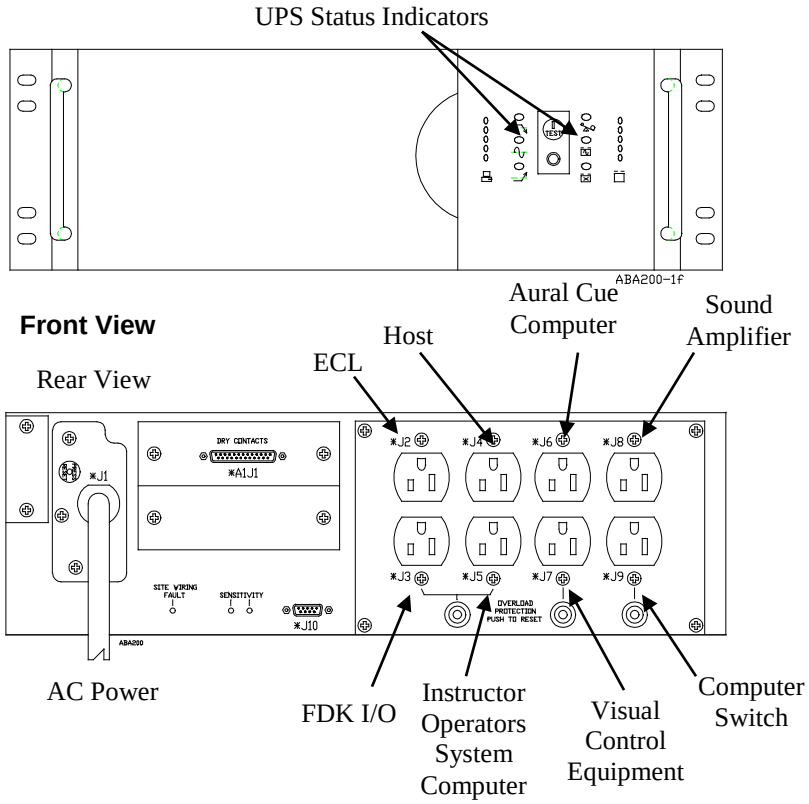


Figure 1-16. Uninterruptible Power Supply

Table 1-5. UPS Characteristics

Parameters	Specifications
AC Power Input	103-132VAC, 2200VA, 1600 Watts
Frequency	50 or 60 Hz +/- 5%
Humidity	0% - 95% non-condensing
Operating Temperature	32°F - 104°F (0°C - 40°C)
Dimensions	5.2” H x 19” W x 26” D (13.2 cm x 48.3 cm x 66 cm)
Weight	102 lbs. (46.3 kg)

1.2.1.5. Digital Servo Remote Power Controller (9A2A5)

The Digital Servo Remote AC Power Controller provides AC power to the Digital Servo Amplifiers for the Electric Control Loading System (ECLS) Actuators. A circuit breaker protects each servo control system as shown in Figure 1-17.

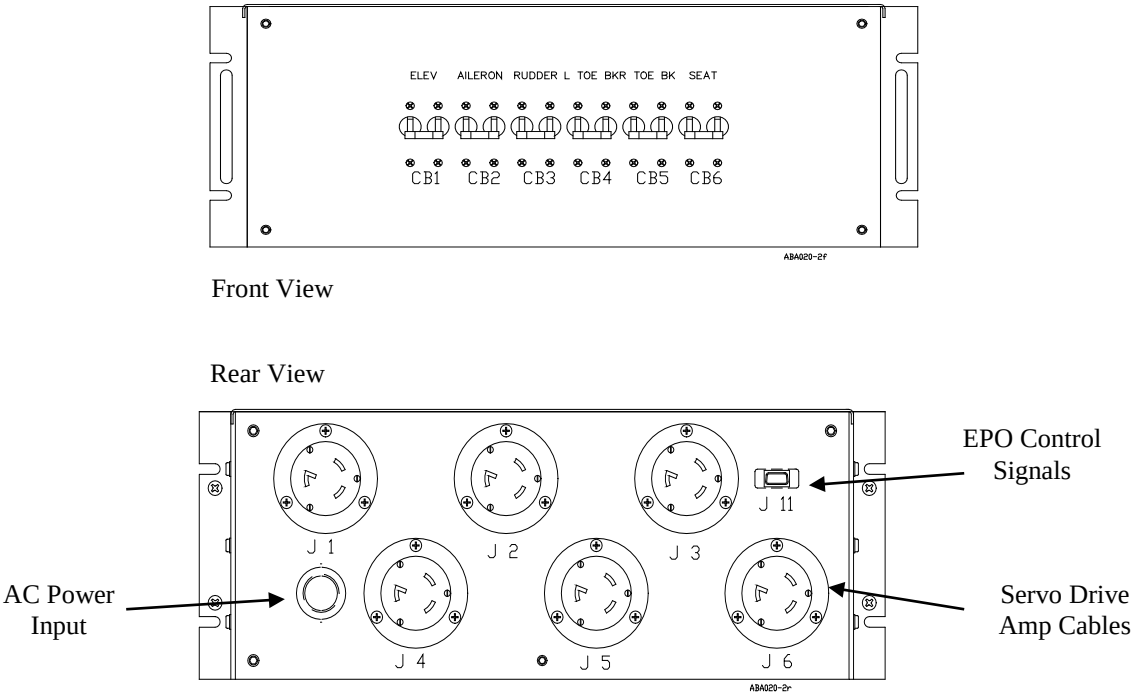


Figure 1-17. Digital Servo Remote Power Controller

Table 1-6 lists Digital Remote Power Controller characteristics.

Table 1-6. Digital Remote Power Controller – Characteristics

Parameters	**Specifications**
AC Power Input	208/120Vac 3-Phase, 80A
Frequency	50-60Hz
Humidity	20-80% noncondensing
Operating Temperature	50-122°F (10-50°C)
Dimensions	7" H x 17" W x 24" D (17.8cm x 43.2cm x 61cm)
Weight	30lb (13.6kg)

1.2.1.6. DC Power Supplies

The 24VDC (7A2PS1) power supply provides 24VDC to the Digital Remote Interface (DRI) Platforms, Utility DRI (UTL-1), Controls DRI (CLS-1), through the Control Loading Patch Distribution panel (7A2) at the rear of the student station frame. (The DAS and DAS II Platforms replace all DRI components listed above.) See Figure 1-18.

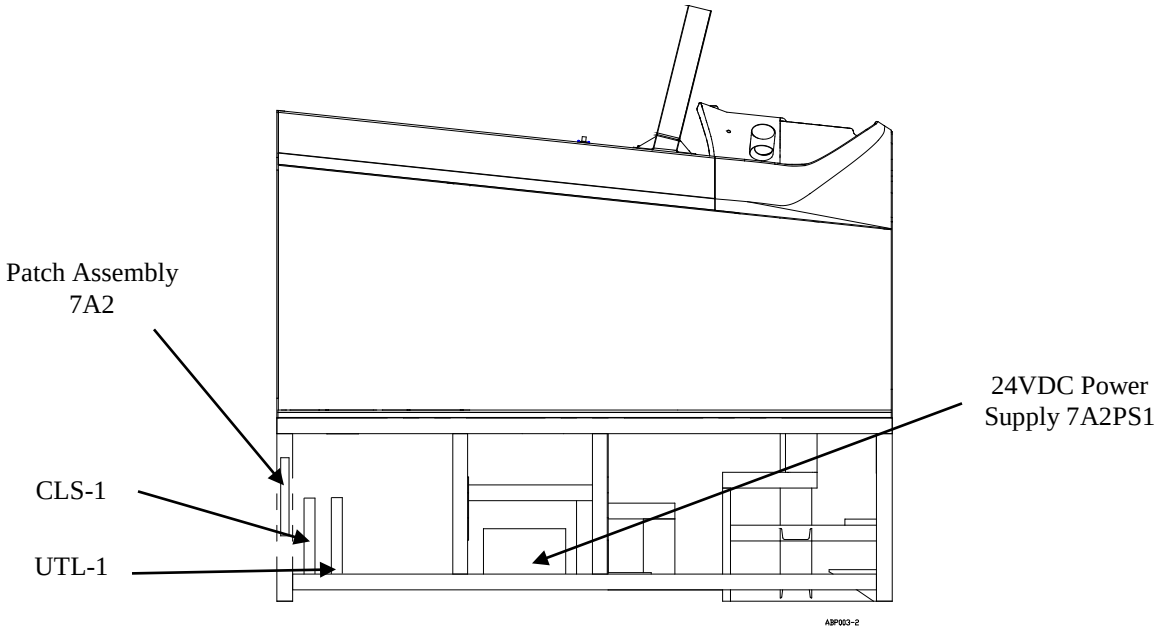


Figure 1-18. Power Supply 24VDC

Subsystem power of 24VDC is provided for the power control circuits:

DRI Platforms (excluded from DAS and DAS II configurations)
Controls (CLS-1) (excluded from DAS and DAS II configurations)
Utility (UTL-1) (excluded from DAS and DAS II configurations)

Subsystem power of 28VDC is provided for:

±10VDC power supply
±15VDC power supply
Radio Management Unit (RMU) power supply
UHF Control Head power supply

Subsystem power of ±15VDC is provided for:

Flight Deck I/O analog input board
Forward Right-hand Switch Control Panel
Conversion Module for the Throttle Control Assembly

Figure 1-19 shows these power supplies:

The 28VDC (9A2A6PS1) power supply provides 28VDC to the equipment cabinet System Patch (9A1A2) for further distribution to the ±10VDC power supply (9A1A2PS1), the ±15VDC power supply (9A2A6PS2), and the RMU power supply (9A2A6A).

The ±10VDC (9A1A2PS1) power supply provides ±10VDC reference voltage to instrumentation in the student station.

The ±15VDC (9A2A6PS2) power supply provides power to the Analog Input Board (9A2A3XA12P2) and the forward right-hand switch control panel. Subsystem ±15VDC includes FDKIO analog input board; forward, right-hand Switch Control Panel; and conversion module for the Throttle Control Assembly.

The RMU (9A2A6A1) power supply provides 28VDC, 16VDC, 5VDC, -6.3VDC, -12VDC to the Radio Management Unit.

The UHF DC-DC Converter (9A1A2A7) provides 185VDC, 10VDC, -26VDC to the UHF Backup Control Panel.

The Mic Pre Amp Power Supply (9A2A6PS3) provides 24 VDC to the Interphone system.

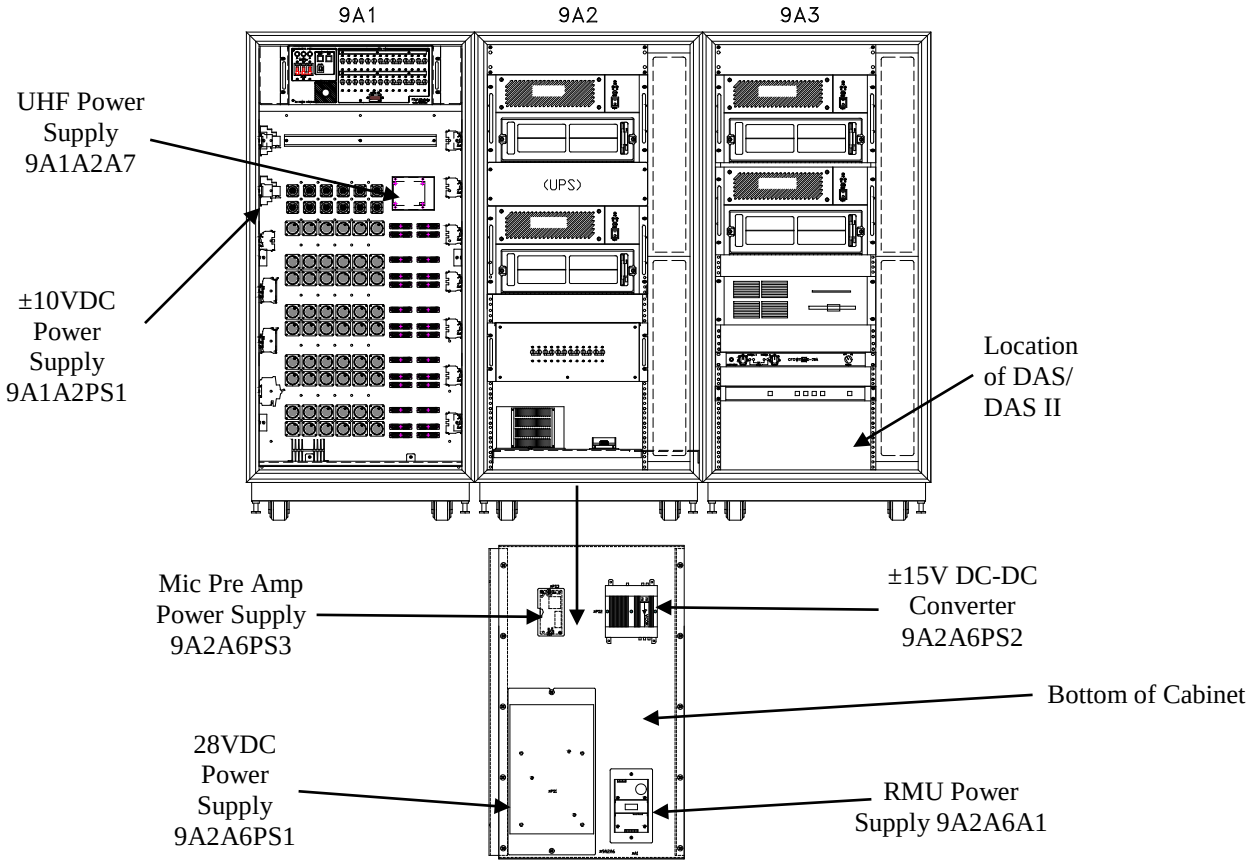


Figure 1-19. Subsystem Power Supplies

1.2.2. Host Computer (9A3A1)

The Host Computer is the training system's primary computational system. It controls the input/output activity to the subsystems and models the flight, engine, navigation, and aircraft system behaviors.

The Host Computer chassis is located at 9A3A1 in the equipment cabinet. See Figure 1-20. Table 1-7 lists the power requirements, environmental requirements, and physical characteristics of the Host Computer chassis.

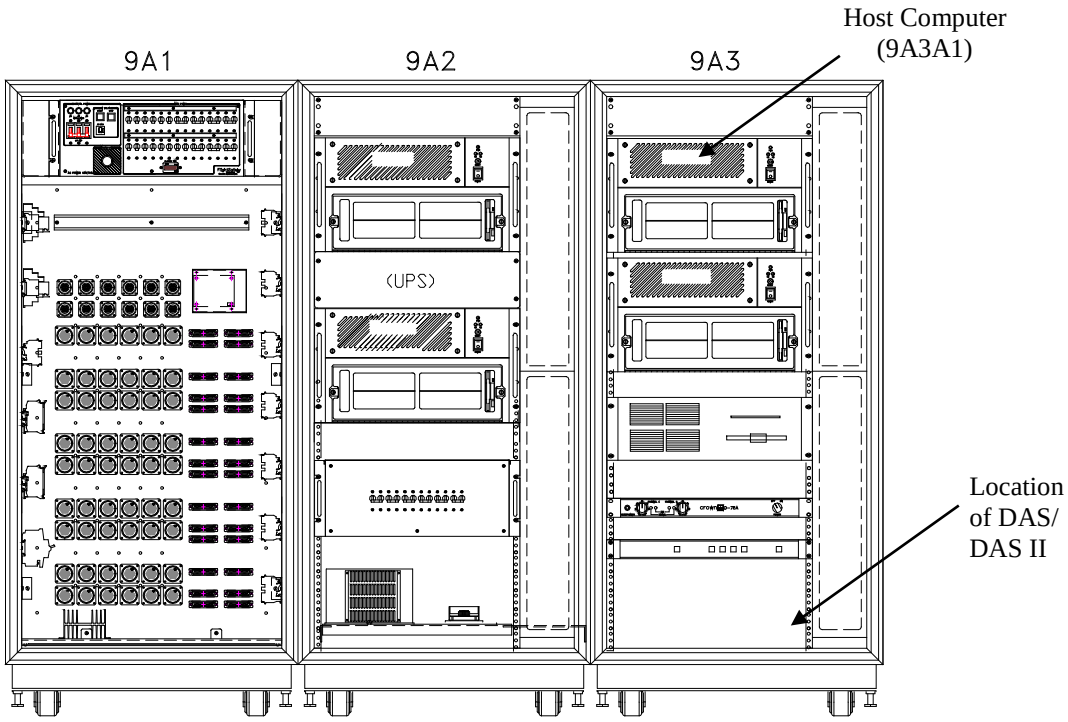


Figure 1-20. Equipment Cabinets-Host Computer

Table 1-7. Host Computer Characteristics

Parameters	Specifications
AC Power Input	120VAC
Frequency	50-60 Hz
Humidity	5% - 90% non-condensing
Operating Temperature	32°F - 140°F (0°C - 60°C)
Storage Temperature	-40°F - 158°F (-40°C - 70°C)
Dimensions	10.5" H x 19" W x 22" D (26.7 cm x 48.3 cm x 55.9 cm)
Weight	40 lbs. (18 kg)

The chassis contains several components to execute real-time math models. The chassis components include:

20-slot PCI/ISA Backplane
Dual Redundant, Hot-Swappable Power Supplies
Single Board Computer
3 Network Interface PCI Bus Boards
Hard Disk Drive
Floppy Disk Drive
Cooling Fans

See Figure 1-21 for the locations.

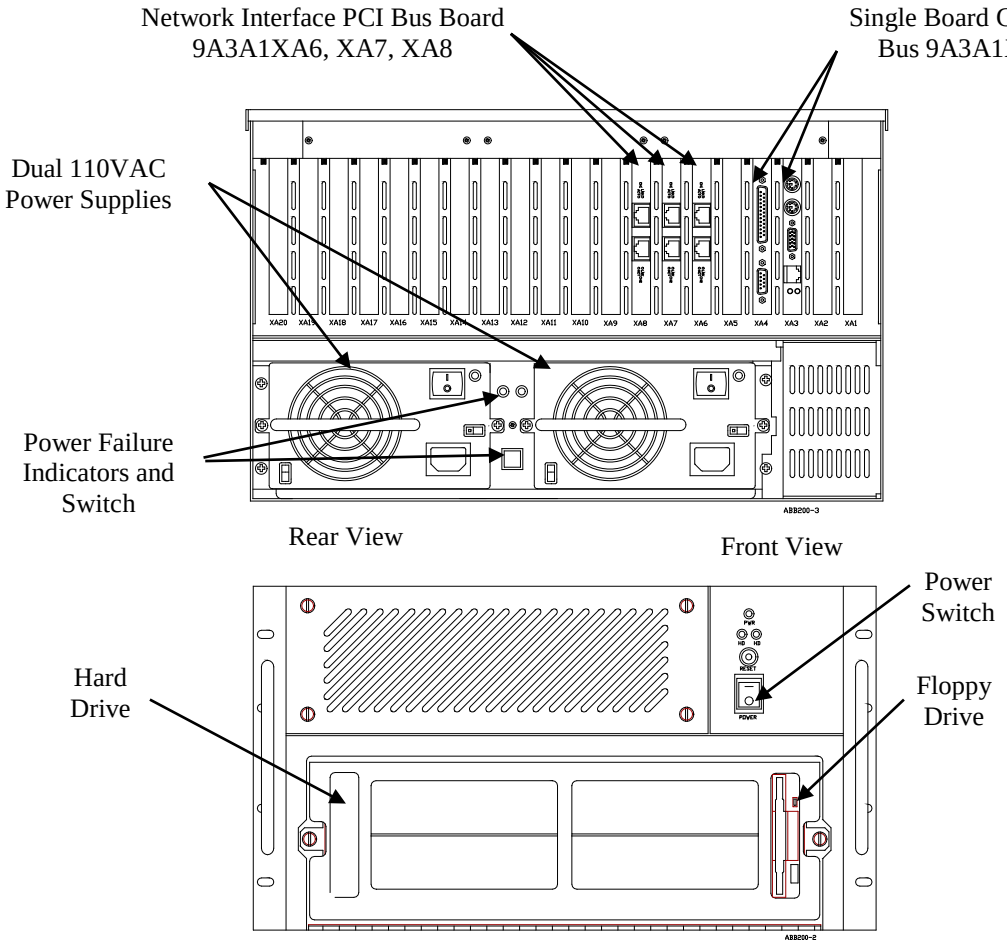


Figure 1-21. Host Computer

The Host Computer chassis (9A3A1) has a 20-slot PCI/ISA backplane with 16 passive PCI slots. Six drive bays are provided; however, only two are used for the Hard Drive and the Floppy Drive. Three cooling fans of 90 cfm provide filtered air to the chassis components.

The front of the chassis contains controls and indicators for powering on and resetting the chassis and showing the operational status of the drives.

On the back of the chassis are two dual-redundant, 300-watt, hot-swappable power supplies that supply DC power to the chassis components. If one supply fails, the other supply immediately takes over. Each power supply contains an audible failure alarm and operational status indicators.

The Host communicates with the Subsystems over a 100BaseT-dedicated network using UDP protocol. The six Ethernet cables interface the host computer with the Instructor Operating System, the Aural Cue System, the Electric Control Loading System, the Flight Deck I/O System, and the Visual Image Generator System.

The Single Board Computer (XA3, XA4) mounts on a PCI bus and has an 800-MHz Pentium III microprocessor, 1024 Mbytes of RAM, two serial ports, one parallel port and 100BaseT Ethernet port. The only back panel wiring at XA3 and XA4 is the computer switch connections to the CompuSwitch (9A2A4).

The Network Interface PCI bus boards (XA6, XA7, XA8) are used for real-time communication. The Ethernet ports have a real-time communication with the subsystem computers. The back panel wiring at XA6 connects to the Local Area Network (top) and the Flight Deck I/O Computer (bottom). Wiring at XA7 is to the IOS (top) and the Aural Cue Computer (bottom). Wiring at XA8 is to the Electric Control Loading System Computer (top) and Visual System Hub (bottom). Each sub-system shares a dedicated network with the Host to form a star type configuration with the Host as the hub.

The Hard Disk drive is used for storing the operating system and simulation software. When the computer turns ON, the CPU looks for the operating system program VxWorks. Once the operating system is loaded into memory of the CPU then it looks for the application program. The Hard Disk drive has 6.5 GB of formatted capacity.

The Floppy Disk drive is used to maintain or rebuild the hard drive if there is a failure of the hard drive system. The Floppy Disk drive uses 3.5-inch floppy disk with 1.44MB capacity.

1.2.3. Aural Cue System (9A3A3)

The Aural Cue System is a vendor-supplied system that provides all the aural, ambient, and environmental sounds necessary of a flight simulator. This system also provides the digital communications system for the simulator.

1.2.3.1. Sound Amplifier (9A3A4)

The Sound Amplifier is a 19-inch, rack-mounted dual channel audio amplifier unit located in the equipment cabinet at 9A3A4. See Figure 1-22.

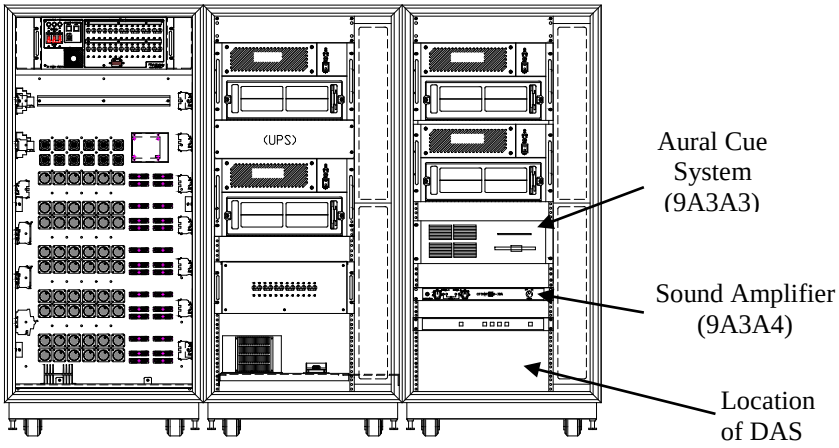


Figure 1-22. Equipment Cabinets-Aural Cue System

The unit features balanced inputs, signal presence, an input/output comparator indicator, and a means to isolate electrical ground from chassis ground. The amplifier is internally protected against external source or load failures.

The sound amplifier provides medium power amplification over two channels. Each channel sends audio signals to a specific speaker. Each channel receives a mixture of all the environmental sounds cued by the training scenario. See Figure 1-23.

Channel 1 of the amplifier sends its mixed sounds to the forward student station speaker. Channel 2 of the amplifier sends its mixed sounds to the aft student station speaker. See Figure 1-24.

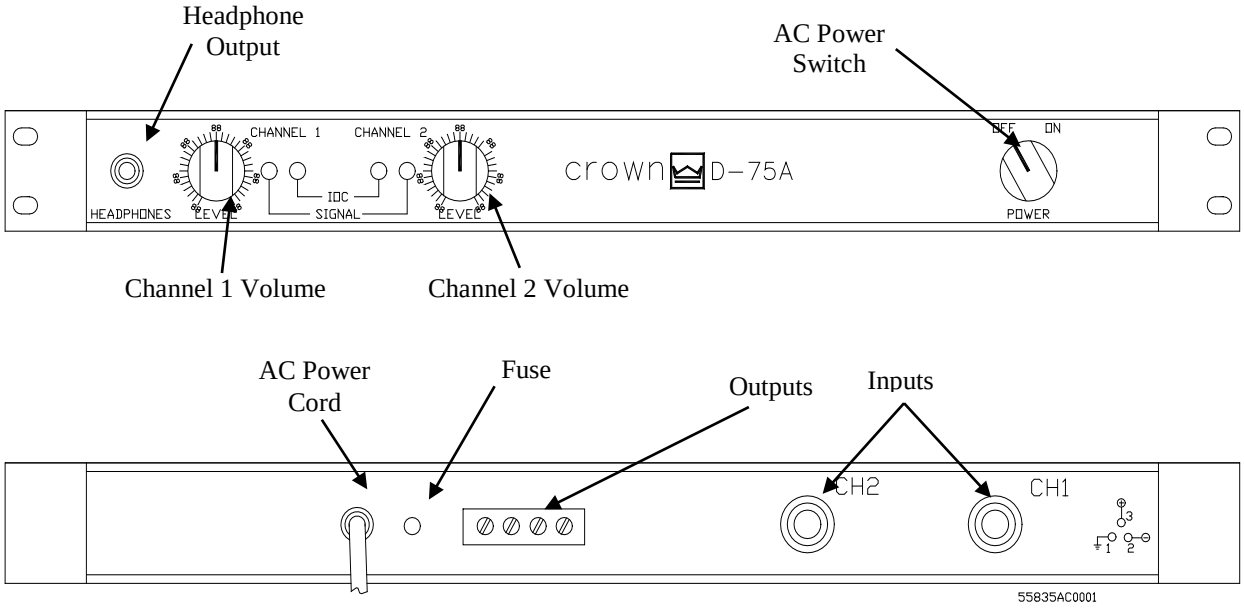


Figure 1-23. Sound Amplifier

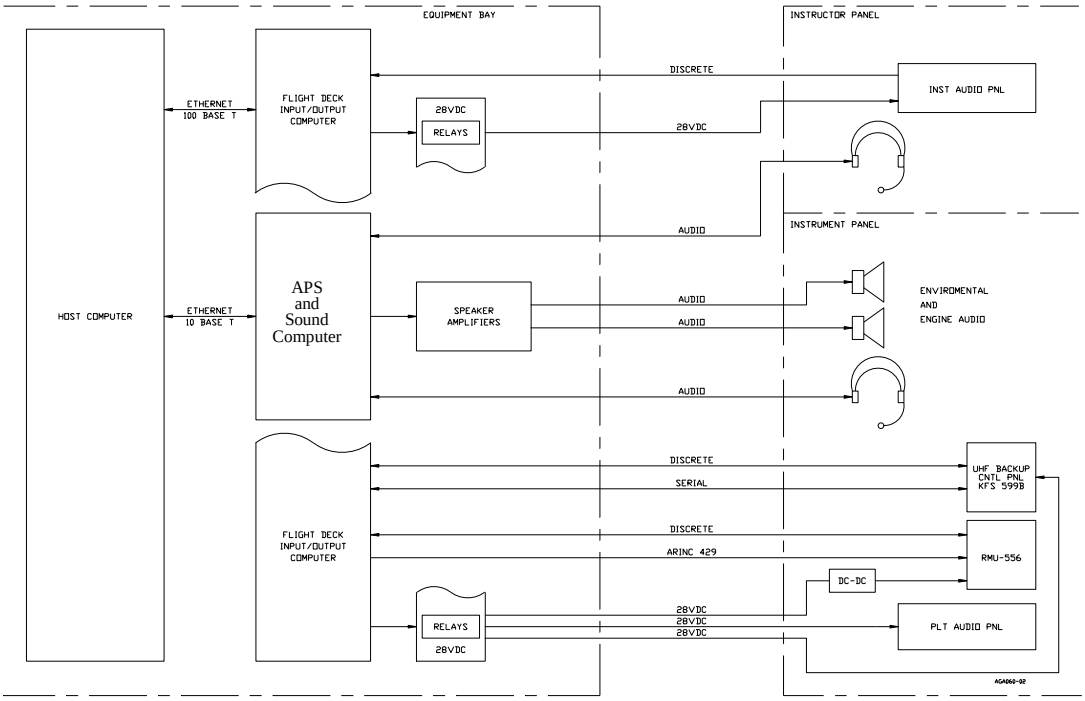


Figure 1-24. Aural Cue System Diagram

1.2.3.2. Speakers (1A1, 1A9)

The sound system has both a forward cockpit speaker and an aft cockpit speaker. Each speaker is a 6 x 9-inch, 100-watt @ 4-ohm impedance, with midrange woofer, tweeter and passive 2-way crossover. The speakers deliver the sounds created by the Audio Processing System (APS) and the Sound System Computer into the student station to enhance the training scenario. See Figure 1-25 and Figure 1-26.

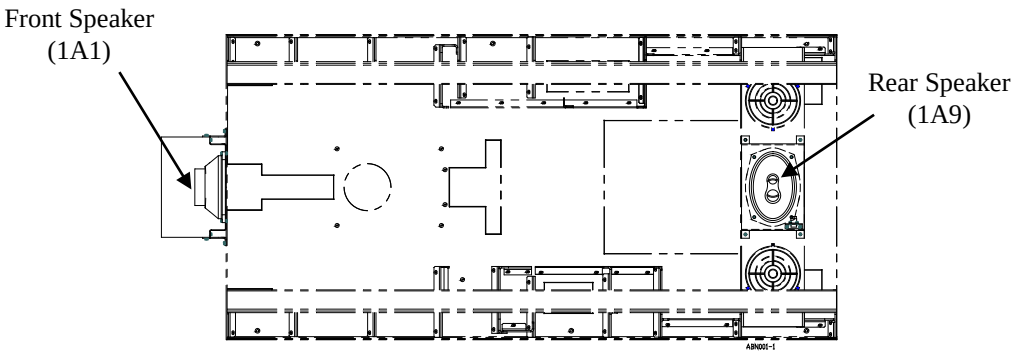


Figure 1-25. Student Station Speakers

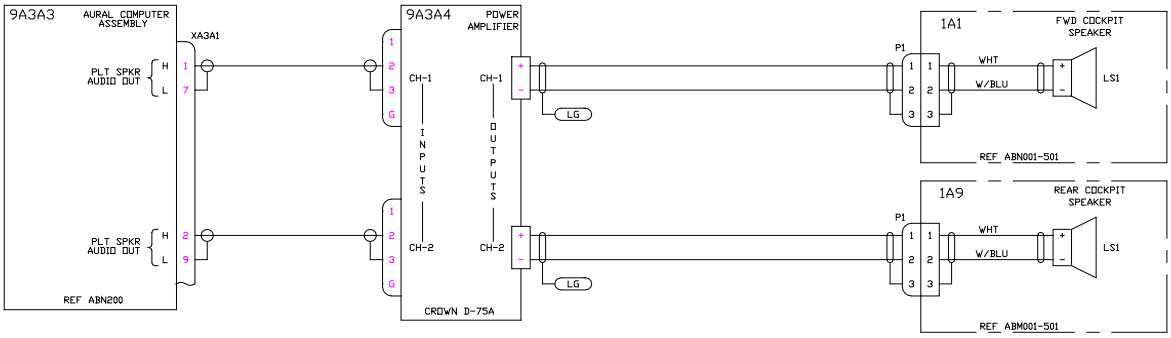


Figure 1-26. Speaker Diagram

1.2.4. Sound System Computer

The Sound System Computer is located in the 9A3 Equipment Cabinet. Refer to Figure 1-9. The Sound System Computer performs all of the sound system modeling.

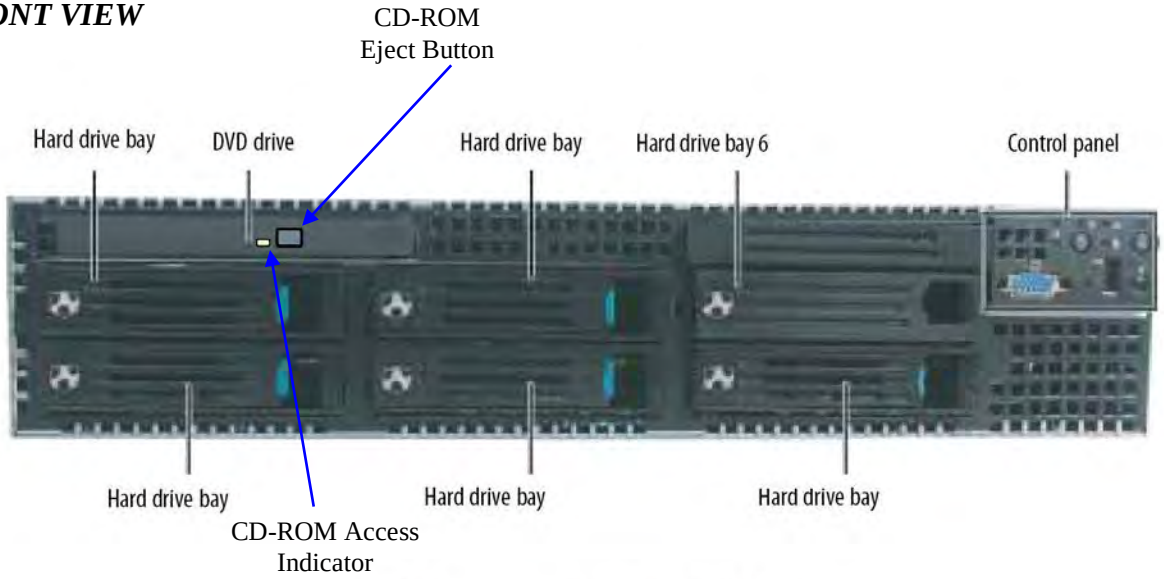
A Win32 (MSWindows) application (SimSound.exe) runs on the Sound System Computer and communicates with the host computer over the Ethernet. SimSound.exe performs all of the APS unit initialization. It takes inputs from the host such as engine RPM, airspeed, flap position, etc., and determines the required waveforms, playback volume, and playback frequency. SimSound.exe also provides the console type user interface for adjusting volumes, output channels, etc. See Figure 1-27 and Figure 1-28. Refer to the Gateway documentation for more information.

The Sound System Computer components include:

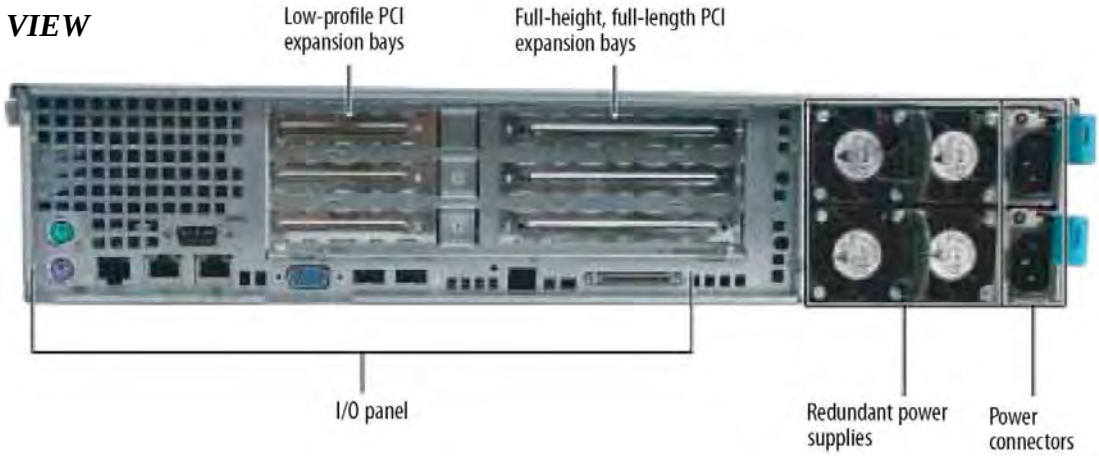
- System Main Board with a 800 MHZ Front Side Bus
    - Two Intel Xeon Dual Core CPU Slots (one 2.8 GHz CPU installed)
    - Six DIMM Memory sockets (1 GB DDR2 installed)
    - Three Low-Profile, 64-Bit, 3.3V and Three Full eight, Full Length, 64-Bit, 3.3V PCI slots
    - Integrated ATI Rage XL Video Controller with 8MB of SDRAM
    - Ultra320 SCSI Integrated Dual Channel Controllers
    - PS/2 Keyboard and Mouse Ports, 1 serial port, 1 VGA, 1 High Density SCSI, 3 Universal Serial Bus (USB) ports
    - Dual 10/100/1000 BaseT RJ-45 Local Area Network (LAN) ports
- Megaraid US 320-2 Two Channel SCSI Raid Controller with 128MB Cache
- Dual 73-GB Ulstra320 SCSI SCA, Hot-Swappable Disk Drives (5 drive capability)
- CD-RW/DVD-Rom Drive
- Two 700-Watt, hot-swappable Power Supplies
- Four Cooling Fans

The Sound System Computer is a standard 2U, 19" rack mount unit. Figure 1-27 illustrates the Sound System computer and its components.

FRONT VIEW



REAR VIEW



I/O PANEL

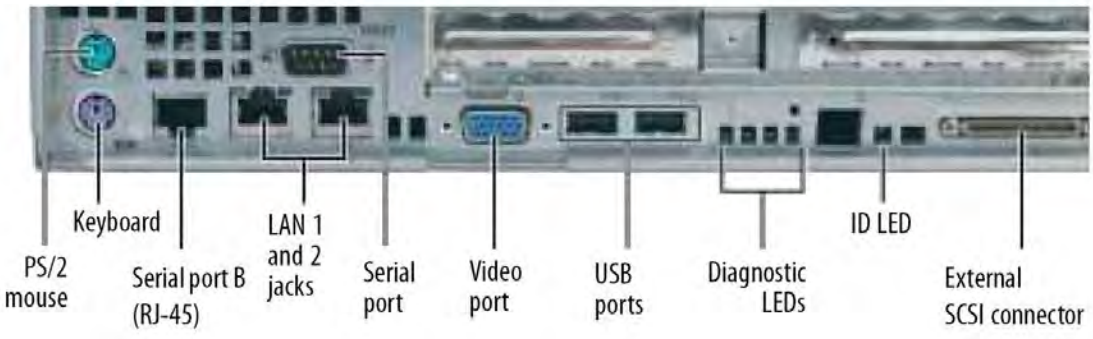


Figure 1-27. Sound System Computer External Components

INTERIOR VIEW

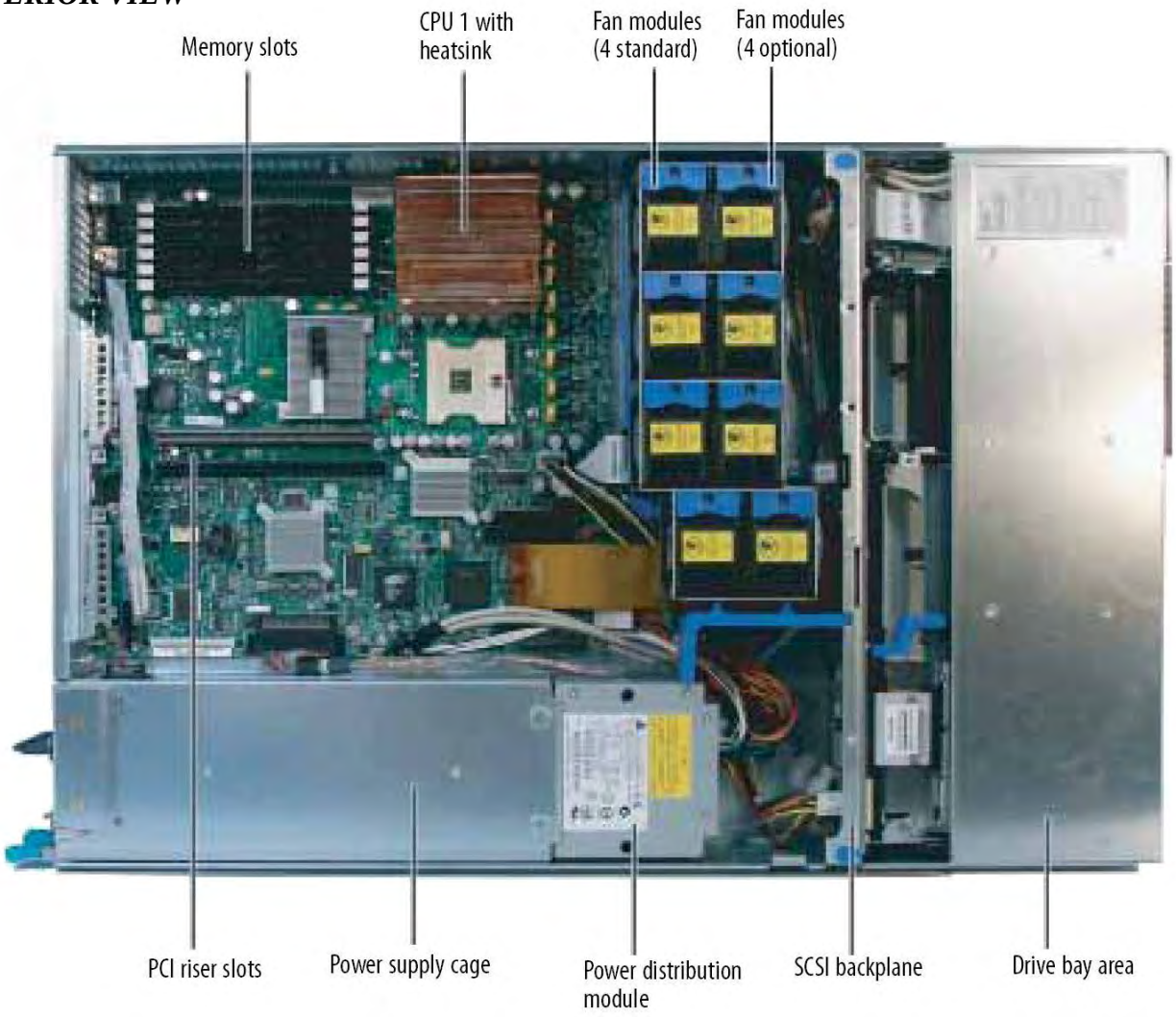


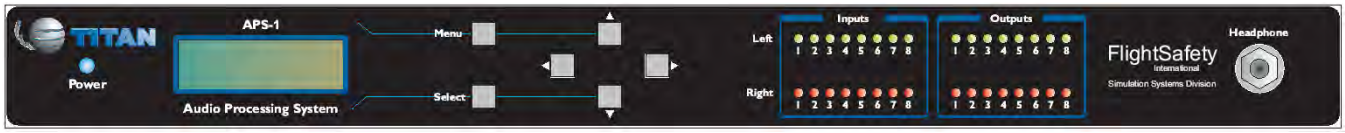
Figure 1-28. Sound System Computer Internal Components

1.2.5. Audio Processing System (APS) Unit

The APS unit is located in the 9A3 Equipment Cabinet. Refer to Figure 1-9.

The APS unit is a 1U, 19” rack-mounted device for performing all audio input and output to the Sound System Computer. See Figure 1-29. The front panel includes push buttons for user selections and a backlit LCD panel for diagnostics and operational status. All IO connections and the AC power switch are located on the rear panel. The APS unit provides the capability of up to 8 stereo single-ended outputs (16 mono) and 8 stereo differential inputs (16 mono). The APS unit interfaces with the Sound System Computer through a dedicated Ethernet connection. Refer to the Titan documentation for more information.

FRONT VIEW



REAR VIEW

Figure 1-29. Audio Processing System Unit

1.2.6. Electric Control Loading System (9A2A1)

The Electric Control Loading System (ECLS) provides the interface between the training device flight controls and the host computer and replicates control forces and seat motion. The ECLS receives inputs from the sensors on the flight controls for processing, and sends them to the host computer. The ECLS also receives inputs from the host computer for processing and sends them to the Digital Remote Interface (DRI) platform assemblies, the Data Acquisition System (DAS), or the DAS II. The DRI system will be discussed first (1.2.6.2). Information on the DAS starts at 1.2.6.34. DAS II is addressed in the separate DAS II supplement.

1.2.6.1. ECLS Chassis

The ECLS Computer chassis is located at 9A2A1 in the equipment cabinet. See Figure 1-30. Table 1-8 lists the power requirements, environmental requirements, and physical characteristics of the ECLS.

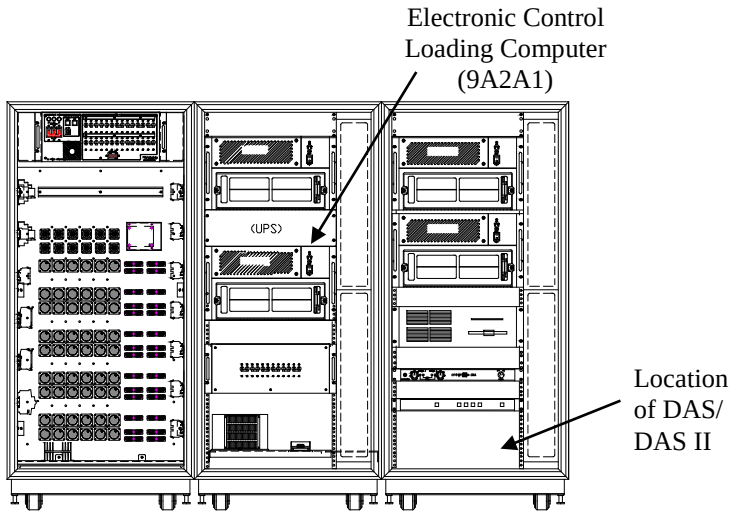


Figure 1-30. Equipment Cabinets-Electric Control Loading System

Table 1-8. ECLS Computer Characteristics

Parameters	Specifications
AC Power Input	120VAC
Frequency	50-60 Hz
Humidity	5% - 90% non-condensing
Operating Temperature	32°F - 140°F (0°C - 60°C)
Storage Temperature	-40°F - 158°F (-40°C - 70°C)
Dimensions	10.5” H x 19” W x 22” D (26.7 cm x 48.3 cm x 55.9 cm)
Weight	40 lbs. (18 kg)

The chassis contains several components to execute real-time math models associated with flight control within the simulation environment.

20 slot PCI/ISA Backplane
Dual Power Supplies
Single Board Computer
Network Interface PCI Bus Board
IP Carrier Board
Hard Disk Drive
Floppy Disk Drive
Internal Cooling Fans (not shown)

See Figure 1-31 for the locations.

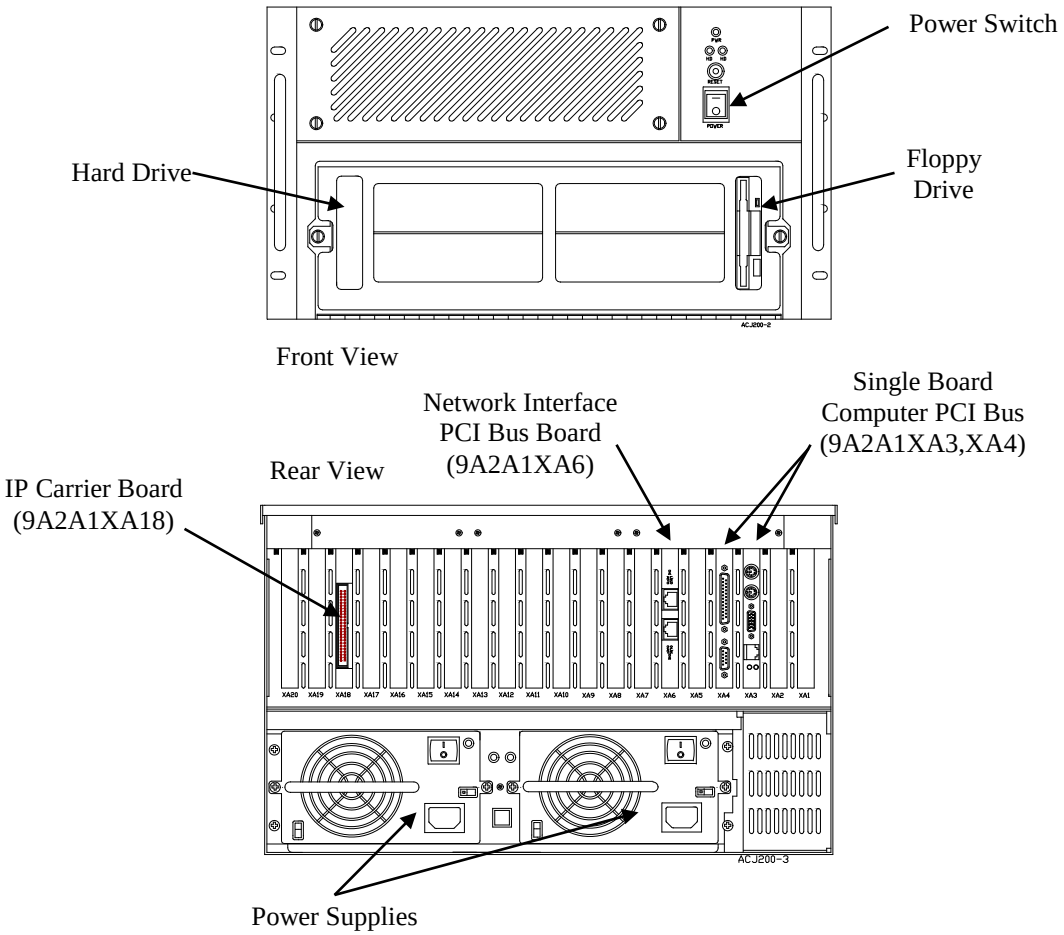


Figure 1-31. Electric Control Loading Computer

The ECLS Computer chassis (9A2A1) has a 20-slot PCI/ISA backplane with 16 passive PCI slots. Only two of the six bays are used: one for the Hard Drive and the other for the Floppy Drive. Three cooling fans of 90-cfm provide filtered air to the chassis components.

The chassis front contains controls and indicators for powering on and resetting the chassis and showing the operational status of the drives.

On the back are two dual, 300-watt, hot-swappable power supplies that supply DC power to the chassis components. If one supply fails, the other supply immediately takes over. Each power supply contains an audible failure alarm and operational status indicators.

The ECLS Computer communicates with the Host Computer over a 100BaseT-dedicated network using User Datagram Protocol (UDP). The Ethernet cable interfaces the Electric Control Loading directly with the Host Computer.

The Single Board Computer (XA3, XA4) mounts on a PCI bus and has a 400 MHz Pentium II (Navy T-6A uses an 850 MHz Pentium III) microprocessor, 256 Mbytes (Navy T-6A uses 1024MB) of RAM, two serial ports, one parallel port and 100BaseT Ethernet port. The only back panel wiring at XA3 and XA4 is the computer switch connections to the CompuSwitch (9A2A4).

The Network Interface PCI bus board (XA6) is used for real-time communication. The backplane wiring on XA6 is the Ethernet connection to the Host Computer.

The Hard Disk drive stores the operating system and simulation software. When the computer turns ON, the CPU looks for the operating system program VxWorks. Once the operating system is loaded into memory of the CPU, it then looks for the application program. The Hard Disk drive has 6.5 GB of formatted capacity.

The Floppy Disk drive is used to maintain or rebuild the hard drive if there is a failure of the hard drive system. The Floppy Disk drive uses 3.5-inch floppy disk with 1.44-MB capacity.

1.2.6.2. DRI Platform System

The DRI Platform System consists of DRI Platform assemblies physically located in close proximity to their control systems. Each DRI Platform assembly is connected to the other DRI Platforms by a fiber optic ring network. Each DRI Platform assembly contains the firmware, input and output (I/O) channels, drivers, and power supplies for operating the assigned electrical devices. Each DRI Platform assembly is specifically configured for the particular devices that it controls and is not interchangeable with any other DRI Platform in the system. See Section 2 for configuration. See Figure 1-32.

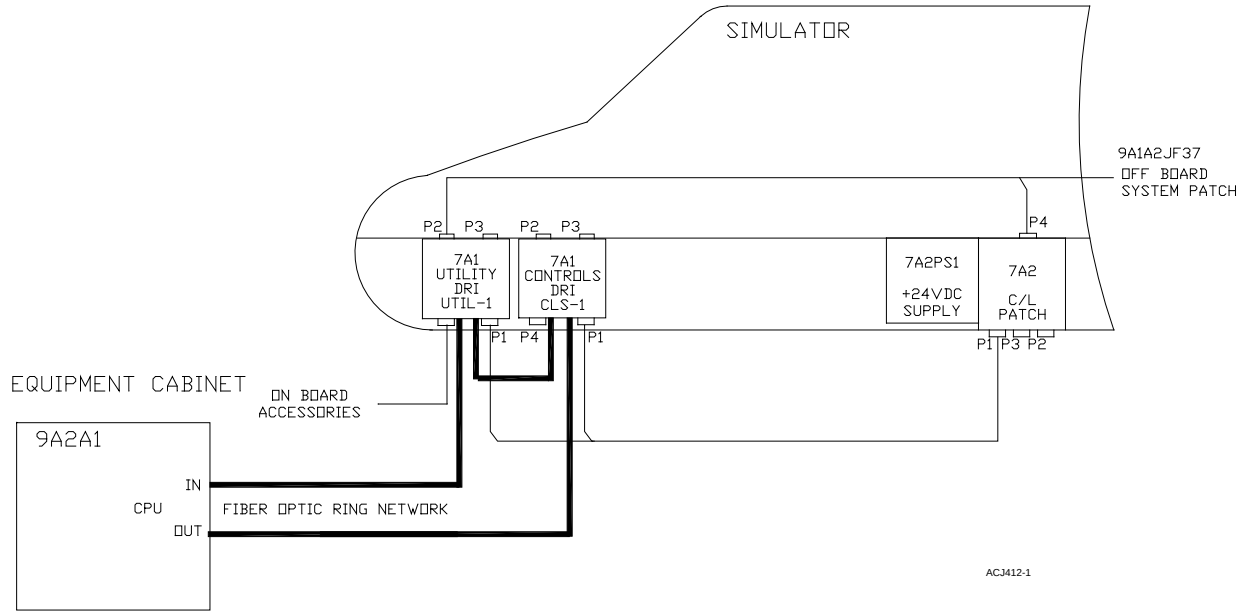


Figure 1-32. Fiber Optic Ring Network

1.2.6.3. DRI System Power Requirements

The control loading platform power supplies receive their electrical power from the AC Power Controller Assembly through the frame distribution box, the 24VDC power supply, and the control loading patch distribution. See Figure 1-33. Table 1-9 lists the power input and output requirements of the DRI power supplies and platforms.

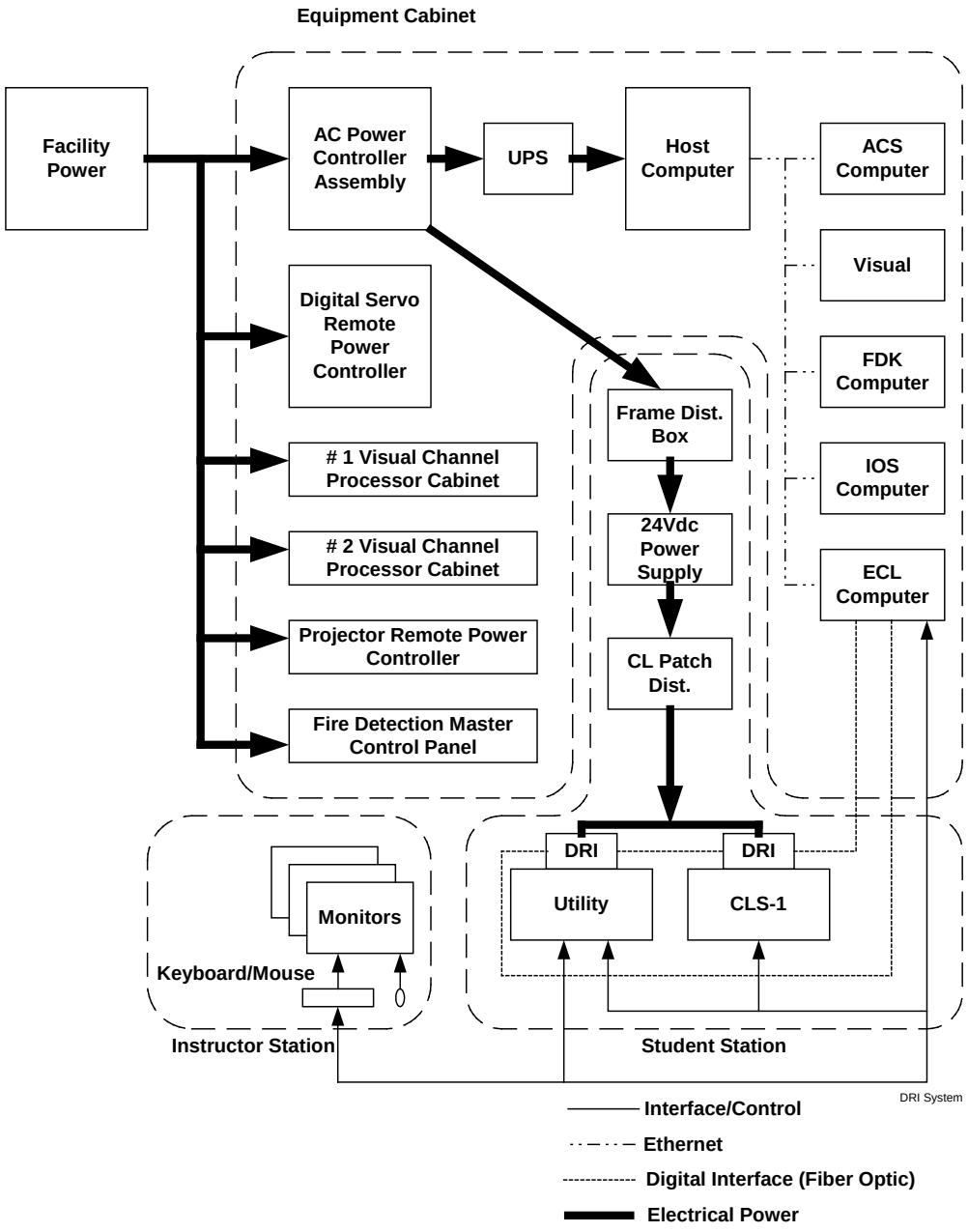


Figure 1-33. DRI System

Table 1-9. System Power and Utility Requirements

INPUT POWER		
COMPONENT	VOLTAGE	CURRENT
DRI Power Supply	110/220 VAC	15 / 7.5 Amp
DRI Platform	24 VDC System Power	3 Amp
OUTPUT POWER		
DRI Power Supply	24 VDC	36 Amp
DRI Platform	± 15 VDC	2 Amp
PSSCB	± 12 VDC	2 Amp
	± 10 VDC	500 mAmp
	+ 5 VDC	2.5 Amp
	± 5 VDC	500 mAmp
	± 2.5 VDC	500 mAmp

1.2.6.4. DRI System Environmental Requirements

The environmental requirements for operating the DRI Platform System are 32°F to 122°F (0°C to 40°C) and 0 to 90% relative humidity (non-condensing).

1.2.6.5. DRI Physical Characteristics

Table 1-10. Physical Characteristics

COMPONENT	SIZE (L, W, D)	WEIGHT
Patch Assembly	17 x 11 x 5 inches	15 pounds
Utility Platform	15 x 15 x 5 inches	12 pounds
CLS-1 Platform	15 x 15 x 5 inches	12 pounds
Power Supply	13 x 8 x 5 inches	23 pounds

1.2.6.6. DRI Platform Components

DRI Platform assemblies are used to position electro-mechanical cylinders in the control loading and seat system. Input and output channels are also used to activate the motion and control loading on and off circuits. If any electro-mechanical component fails, the associated DRI Platform is responsible for initiating a shutdown of the system and activating the appropriate indicators.

The control loading DRI platform assemblies UTL-1 and CLS-1 are mounted on slide-out frames, allowing access to components on both sides of the assemblies. The frame assemblies are mounted around the outside of the student station frame. See Figure 1-34.

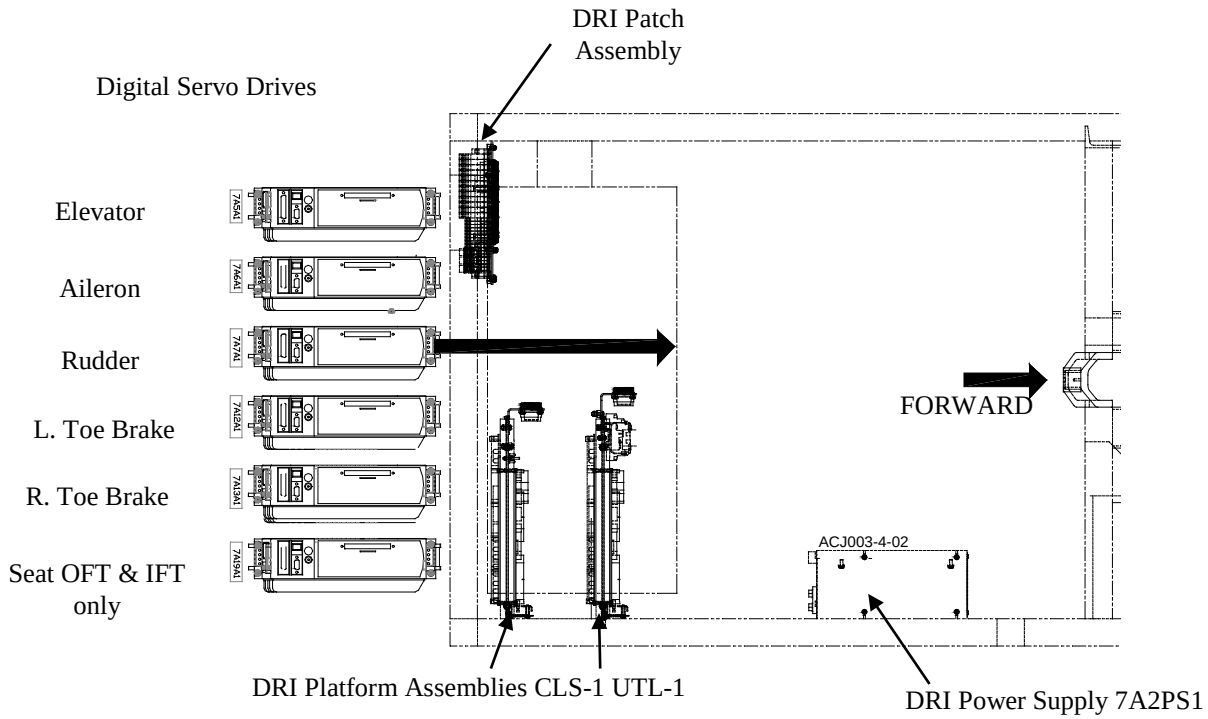


Figure 1-34. DRI Components

1.2.6.7. DRI Platform Assembly

Each DRI Assembly consists of two boards:

Platform332 Board
Power Supply/Signal Conditioning Board (PSSCB)

Figure 1-35 shows the two boards and their interconnect cable connections.

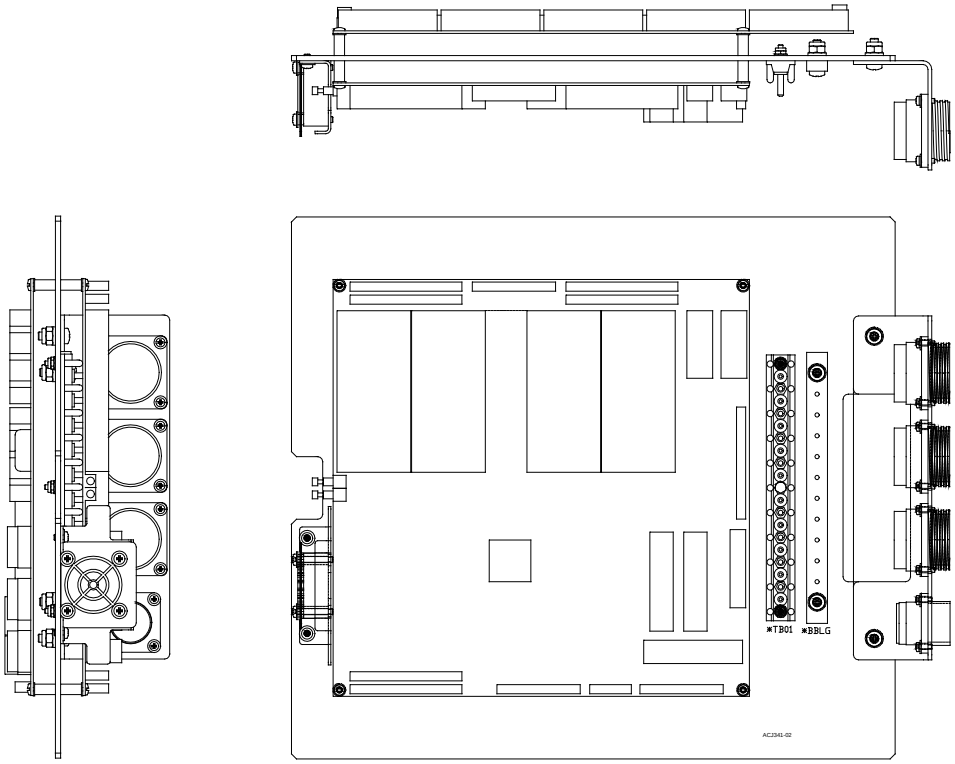


Figure 1-35. Control Loading DRI Platform Assembly

1.2.6.8. Patch Assembly

The Patch DRI Assembly, 7A2 C/L Patch, is located on the left rear corner of the student station frame. The platform is a solid mount on the frame assembly. See Figure 1-36.

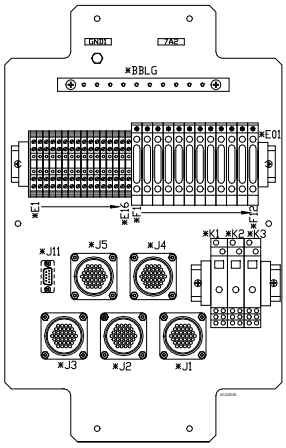


Figure 1-36. DRI Patch Assembly

1.2.6.9. Utility (UTL-1)

The Utility DRI Platform, 7A1UTL-1, is located on the right rear corner of the student station frame. This platform is designated as UTL-1. The platform is mounted on a slide out frame assembly to allow access to both sides of the DRI assembly. The Utility platform services the Gust Lock, Control Loading Reset 1A5SDS1 (Left side console), Control Loading 2A2A4SDS3 (Instructor Operator Station), Dynamic Seat 2A2A4SDS4 (Instructor Operator Station), Seat Belt Lock logic, ECL load cell voltage conversions, Control Measurement System (CMS), and the simulator In Operation light. See Figure 1-37.

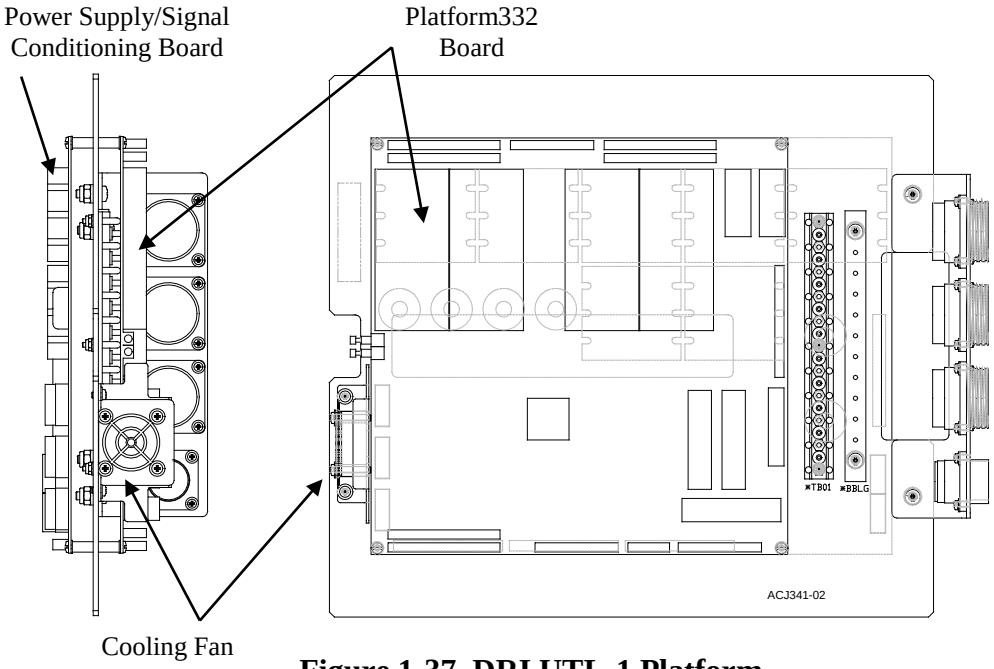


Figure 1-37. DRI UTL-1 Platform

1.2.6.10. CLS-1

The Controls DRI Platform, 7A1CLS-1, is located on the right rear corner of the student station frame. This platform is designated as CLS-1. The platform is mounted on a slide out frame assembly to allow access to both sides of the DRI assembly. The CLS-1 Platform controls six power amplifiers and motor actuators for Elevator (7A5), Aileron (7A6), Rudder (7A7), Left Toe Brake (7A12), Right Toe Brake (7A13), and Seat (7A19). See Figure 1-38.

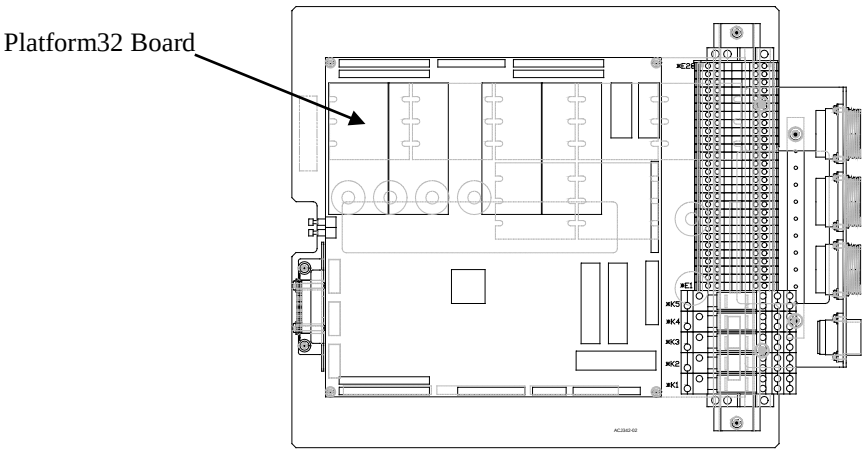


Figure 1-38. DRI CLS-1 Platform

Figure 1-39 shows the Platform332 and PSSCB boards and their interconnect cable connections.

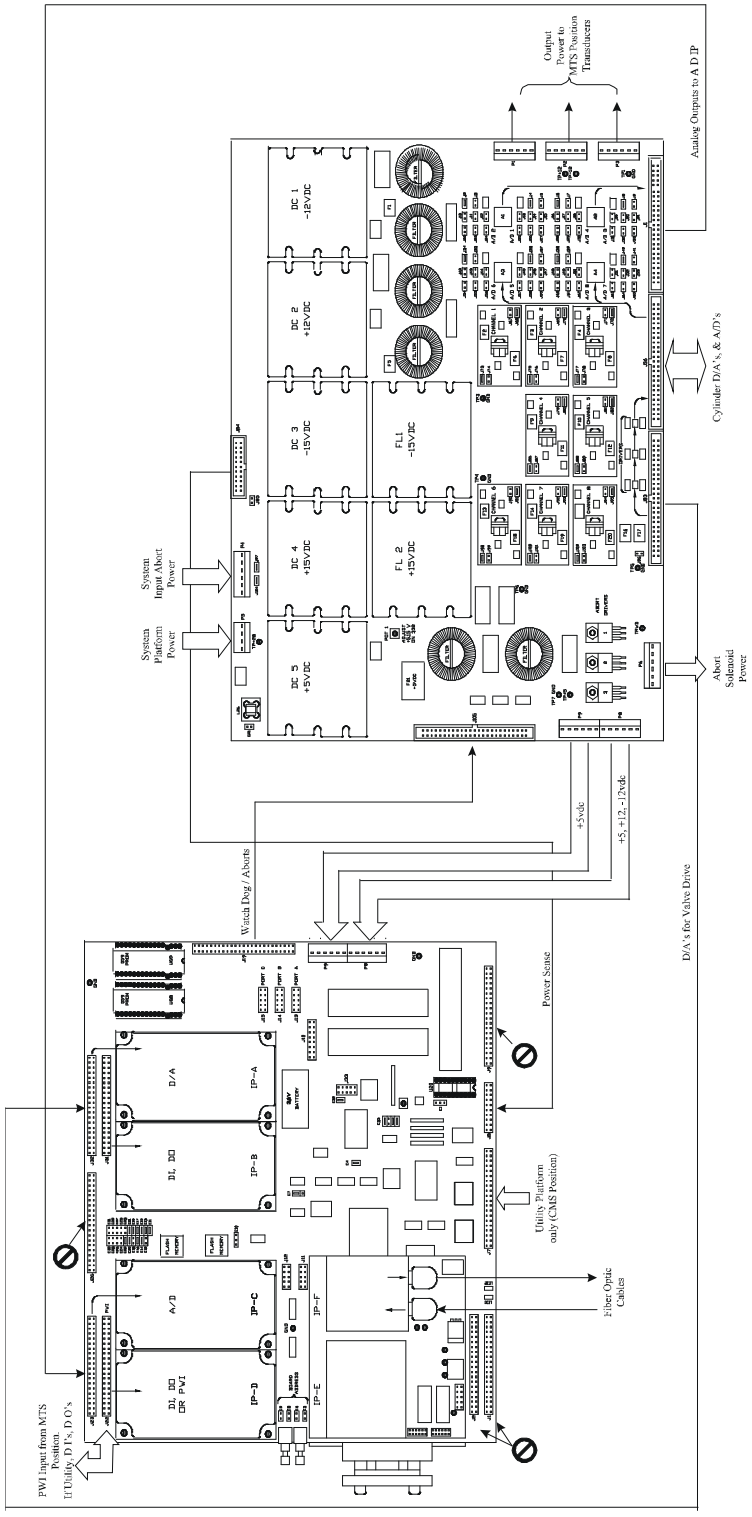


Figure 1-39. DRI Platform Boards

1.2.6.11. OS9 EPROMS and Flash Memory

Two OS9 EPROMS are located on the Platform332 Board. These EPROMS come preloaded with the OS9 basic operating system software for the DRI Platform assemblies. Two battery-backed flash memories EPROMS are also located on the Platform332 Board. Flash memory contains the application software programs for operating the Platform332 Board in simulator DRI System configuration. See Figure 1-40.

1.2.6.12. IP Modules

In theory, up to six IPs may be installed on any given Platform332 Board. All of the DRI platform assemblies are connected to the Fiber Optic Ring Network. Slots E and F of each Platform332 Board are reserved for an IP-GSnet fiber optic transmitter/receiver. Slots A, B, C, and D are available for any variety of IP modules depending on configuration requirements of the simulator. See Figure 1-40.

1.2.6.13. Platform332 Board Components

The Platform332 Board is a stand-alone, single-board computer based on the Motorola MC68332 Integrated Microcontroller. Versatility and modularity are realized by combining 68000 software compatibility with the ability to accommodate up to six Industry Pack (IP) I/O Modules. The Platform332 Board contains four megabytes of DRAM and one megabyte of EPROM Flash Memory. See Figure 1-40.

1.2.6.14. Battery

A 3.6VDC lithium battery is installed on the Platform332 Board. This battery is used to provide backup power to the standby RAM on the 68332 processor, the RTC clock/calendar, and the SRAM. See Figure 1-40.

1.2.6.15. Switches

Abort and Reset switches are provided for user operation and are located on the left-hand edge of the Platform332 Board. See Figure 1-40. The two switch functions are:

ABORT - Activates the abort function of the DRI Platform assembly.
RESET - Returns the DRI Platform to normal operation.

1.2.6.16. LED Indicators

The Platform332 Board has two LED indicators. See Figure 1-40. The LED1 indicator shows that the DRI Platform is running and that RAM is being accessed. The LED2 indicator illuminates when the Flash Memory is being accessed.

1.2.6.17. Serial Ports

Serial Ports A, B, and C are located on the right side of the Platform332 Board. See Figure 1-40. The serial ports provide the means of connecting a laptop computer or other communication device to the DRI Platform. Only Port A is currently used.

1.2.6.18. Interface Connectors

Connectors located on the Platform332 Board edge provide an interface with the PSSCB. See Figure 1-40. These connectors are:

J32 - D/As for servo valve drivers on the PSSCB
J23 - A/Ds from PSSCB for input to A/Ds IP
P8 & P9 - Power inputs from PSSCB Power supplies
J19 - Aborts and watch dog timer
J8 - Power sense from the PSSCB
J22 - PWI Input (Utility Platform - DIs & DOs)

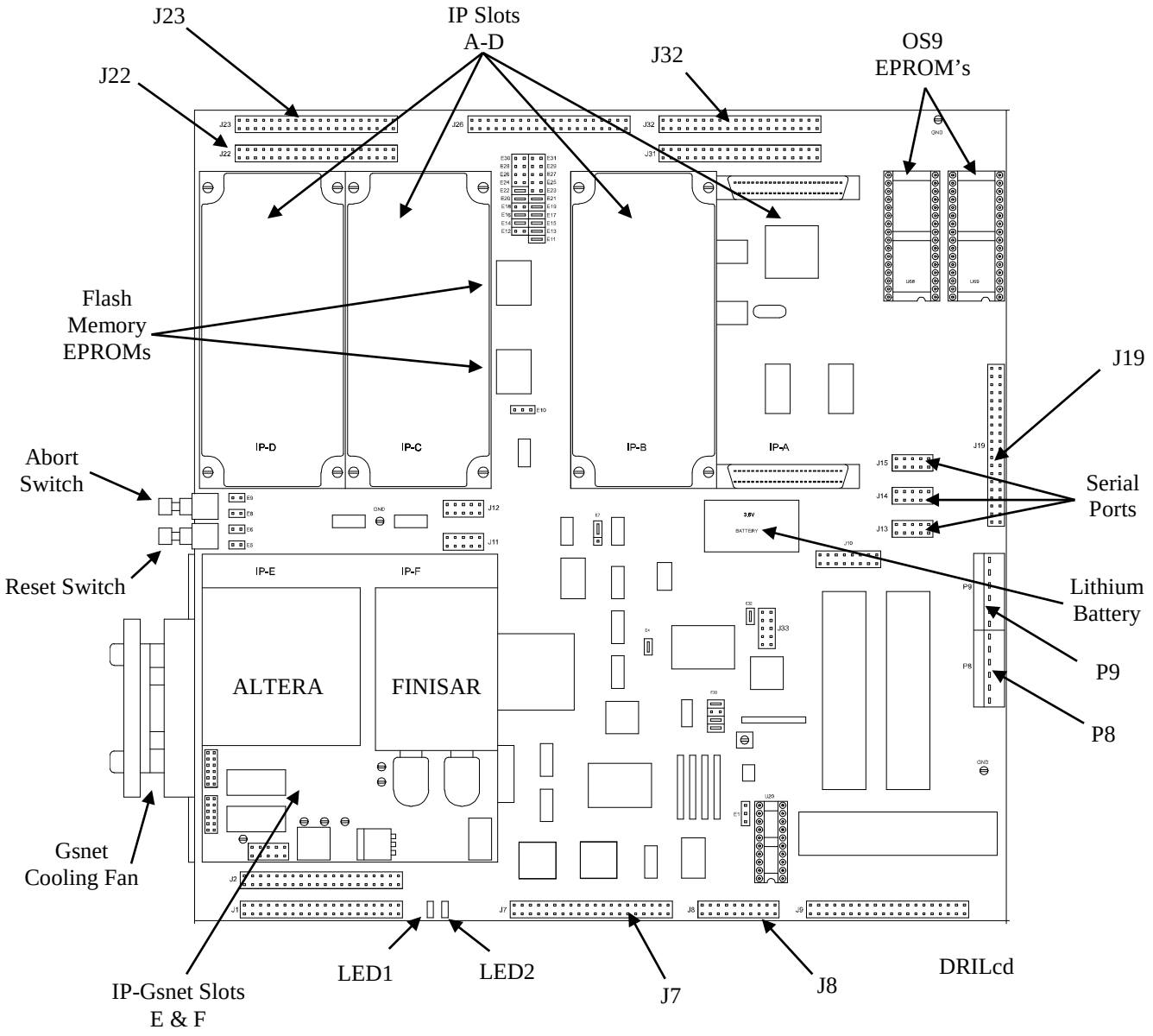


Figure 1-40. Platform 332 Board

1.2.6.19. IP-16DAC Module

The IP-16DAC module is a three-channel, 16-bit, digital-to-analog converter normally used to control the actuator motor or to drive an analog instrument. See Figure 1-41. Each channel controls one device and is normally controlled by software. The IP-16DAC Module occupies IP slots A and B on the CLS-1 Platform332 Board.

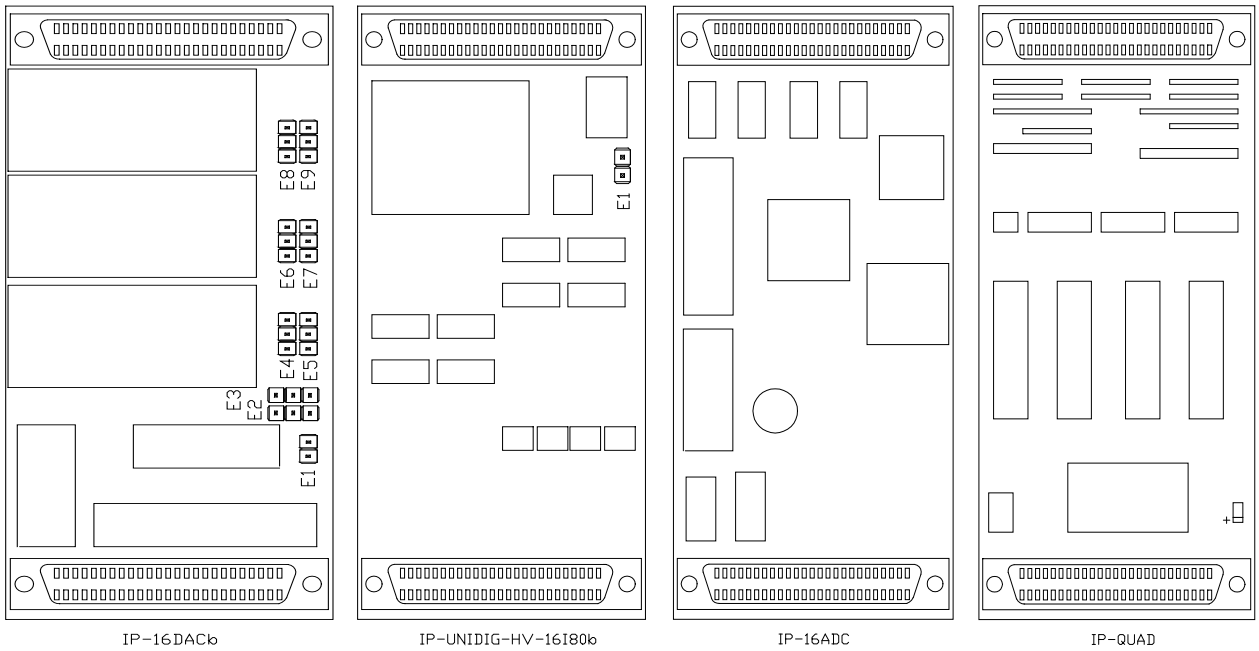


Figure 1-41. IP Modules

1.2.6.20. IP-UNIDIG-HV 16180 Module

The IP-UNIDIG-HV-16180 Module is a 24-Line High Voltage IP with 16 differential digital inputs (DIs) and 8 differential digital outputs (DOs). Refer to Figure 1-41. The inputs are applied to differential amplifiers whose outputs are sent to comparators. When the differential input exceeds the threshold voltage, logic one is set. Outputs of the module are used to activate lamps, solenoids, valves, and relays. A feedback register allows software to read the state of each device. The IP-UNIDIG occupies IP slot B on the UTL-1 Platform332 Board.

1.2.6.21. IP-16ADC Module

The IP-16ADC Module is a 16-bit, 16-line, analog-to-digital converter. Refer to Figure 1-41. It provides eight differential (multiplexed) A/D channels with 16 bits of resolution. The IP-16ADC is used to convert analog voltages from load cells, accelerometers, etc., to digital words to be used by the software. The IP-16ADC Module occupies IP slot C on the UTL-1 Platform332 Board.

1.2.6.22. IP-QUAD Module

The IP-QUAD Module is a four-channel decoder, which is used to decode the position of electric control loading and secondary motion cylinders. Refer to Figure 1-41. The IP-QUAD Module occupies IP slots C and D on the CLS-1 Platform332 Board. This IP is not used on the Utility DRI Platforms.

1.2.6.23. IP-GSnet Module

The IP-GSnet Module is a Gigabit optical reflective memory module, installed on each of the DRI Platform332 Boards and on the ECL chassis Input/Output Processor. See Figure 1-42. The IP-GSnet Module is referred to as a node. A fiber optic ring network connects all of the nodes on the DRI Platform Assemblies, plus the ECLS chassis. IP-GSnet nodes contain a transmitter and a receiver for sending and receiving status and data on the fiber optic ring network. The IP-GSnet occupies slots E and F on the DRI Platform332 Board.

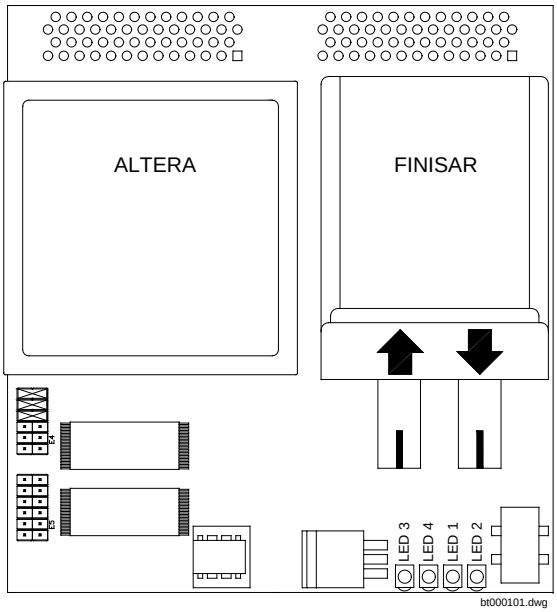


Figure 1-42. IP-Gsnet Module

1.2.6.24. IP-GSnet Cooling Fan

A fan assembly is mounted next to the DRI Platform332 board. It consists of a fan and filter, and provides cooling airflow for the IP-GSnet fiber optic interface module on the Platform332 Board. See Figure 1-43.

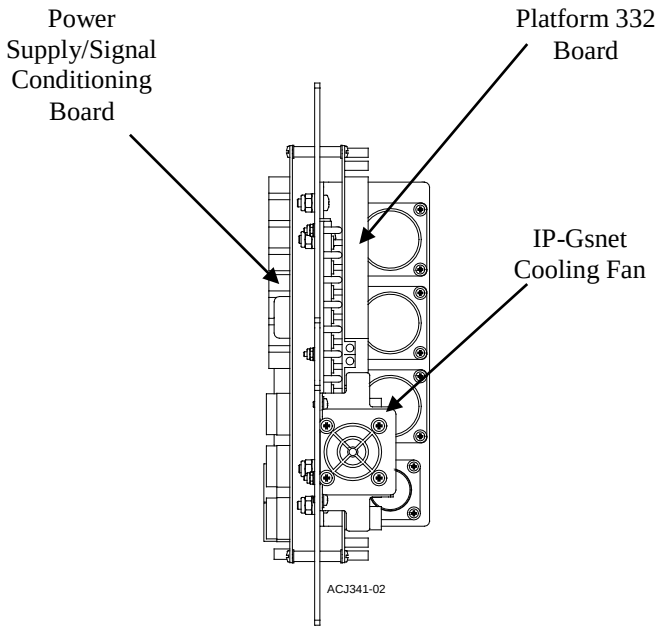


Figure 1-43. IP-Gsnet Cooling Fan

1.2.6.25. Power Supply/Signal Conditioning Board (PSSCB) Components

The PSSCB Board provides the required power supply voltages for the Platform332 Board. See Figure 1-40. The board also supplies power to the A/D channels and programmable amplifiers for conditioning the analog signals prior to processing by the IP-ADC on the Platform332 Board. The PSSCB components are described in the following paragraphs.

1.2.6.26. On Board Power Supplies

Power supplies DC1 through DC5, FL1, and FL2 provide on board power for the PSSCB. Power supply outputs are ±12 VDC, +5 VDC and two sources of ±15 VDC. The + 5VDC and ±12 VDC are also applied to the Platform332 Board. See Figure 1-44.

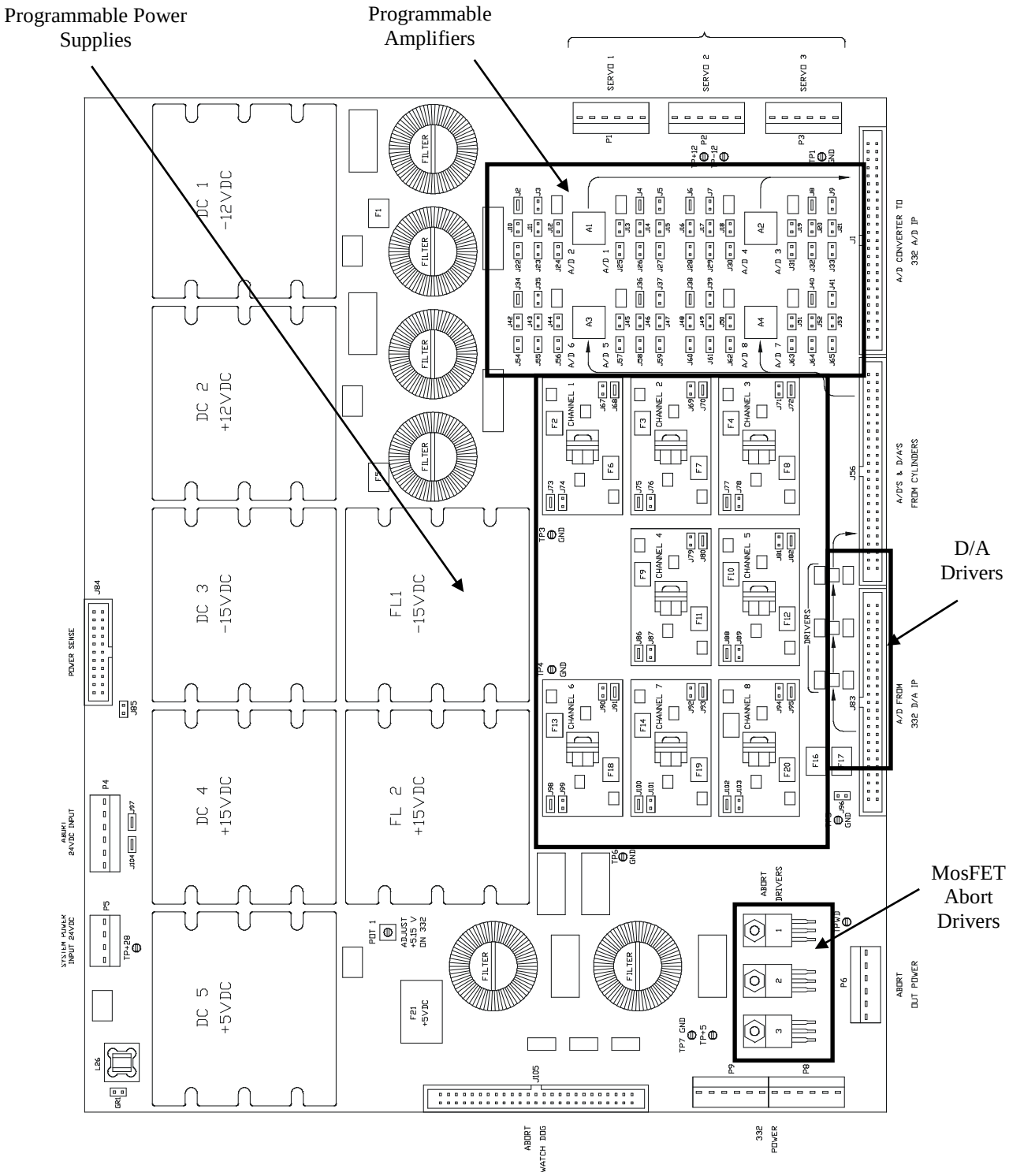


Figure 1-44. PSSCB Board

1.2.6.27. Channel Programmable Power Supplies

The PSSCB contains eight power supplies used to activate assigned electrical actuators on the student station frame. The power supplies are designated Channels 1 through 8. Each power supply can be configured to supply ±10VDC, ±5VDC, or ±2.5VDC. Refer to Figure 1-44.

1.2.6.28. Programmable Amplifiers

Amplifiers A1 through A4 provide amplification of two programmable A/D input voltages. Refer to Figure 1-44. Configuration of these A/D channels is described under the PSSCB in Section 2 of this manual.

1.2.6.29. D/A Drivers

There are three pairs of D/A drivers located on the PSSCB. Refer to Figure 1-44. Each pair provides the required current (amperage) to activate the three servo actuators assigned to the DRI Platform Assembly.

1.2.6.30. Fuses

Fuses are located on each of the channel power supplies and in various locations on the PSSCB. They are labeled F1 through F21. Refer to Figure 1-44. The fuses are located on the front and back of the board.

1.2.6.31. Interface Connectors

Connectors located on the PSSCB board edge provide an interface to the Platform332 Board as listed below. Refer to Figure 1-44.

P4 - Abort +24VDC Input Power
P5 - System +24VDC Input Power
P6 - Abort Solenoid Power Out
P9 and P8 - Power Out to the Platform332 Board
J1 - A/D converters to the Platform332 A/D IP
J56 - Cylinder D/As and A/Ds
J83 - D/A signals from the Platform332 D/A IP
J84 - Power Sense
J105 - Abort and Watch Dog timer

1.2.6.32. DRI Platform Power Supplies

Each DRI Platform assembly requires +24 VDC from 7A2PS1 Power Supply. The power supply is located on the right side of the student station in the frame next to the DRI platforms. It supplies +24VDC power to the CLS-1 and UTL-1 platforms. See Figure 1-45.

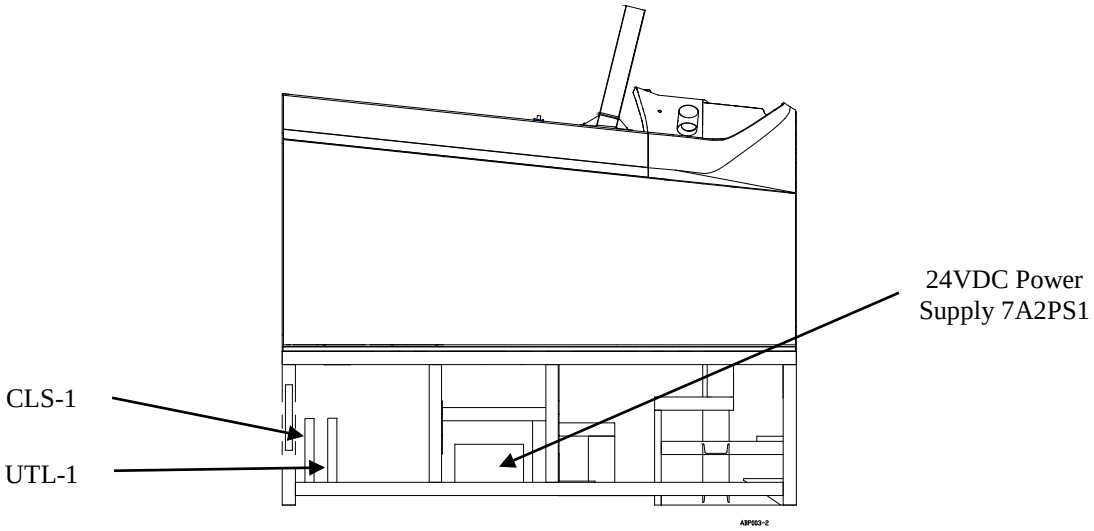


Figure 1-45. Power Supply 24VDC

1.2.6.33. DRI Platform Interface

The DRI Platform interface consists of a fiber optic ring, which connects all DRI platforms in series with the ECL chassis. Figure 1-46 shows the fiber optic ring network. The CLS chassis and each DRI platform have a GSnet fiber-optic transmitter and receiver installed. Fiber-optic cables are connected to the IP-GSnet Module on each Platform332 Board as shown in Figure 1-47. The GSnet on the ECL Input/Output board is identical to the ones on the platforms.

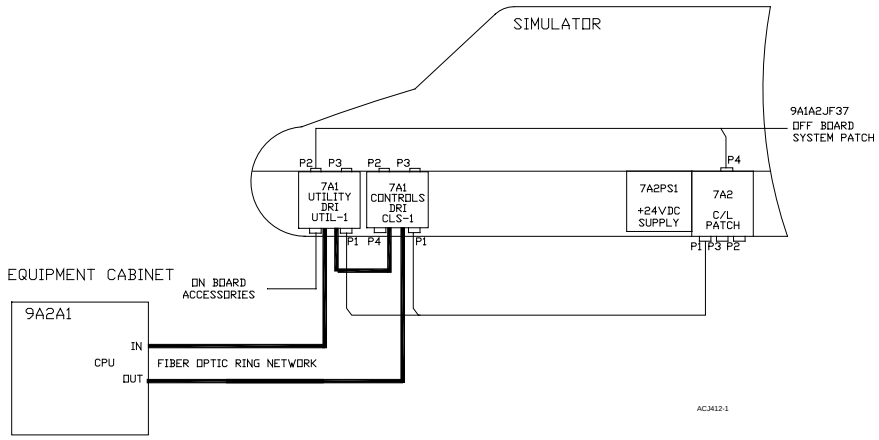


Figure 1-46. Fiber Optic Ring Network

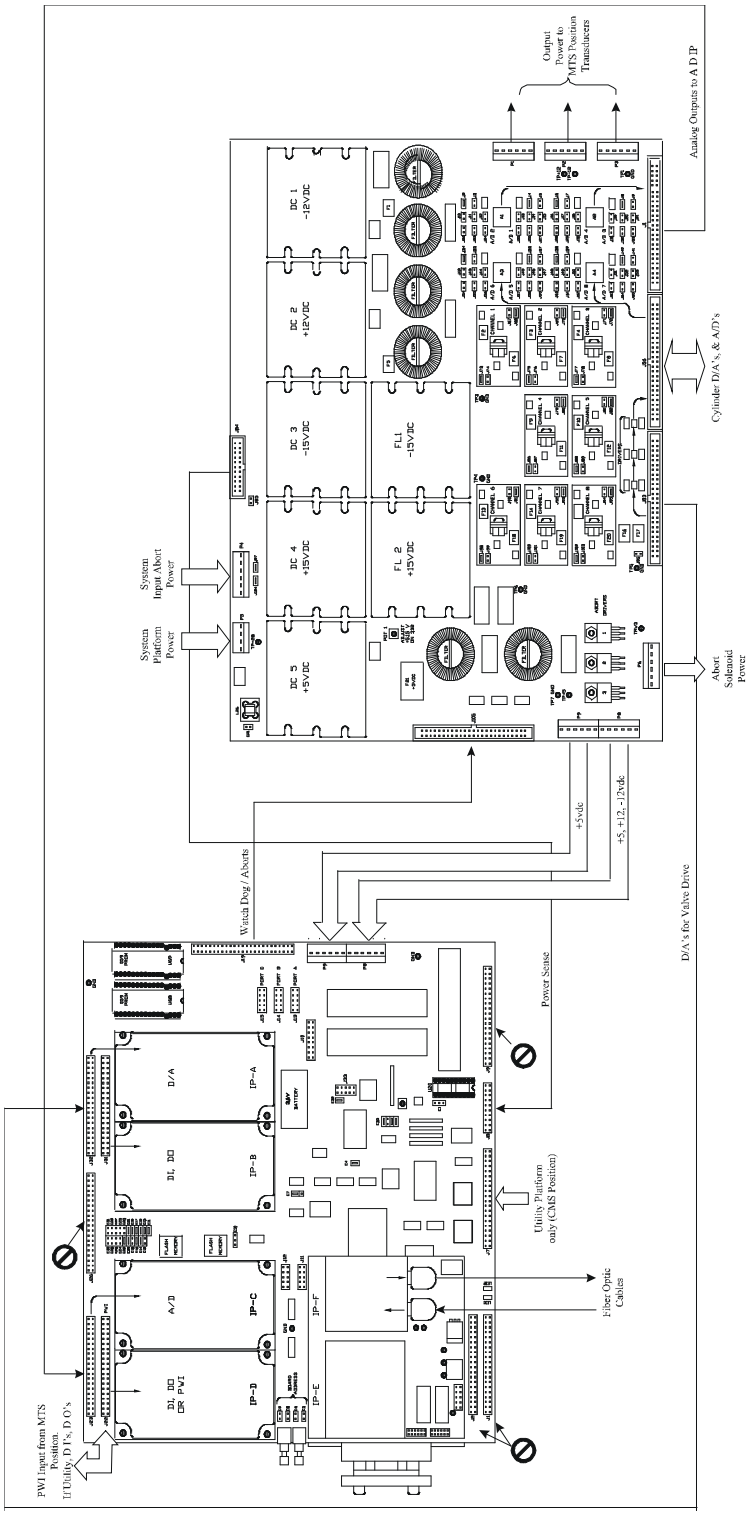


Figure 1-47. DRI Platform Boards

1.2.6.34. Data Acquisition System (DAS) (9A3A6)

The DAS controls the motion and control loading systems in the simulator, performing the combined functions of the DRI CLS-1 and DRI UTL-1 platform assemblies. With DAS in place of DRI, the ECL system consists of the ECL computer chassis, DAS, a patch panel, and five or six digital servo amplifiers (UTD has five; IFT and OFT have six). The computer and DAS chassis are located in the equipment cabinets and the rest of the components are located in the cockpit frame. DAS II is similar to DAS but is covered in a separate supplement.

1.2.6.35. DAS Chassis

The DAS chassis is the input/output controller for the control loading and motion systems. It is used to interface load cells, interlocks, switches, warning lights, etc., to the ECL computer. The chassis is located at 9A3A6 in the equipment cabinet and consists of:

- CPU Main Board with a 333 MHz front side bus
- One PCI Master and one PCI Slave IP Carrier Board
- Power Supply and Signal Conditioning Board (PSSCB)
- Power Supply Module
- Three cooling fans

The DAS chassis is a standard 19” rack-mount unit. The PSSCB supplies excitation voltages to the control loading load cells and conditions the signals received from the load cells. The 12/24 VDC power supply provides 12 and 24 volt logic power to the control loading and motion (seat in IFT and OFT) circuits.

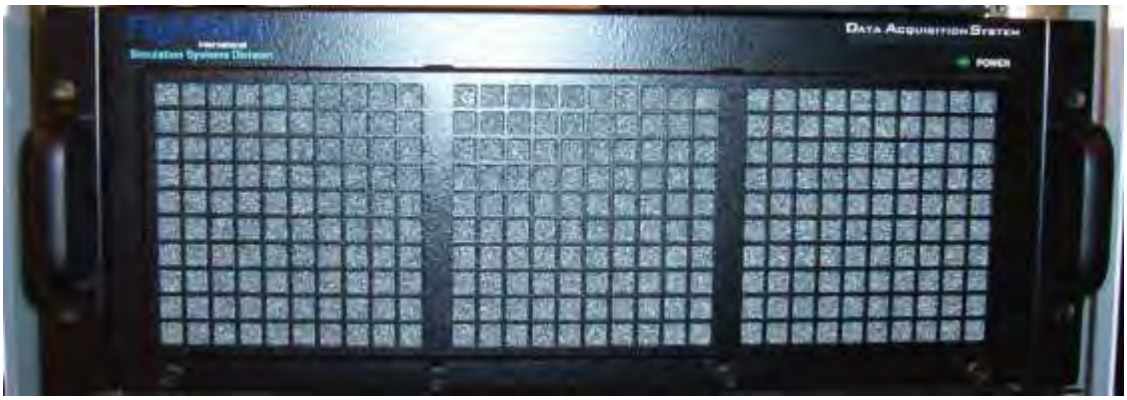


Figure 1-48. DAS Chassis Front

1.2.6.36. The DAS Process

The DAS chassis receives commands from the ECL computer via the GSNet Fiber optic interface. The DAS chassis also uses the Fiber Optic interface to send current status and failure information back to the ECL computer. The control loading processors in the ECL Computer receive the data from the load cells via DAS, determine which control is to be driven, how hard the control is to drive, and which direction it is to be driven. The ECL Computer combines this information with the host data and sends a command to the DAS platform to generate a servo drive signal in response to the load cell inputs. This drive signal is output to the appropriate servo valve to drive the cylinder.

As the cylinder is being driven, the ECL Computer via the DAS monitors the feedback signal to ensure the servo loop is responding correctly to the drive signal. See Figure 1-49.

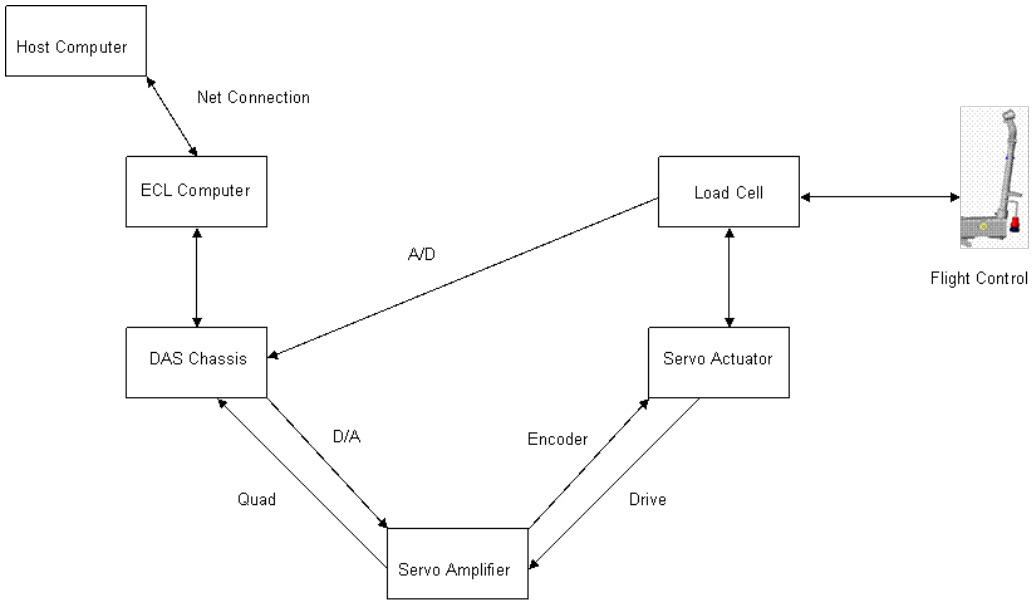


Figure 1-49. DAS/DAS II Process

1.2.7. Flight Deck I/O System (9A2A3)

The Flight Deck I/O (FDKIO) system is the interface between the Host Computer and the simulator cockpit indicators and switches. The major components are network interface PCI Bus board, 3 IP Carrier boards, single board Computer PCI Bus, ARINC 429 interface, hard disk drive and floppy disk drive.

The FDKIO system computer chassis is located at 9A2A3 in the equipment cabinet. See Figure 1-50. Table 1-11 lists the power requirements, and physical characteristics of the Flight Deck I/O System Computer chassis.

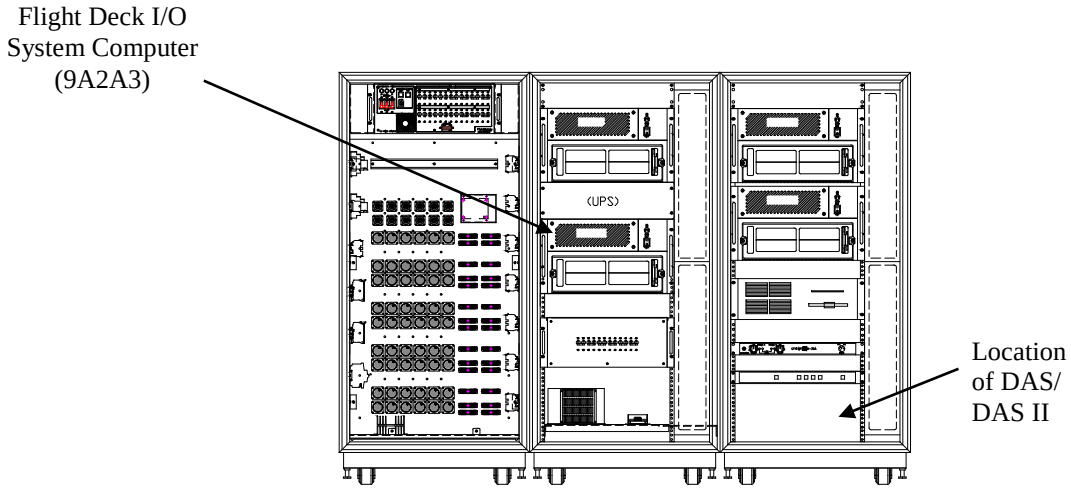


Figure 1-50. Equipment Cabinets-Flight Deck I/O

Table 1-11. Flight Deck I/O Computer Characteristics

Parameters	Specifications
AC Power Input	120VAC
Frequency	50-60 Hz
Humidity	5% - 90% non-condensing
Operating Temperature	32°F - 140°F (0°C - 60°C)
Storage Temperature	-40°F - 158°F (-40°C - 70°C)
Dimensions	10.5” H x 19” W x 22” D (26.7 cm x 48.3 cm x 55.9 cm) * 7” x 19” x 26.4” (17.7 x 48 x 67)
Weight	40 lbs. (18 kg)

* Navy T-6A

The chassis contains several components to execute real-time math models associated with flight, navigation, engine, and communication systems.

20 slot PCI/ISA Backplane
Dual Power Supplies
Single Board Computer
Network Interface PCI Bus Board
3 IP Carrier Boards
3 ARINC 429 Interface Boards
Hard Disk Drive
Floppy Disk Drive
Cooling Fans (not shown)

See Figure 1-51 for the locations.

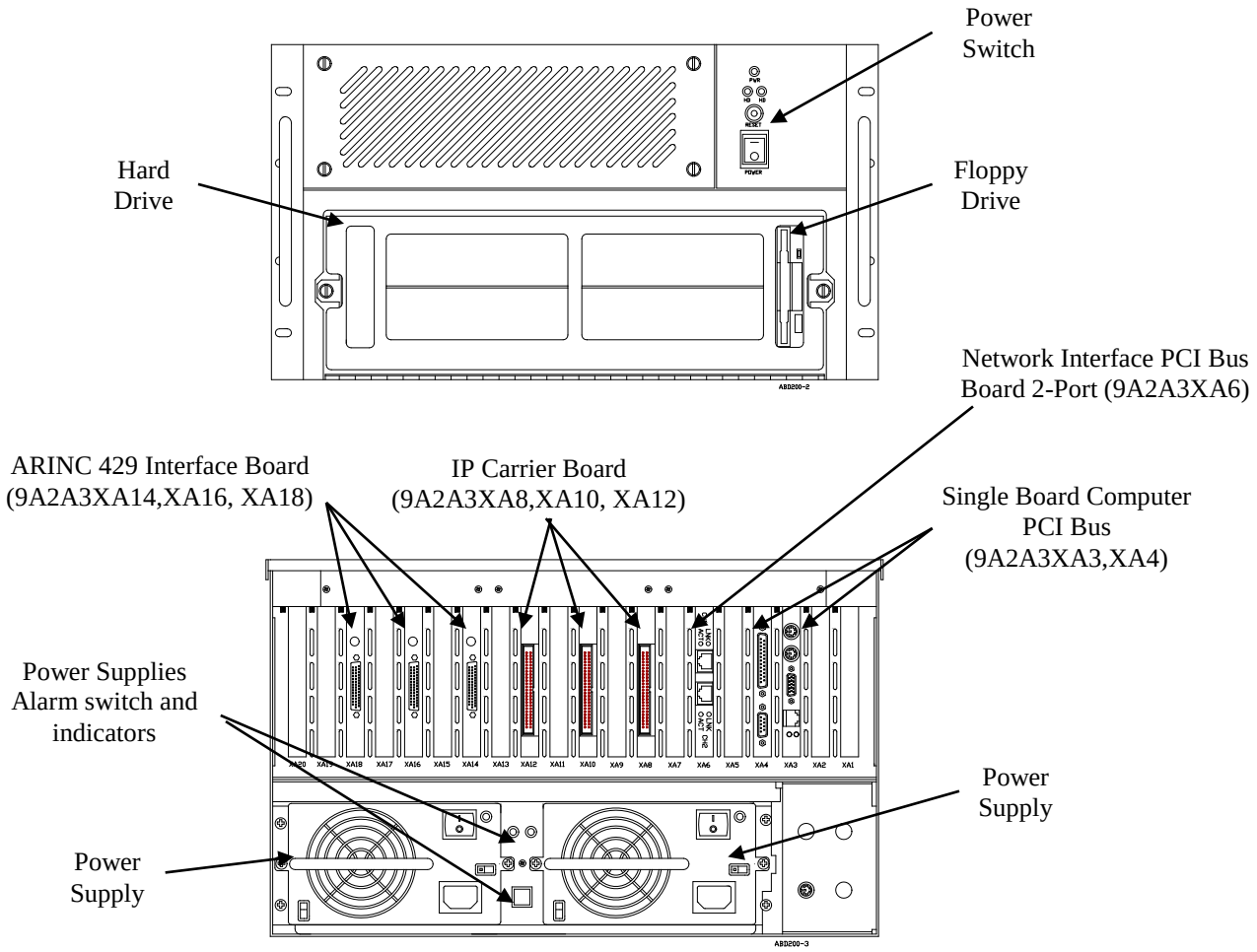


Figure 1-51. Flight Deck I/O Computer

The Flight Deck I/O System Computer chassis (9A2A3) has a 20-slot PCI/ISA backplane with 16 passive PCI slots. Six drive bays are provided; however, only two are used: one for the Hard Drive and the other for the Floppy Drive. Cooling fans provide filtered air to the chassis components.

The front of the chassis contains controls and indicators for powering on and resetting the chassis and showing the operational status of the drives.

On the back of the chassis are two dual, 300-watt, hot-swappable power supplies that supply DC power to the chassis components. If one power supply fails, the other power supply immediately takes over. Each power supply contains an audible failure alarm and operational status indicators.

The FDKIO System communicates with the Host Computer over a 100BaseT-dedicated network using UDP protocol. The Ethernet cable interfaces the Flight Deck I/O System directly with the Host Computer.

The Single Board Computer (XA3, XA4) mounts on a PCI bus and has a 400 MHz Pentium II (Navy T-6A uses an 850 MHz Pentium III) microprocessor, 256 Mbytes (Navy T-6A uses 1024MB) of RAM, two serial ports, one parallel port and 100BaseT Ethernet port. The only backplane wiring at XA3 and XA4 are the computer switch connections to the CompuSwitch (9A2A4).

The Network Interface PCI bus board (XA6) is used for real-time communication. The Ethernet port has a real-time communication with the subsystem computers. The back panel wiring at XA6 is the connection to Host Computer.

The FDKIO System Computer has three IP Carrier boards. The IP carrier board in slot XA8 uses 5 IPs for DI data. Each Industry Pack for the DI board has 48 channels for translating PCI bus data to IP bus data. This board is used for digital input data such as sensing switch closure. Logic is 1=High as any input between +2.0VDC and +32VDC with incorporated, current-limited, high-clamped to +5VDC.

The IP carrier board in slot XA10 uses 5 IPs for DO data. Each IP has 40 channels for digital outputs for lamps, power, sound, etc. These outputs are always off at power-up and cleared after a system reset. Gate pulldowns are provided to prevent momentary output turn-on with power-up. Logic is 1=ON/switch closed, and 0=OFF/switch open. Individual output channels may sink up to 1 amp continuous with a total of 10 amps combined.

The IP carrier board in slot XA12 uses 6 IPs: 2 for AI data, 3 for AO data, and 1 for the RS422. The AI boards have 20 channels for digital inputs of +/-10VDC. The AO boards have 16 (Navy T-6A has 20 for digital only) channels for analog outputs to the servomotors. The RS422 board drives the smartmotor for playback. The module will drive the throttle, then the throttle position is sent back through the RS422. The RS422 also gives position and receives movement signals from the GPS data.

The ARINC 429 converts data from the Host to the proper format to drive the aircraft avionics and from the aircraft avionics format to the Host computer format. The ARINC 429 Interface boards (XA14, XA16, and XA18) transmit or receive aircraft serial data bus to PCI bus data but do not process any of the data. These boards can be programmed to transmit or receive data from each bus system. The 32-bit signal has 8 bits for label only, such as airspeed, and 24 bits for airspeed data.

The Hard Disk drive stores the operating system and simulation software. When the computer turns ON, the CPU looks for the operating system program VxWorks. Once the operating system is loaded into memory of the CPU, it looks for the application program. The Hard Disk drive has 6.5 GB of formatted capacity.

The Floppy Disk drive is used to maintain or rebuild the hard drive if there is a failure of the hard-drive system. The Floppy Disk drive uses 3.5-inch floppy disk with 1.44MB capacity.

1.2.8. Instructor Operator Station (IOS) (2A2)

The IOS provides a facility from which the instructor can monitor, control, and direct the training environment. It is located behind and next to the Student Station for visual observation of the pilot's activity. See Figure 1-52.

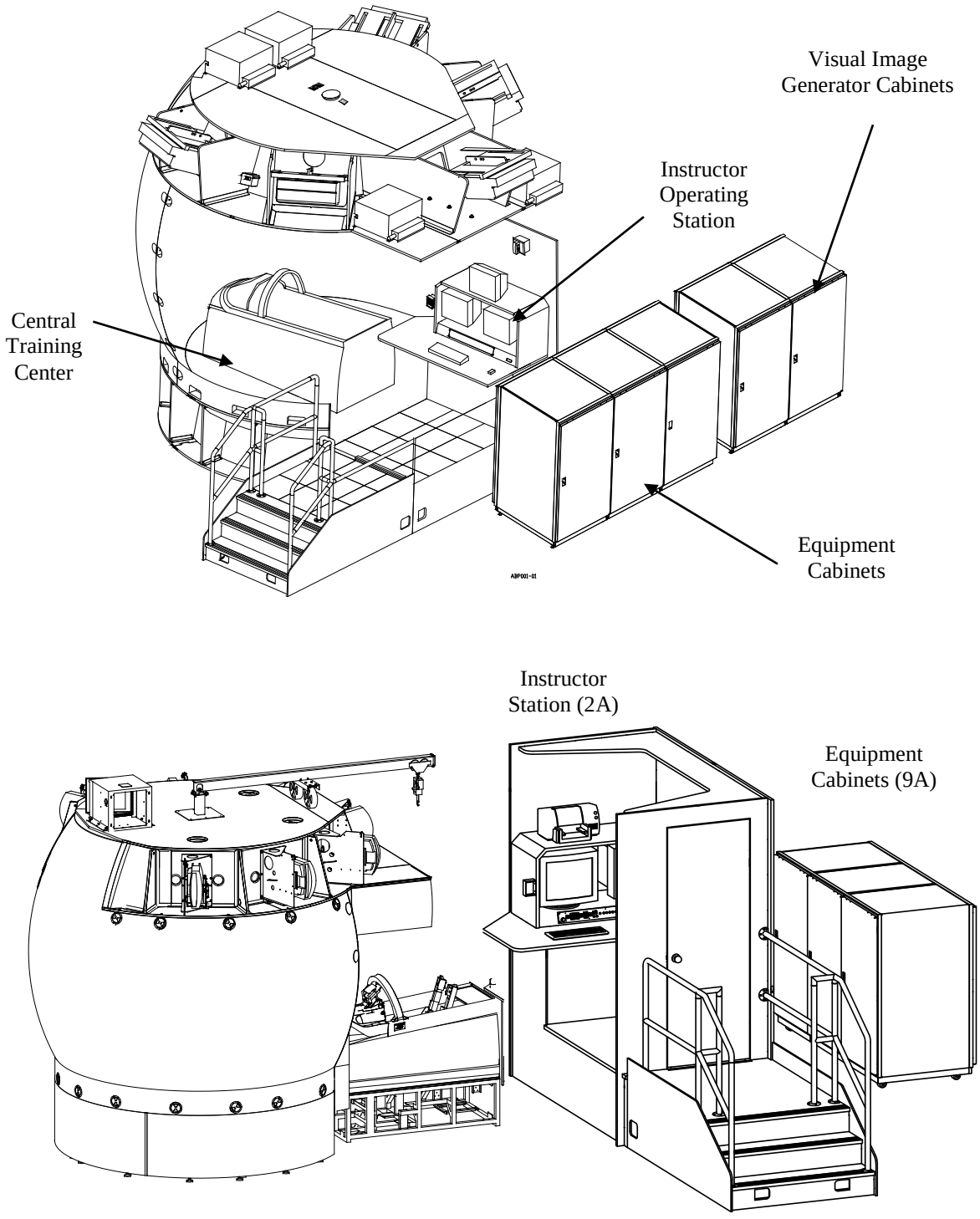


Figure 1-52. OFT Instructor Operating Station

The Instructor Operator System utilizes the IOS Computer in the Equipment Cabinet (See Figure 1-53) and the IOS with two 21-inch screen displays, console assembly, keyboard, mouse, and printer (See Figure 1-54). The OFT and IFT each has one additional 21-inch screen display for viewing the center channel of the visual scene. (The Navy T-6A IOS also has a cockpit repeater display on a swivel arm mounted on the table top to the left of the monitors.)

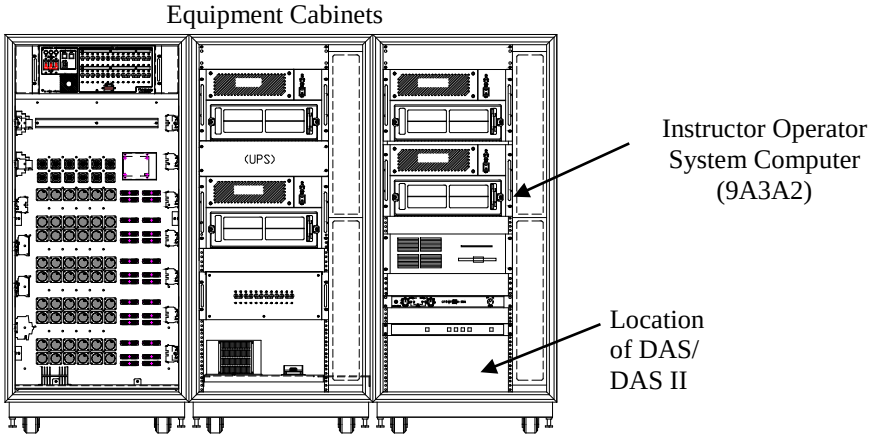


Figure 1-53. Equipment Cabinets-IOS Computer

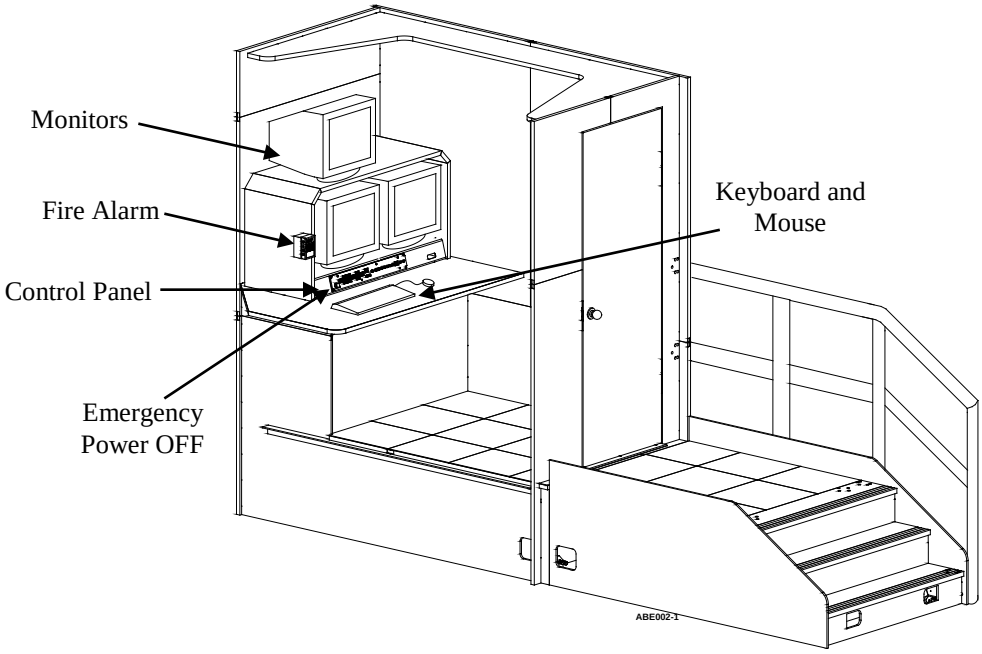


Figure 1-54. Instructor Operator Station

An EMERGENCY POWER OFF push button is located on the left side of the control panel. Fixed handrails surrounding the IOS platform help to prevent falls from the FTD.

Table 1-12 lists the power requirements, environmental requirements, and physical characteristics of the Instructor Operator System Computer chassis.

Table 1-12. IOS Computer Characteristics

Parameters	Specifications
Computer	
AC Power Input	120VAC
Frequency	60 Hz
Humidity	5% - 90% non-condensing
Operating Temperature	32°F - 140°F (0°C - 60°C)
Storage Temperature	-40°F - 158°F (-40°C - 70°C)
Dimensions	10.5” H x 19” W x 22” D (26.7 cm x 48.3 cm x 55.9 cm) * 7” x 19” x 26.4” (17.7 x 48 x 67)
Weight	40 lbs. (18 kg)
CD-ROM	
DC Power Input	5VDC, 12VDC
Dimensions	1.63 in H x 5.75 in D x 7.9 in W (4.1 cm x 14.6 cm x 20.1 cm)
Weight	1.5 lbs. (0.7 kg)

* Navy T-6A

Table 1-13 lists the power requirements, environmental requirements, and physical characteristics of the IOS.

Table 1-13. IOS Component Characteristics

Parameters	Specifications
Monitor	
AC Power Input	100-120 VAC, 160W
Frequency	60 Hz
Graphics Resolution	1280 x 1024 at 75 Hz Refresh Rate Each Screen (2)
Text Mode	720 x 400
Horizontal Dot Pitch	0.22 mm
Horizontal Frequency	30-107 kHz
Vertical Frequency	48-160 Hz
Operating Temperature	50°F - 104°F (10°C - 40°C)
Storage Temperature	-40°F - 149°F (-40°C - 65°C)
Operating Humidity-Noncondensing	20%-80%
CRT Screen Size	21”
Dimensions	19.9” H x 20” D x 19.3” W (50.6 cm x 50.7 cm x 49 cm)
Weight	65 lbs. (30 kg)

1.2.8.1. Instructor Operator System (9A3A2)

The IOS interfaces the Host Computer with the inputs of the Instructor Station Keyboard and the Control Panel. The system allows the instructor to monitor, control, and direct the training environment of the student.

The chassis contains several components to interface the instructor, simulator and student training environment. The chassis components include:

20 slot PCI/ISA Backplane
Dual Power Supplies
Single Board Computer
Serial Data Board
2 Graphics Accelerator PCI Bus Boards
2 Network Interface PCI Bus Boards
Hard Disk Drive
Floppy Disk Drive
CD ROM Drive
Cooling Fans (not shown)

See Figure 1-55 for the locations.

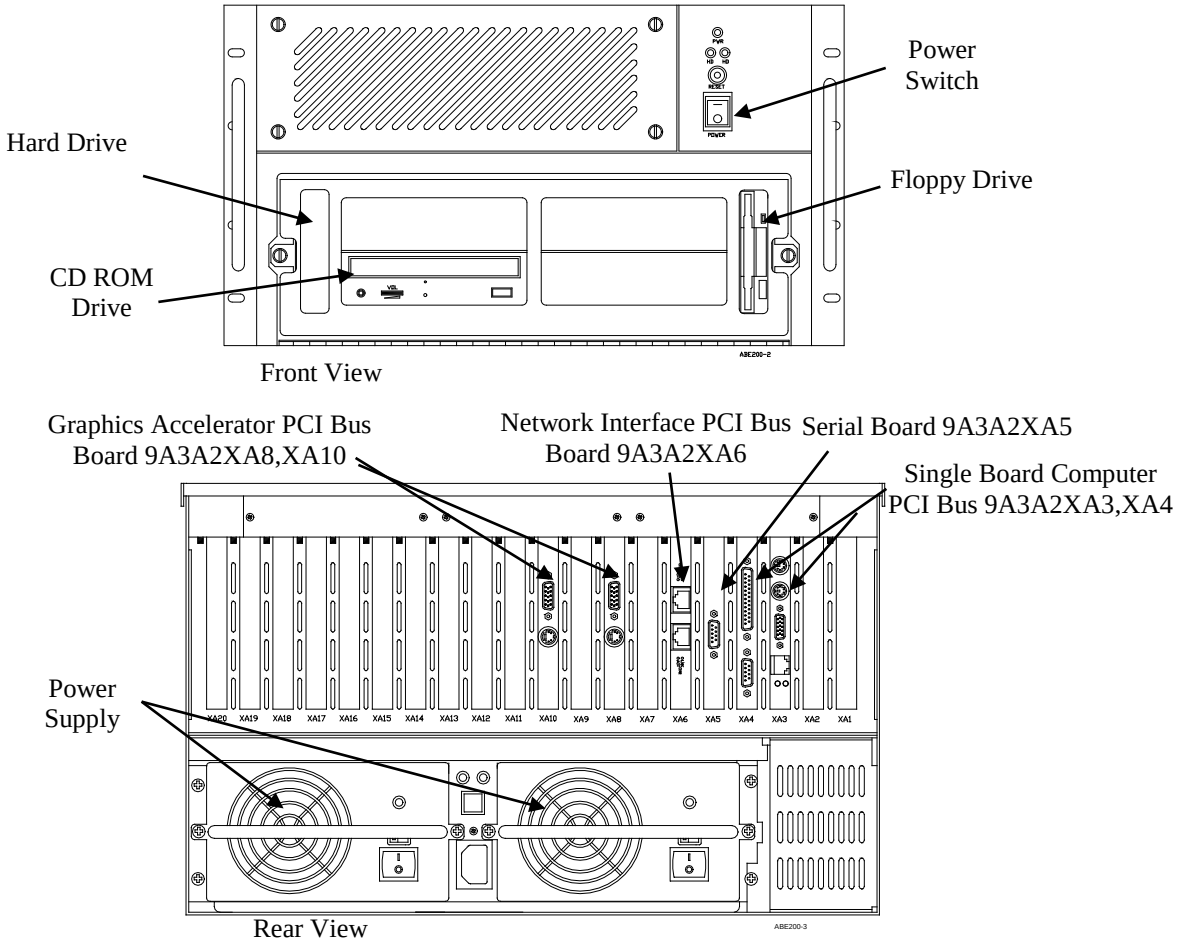


Figure 1-55. IOS Computer

The IOS Computer chassis (9A3A1) has a 20-slot, PCI/ISA backplane with 16 passive PCI slots. Six drive bays are provided; however, only three are used for the Hard Drive, the Floppy Drive, and the CD-ROM Drive. Three 90-cfm cooling fans provide filtered air to the chassis components.

The front of the chassis contains controls and indicators for powering on and resetting the chassis and showing the operational status of the drives.

On the back of the chassis are two dual, 300-watt, hot-swappable power supplies that supply DC power to the chassis components. If one power supply fails, the other power supply immediately takes over. Each power supply contains an audible failure alarm and operational status indicators.

The IOS communicates with the Host Computer over a 100BaseT-dedicated network using TCP/IP socket interface Protocol. The two Ethernet cables interface connect the Instructor Operator System directly with the Host Computer and site local area network through the Ethernet hub.

The Single Board Computer (XA3, XA4) mounts on a PCI bus and has an 800 (the Navy uses 850) MHz Pentium III microprocessor, 1024MB of RAM, two serial ports, one parallel port and 100BaseT Ethernet port. The only backplane wiring at XA3 and XA4 are the PS2 port connections to the keyboard and the mouse. The CompuSwitch (9A2A4) connection is made on the Graphics Accelerator Board at XA8.

The Serial Data board (XA5) is an extension of the serial port on the single-board computer in slot XA3 and XA4. A ribbon cable extension makes the port available for external use.

The Network Interface PCI bus board (XA6) is used for diagnostics and real-time communication. One Ethernet port always has access to the computer system for diagnostics. The other Ethernet port has a real-time communication with the Host computer. The backplane wiring at XA6 is the connection to Host Computer and the Ethernet on-site Computer Hub.

The Graphics Accelerator PCI bus boards (XA8, XA10) are used for driving one IOS monitor through the CompuSwitch (A2A4) and the other monitor directly.

The Hard Disk drive stores the operating system and simulation software. When the computer turns ON, the CPU looks for the operating system program in Windows 2000™. Once the operating system is loaded into memory of the CPU, it looks for the application program. The Hard Disk drive has 6.5 GB of formatted capacity.

The Floppy Disk drive maintains or rebuilds the hard drive if there is a hard-drive failure. The Floppy Disk drive uses 3.5-inch floppy disks with 1.44MB capacity.

The CD-ROM is used to load software when necessary.

1.2.8.2. Instructor Operator Station (IOS) (2A2)

The IOS is the instructor interface to the FTD and the student. Additionally, the IOS provides maintenance facilities, such as software debugging and diagnostics. The IOS is composed of two systems: hardware and software. This manual primarily addresses hardware; however, software is presented to the extent required to operate and maintain the equipment. The complete operation of the IOS is covered in the IPH.

The instructor can access pages for selecting mission scenarios, environmental conditions, threats, and malfunctions. The pages are windows into the simulation software through which the training environment, conditions, and lessons can be selected and changed to meet the training requirements. The pages allow the selection of certain routines, which offer control over simulation, such as freezes and re-positioning for take-off.

1.2.8.3. Instructor Operator Station Control Panel

The IOS control panel is located below the monitors and has a variety of switches and controls available for software debugging, recording, maintenance and monitoring the trainer.

Power Controls
Freeze Controls
Reset Controls
Lighting Controls
Simulation Sound Controls
Navigation/Communication Controls

Figure 1-56 shows the overall view of the IOS Control Panel. See Figure 1-57 for component locations.

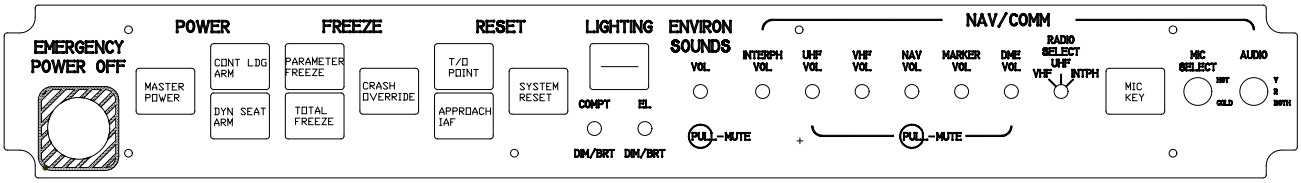


Figure 1-56. Instructors Operator Station Control Panel

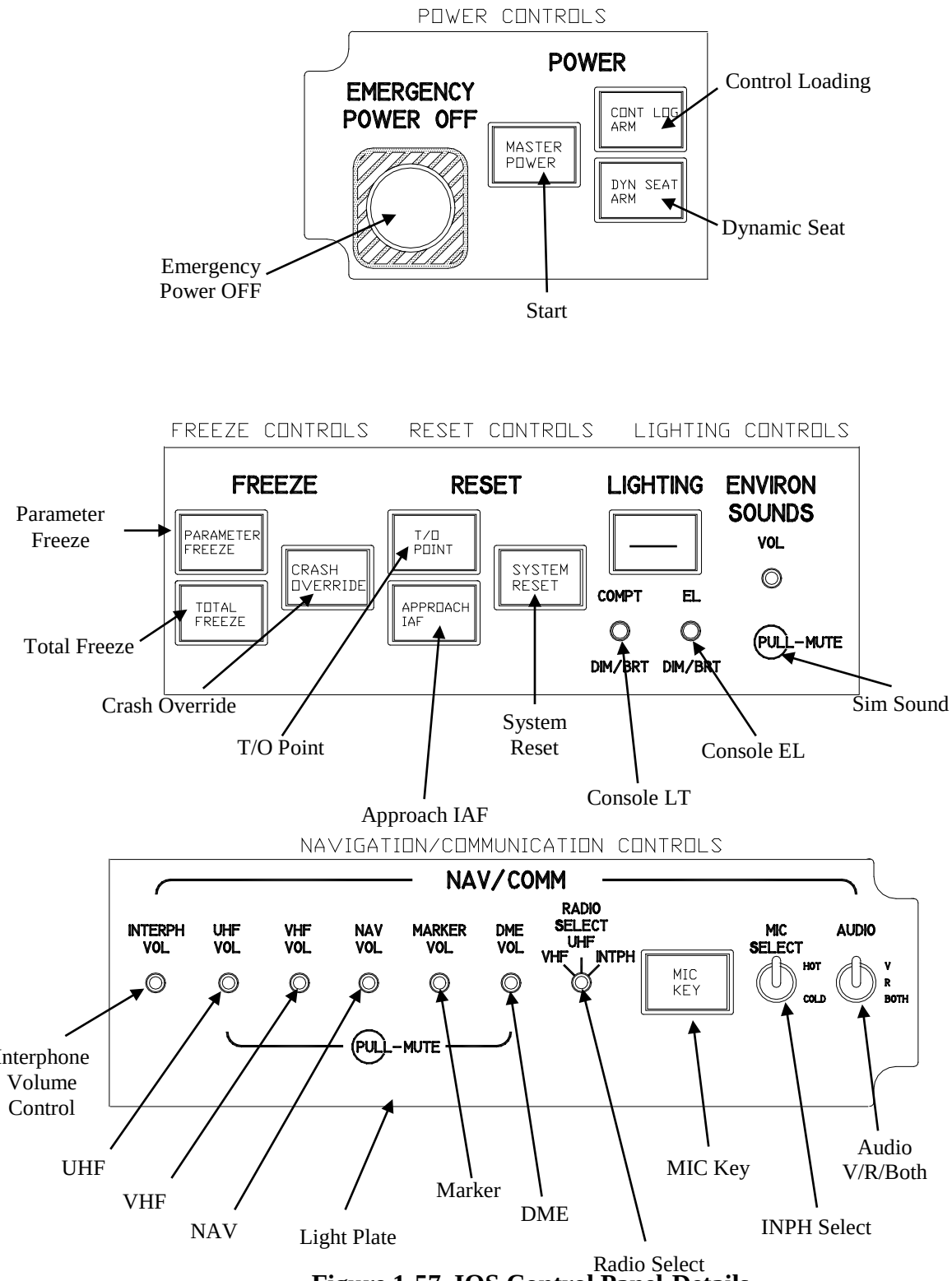


Figure 1-57. IOS Control Panel-Details

1.2.8.4. Audio Panel Assembly

The Instructor's Audio Jack Panel is located below the IOS tabletop on the right hand side. The J1 Instructor's Headphone is the audio output from and the Instructor's microphone input to the Aural Cue Chassis (9A3A5).

1.2.8.5. Fire Alarm Pull Station

The Fire Detection system has a manual pull fire box on the left side of the monitors. The system includes a strobe light and a warning horn. Temperature sensors are located in the Electrical Equipment Cabinets, under the cockpit floor, in the nose of the cockpit and in the top cap dome structure. Smoke detectors are located in the OFT dome and the IFT ceiling.

1.2.9. Student Station

The student station replicates the aircraft panels, controls, and displays, which face the student in the normal aircraft. See Figure 1-58. The student station contains:

Student Station Panels
- Main Instrument Panel
- Left Side Console
- Right Side Console

Controls
Lighting
Seat

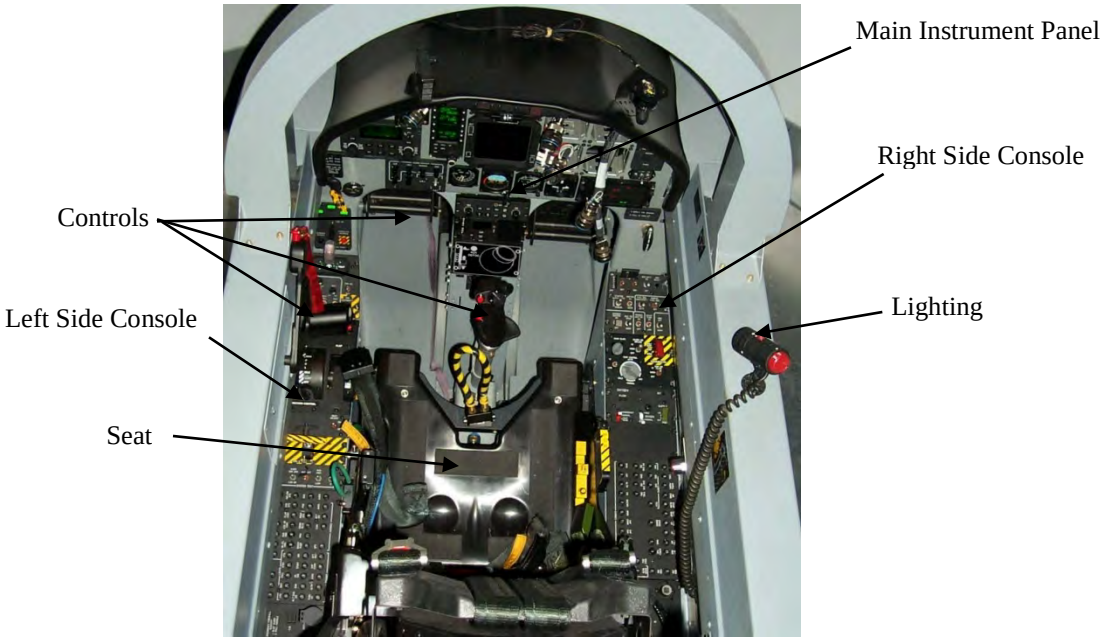


Figure 1-58. Student Station

The student station provides the environment in which the student is exposed to sensory cues and operational conditions from which the student gains the knowledge and experience with the procedures required for training. The student station contains instruments, displays, and controls further described in Section 3.

1.2.9.1. Student Station Panels

The Student Station Panels can be found on the Main Instrument Panel (Figure 1-59), the Left Side Console (Figure 1-60), and the Right Side Console (Figure 1-61). All student station panels, switches, knobs, handles, instruments, indicators, and lights duplicate the actual aircraft part in location and appearance. The instruments and displays indicate the aircraft's performance and responses for normal, abnormal, and emergency situations. This simulator is not furnished with oxygen masks or flight helmets.

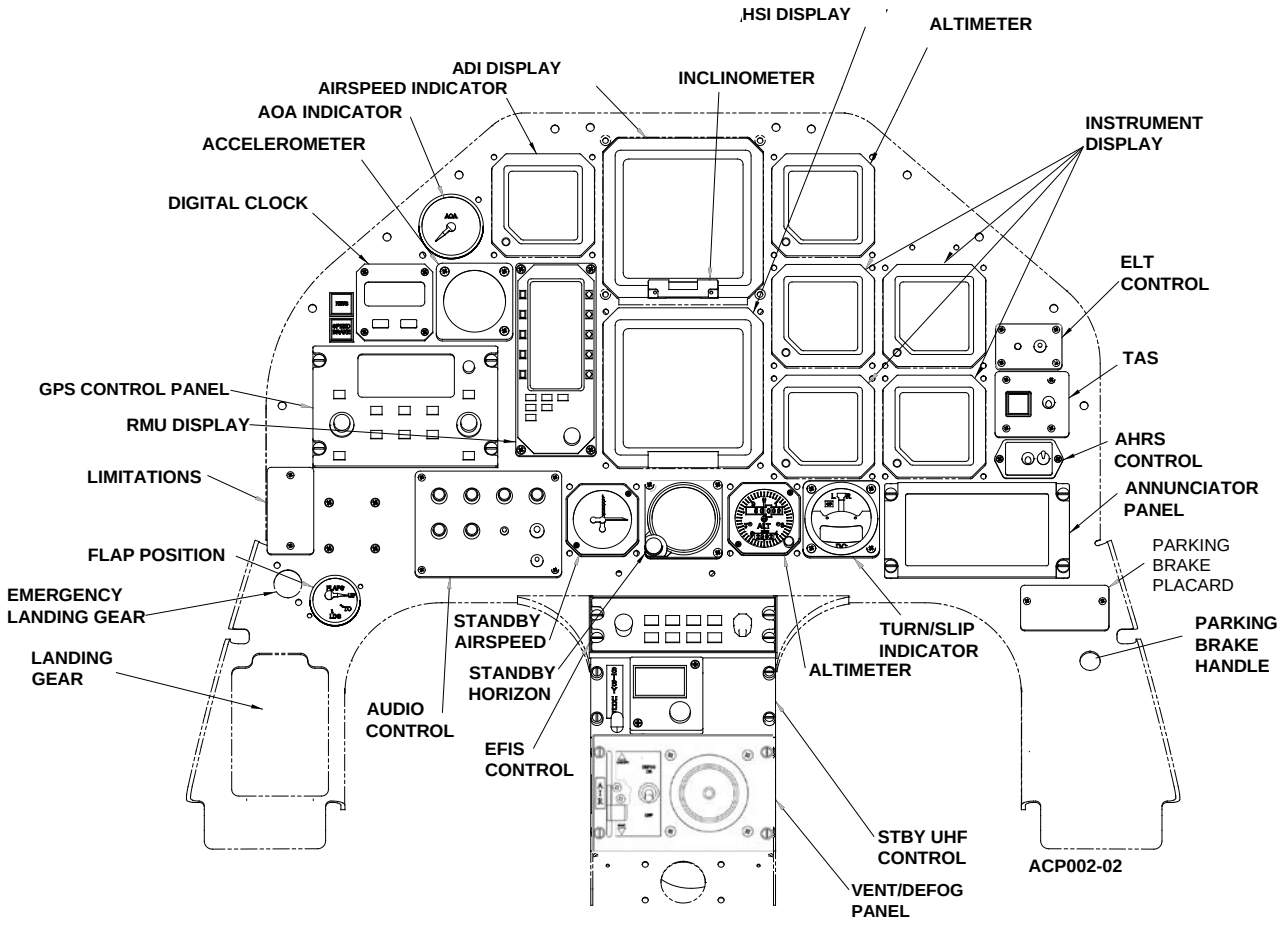


Figure 1-59. Main Instrument Panel

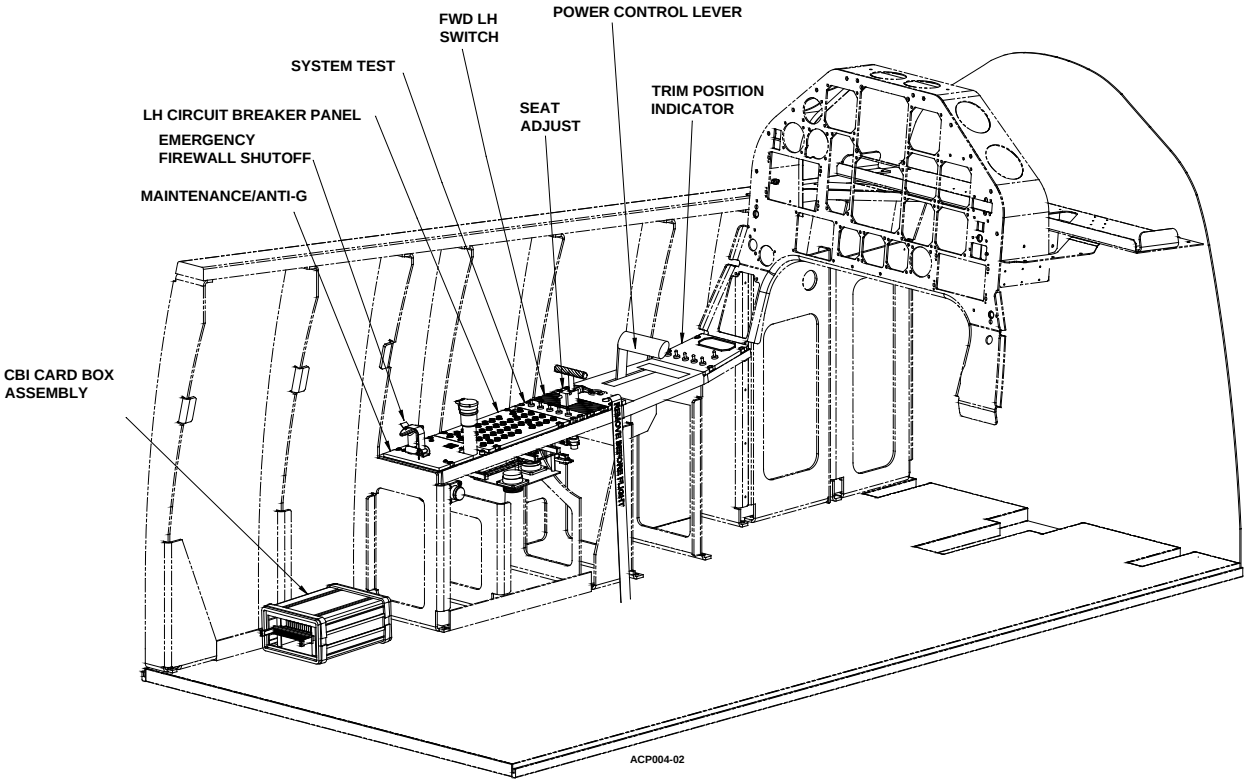


Figure 1-60. Left Side Console

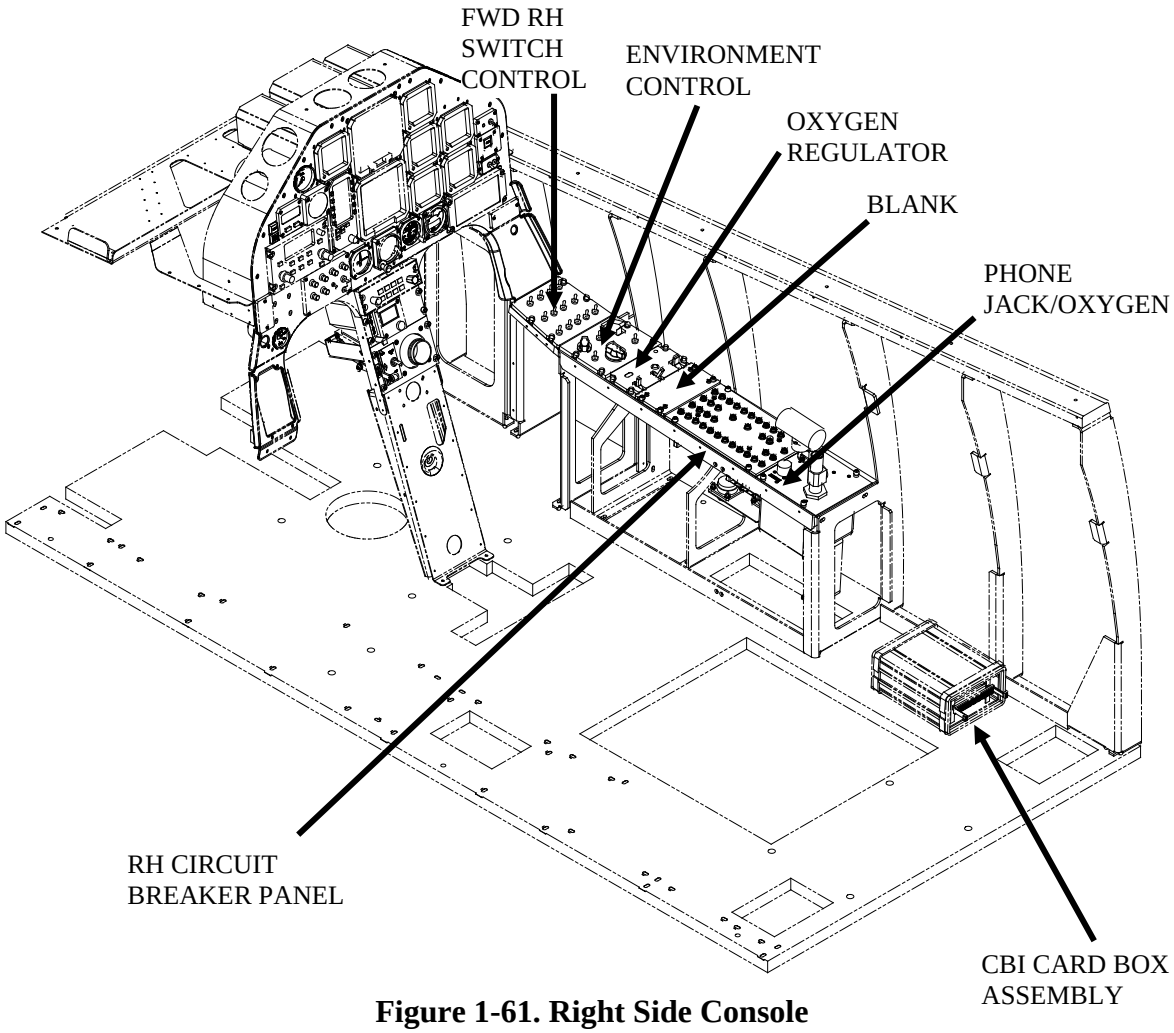


Figure 1-61. Right Side Console

1.2.9.2. Controls

The Control Loading System will activate the control stick in the cockpit to the flight neutral position. The Gust Lock needs to be in the Off position prior to Control Loading System startup.

WARNING

STUDENT SHOULD NOT BE IN STUDENT PILOT SEAT WHEN THE CONTROL LOADING SYSTEM IS ACTIVATED.

NOTE

INSURE THE GUST LOCK IS OFF PRIOR TO ACTIVATING THE CONTROL LOADING SYSTEM.

1.2.9.3. Lighting

Relays and power supplies in the 9A1-equipment cabinet provide the main lighting power. The forward instrument panel, left side panel, right side panel, cockpit day/night and emergency lights are 0-5VDC. The cockpit floodlights are 115VAC. The utility lights are 28VDC.

- AC Light Dimmers
- 0-28VDC Lighting
- 28VDC Lighting
- 0-5 VDC Lighting

Table 1-14 lists the lighting system power supplies locations by drawing designators.

Table 1-14. Lighting Power Supplies

Lighting	Relay	Main Panel	Voltage	Drawing
Forward Instrument Panel	K01	A1	28VDC to 0-5VDC	6520AGL002
Side Panels-Left and Right	K02	A2	28VDC to 0-5VDC	6520AGL003
Emergency	K03	A3	28VDC to 0-5VDC	6520AGL004
Cockpit Day/Night	K08 K06, K22	A4	28VDC 0-28VDC / 14VDC	6520AGL005 6520AGL008
Cockpit Flood	K31	A5	0-115VDC	6520AGL006
Utility			28VDC	6520AGL007

1.2.9.4. Seat

The Student Station seat is a copy of the actual aircraft without the ejection activity function. A seat adjustment actuator is in the back of the seat, while under the seat is a dynamic seat actuator mounted to the facility floor. The seat adjustment switch, seat actuator controller, and the limit switches are for seat extension and retraction. See Table 1-15 and Figure 1-62.

Table 1-15. Seat System Characteristics

Parameters	Specifications
Actuator Controller	
AC Power Input	120VAC, 5 amp
Frequency	60 Hz
Output Voltage	24VDC, 20 amps
Input Fuse (F1)	5 amp, 250V Fast Blow
Output Fuse (F2)	20 amp, 32V Fast Blow
Dimensions Controller	6” H x 10.5” W x 7.75” D (15.2 cm x 26.7 cm x 19.7 cm)
Weight	16 lbs.

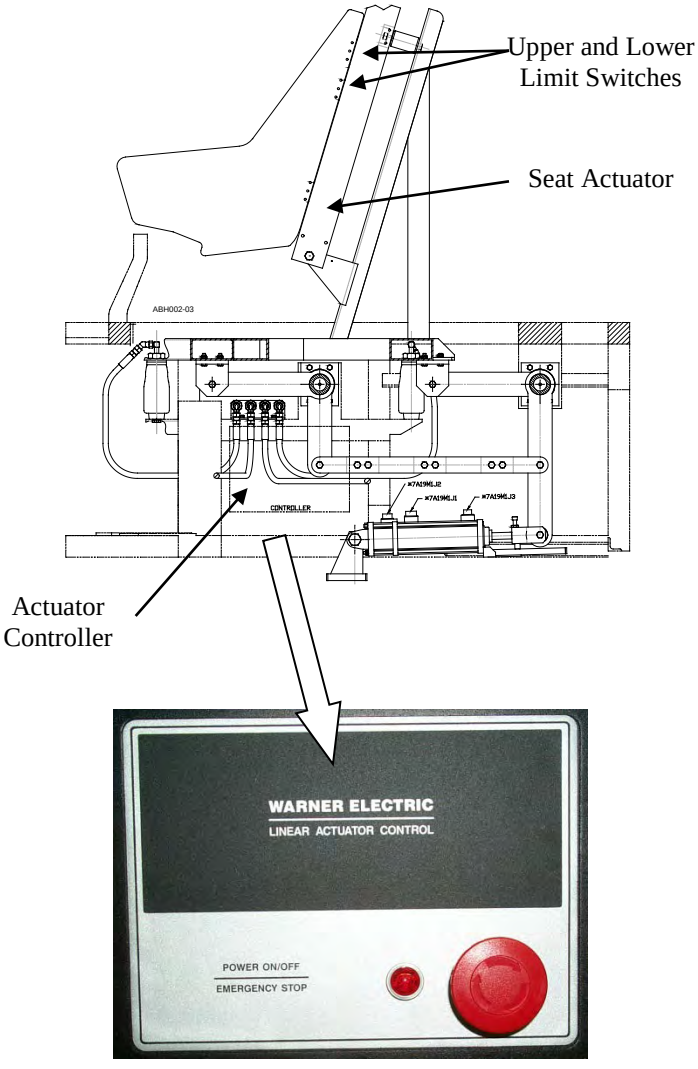


Figure 1-62. Student Station Controller

The dynamic seat actuator, bolted to the facility floor, provides seat movement with the Electric Control Loading System secondary controls. See Figure 1-63.

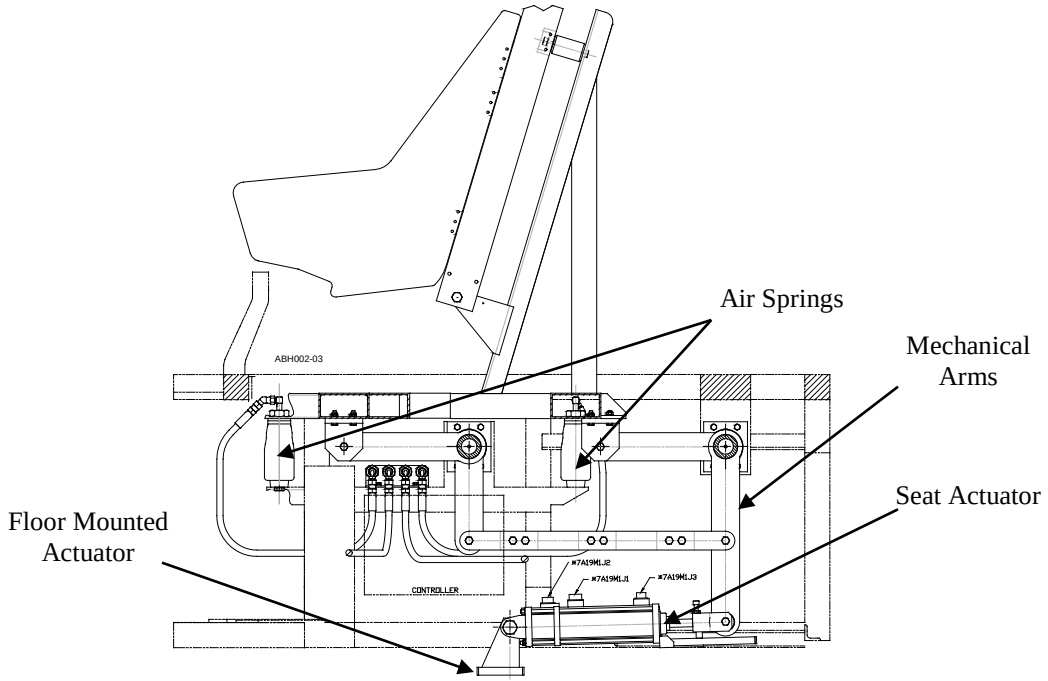


Figure 1-63. Dynamic Seat Actuator

1.2.10. Visual System

The Visual System creates a 2-dimensional representation of a 3-dimensional environment and displays it as seen through the windows on the flight deck from the pilot's eye-point. This visual environment provides the cues necessary to create a sensation of movement and flight. The Visual System is comprised of the Image Generator, the Projection or Display System and the Visual Database. Only the OFT and IFT training devices use a visual system.

For both the OFT and the IFT refer to FSI-VSS Vital X or Vital 1100 Operation and Maintenance Manual documentation for maintenance information on the Visual Image Generation System.

For OFT and IFT projector maintenance, refer to the Sony Video Projector VPL-GH10 Remote Commander Service Manual.

1.2.11. Fire Detection System

The Fire Protection System provides smoke and heat detection for the Student Station, IOS, Equipment Cabinets (9A2 and 9A3), OFT Dome and Visual Cabinets (10A1 and 10A2), IFT Visual Structure and Visual Cabinet (10A1).

The Fire Detection System has one smoke detector, several thermal detectors, and a manual alarm for activation on the OFT and IFT. The Fire Detection System on the UTD only has thermal detectors and a manual alarm for activation. Figure 1-64, Figure 1-65, and Figure 1-66 show the three flight training devices with each of their Fire Detection Systems components. The Master Control Panel is installed as required on the site facility wall. Table 1-16 shows the Fire Detection System characteristics.

Table 1-16. Fire Detection System Characteristics

Parameters	Specifications
AC Power Input	120VAC 15 amp
Frequency	50-60 Hz
Dimensions Master Control Panel	4” H x 15” W x 19.38” D (10.2 cm x 38.1 cm x 49.2 cm)
Weight	65 lbs.

The Master Control Panel controls the Fire Detection System and communicates with the facility fire detection system. The system includes temperature sensors, photoelectric smoke detectors, a manual activation station and alarms. The Fire Detection System key components are:

Master Control Panel	Thermal Detector
Smoke Detector	Temperature Sensor
Manual Pull Station	Alarm Horn & Strobe Light

1.2.11.1. Master Control Panel

The Master Control Panel is the heart of the fire protection system and is located on the site facility wall adjacent to the simulator. This unit contains the switches and indicators, both visible and audible, necessary to test the system and indicate faults in the system’s circuits. The unit accepts an alarm input from the smoke and temperature sensors and provides the interface to activate visual and audible alarm signals to alert personnel of a fire in the simulator area. It also interfaces with the facility control panel to alert the facility of a fire in the system. Figure 1-67 shows the Master Control Panel.

OFT

Fire detection components are in the same basic locations regardless of the visual system.

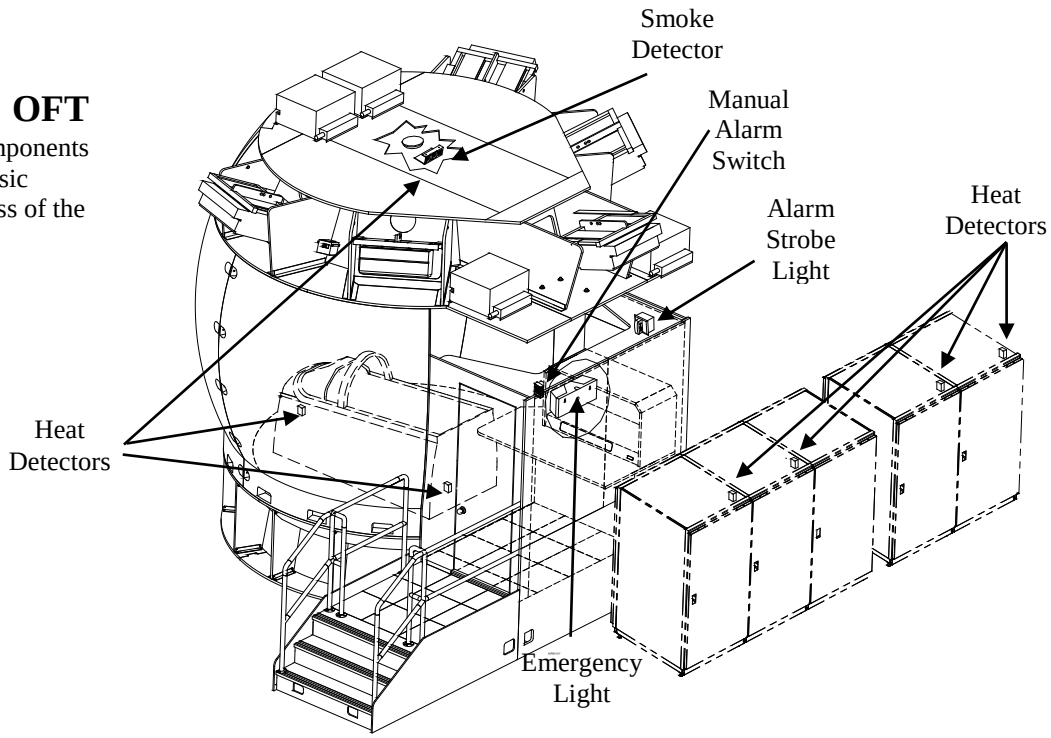


Figure 1-64. OFT Fire Detection System Diagram

IFT

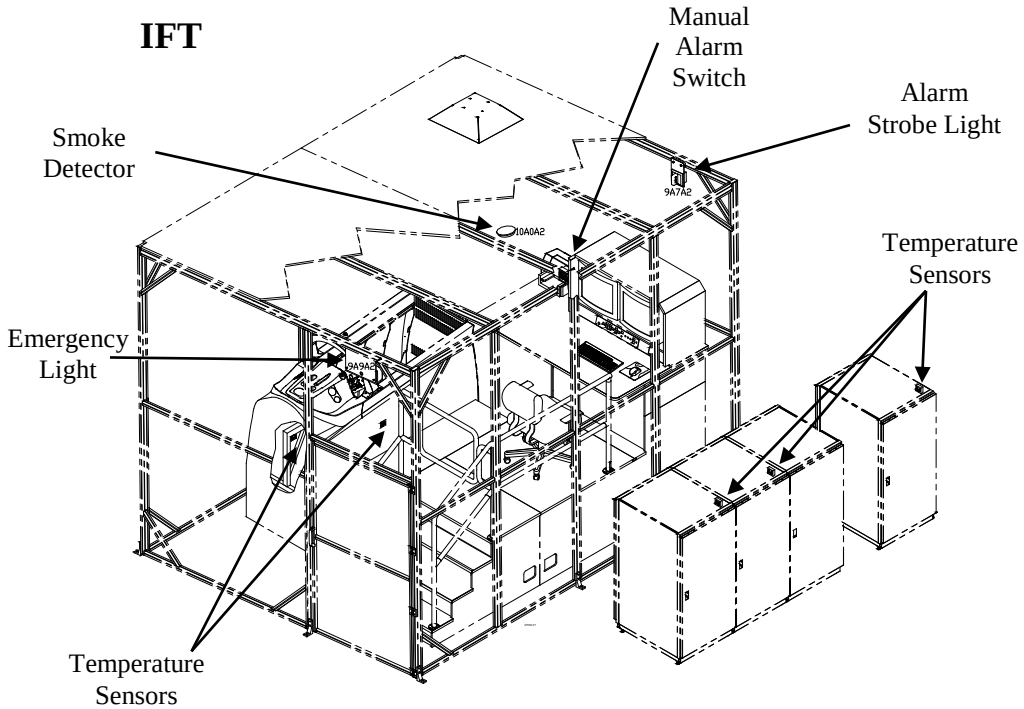


Figure 1-65. IFT Fire Detection System Diagram

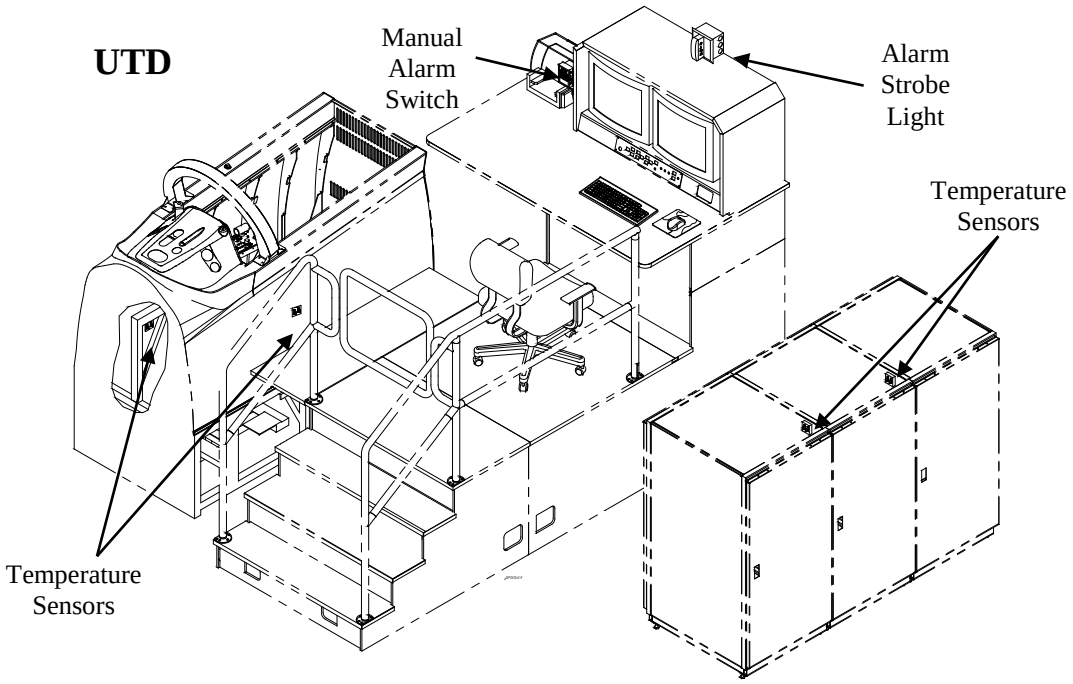


Figure 1-66. UTD Fire Detection System Diagram

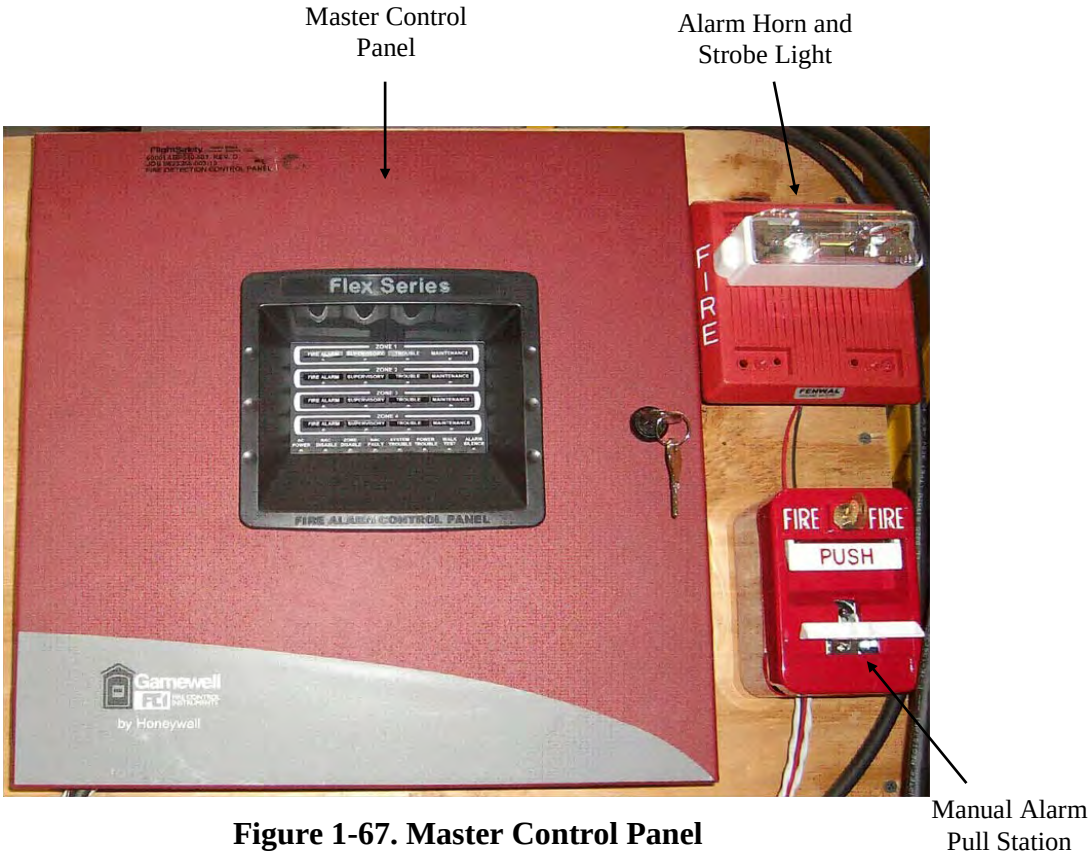


Figure 1-67. Master Control Panel

1.2.11.2. Thermal Detector

The thermal detector is a two-stage, thermally sensitive detection device with an upper trip point of 170°F and a lower trip point of 140°F used in conjunction with the smoke detectors to activate the fire alarm system. When the lower trip point is reached, the system is put in a warning type condition. When the upper trip point is reached, the system shuts down. They are located in key electrical equipment areas of the simulator as shown in Figure 1-64, Figure 1-65, and Figure 1-66.

1.2.11.3. Smoke Detector

The smoke detector is a photoelectric-type smoke detector used in conjunction with the thermal detectors to activate the fire alarm system. The smoke detectors sense particles commonly generated by combustion. A pulsing LED shows the detector is functioning. Under an alarm condition, the LED switches to a steady red illumination. The smoke detectors are located in key electrical equipment areas of the simulator as shown in Figure 1-65 and Figure 1-66.

1.2.11.4. Manual Alarm Switch

The manual alarm switch is a small, red, mounted box on the left sidewall cabinet of the IOS monitors. It encloses a toggle switch to be used by personnel to manually activate the fire alarm.

1.2.11.5. Alarm Horn and Strobe

The alarm horn and strobe units are located above the IOS monitors. The combined warning horn and flashing light (with a FIRE legend) provide audible and visible warnings to alert personnel of smoke or fire in the simulator area. It is also tied into the facility fire detection system.

The alarm horn and strobe unit is typically located in the facility adjacent to the control unit. The unit consists of a Lexanlens with the FIRE legend visible from three directions and a warning horn with a typical output of 95dB.

1.2.12. Equipment Cooling

1.2.12.1. Fans

The fans on the Student Station, Equipment Cabinets, Dome, and Visual Structure work in conjunction with the site air conditioning system to provide forced ventilation to heat-sensitive electronic equipment on the Flight Training Devices. The fans are located in the main instrument area, behind the pilot seat, top of the equipment cabinets, OFT top cap dome structure, and IFT top visual structure.

1.2.12.1.1. Student Station Fans

Three fans and a blower unit are associated with the student station area. One fan blows air into the main instrument area. The blower unit has hoses routed to blow air directly on the back of the instruments in the instrument panel. They help ventilate and cool the electrical equipment housed in the instrument panel. Two other fans are located behind the pilot seat to help ventilate and cool the electrical equipment for the secondary controls. See Figure 1-68 through Figure 1-70 for location of the fans.

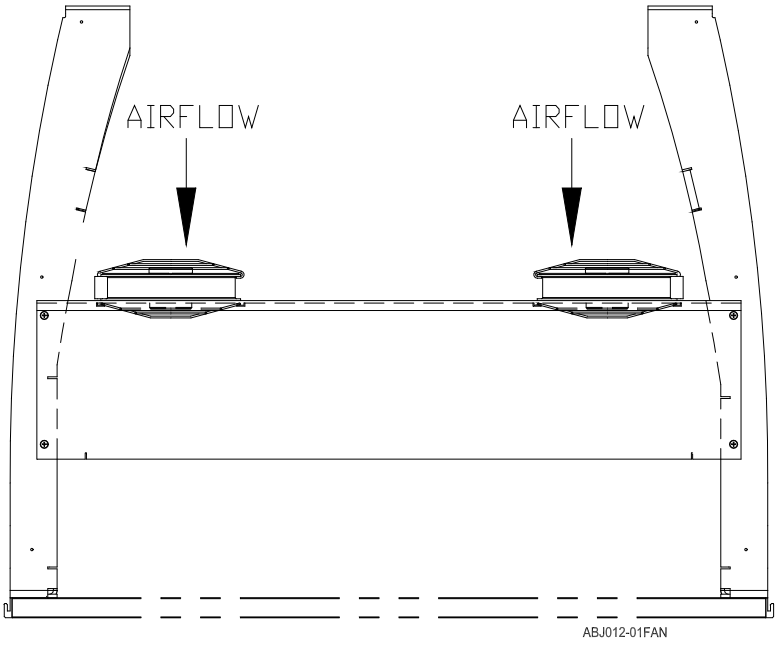


Figure 1-68. Student Station DRI Amplifier Fans

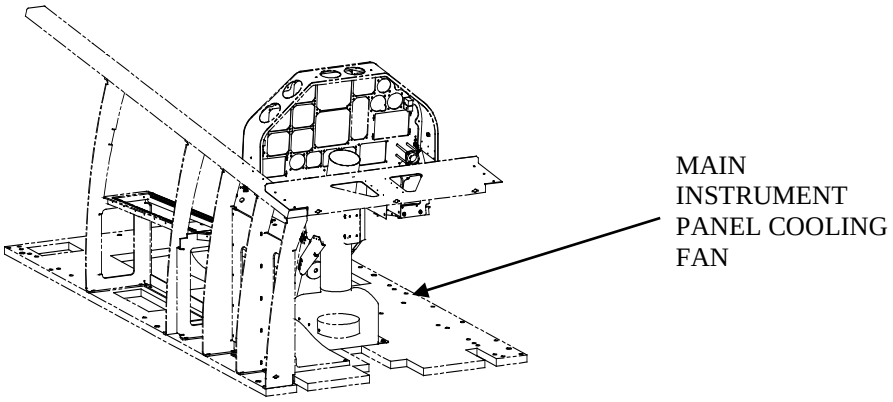


Figure 1-69. Main Instrument Panel Fan

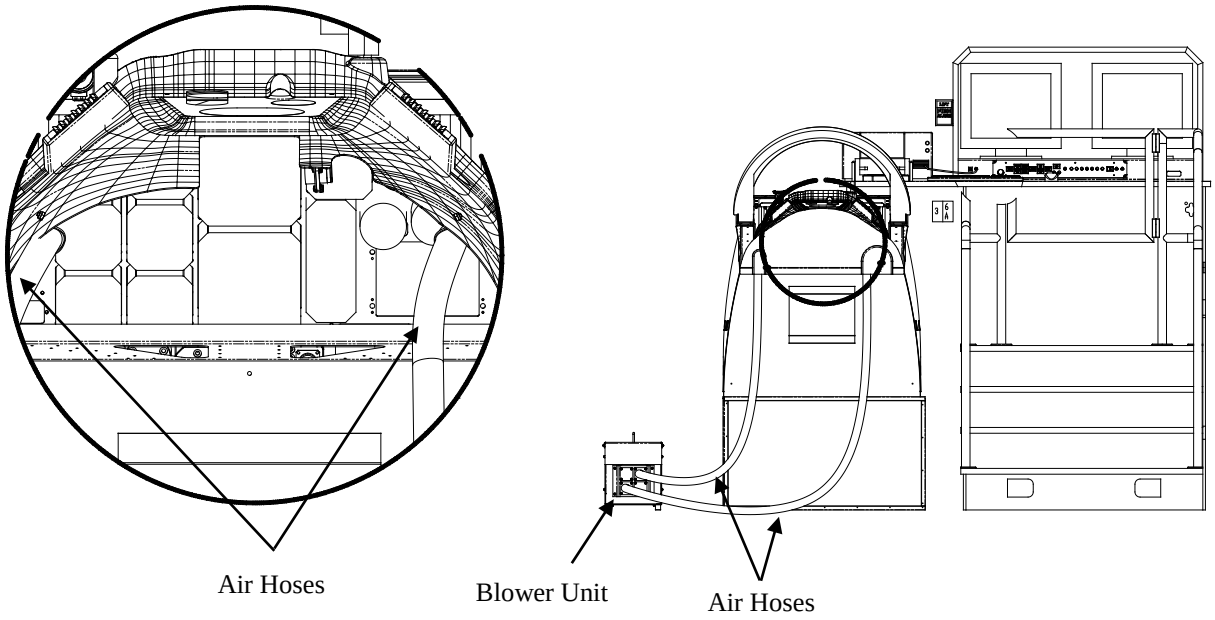


Figure 1-70. Main Instrument Panel Blower Unit

1.2.12.1.2. Equipment Cabinet Fans

A fan pack containing two side-by-side fans is located at the top of equipment cabinets 9A2 and 9A3. This fan packs draw warm air out of the cabinets to help cool the electronic equipment housed inside. Figure 1-71 shows the location of the fans.

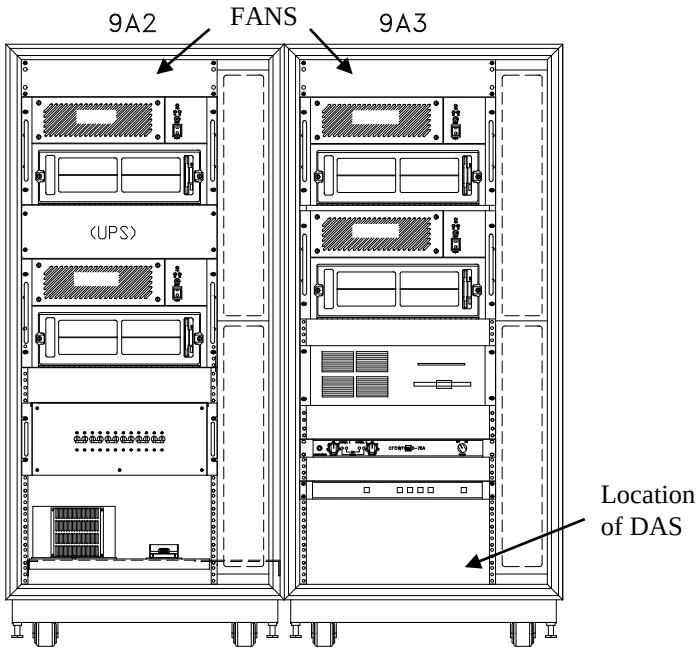


Figure 1-71. Equipment Cabinet Fans

1.3. LIST OF RELATED PUBLICATIONS

The following list of manuals is either referenced in this manual or are vendor manuals related to the equipment installed in your simulator. Volume Two of this manual includes copies of these manuals except for the Visual O & M Manuals. They are in Visual System Volumes one and two.

COMPONENT	TYPE OF MANUAL	VENDOR	O & M VOLUME
8500-486-E98M015	Series IP220 High Density Analog Output Board User's Manual	Acromag Inc.	2
8500-484-E98M015	Series IP320 High Density Analog Input Board User's Manual	Acromag Inc.	2
8500-530-C98M015	Series IP405 40-Channel Digital Output Board User's Manual	Acromag Inc.	2
B-T-MU-DID48A-0-A4	DID48 48-Channel Debounced Discrete Input Board User's Manual	Aerotech World Trade LTD.	2
990-7016B	Smart UPS Uninterruptible Power Supply 120 VAC Users Manual	American Power Conversion	2
990-7021A	Smart UPS Rack Mount Supplement User's Manual	American Power Conversion	2
990-0125, Rev 1, Mar 95	Relay I/O Module	American Power Conversion	2
A429-PCI-8	Getting Started with the Arinc PCI-8	Arinc (SBS Technologies)	2
73-180-723	VS Series 800-2500 Watt Power Supply Spec Sheets	Astec America, Inc. (Supplied by Norvell)	2
351758-001	V1000 Color Monitor User's Manual	Compaq Computer Corp.	2
K80593A3	D45 and D75A D Series Reference Manual	Crown International	2
DMC50-416	RMU Power Supply Spec Sheet	Digital Power Corp	2
400501-02	E Series EN Digital Servo Drive Installation Manual	Emerson Motion Control	2
10278	GS Series Linear Actuator Installation and Service Manual	Exlar Corporation	2
MC-410	3210 Series Fire Control Unit Design Manual	Fenwal Protection System	2
MC-403A	3210 Series Fire Control Unit Installation and Operation Manual	Fenwal Protection System	2
75-001	MT and MT Stable Series-Electronic Horn/Multitone Signals	Fenwal Protection System	2
KF0020	Fenwal Smoke Detectors	Fenwal Protection System	2
29-320000-28X	Series 3200 Manual pull Station	Fenwal Protection System	2
	VE Surface Temperature Sensors	Fenwal Protection System	2
9000-0007	FC-72 Series Fire Alarm System Instruction/Operation Manual	Fire Control Instruments	2
C 6413-90009	800-Series HP DeskJet Printer Users Guide	Hewlett Packard	2

COMPONENT	TYPE OF MANUAL	VENDOR	O & M VOLUME
36006-7	LT-103 Light Dimmer Power Supply Removal/Installation Manual	KGS Electronics	2
55106	LT-55A Light Dimmer Power Supply Removal/Installation Manual	KGS Electronics	2
006-0583-01	KA579A Remote Power Supply	King (Allied Signal)	2
Schematics	31JGF11A-2016 Power Supply Drawings	Lambda Electronics Inc.	2
Schematics	31JG16F-1539 Power Supply Drawings 28 Volt	Lambda Electronics Inc	2
IMJFS10	JFS1000 Series Instruction Manual Power	Lambda Electronics Inc	2
IMJFS20	JFS2000 Series Instruction Manual Power	Lambda Electronics Inc	2
FX3200	FX Series IDE CD-ROM Drive Installation Manual IOS	Mitsumi Electronics Corp.	2
0304	Model D359M3 Data Sheet Floppy Disk Drive 57025AB0003	Mitsumi Electronics Corp.	2
866-500-1	Specification for Dual Power Supply Pacific Systems P.N.-866-500-1	Pacific Systems	2
ES-1066	Model AG1A823 Product Specifications	Panasonic/Matsushita Elec. Co.	2
HPF5 Series	2000 Watt, 28 VDC, Power Supply Data Sheet	Power-One	2
PSA-10L-240	MIC Pre-Amp Power Supply Spec Sheet	Phihong	2
Ver OB	Master Console II, S Model and X Model User's Manual	Raritan Computer Inc.	2
ARINC429	Arinc 429 User's Manual	SBS Avionics Technologies	2
A429-PC8-PC16-GS	Getting Started w/ Arinc PCI-8/PC16	SBS Avionics Technologies	2
IP-Quadrature	IP Quadrature 4 Channel Decoder User Manual	SBS GreenSpring Computer	2
IP-GSnet	Gigabit Synchronous Optical Reflective Memory Industry Pack	SBS GreenSpring Computer	2
IP-QuadPlus-422	IP-QuadPlus-422-ET Application Information	SBS GreenSpring Computer	2
IP-QuadPlus-422	IP-QuadPlus-422-ET Four EIA422 Serial Channel User Manual	SBS GreenSpring Computer	2
PCI-60A	PCI60A Hex IP Carrier for PCI Bus User Manual	SBS GreenSpring Computers	2
Platform332 -100	Platform332 DRI Platform Board User Manual	SBS GreenSpring Computer	2
IP-16DAC	IP-16 DAC User Manual	SBS GreenSpring Computer	2

COMPONENT	TYPE OF MANUAL	VENDOR	O & M VOLUME
IP-16ADC	IP-16 ADC User Manual	SBS GreenSpring Computer	2
IP-PWI	IP-PWI User Manual	SBS GreenSpring Computer	2
IP-Unidig-HV	IP-Unidig-HV 16I8O and 8I16O User Manual	SBS GreenSpring Computer	2
Power Supply and Signal Conditioning Board	Schematic Diagrams (0390-1197, 22 sheets)	SBS GreenSpring Computer	2
722-S121	FlightSafety Model 722-S121 PC Enclosure System Notes	SBS Technologies	2
	Medallist Pro Hard Drive Installation Guide	Seagate Technology	2
32659-001	Medallist Pro 6530 Product Manual	Seagate Technology	2
87-001036-000	ISA/PCI Passive Backplanes Technical Reference Manual	Trenton Technology	2
87-005649-000	P2BX/P2GX T2BX Basic 5649-xxx Technical Reference Manual Single board Computer, PCI Bus	Trenton Technology	2
VI-PJ222-EZZ	VI-PJ222-EZZ DC/DC Power Supply	Vicor Corp.	2
P-264-C	Controls for Electrak Series Actuators Installation and Operation Manual Actuator Controller MCS-2015	Warner Electric / Dana Corp.	2
P1023	Electrak 2000 Programmable Actuator Systems	Warner Electric / Dana Corp.	2
P786	Electrak Linear Actuator Systems	Warner Electric / Dana Corp.	2
DU0875-01	Model ZX348Q Multi Channel Adapters	Znyx Corporation	2
Sound System Computer	9515 Server User's Guide	Gateway	2
APS-1, Audio Processing System	Titan Audio Processing System User's Manual	Titan	2
JPATS-FTD-SPS	Software Product Specification for the Flight Training Device component of the Joint Primary Aircraft Training System Ground Based Training System	FlightSafety International Simulation Systems Division	Separate Document
JPATS-FTD-SUM	Software User Manual for the Flight Training Device component of the Joint Primary Aircraft Training System Ground Based Training System	FlightSafety International Simulation Systems Division	Separate Document
4-139-070-02 (1)	Sony Data Projector Operating Instructions VPL-GH10	Sony	Separate Document
9-883-670-01	Sony Video Projector VPL-GH10 Remote Commander Service Manual	Sony	Separate Document
255-80-3100	MasterConsole II User Manual for MCC4, MCC8, MCC16, MCC4R, MCC8R, MCC16R, MCC8RD, MCC16RD	Raritan	Separate Document
87-005721-000	CBI/CGI CB Basic Technical Reference	Trenton	Separate Document

COMPONENT	TYPE OF MANUAL	VENDOR	O & M VOLUME
CDI-E328-010	Canon PowerShot G9 Camera User Guide	Canon	Separate Document
90001085	AnywhereUSB Remote I/O Concentrator	Digi	Separate Document
	DMS Installation Checklist	FlightSafety International	Separate Document
W1610AA2025	DMS User Manual for Version 2.6	FlightSafety International	Separate Document
	DMS Hardware Manual	FlightSafety International	Separate Document
EDH0235En1030 – 08/15	ESP301 Integrated 3-Axis Motion Controller/Driver User's Manual	Newport	Separate Document
	EZscan Configure User's Manual, Rev 1.2.0	Westar Display Technologies, Inc.	Separate Document
	EZscanTM Users Guide, Rev. 002	Westar Display Technologies, Inc.	Separate Document
	FreeAgent GoFlex Home User Guide	Seagate Technology, LLC	Separate Document
	NVP117/NVP119 1U LCD Console Drawer User Manual	i-Tech Company, LLC	Separate Document
	Maxtor OneTouch 4 Windows User's Guide	Maxtor	Separate Document
	Maxtor OneTouch 4Plus/ OneTouch 4Mini Windows User's Guide	Maxtor	Separate Document
202-1136-01	ProSafe (r) GS752TP, GS728TP, and GS728TPP Gigabit Smart Switches Hardware Installation Guide	NETGEAR	Separate Document
VS986302	Olympus Digital Camera E-620 Instructional Manual	Olympus Imaging Corp.	Separate Document

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