Table of Contents

List of Figures

List of Tables

SECTION 5. MAINTENANCE

5.1. GENERAL

The maintenance instructions contained in this section have been selected using available historical data to identify areas most likely to require attention. Overhaul instructions are not included.

A regular, preventive maintenance program can diminish catastrophic breakdowns and simulator down time. This section presents an effective preventive maintenance program.

5.1.1. List of Test Equipment Required

Table 5-1 lists the test equipment required to perform all procedures contained in this section. The test equipment required for each procedure is listed at the beginning of each procedure.

Table 5-1. Test Equipment

Digital Voltmeter, Fluke 77 or equivalent (87-5 or equivalent if DAS-equipped)
Fiber Optic Test Cable – SRA016-E0E00-05F
Laptop or Desktop Computer
Oscilloscope with scope leads
Platform Test Cable 60001ACJ858-501
Digital Level (PRO360 or equivalent)
Bus Analyzer

5.1.2. List of Tools Required

Table 5-2 lists the tools required to perform all procedures contained in this section. The specific tools required for each procedure are listed at the beginning of each procedure.

Table 5-2. Tools Required

Non Conductive Trimpot Adjustment Tool
Standard Tool Kit
Static Dissipative Field Service Kit
Tensiometer
Vacuum Cleaner
Variable Flow Peristaltic Pump (McMaster-Carr 43205K15) or a Hand held vacuum pump kit (McMaster-Carr 9963K11)
Grounded Wrist Strap
Jumper with Clip

5.1.3. List of Materials Required

Table 5-3 lists the recommended materials required to perform the procedures in this section.

Table 5-3. Materials Required

242 Loctite, or similar product
3/8” clear hose (McMaster-Carr 5233K56)
609 Loctite, or similar product
Chemtronics Optic Prep pre-saturated wipe CP410 (alcohol wipes)
Connector, Tubing (McMaster-Carr 53415K106)
Coupler, P/N – 6608-6-6 (Parker)
Female JIC 37° Swivel, P/N – 30682-4-4b (Parker)
Flare Union Adapter, P/N – 2027-6-4s (Aeroquip)
Lint-Free Cloth
Lubriplate grease (white lithium grease)
Mild Soap
Oil sample container (894277)
O-ring, P/N – 22617-6 (Aeroquip)
Paper Tags for labeling wires and cables
Petroleum based gear oil, with an EP additive - ISO grade 100
Two graduated Beakers (McMaster-Carr 4187T43)

5.2. PREVENTIVE MAINTENANCE

Preventive maintenance is the key to solving small problems before they become major repair actions. In addition, preventive maintenance can be used to locate an operationally marginal assembly. This will allow the maintenance technician the opportunity to replace the faulty component/assembly before it causes a loss of training. Procedures in this section document performance of the preventive maintenance presented on the Maintenance Schedule.

Operation tempos and student populations at the various training sites may require some inspections to be conducted more often than mandated in this manual and related checklists. Nothing in this document or in the related checklists prohibit a greater frequency of inspection than presented.

5.2.1. Daily Maintenance

Daily Inspection and Daily Readiness Test (DRT) is recommended to be accomplished after the last operation of the day, prior to maintenance activity, and again after maintenance activity before the first operation of the following day. These tasks should be conducted within twenty-four hours of the following operational day.

Tasks consist of checking the training device operation by performing the visual examination and operational test, as listed in the Inspection Manual TM-JPATS-FTD-02-000-100, to discover defects and adjustments that, if not corrected, could cause delays to training operation.

5.2.2. Weekly Maintenance

Maintenance on a weekly basis should be performed per the Inspection Manual TM-JPATS-FTD-02-000-100.

5.2.3. Bi-Weekly Maintenance

Maintenance on a bi-weekly basis should be performed per the Inspection Manual.

5.2.4. Monthly Maintenance

Maintenance on a monthly basis should be performed per the Inspection Manual.

5.2.4.1. Gas Spring Charging Procedures

Inspection of the seat gas spring should occur per the following.

1) With no weight in the seat, check the pressure of each gas spring with a calibrated air gauge for 25 ± 5 psi.
2) With a regulator, charge each spring to 25 ± 5psi.
3) Check system for leaks.

5.2.4.2. Flight control cable tensioning procedures

Recommended tools for this procedure include:

Tensiometer/Cable Gauge P/N – BT-3375-D MFR. – Unknown

5.2.4.2.1. Aileron

1) Place tensiometer on cable.
2) Place inclinometer on the control stick column. Place the stick at 0 degrees of roll.
3) Adjust tension with turnbuckles on both sides of pulley, turning one then the other to ensure control stick stays at 0 ± .5 degrees of roll while achieving 60 ± 2 lbs. of tension.

5.2.4.2.2. Rudder

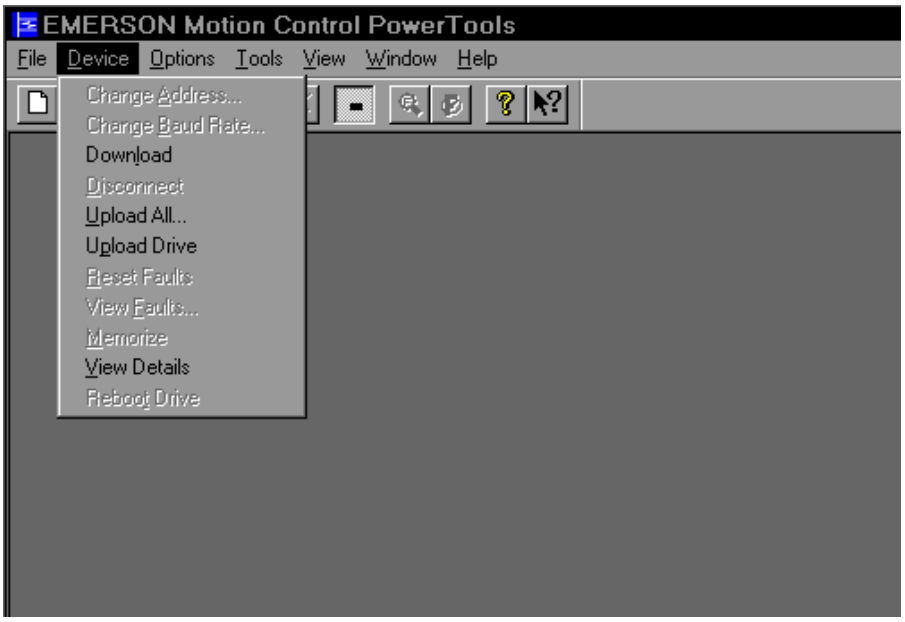
1) Place tensiometer on cable where clearance can be found.
2) Adjust turnbuckles to achieve 60 ± 2 lbs. of tension.

5.2.4.3. Electric Control Loading System (ECLS) Servo Amplifier Calibration

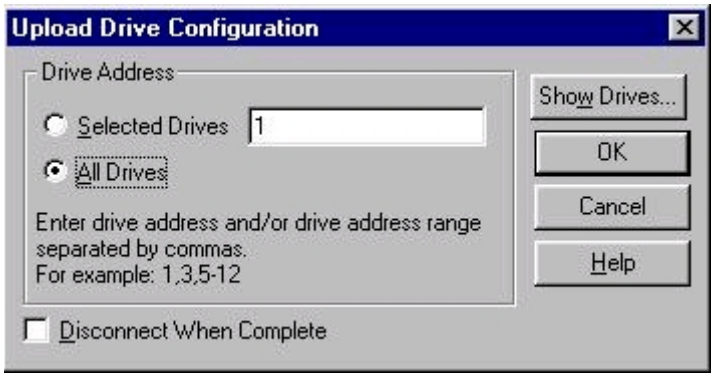
The following equipment is required for calibrating the servo amplifiers.

- Serial cable – P/N – 5416ABH803
- Power tools software, version 4.2
- PC/Laptop computer

1) Connect the serial cable from the PC/Laptop directly into the servo amplifier serial port J4 of each control in turn.
2) Enter the “Power Tools” program.
3) Double click on the “Power Tools” icon on the IOS monitor (in the DRI mode, if so equipped) or on the Laptop computer.
4) Select “Upload All…” from the Device pull-down menu.



5) From the “Upload Drive Configuration” window click on “All Drives” and then on “OK”.



6) Edit/Monitor the file for the selected control by using the following typical pull-down menu sets.

WARNING

DO NOT MANIPULATE VARIABLES OTHER THAN THOSE NOTED IN THIS PROCEDURE. MOST ARE OF A PREDETERMINED NATURE FOR YOUR SYSTEMS OR ARE THERE FOR MONITORING THE CONTROL LOADING SYSTEM. MANIPULATION COULD RESULT IN DAMAGE TO EQUIPMENT AND PERSONNEL.

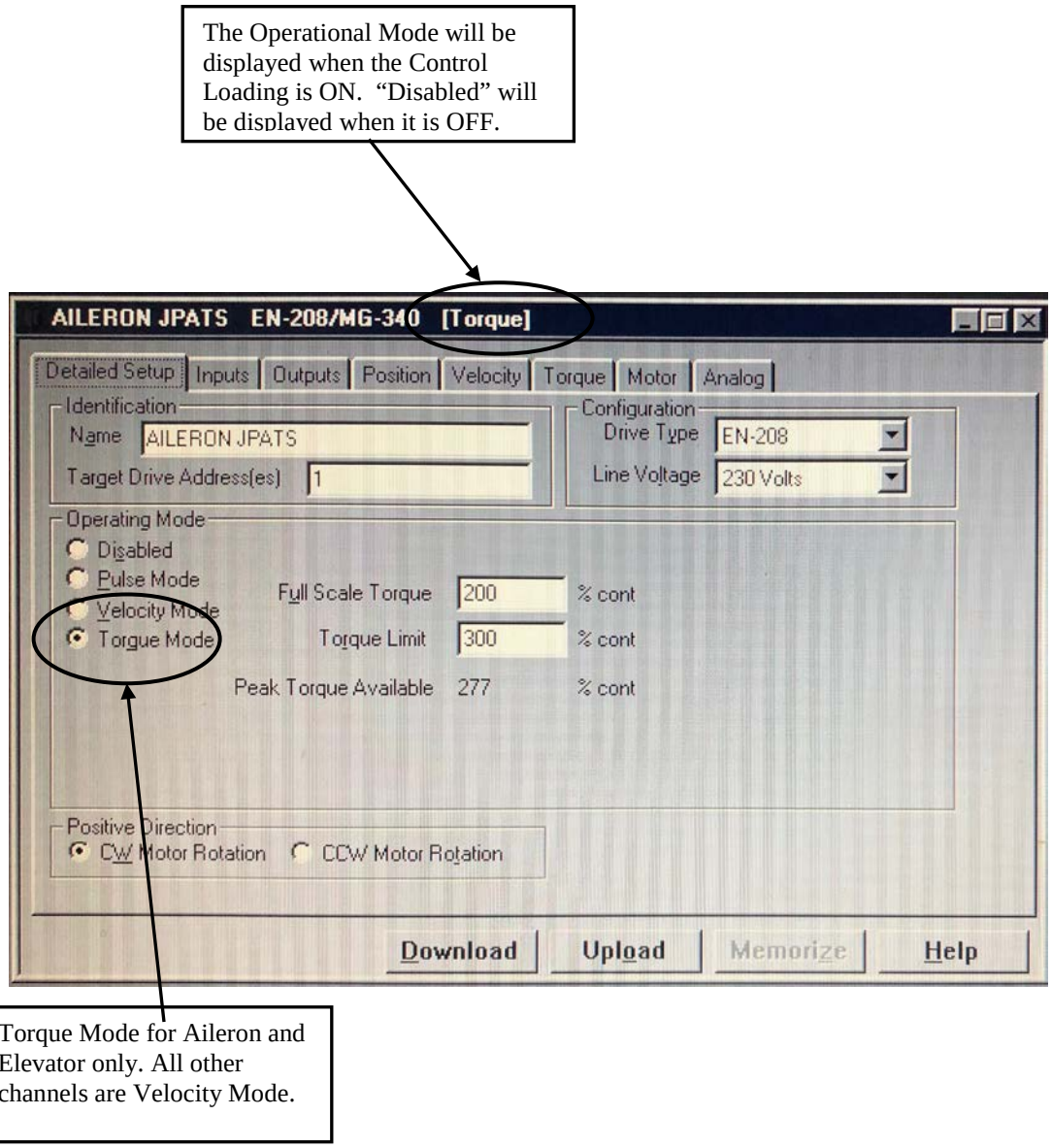
NOTE

Most values and status items will only display valid data with the control loading system ON. They will display zero (0) if the control loading system is OFF.

"History" and "Status" are the most useful tabs for troubleshooting. "History" shows all the failures logged on the system and the power-up number during which the fault occurred. It also shows the number of occurrences of each logged fault.

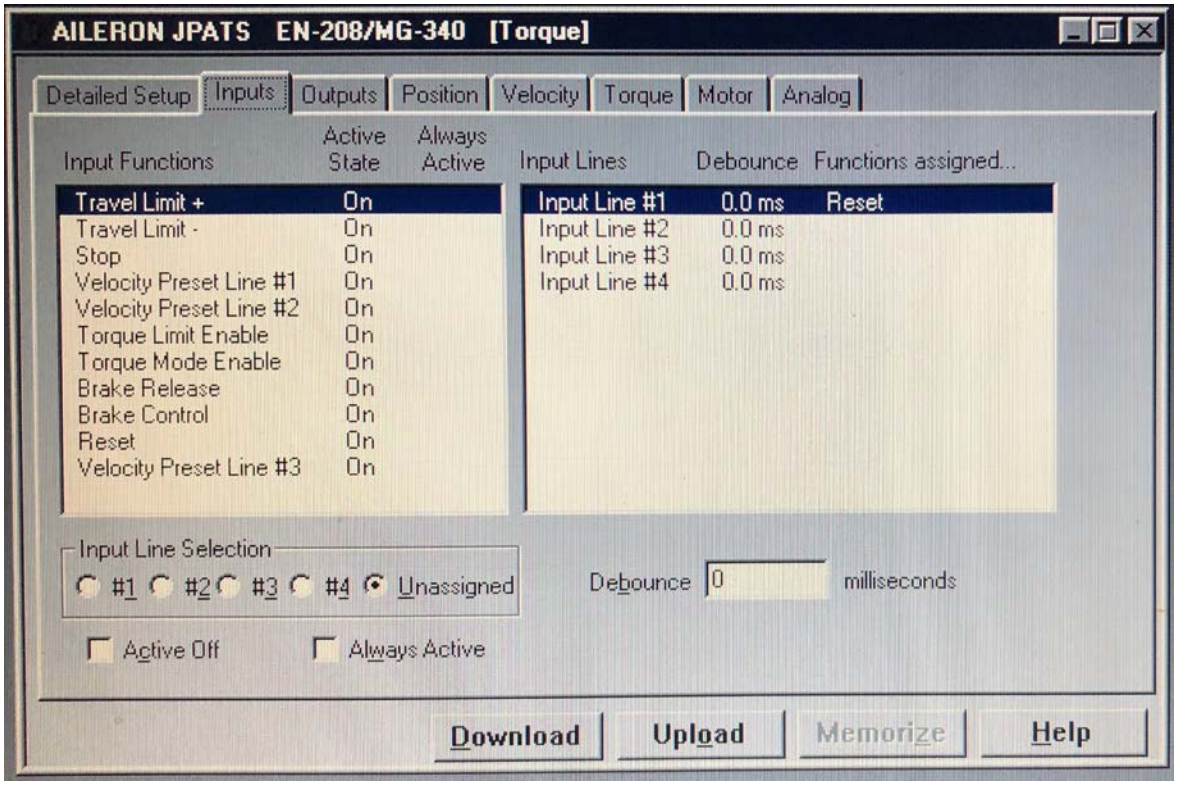
"Status" displays a number of things about the control channel including the number of hours it has been powered on and the number of times it has been powered on. It also has a selection box to display the current active faults.

A. Ensure “View Details” is selected from the Device pull-down menu. Select the Detailed Setup tab. Ensure:

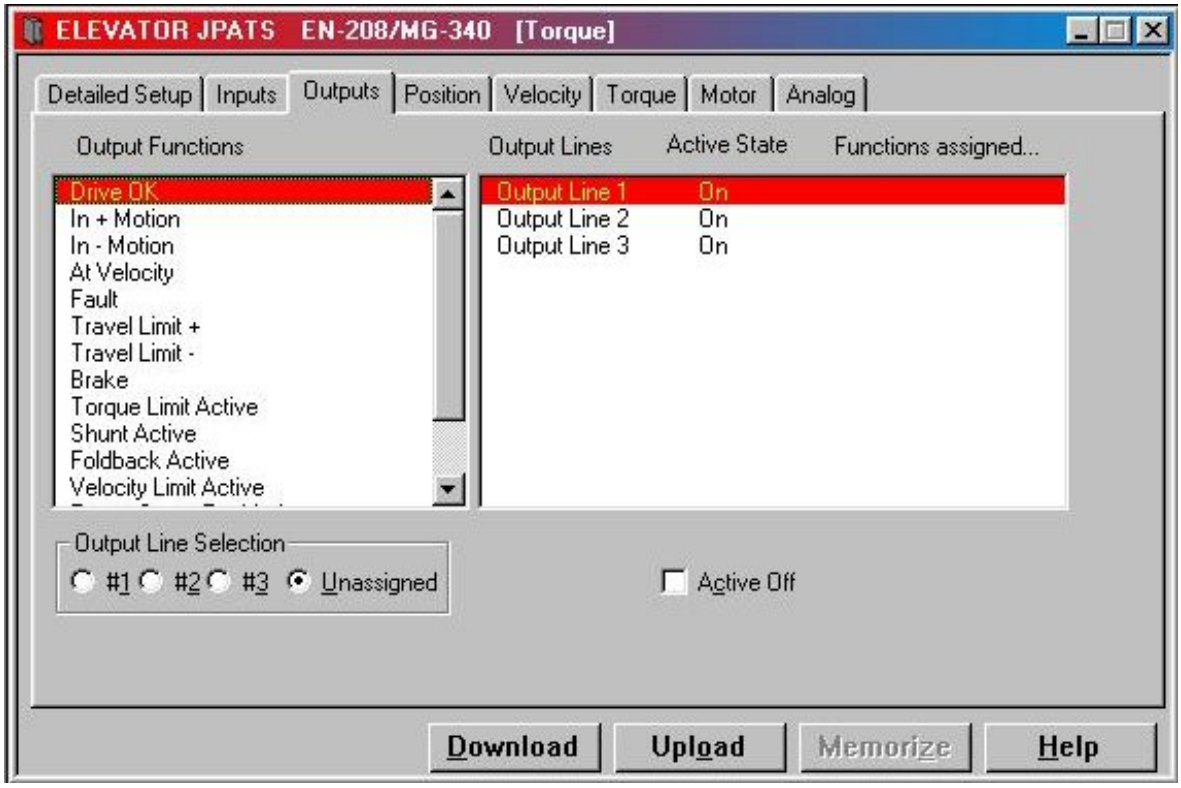


1. In the Detailed Setup tab, verify that “Torque Mode” and the “Analog” Submode are both selected for the Aileron and the Elevator channels. All other channels must have the “Velocity Mode” and the “Analog” Submode selected.

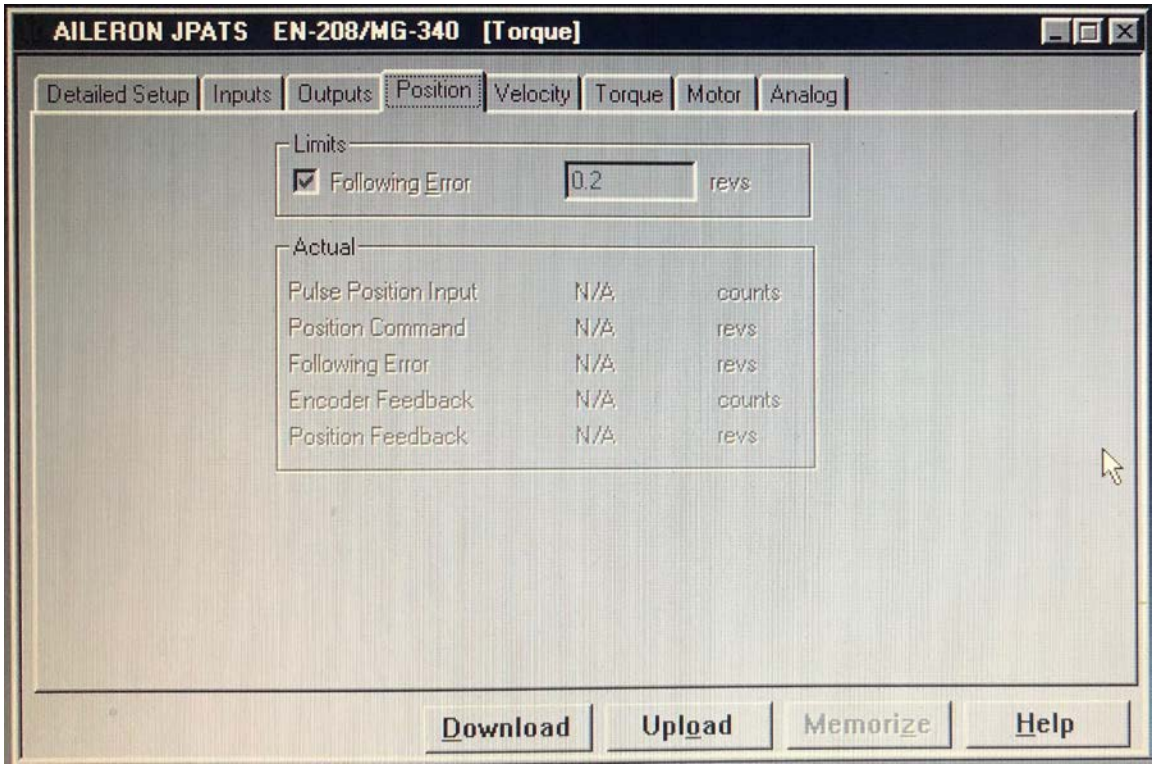
B. Observe the Inputs tab menu. No changes should be made.



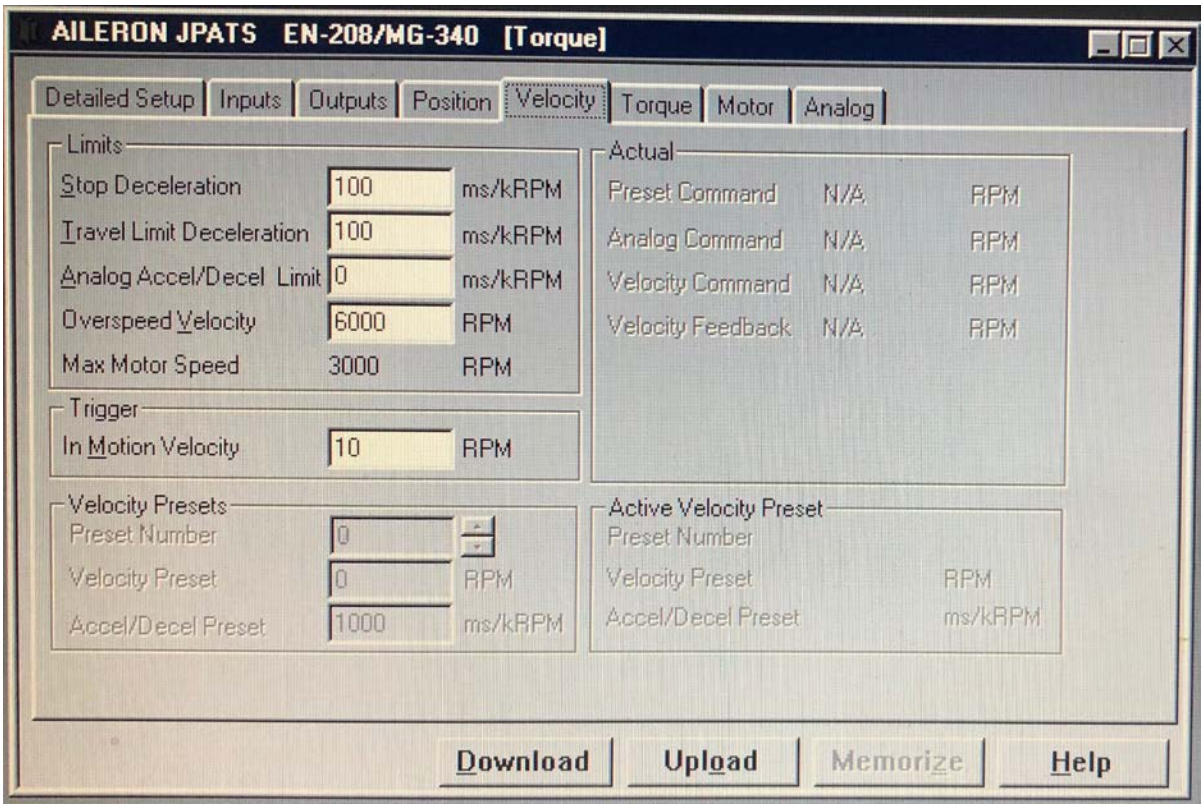
C. Observe the Outputs tab menu. No changes should be made.



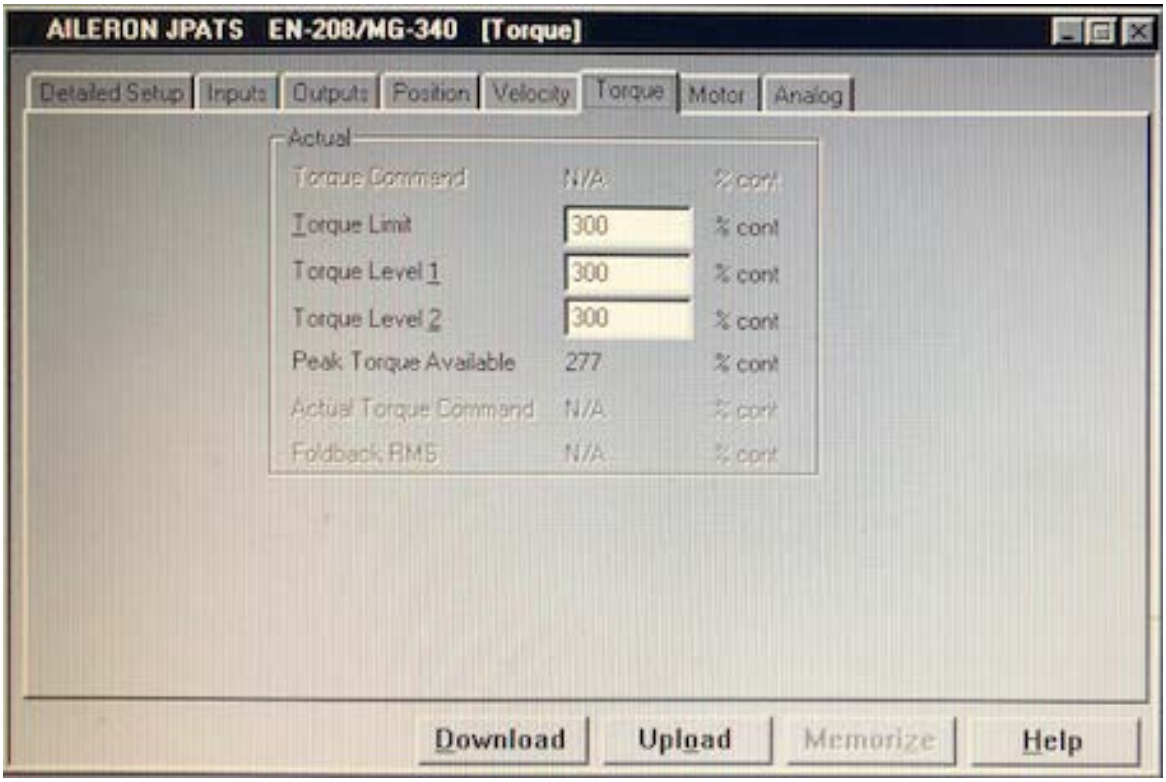
D. Observe the Position tab menu. No changes should be made.



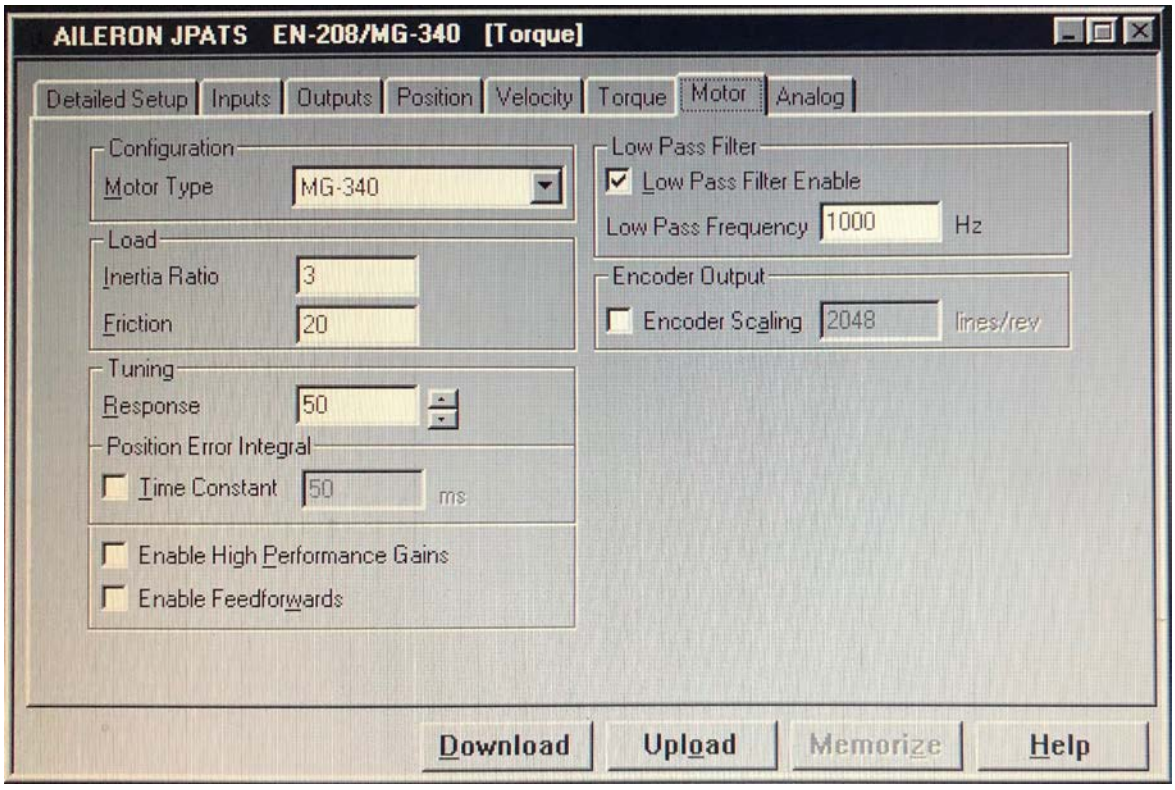
E. Observe the Velocity tab menu. No changes should be made.



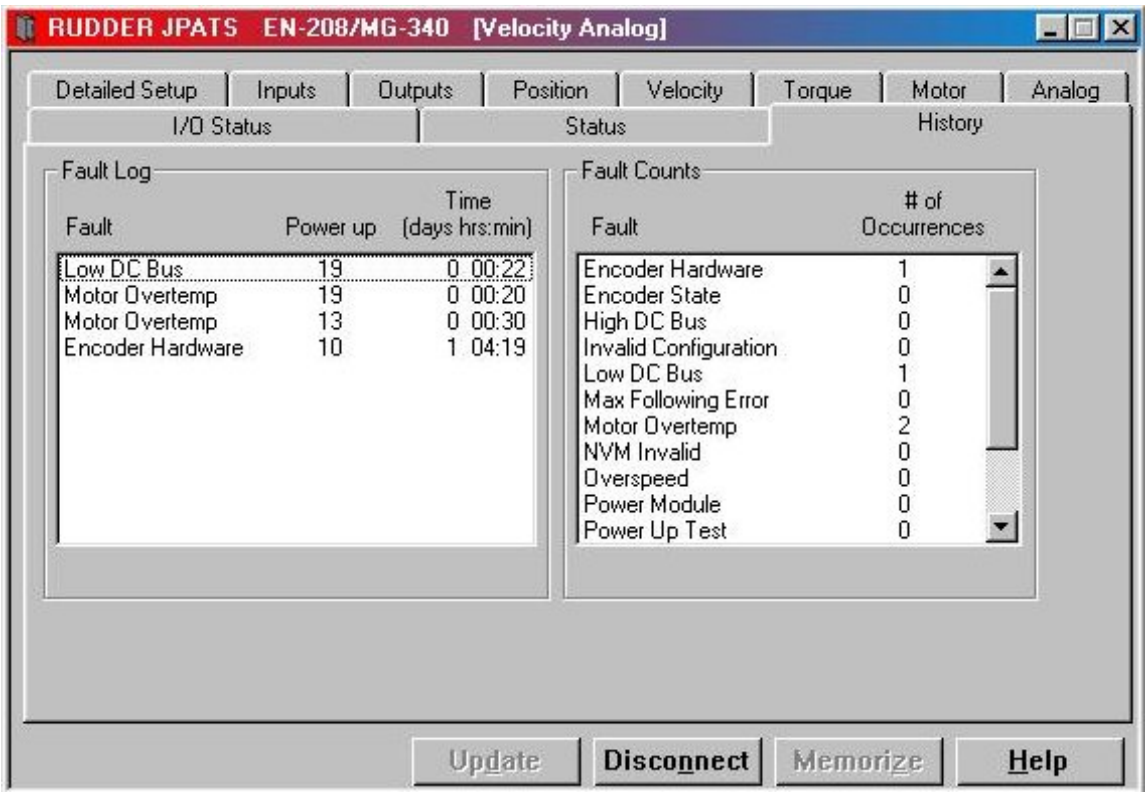
F. Observe the Torque tab menu. No changes should be made.



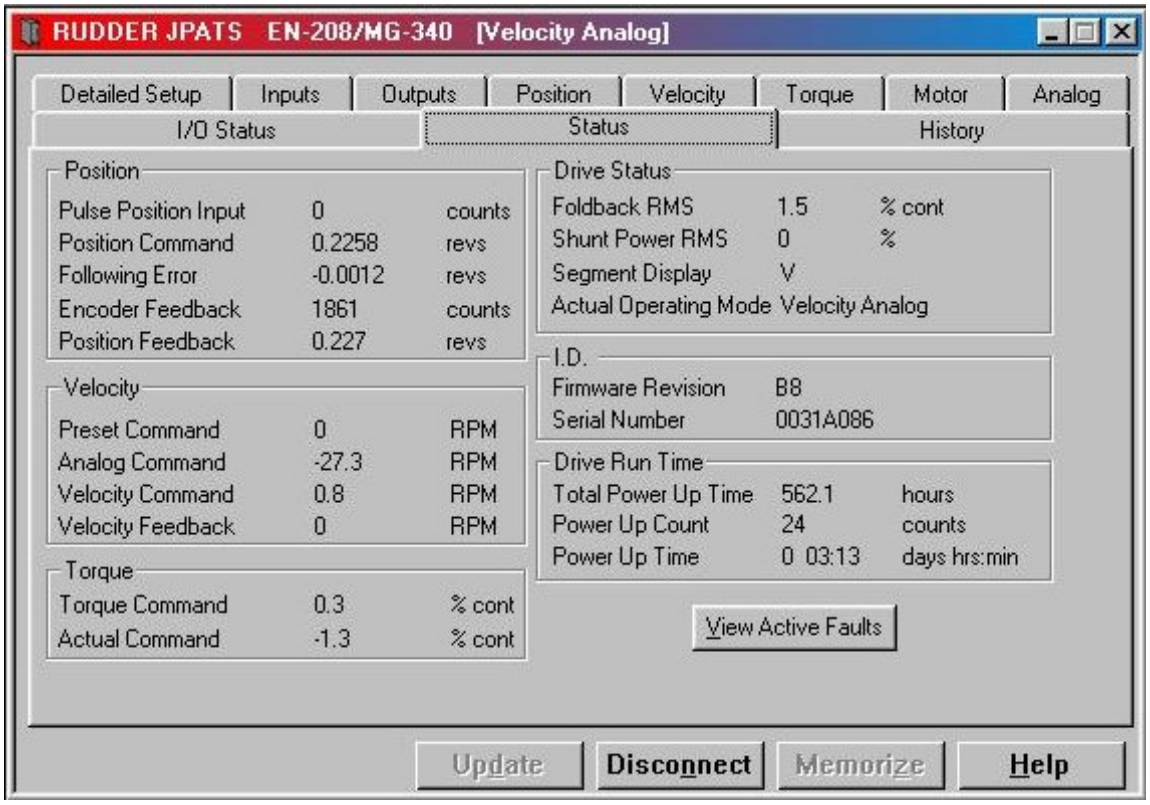
G. Observe the Motor tab menu. No changes should be made.



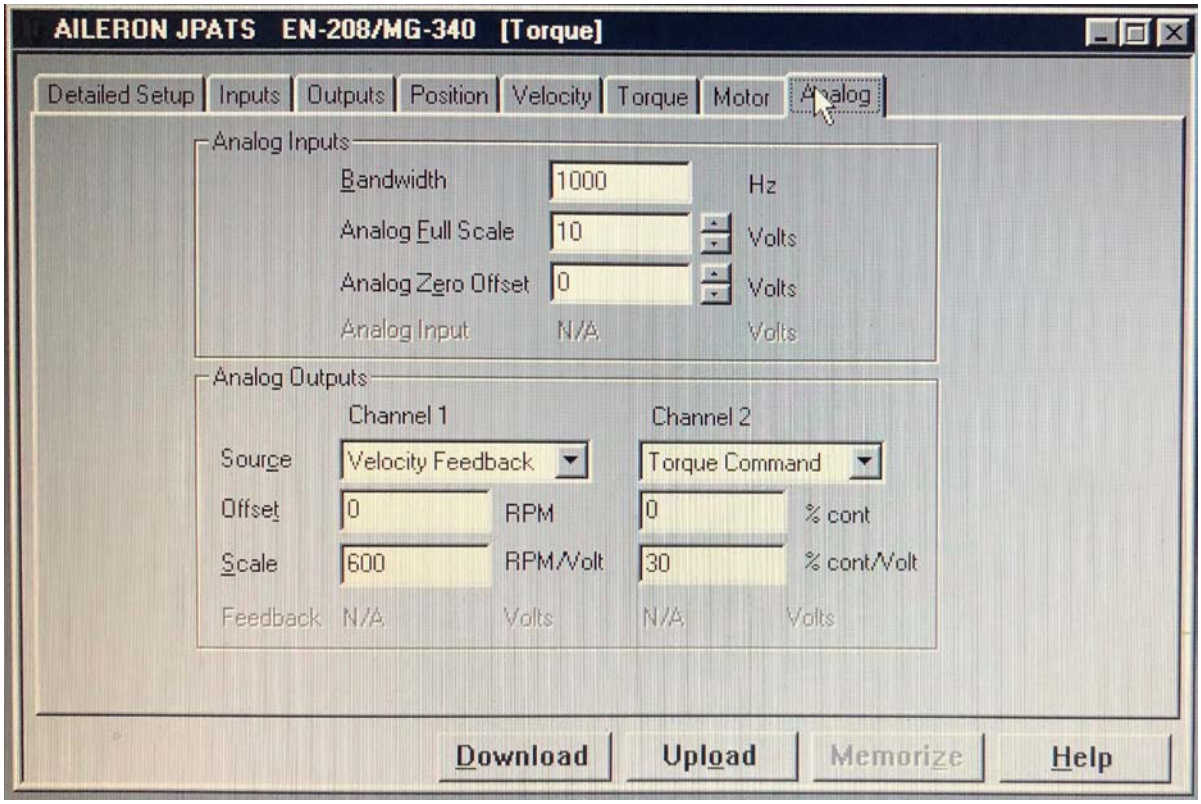
H. Observe the History tab menu. No changes should be made.



I. Observe the Status tab menu. No changes should be made.



J. Observe the Analog tab menu. Ensure:



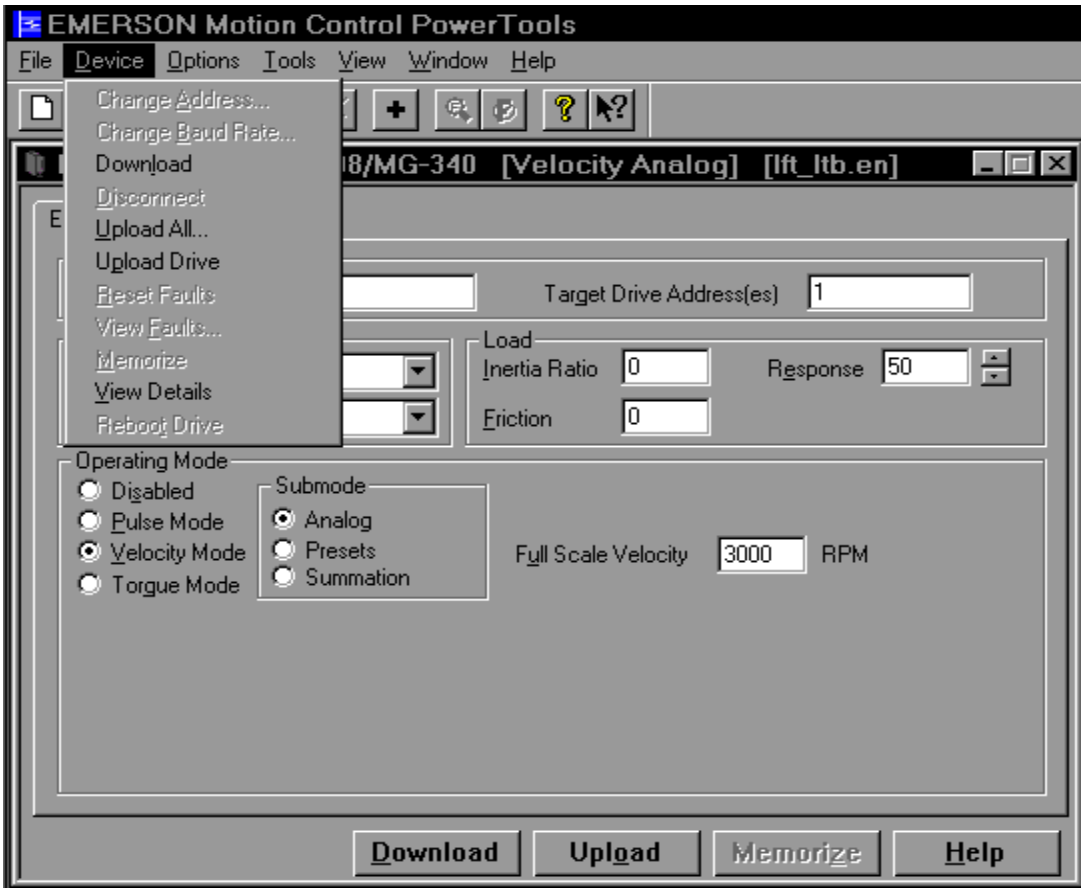
VELOCITY MODE ONLY CHANNELS

1. Verify the “Analog Zero Offset” voltage is equal to the “Analog Input” highest fluctuation level, positive or negative. This will set up the null point for the servo control axis.
2. Enter the offset value using the arrow buttons next to its window field and press the Enter key. This will change the “Update” button color to green.

TORQUE MODE ONLY CHANNELS

1. Verify the “Analog Zero Offset” voltage is zero (0). This will set up the null point for the servo control axis.
2. Enter the offset value using the arrow buttons next to its window field and press the Enter key. This will change the “Update” button color to green.

7) Select “Update” when changes are complete. This downloads the file into the amplifier.
8) Click “Disconnect” after the download is complete. When prompted to save changes, select “No”.



9) Disconnect serial cable from the J4 on the Digital Servo Amplifier and plug it into the next Digital Servo Amplifier. Repeat steps 2) through 9) until all channels have been checked/calibrated.

10) Fly the trainer and test the controls to ensure proper operation.

5.2.5. Bi-Monthly Maintenance

No bi-monthly inspection exists at this time.

5.2.6. Quarterly Maintenance

Maintenance on a 3-month basis should be performed per the Inspection Manual.

5.2.6.1. Rudder Pedal Stature lubrication

1) Lubricate rudder pedal stature and associated mechanical assemblies in accordance with drawing 6520ACJ029.
2) Lubricate all adjustment surfaces with WD-40 only.

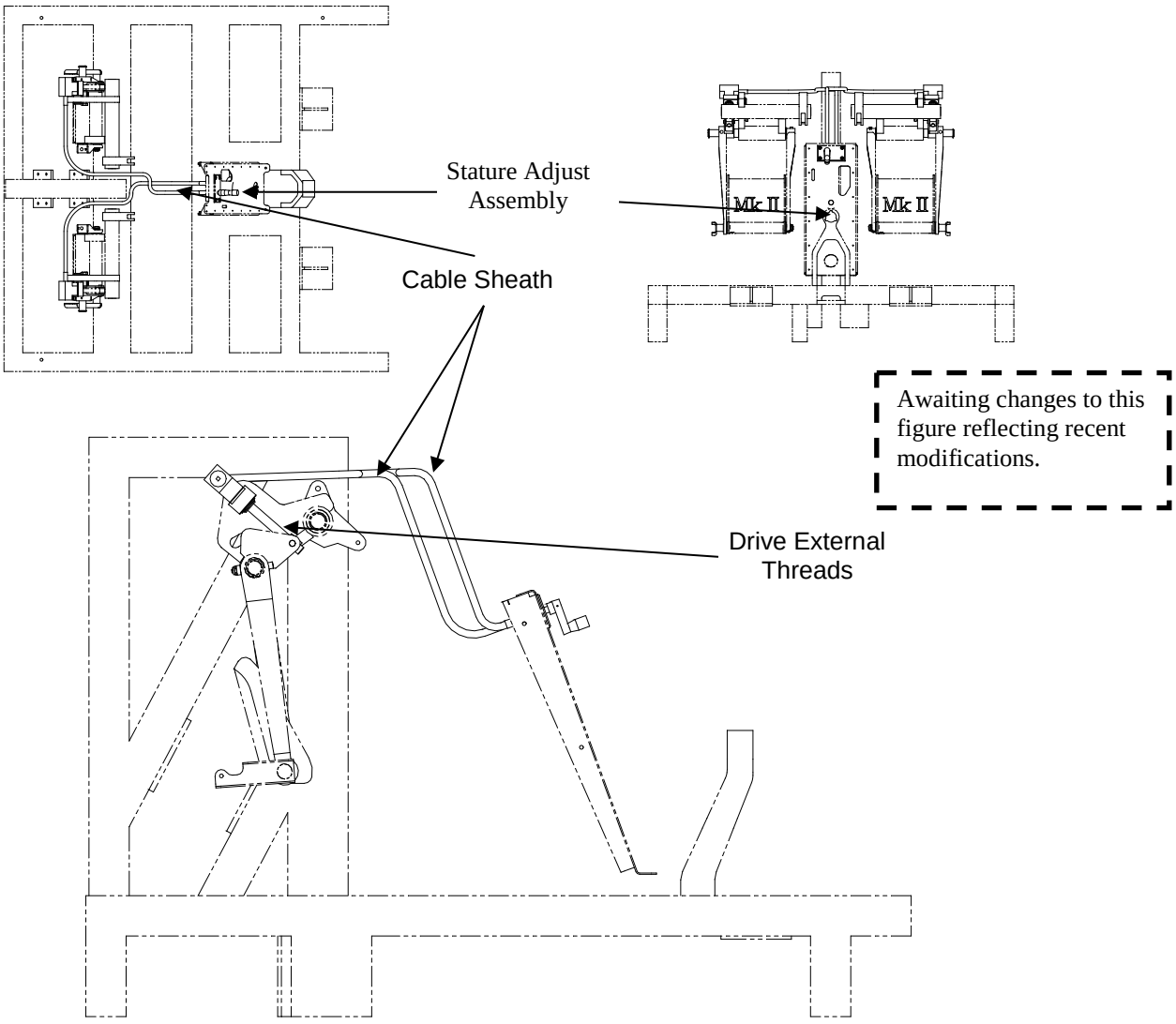


Figure 5-1. Rudder Pedal Stature and Mechanical Assemblies

5.2.7. Semi-Annual

Maintenance on a 6-month basis should be performed per the Inspection Manual.

5.2.7.1. Servo Actuator Oil

The Electric Control Loading and Dynamic Seat actuator oil is used to facilitate adequate cooling and lubrication. The oil, acting as a thermal conductor between the internal mechanism of the actuator and the case, achieves cooling. Each actuator has two oil ports. Twelve bulkhead quick-release fittings are on the Operational Flight Trainer (OFT) and the Instrument Flight Trainer (IFT) and ten fittings are on the Unit Training Device (UTD).

The frequency of oil change:

- Every 3,000 hours as measured by the elapsed time indicator on the power controller in the 9A1 equipment cabinet or 6 months, whichever comes first.

The recommended oil is petroleum-based gear oil with an EP additive and ISO grade of 100.

The paragraph below directs how to change the oil and identify the tools necessary to accomplish the change.

Dispose of waste oil IAW local area HazMat requirements.

5.2.7.2. Actuator Oil Replacement

Equipment needed for this maintenance action:

- Two female disconnects consisting of 2 each of the following.
    - Coupler P/N – 6608-6-6 (Parker)
    - O-ring P/N – 22617-6 (Aeroquip)
    - Flare Union Adapter P/N – 2027-6-4s (Aeroquip)
    - Female JIC 37° Swivel P/N – 30682-4-4b (Parker)
- Connector, Tubing (McMaster-Carr 53415K106)
- Either a Variable Flow Peristaltic Pump (McMaster-Carr 43205K15) or a hand-held vacuum pump kit (McMaster-Carr 9963K11)
- 3/8” clear hose (McMaster-Carr 5233K56)
- Two graduated Beakers (McMaster-Carr 4187T43)
- Oil sample container (894277)

1) Pour new oil into a clean graduated cylinder or other large container (at least 24 ounces, preferably 48 ounces).
2) Note oil level in the measuring container.
3) If using an electric pump, follow Step A. If using a hand pump, follow Step B.

    Step A: Connect electric pump to the inlet side of the manifold and its dump hose to the outlet side of the manifold. See Figure 5-2.

    Step B: Connect siphon hose to the inlet side of the manifold and the hand pump with reservoir to the outlet side of the manifold. See Figure 5-3.

4) Place the siphon hose into the container with the new oil in it.
5) Pump the oil until the oil in the pump reservoir changes color. STOP.

NOTE

The pump reservoir may need to be emptied a couple of times before the oil changes color. Empty the contents of the pump reservoir into the second clean graduated cylinder.

6) Disconnect the siphon hose.
7) Compare the volume of the fluid drawn out of the actuator with the volume of new fluid put into it. Determine the total amount of fluid added to the actuator.
8) Draw out 10% of the total volume that was put into the actuator. This is to allow for expansion and contraction of internal components within the actuator.
9) Disconnect the pump hose.
10) Clean up area.

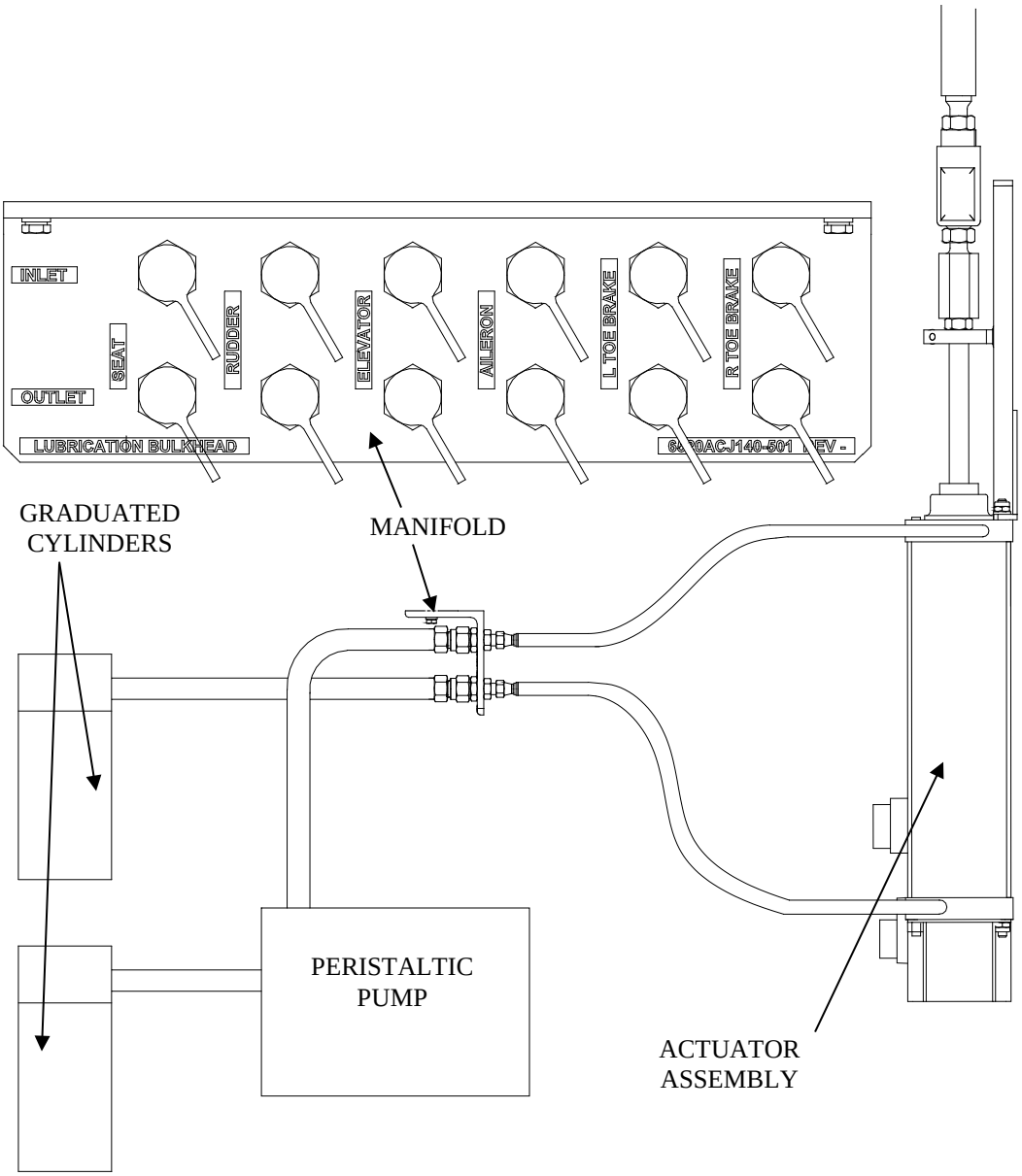


Figure 5-2. Electric Pump Connections

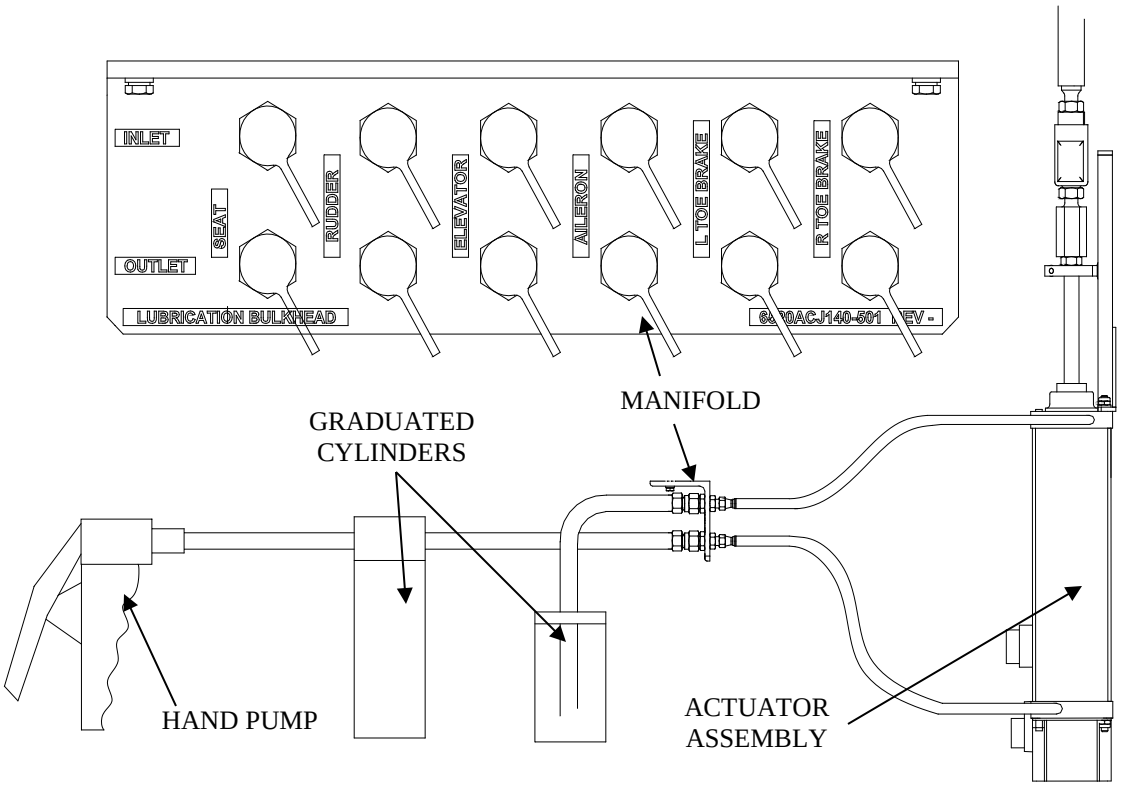


Figure 5-3. Hand Held Pump connections

5.2.7.3. Emergency Power Off (EPO) Switch

Test EPO switch to ensure it properly shuts down the entire FTD. This test should be performed on both IOS and Cockpit EPOs.

- If the FTD is powered off upon performing the test:
    1. Turn on power at the 9A1 cabinet.
    2. Insure the 2200SMART UPS turns on.
    3. Allow all the computers to fully boot up.
    4. Press the Emergency Power Off switch.
    5. Repeat for Each Emergency Power Off switch tested.
- If the FTD is up and fully functional upon performing the test:
    1. Perform normal Vital X / 1100 visual system shutdown procedures.
    2. Perform normal Sound Computer shutdown procedures.
    3. Perform normal Instructor Operating Station computer (IOS) shutdown procedures.
    4. Perform normal Flight Deck computer shutdown procedures.
    5. At the 9A2A2 cabinet, set all control loading circuit breakers to the “Off” (down) position.

6. Press the Emergency Power Off switch; observe total FTD system shutdown.

5.2.8. Annual

Perform annual maintenance in accordance with the Inspection Manual.

5.2.9. Two Year

Perform biannual maintenance in accordance with the Inspection Manual.

5.3. MAINTENANCE SCHEDULE

Refer to Inspection Manual TM-JPATS-FTD-02-000-100 for cleaning principles and inspection schedules.

This suggested maintenance schedule provides guidelines from which maintenance technicians can devise a specific schedule that reflects the conditions and needs at their site. The DRI Platform is relatively maintenance free; however, a daily inspection schedule of components must be implemented and followed. Regular maintenance of the components can prevent a small problem from becoming a major one.

The maintenance schedule should encompass all simulator systems. The following procedures address the DRI Platform Assemblies.

INSPECTIONS - Daily:

- Check for signs of burning and overheating.
- Check wiring for damage or loose connections.
- Units with APS: Perform Daily Operational Check in accordance with paragraph 5.5.3.

INSPECTIONS - Weekly:

- Inspect all filters and clean if necessary.
- Inspect all air flow vents and fans on the APS unit.
- Inspect all air flow vents and fans on the sound computer.

CLEANING - Monthly

- Clean the Utility and Control Loading DRI platform assemblies in accordance with paragraph 5.4.1.
- Clean the GSnet cooling fan filters on all platforms in accordance with the procedure in paragraph 5.4.3.
- Clean the Oxygen panel assembly air filter in accordance with the Inspection Manual TM-JPATS-FTD-02-000-100.
- Clean air flow vents and fans on the Audio Processing System (APS) unit.
- Clean air flow vents, fans, and filters on the sound computer.

REPLACEMENT:

- Replace lithium battery on the Platform332 Board every 10 years or as needed in accordance with paragraph 5.7.3.3.3.

5.4. CLEANING

5.4.1. General Cleaning Principles

1) Do not damage anything. Be especially careful around delicate components, connections, wires, and cables.
2) Use the proper cleaning materials.
3) Observe safety precautions. Do NOT use flammable materials unless specified; and if specified, handle with care.
4) Do NOT use compressed air. Compressed air, in many cases, contains moisture, dust particles and oil which could be harmful to the hardware. Also, compressed air blows material from one area to another, instead of cleaning anything. Use a vacuum for cleaning.
5) Be alert for electrical hazards. High voltage is present in many areas.

5.4.2. Fire Detection

Cleaning: Monthly

- IFT and OFT: Use a vacuum cleaner to clean smoke and temperature sensors of lint and dirt.
- UTD: Use a vacuum cleaner to clean temperature sensors of lint and dirt.

5.4.3. DRI Platform Assemblies (if installed)

The DRI Platform Assemblies should be kept as clean as possible.

WARNING

DISCONNECT ALL INCOMING POWER TO THE DRI PLATFORMS PRIOR TO CLEANING

5.4.3.1. GSnet Cooling Fan Filters

Use the following procedure to clean the GSnet cooling fan filters.

1) Remove power by opening CB21 on the AC Power Controller (9A1A1) before disconnecting J1 on the DRI Assembly. See Figure 5-4.

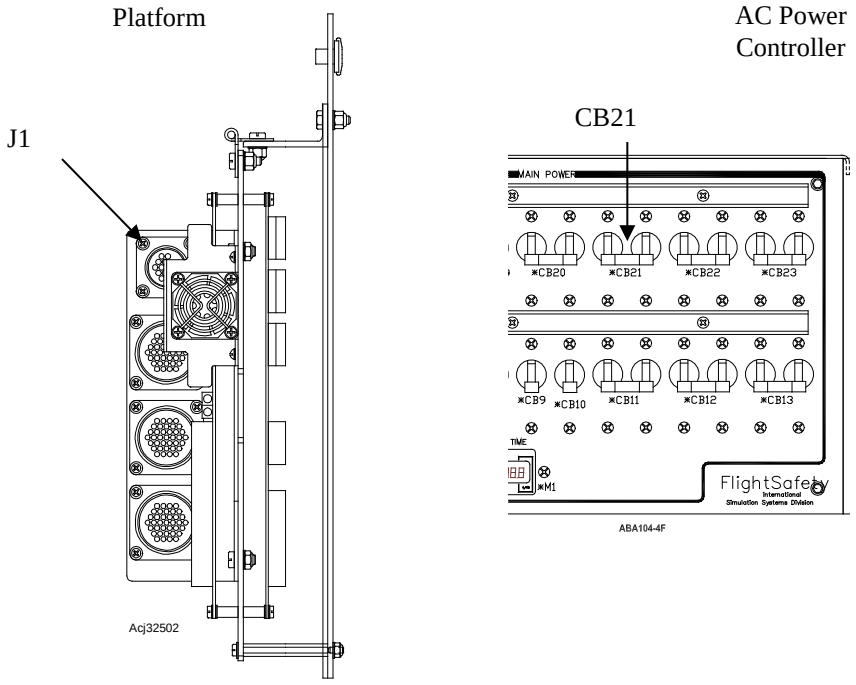


Figure 5-4. DRI Platform

2) Remove the four screws, washers, and outer guard. Refer to Figure 5-5.

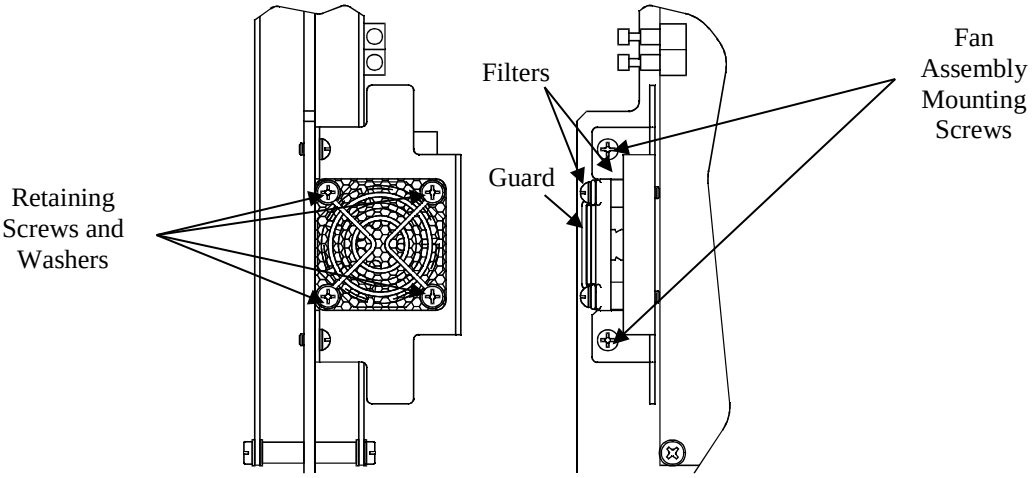


Figure 5-5. GSnet Cooling Fan Filters

3) Remove the filters and clean in warm soapy water. Rinse thoroughly and let dry.

4) Install the filters and outer guard with the attaching washers and screws.

5.4.4. Data Acquisition System (DAS) (if installed)

Use the following procedure to clean the DAS Chassis filter. See Figure 5-6. The following equipment is required to perform this procedure.

- Vacuum Cleaner
- Soap and Water

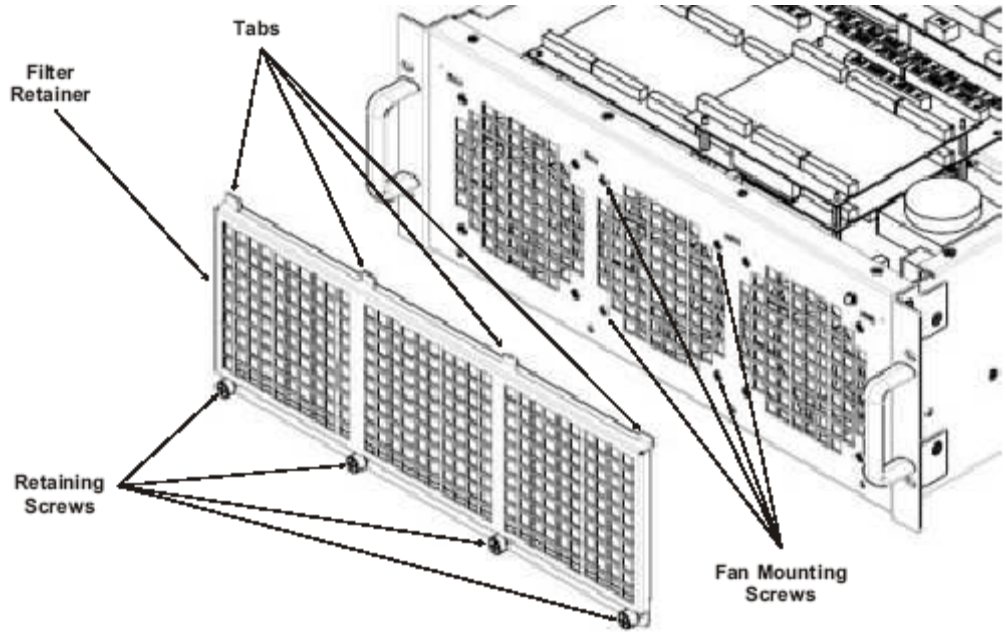


Figure 5-6. DAS Filter

WARNING

TURN OFF ALL POWER TO THE DAS CHASSIS PRIOR TO PERFORMING THE CLEANING PROCEDURE. AFTER POWER IS DISCONNECTED, USE A METER OR OTHER APPROPRIATE TESTING DEVICE TO ENSURE POWER HAS BEEN REMOVED FROM THE EQUIPMENT.

1) Remove power to the DAS chassis by utilizing the Power Down procedure in Section 3 of this manual.
2) Remove the filter retainer from the front of the DAS chassis by unscrewing the captive retaining screws below the filter, then pulling the bottom of the retainer out and down until the tabs are clear of the holes in the chassis. The captive screws stay with the retainer.
3) Remove the filter and clean in warm soapy water. Rinse thoroughly and let dry. Vacuum the filter retainer and the air intakes on the front of the chassis.
4) Install the filter in the retainer, insert the tabs in the matching holes on the front of the chassis, push the retainer up and in until the retaining screws line up. Tighten the retaining screws snug. Be careful not to over-tighten as this will distort the filter retainer.
5) Power up the system in accordance with the Power Up procedure in Section 3 of this manual.

5.4.5. OFT Dome

CAUTION

Do not touch, mark on, or lean anything against the OFT visual screen as the surface may be damaged easily.

1) Inspect the OFT visual screen weekly for cleanliness and damage. Clean when required.
2) To clean the OFT visual screen, use a Static Duster to remove the dust buildup on the screen. If further cleaning is necessary to remove smudges or other marks, use a mild liquid soap diluted with water, in a dabbing motion. DO NOT WIPE SURFACE. Rinse with clear water and blot dry the surface.

5.4.6. APS Sound System

The APS Sound System components should be kept as clean as possible. The following principles should be used.

WARNING

DISCONNECT ALL INCOMING POWER TO COMPONENTS PRIOR TO CLEANING. AFTER POWER IS DISCONNECTED, USE A METER OR OTHER APPROPRIATE TESTING DEVICE TO ENSURE POWER HAS BEEN REMOVED FROM THE EQUIPMENT.

5.4.6.1. General Cleaning Principles

- Be careful not to damage APS Sound System components (wiring connections, etc.). Be especially careful when cleaning around delicate components, connections, wiring, and cables.
- Be especially careful when cleaning plastic and vinyl surfaces. DO NOT spray cleanser products directly on electrical components or connectors.
- Observe all products and maintenance safety precautions.
- Ensure all electrical power is removed before cleaning.
- Clean air flow vents, fans, and filters on APS and Sound System computers.

5.5. INSPECTIONS

Perform inspections on a regular basis in accordance with the Inspection Manual. A good time to perform an inspection is immediately after cleaning. An inspection provides an opportunity to spot small problems before they become major repairs. Conduct periodic inspections in an orderly manner. Follow circuits from beginning to end and note the conditions of all components. Pay particular attention to components that are prone to failure or have recently been removed, repaired, and replaced. For more information on the Inspection and Maintenance Schedules, see the Inspection Manual for the Flight Training Device.

WARNING

DISCONNECT FACILITY POWER TO COMPONENTS BEFORE MAKING ANY INSPECTIONS. AFTER FACILITY POWER IS DISCONNECTED, USE A METER OR OTHER APPROPRIATE TESTING DEVICE TO ENSURE POWER HAS BEEN REMOVED FROM THE EQUIPMENT.

5.5.1. General

1) Check for component discoloration. It indicates overheating and/or burning.
2) Check all electrical connections for tightness.
3) Check for frayed and broken wiring.
4) Check for evidence of arcing.
5) Check cooling fans and filters for cleanliness.
6) With the system powered-up with CB1 ON, ensure the AC power phase indicators on the AC Power Controller Assembly are illuminated.
7) Verify illumination of green power LED on the front of each computer chassis in equipment cabinets.
8) Located at the top of each equipment cabinet is a blower assembly. Ensure fan assemblies are operating and airflow is evident.

5.5.2. Fire Detection

Daily Inspections:

1) Check LEDs on smoke detectors for visual indication of proper detector operation.
2) Check Master Control Panel for visual trouble indication.
3) Perform lamp test on Master Control Panel. Ensure all lamps illuminate.

Semi-annual Inspections:

1) Check all components supporting hardware and tighten, repair, or replace as required.

2) Visually check all components for evidence of physical abuse or damage. Replace any component if at all in doubt of its ability to perform properly.

5.5.3. Daily Operational Check

For units with Sound System and APS:

1) Ensure the Power Control System (PCS) is turned on and power is applied to all the subsystems.
2) Ensure the simulation program is running and the IOS is booted in accordance with the procedures in Section 3 of this manual.
3) Turn on the Control Loading System in accordance with the procedures in Section 3.
4) At the IOS, reposition the aircraft to the Takeoff Point.
5) At the aircraft cockpit, start the engines and perform the aircraft's preflight check, in accordance with paragraph 2.7.8.
6) At the IOS, disable the FLIGHT FREEZE function by pushing the FLIGHT FREEZE pushbutton.
7) At the Pilot controls, take off and verify all indications of sound and communications are correct.

5.6. TROUBLESHOOTING AIDS AND DIAGNOSTIC TOOLS

This section provides the technician with troubleshooting aids and diagnostic tools for the power distribution system, control panels, and associated components. Additional troubleshooting information can be found in the List of Related Publications in Section 1 of this manual.

While specific suggestions are made in the fault isolation paragraph, note that not all possible malfunctions or manifestations of these malfunctions can be addressed. It is not uncommon for complex equipment to "find" new ways to break. These paragraphs should only be used as a guide. Common sense and a thorough visual inspection are the keys to quick and accurate troubleshooting.

Some general principles will be of help. When a failure occurs, systematically check all fuses, circuit breakers, and wiring before troubleshooting the equipment. If a circuit breaker has tripped open or a fuse has blown, investigate and correct the cause of the overload before replacing the fuse or resetting the circuit breaker. Use the signal flow diagrams in Section 4 and the schematic diagrams listed in Section 6 as an aid in locating trouble causes. Review the Safety Summary at the front of this manual before performing any troubleshooting.

- Pay close attention to what the equipment is telling you. Listen and look carefully. Make a complete inspection.
- Do not ignore the obvious.
- Carefully observe what is occurring and compare that to what should occur.
- Use all documentation available.
- Read a procedure from beginning to end before starting work.
- Make complete use of available self-diagnostics.
- Keep a troubleshooting and repair log.
- Do not do anything that is unsafe.

WARNING

DANGEROUS VOLTAGES, CAPABLE OF CAUSING DEATH, ARE PRESENT IN THIS EQUIPMENT. USE EXTREME CAUTION WHEN HANDLING, TESTING, AND ADJUSTING. REMOVE POWER BEFORE TOUCHING ANY COMPONENT.

5.6.1. Maintenance Controls and Indicators

The following subparagraphs contain a brief physical description, location, and functional description of the Maintenance Controls and Indicators available in the Flight Training Device. Operational controls and indicators may be found in Section 3 of this manual.

5.6.1.1. Power Distribution System

The AC Power Controller contains maintenance-related controls and indicators, which aid the technician in troubleshooting the system. See Figure 5-7.

After facility power is applied and the Essential Power CB1 circuit breaker is turned on, the following conditions should occur.

- The AC Power phase indicators DS1, DS2, and DS3 illuminate green.
- The Start Switch illuminates green.

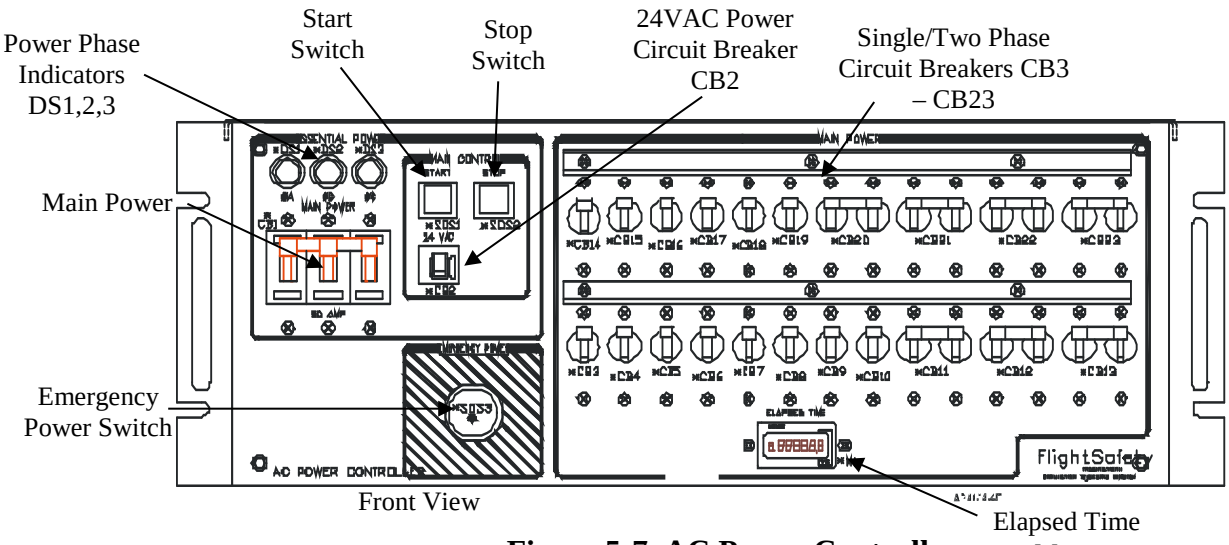


Figure 5-7. AC Power Controller

If the Stop Switch or Emergency Power Switch illuminates red then a complete shutdown of the power to the UPS, system patch and 28VDC System Power Supply will occur.

The fuses on the System Patch (9A1A2) DIN rail are mounted in an enclosed housing. The fuse retainer must be pulled from the holder to visually inspect the fuse.

The relays on the same DIN rail are fully enclosed and a clicking sound can be heard when the relay activates.

The computer power light will illuminate green with power from the AC Power Controller or the UPS. The hard drive lights will illuminate orange when activated.

Site AC power failure will turn the UPS orange light ON and sequential green lights will indicate the power level left within the UPS for holding the computers and monitor online for shutdown.

DRI Platforms receiving power will have a green blinking light and a solid red light illuminated.

Digital Servo Power Amplifiers will have a red “P” light illuminated with AC power from the Remote Digital Servo Power Controller.

Any single or two-phase circuit breakers (CB3-CB23) in the Off position (down) will remove power from the component/systems shown in Table 5-4.

Table 5-4. AC Power Controller Circuit Breakers

Circuit Breaker	Component/System
CB1	Main Power Circuit 208 3 Phase 60 Hz 50 Amp 9A1A1
CB2	24VAC Power Circuit 9A1A1
CB3	Blower Assembly 9A2B1
CB4	AC Power Distribution Box 9A2
CB5	Blower Assembly 9A3B1
CB6	AC Power Distribution Box 9A3
CB7	Spare
CB8	Spare
CB9	Uninterruptible Power Supply 9A2A2
CB10	Emergency Lighting 9A2A2
CB11	Spare
CB12	28VDC Power Supply 9A2A6PS1
CB13	Spare
CB14	Compartment Light Utility Box 9A9A3
CB15	IOS Monitors 2A1A1,A2,A3
CB16	Seat Motor Controller 1A9A1A1/AFT Fan 6A2
CB17	Visual Projector cooling fans (N/A UTD)
CB18	Nose and AFT Fans 6A2
CB19	Maintenance Outlets 6A2A1
CB20	Spare
CB21	24VDC Power Supply 7A2PS1
CB22	Spare
CB23	Spare

5.6.2. Top Level

See Figure 5-8 for a top-level block diagram. Use this diagram for guidance in troubleshooting to a general level. Conduct further analysis to a more specific subsystem level using the appropriate system drawings.

Note

While Figure 5-8 depicts the BARCO projection system, the basic layout applies to the Sony projectors as well.

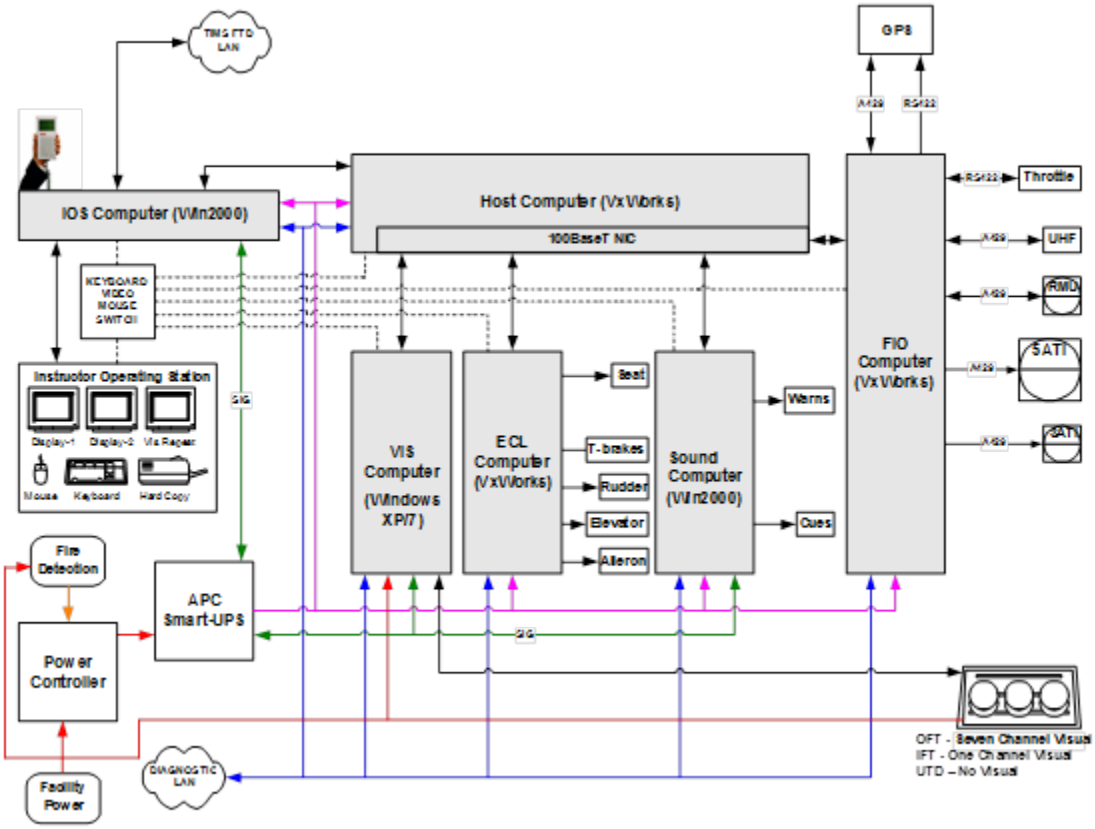


Figure 5-8. FTD Block Diagram

5.6.3. AC Power

5.6.3.1. Uninterruptible Power Supply

Use the table below to solve minor UPS installation problems. Refer to vendor data for other UPS problems.

Table 5-5. Troubleshooting the UPS

Problem and Possible Cause	Solution
UPS will not turn on.	
ON button not pushed	Press ON button once to power the UPS and the load.
UPS not connected to AC power supply.	Check secure power cable connections between UPS and the power supply.
UPS input circuit breaker tripped.	Reduce the UPS load by unplugging equipment and resetting the circuit breaker (on back of UPS) by pressing the plunger back in.
Very low or no utility voltage.	Check the AC power supply to the UPS with a DVM. If low voltage, check the site power supply.
Battery not connected properly.	Confirm the battery connections.
UPS will not turn off.	
Internal UPS fault. Do not attempt to use the UPS. Unplug and service immediately.	
UPS operates on-battery although normal line voltage exists.	
UPS input circuit breaker tripped.	Reduce the UPS load by unplugging equipment and resetting the circuit breaker (on back of UPS) by pressing the plunger back in.
Very high, low, or distorted line voltage. Inexpensive fuel-powered generators can distort the voltage.	Move the UPS to a different outlet on a different circuit. Test input voltage with the utility voltage display. If acceptable to the load, reduce UPS sensitivity. See Section 2 for sensitivity procedures.
UPS beeps occasionally.	
Normal UPS operation.	None. The UPS is protecting the load.

Table 5-5. Troubleshooting UPS (Continued)

Problem and Possible Cause	Solution
UPS does not provide expected backup time.	
The UPS battery is weak due to recent outage or is near the end of its service life.	Charge the battery. Batteries require recharging after extended outages. Also, they wear faster when put into service often or when operated at elevated temperatures. If the battery is near the end of its service life, consider replacing the battery even if the "replace battery indicator" is not yet lit.
The UPS is overloaded.	Check the UPS load display. Unplug non-essential equipment, such as printers.
Front panel indicators flash sequentially.	
The UPS has been shut down by remote control.	None. The UPS will restart automatically when utility power returns.
All indicators are lit and UPS emits a constant beeping.	
Internal UPS fault.	Do not attempt to use the UPS. Turn the UPS off and have it serviced immediately.
All indicators are off and UPS is plugged into wall outlet.	
The UPS is shut down and the battery is discharged from an extended outage.	None. The UPS will return to normal operation when the power is restored and the battery has a sufficient charge.
The replace battery light is lit.	
Weak batteries.	Allow the batteries to recharge for at least four hours. If the problem persists after recharging, replace the batteries per paragraph 5.7.1.3.1.1.
Replacement batteries not connected properly.	Confirm the battery connections.

5.6.4. DC Power

Ensure AC power input to the failed component is provided and there are no blown fuses. If there is correct AC power input and no DC power output, replace the component.

5.6.5. Flight Deck I/O Diagnostics

5.6.5.1. Circuit Breaker System Interface Control

This subsection defines the interface between the Host computer and the Circuit Breaker System of the FTD.

Use this subsection to establish a connection between the Host-based Aircraft Systems software and the FDKIO subsystem and to test the circuit cards.

Figure 5-9 shows the major components of the Circuit Breaker System.

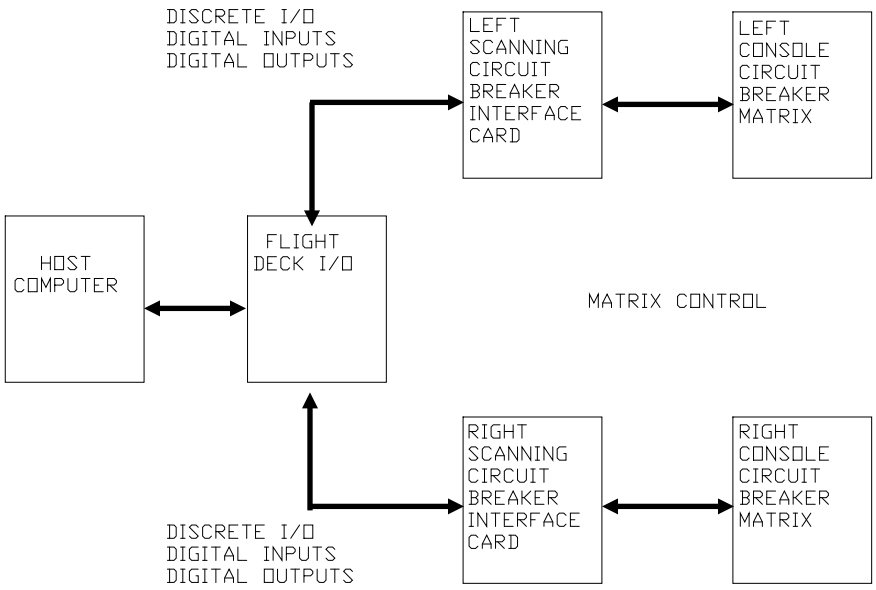


Figure 5-9. Circuit Breaker System Block Diagram

Circuit breakers may be manually popped one at a time by driving them from the IOS.

Determine the state of a circuit breaker by examining one (1) column at a time and reading digital inputs with the FDKIO GUI utility.

Table 5-6 lists the associated CB System drawings, diagrams and schematics.

Table 5-6. Circuit Breaker System Documentation

Document Number	Document Title
6520AGF002	Right Side Console Panel System Diagram
6520AGE002	Left Side Console Panel System Diagram
6520ACP005	Panel Assembly, Left Hand Circuit Breaker
6520ACP005E	Circuit Breaker Panel, Left Console Wiring Diagram
6520ACP006	Panel Assembly, Right Hand Circuit Breaker
6520ACP006E	Circuit Breaker Panel, Right Console Wiring Diagram
6520ABK055	PCB Assembly, Scanned Circuit Breaker Interface
6520ABK055E	Scanned Circuit Breaker Interface – System Schematic

The 60001ABK055 card pops a specific CB using a keyboard scanning technique. It was designed to pop for only a second when software commands it with a transition flag.

5.6.5.1.1. General Circuit Card Test

Bench test the circuit card (removed from the circuit) with a 5A power supply and a DVM:

1) Apply +28VDC to A1 and A3 and -8VDC and –28VDC to A2 and A4. Ensure the E4 link is installed. On boards with Serial Numbers 0001-0011, ensure E6 links are installed. Serial Numbers 0012 and subsequent have these links made within the PCB.
2) Test the power supply voltages. (This card converts 28VDC to 15VDC and 5VDC.) Connect meter –VE to TP E7, then turn the power switch to the on position.

   Observe 28VDC ± .5 VDC at E1 (either leg).

   Observe 15VDC ± .5 VDC at +VE end of C11.

   Observe 5VDC ± .3 VDC at +VE end of C5.

   Observe the grid power LED is illuminated on the front panel.

5.6.5.1.2. SCBI Circuit Card Test

Setup:

1) Ground the CB ENA flag (A22) and verify the yellow LED is illuminated.
2) Attach test leads to the CB; this will enable the technician to connect to the card under test.

5.6.5.1.2.1. Test Procedures

In the following tests, see Table 5-7 to read pins for CB1, CB2 and CBV. Perform Test 1 and Test 2 using the first row of Table 5-7.

1) Test 1

   Connect the circuit breaker across (CB1) and (CB2) and close the circuit breaker.

   Ground (A9), (A10), and (A11) as specified in Table 5-7. See Note 1.

   Ground (A15), (A16), and (A17) as specified in Table 5-7. See Note 1.

   Verify a ground is at (CBV).

   Check off pass in Table 5-7 under Test 1.

2) Test 2

Verify the following occurs when the CB change flag (A21) is connected to ground.

   Verify the CB actually pops.

   Verify the pop power LED is illuminated for a brief period of time.

   Verify the yellow CB change flag LED is illuminated.

   Verify 5VDC ± .3 VDC is at (CBV).

   Check off pass in Table 5-7 under Test 2.

   Remove the ground on CB change flag (A21).

Go back and perform Test 1 and Test 2 on the remainder of the Rows of Table 5-7.

Table 5-7. Scanned Circuit Breaker Interface Card

COLUMN			ROW			CB Connection		CB Verification	Passes	
A11	A10	A9	A17	A16	A15	(CB1)	(CB2)	(CBV)	Test 1	Test 2
0	0	0	0	0	0	C9	C20	A24		
0	0	1	0	0	1	C10	C21	A25		
0	1	0	0	1	0	C11	C22	A26		
0	1	1	0	1	1	C12	C23	A27		
1	0	0	1	0	0	C13	C24	A28		
1	0	1	1	0	1	C14	C25	A29		
1	1	0	1	1	0	C15	C26	A30		
1	1	1	1	1	1	C16	C27	A31		

NOTE: A “1” in Table 5-7 represents grounding the appropriate action.

3) Test 3

Reset the recently popped CB.

Ground CB change flag (A21) so the CB pops.

Wait approximately 1 second after the CB pops and then reset the CB.

Verify the CB does not pop again when being reset.

4) Test 4

Remove the ground from the CB change flag (A21) and reset the recently popped CB if necessary.

Remove the ground from CB ENA flag (A22).

Ground the CB change flag (A21).

Verify the CB does not pop again.

Verify the CB card enable yellow LED is extinguished.

5.6.6. Electric Control Loading System (DRI Systems Only)

5.6.6.1. Platform Control Pages

This procedure is an introduction to a troubleshooting tool and is not intended as a guide to troubleshooting problems or failures. The following paragraphs describe the basic operation of the control pages and the items available to the technician.

5.6.6.1.1. Connection to the Platform

Connect the platform test cable (P/N-60001ACJ858-501) to J13 (Port A) on the DRI platform and to COMM PORT 1 on the computer.

5.6.6.1.2. Running the Program

The following procedure is used to start the Platform Control Page Graphical User Interface Program via Computer boot up.

1) Turn on the Computer and let it boot up in the normal manner.
2) The Platform Control Page GUI should start and display the START page momentarily and then the DRI SYSTEM page should appear. See Figure 5-10.

The following procedure is used to start the program without a computer reboot or if the computer does not boot it automatically.

1) If the system is running Windows, get to the Command Prompt or reboot into DOS mode.
2) At the DOS prompt, change to the “c\work” directory and type “start” then type “hcsjpat” <ret>

   >cd c:\work <ret>

   >start <ret> (This sets up the comm Port)

   >hcsjpat <ret>
3) The Platform Control Page GUI should start and display the START page momentarily; the DRI SYSTEM page should then appear. See Figure 5-10.

5.6.6.1.2.1. Key Board Controls

The Platform Control Pages are displayed with a black background and writing is green, red, blue, yellow, and white. Green is for normal items while blue indicates which page is being displayed. Yellow indicates the DRI System mode and Emergency Stop. Red indicates failures. White indicates which keyboard keys are used for selecting various system pages, function, and options.

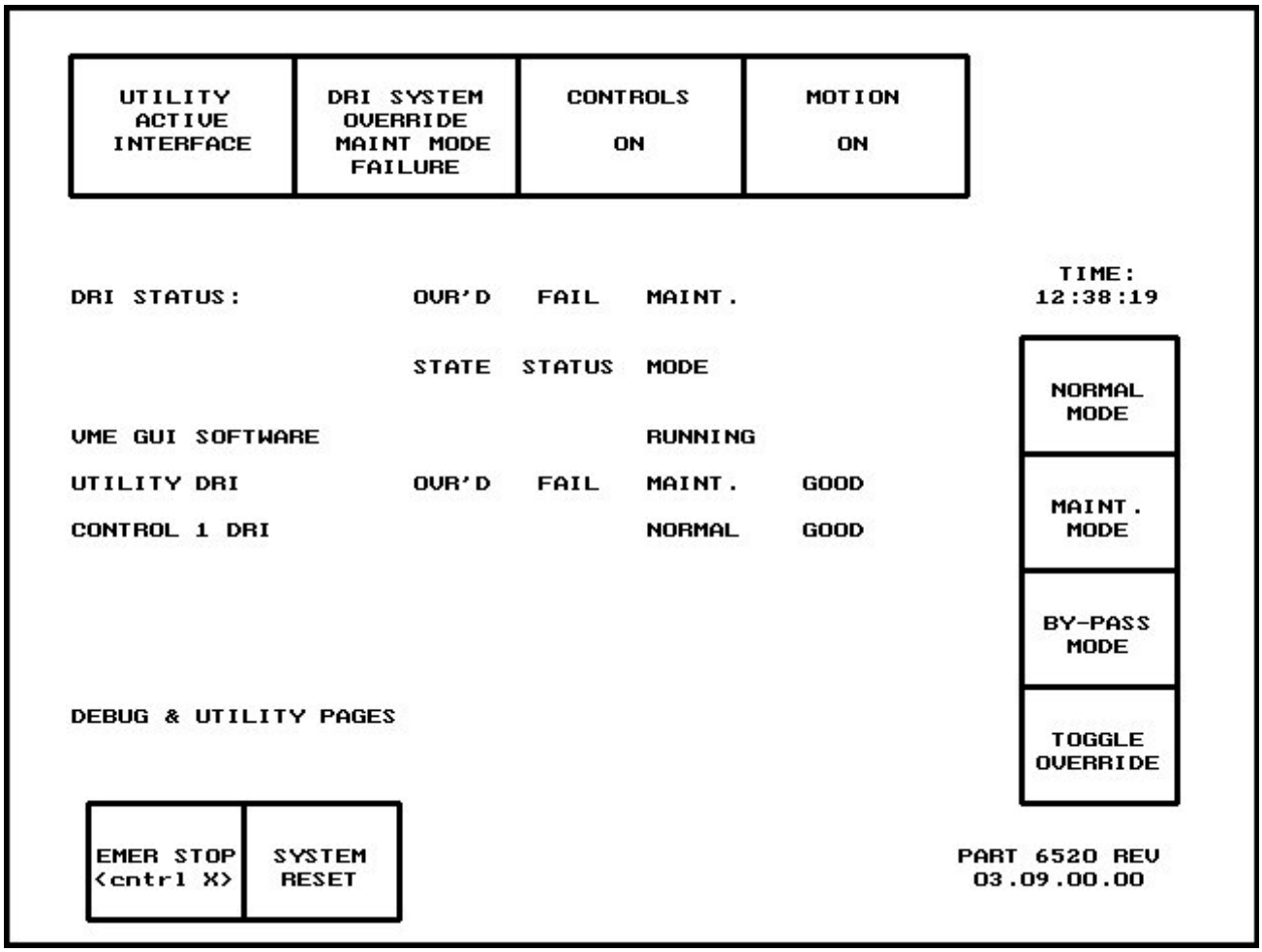


Figure 5-10. DRI System Page

5.6.6.1.2.2. System Page Select

Use the arrow keys to select the DRI SYSTEM, CONTROLS, and MOTION pages. The appropriate system page is selected and the box is highlighted in blue. The first letter of each page is highlighted in white; these pages may also be selected by using the highlighted or Hot key. Refer to Figure 5-10.

5.6.6.1.2.3. Platform Page and Subsystem Page Select

To access the platform pages and the subsystem pages, use the up and down arrow keys to highlight the desired item then press the Enter key.

5.6.6.1.2.4. EMERGENCY STOP

EMERGENCY STOP shuts down the DRI systems. Simultaneously press the "CNTRL" (CTRL on some keyboards) and the "X" keys to activate the emergency stop. The EMER STOP box on the display has <cntrl x> highlighted in white on the screen to indicate how to activate the EMERGENCY STOP function. The Emergency Stop function is active on all pages even if the EMER STOP box is not present.

5.6.6.1.2.5. System Reset

To initiate the System Reset function, press the “R” key. It is highlighted in white within the SYSTEM RESET box.

5.6.6.1.2.6. Exit the GUI Program

To exit the Platform Control GUI program, press the “Esc” key on the keyboard. This will return the user to the DOS prompt. This command does not appear on any Platform Control Pages but can be used from any page.

WARNING

FAILSAFE PROTECTIONS CAN BE BY-PASSED IN THE MAINTENANCE OR BY-PASS MODES. ENSURE THAT ALL PERSONNEL ARE CLEAR OF THE SIMULATOR PRIOR TO SELECTING EITHER OF THESE MODES.

5.6.6.1.2.7. Mode Select

The mode selection boxes indicate how to change the mode of the displayed system or platform. Pressing the letter that is highlighted in white in each mode select box can change the system mode. The mode select boxes run down the right side of the DRI System pages. Refer to Figure 5-10. The mode select keys are:

- “N” will activate NORMAL MODE
- “I” will activate MAINT MODE
- “B” will activate BY-PASS MODE (Not Used)

5.6.6.1.2.8. Toggle Override

The TOGGLE OVERRIDE box indicates how to change the highlighted item to/from the override mode. Refer to Figure 5-10. Press the “T” key to toggle the override mode on and off. The “T” is highlighted in white.

5.6.6.1.2.9. Exit Page

To exit a page and return to the previous page, use the “Backspace” key. The <BACK><SPACE> box is shown on various control pages. The “<” and “>” characters are highlighted in white. This key is active on all pages even if the <BACK><SPACE> is not present.

5.6.6.1.3. DRI System Page

The DRI System page lists the DRI Platforms that exist on the simulator. The DRI SYSTEM box is highlighted while this page is being displayed. Figure 5-10 shows the DRI SYSTEM page.

5.6.6.1.3.1. ACTIVE INTERFACE Box

This box, in the upper left corner of the displayed page, indicates the communications between the computer and the platform it is connected to are acceptable. The platform connected will be displayed in this box, also.

5.6.6.1.3.2. DRI SYSTEM Box

This box indicates the current operating mode of the DRI system and FAIL if any failures exist in the system. The modes are NORM, MAINT, and BY-PASS.

5.6.6.1.3.3. CONTROLS and MOTION Boxes

These boxes indicate the status of the listed system. These also bring up the appropriate system page when selected.

5.6.6.1.3.4. Platform332 Firmware Version

The Job Number and Firmware Revision are displayed on the lower right corner of the display (i.e. PART 6520 REV 3.09.00.00).

5.6.6.1.4. HOST DRI Page

The Host DRI page displays the Status and Operating Mode of the HOST DRI system. It also displays the ON/OFF or FAIL condition of Host communications. When the system is ON and operational, the Host communications will indicate “ON”, telling the user the communication between the Host and the ECL computer is functional. Use the backspace key to return to the previous page. See Figure 5-11.

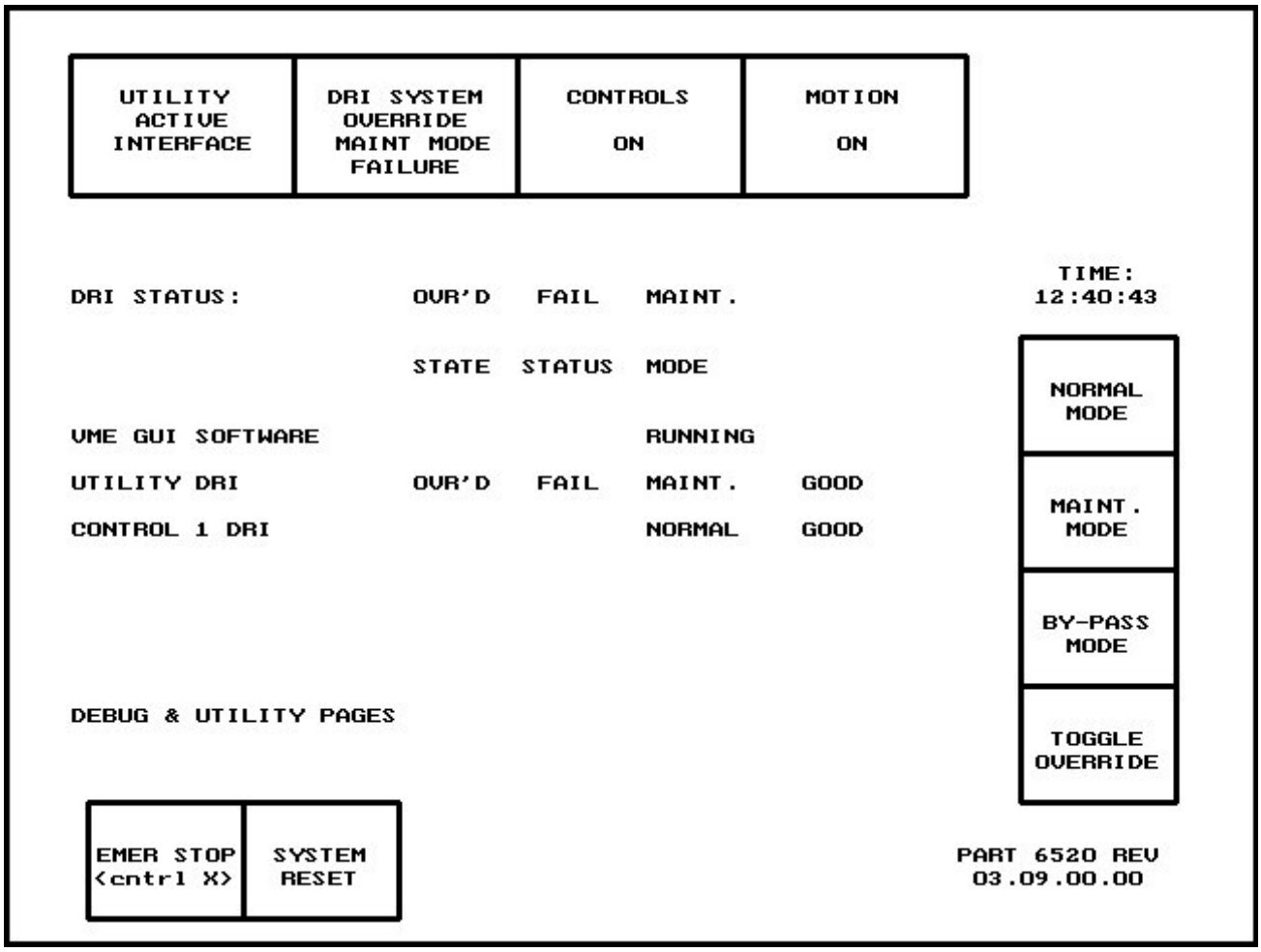


Figure 5-11. Host DRI Page

5.6.6.1.5. UTILITY DRI Page

The Utility DRI (UTL-1) platform page displays the Status and Operating Mode of the utility DRI system. The subsystem pages can be entered by utilizing the arrow keys to highlight the appropriate item and pressing the Enter key. Use the backspace key to return to the previous page. See Figure 5-12.

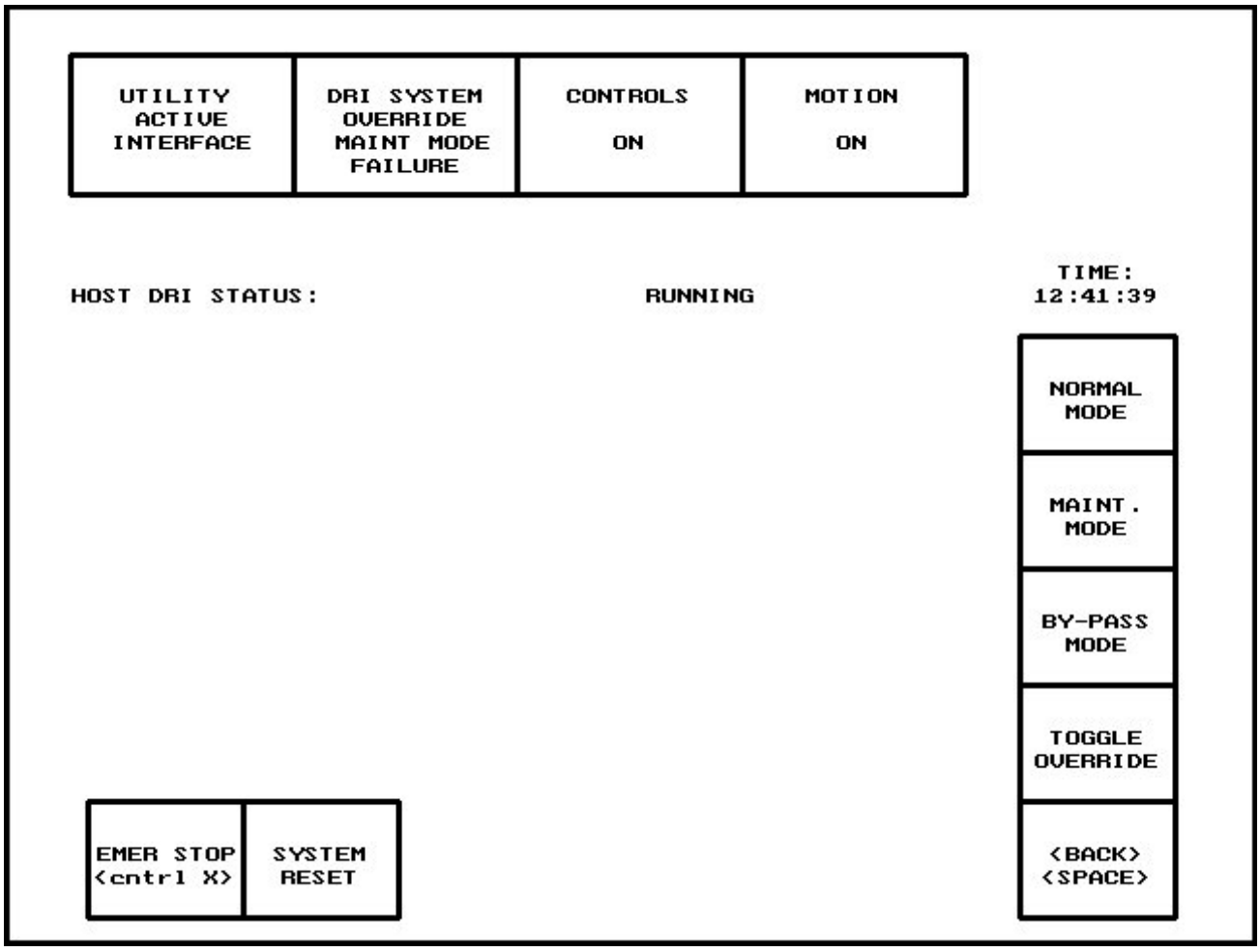


Figure 5-12. UTILITY DRI Page

5.6.6.1.5.1. UTILITY POWER Page

The Utility Power Page displays the current Status of the UTL-1 Platform power system. It displays the voltage and the ON/OFF or FAIL status of the battery and the voltages generated by the PSSCB, the 24VDC input power to the PSSCB and the 24VDC Abort power. Use the backspace key to return to the previous page. See Figure 5-13.

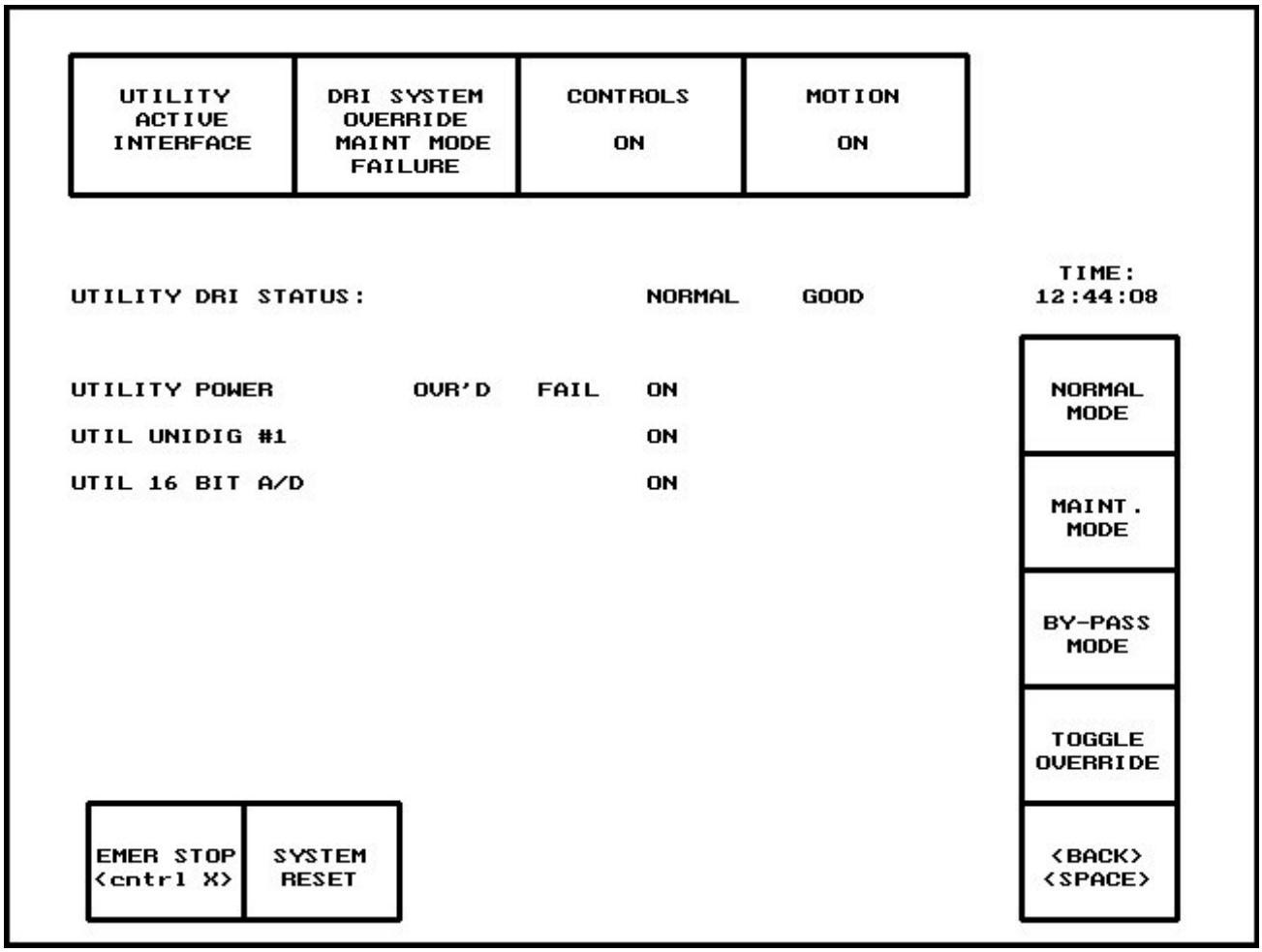


Figure 5-13. UTILITY Power Page

5.6.6.1.5.2. Utility UNIDIG #1 Page

The Utility UNIDIG#1 page displays the status and condition of the UTL-1 Unidigit #1 IP module. To the right of the status is a count of how many DIs and DOs are being used on this module. Below the status is a list of the DIs and DOs by their functional names. To the right of each DI and DO is the status of that function. ON represents a SET or ACTIVE condition. See Figure 5-14.

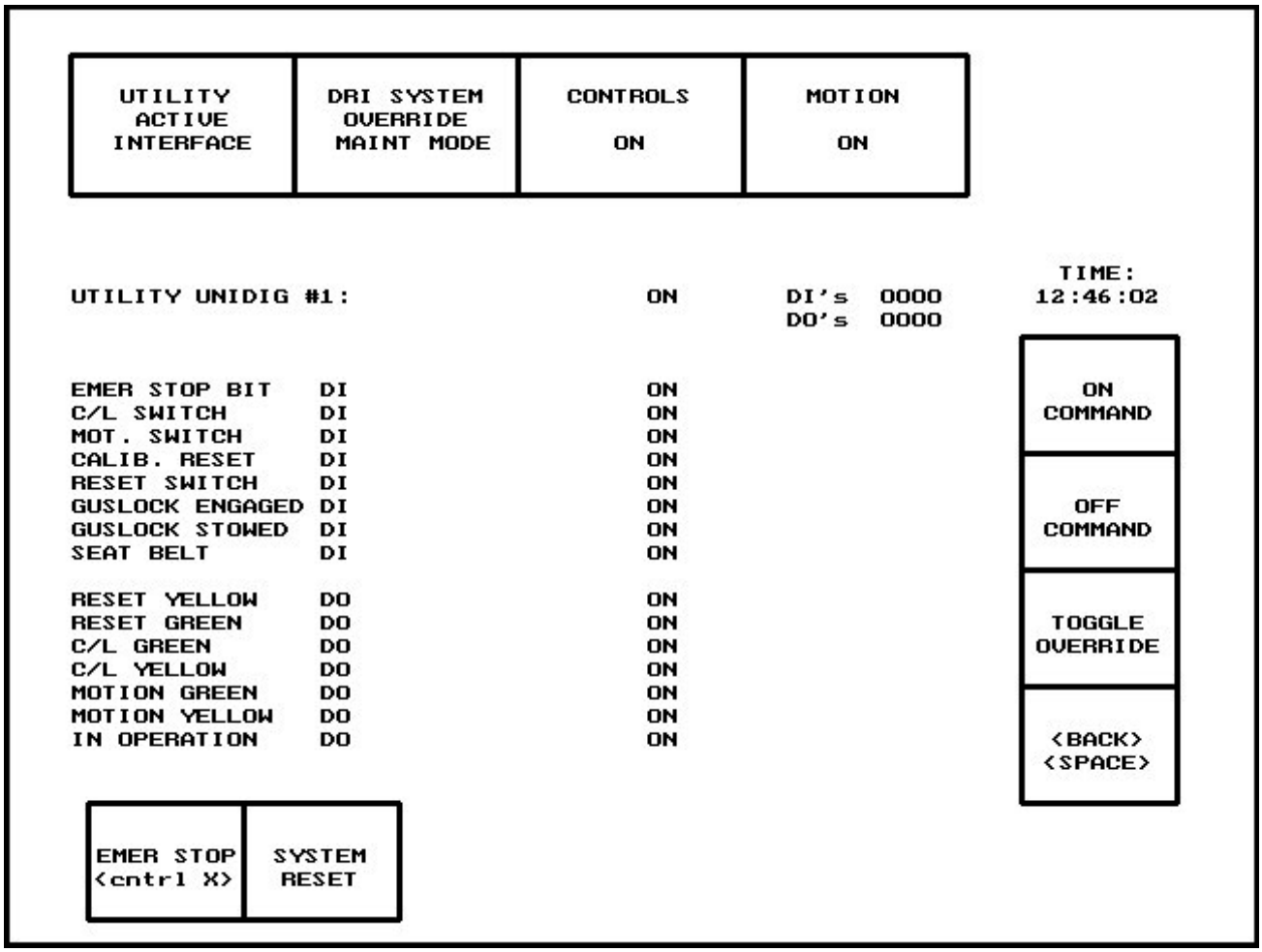


Figure 5-14. UTILITY Unidig #1 Page

5.6.6.1.5.3. Utility 16-Bit A/D

The UTL-1 16-Bit A/D page displays the status and condition of the Utility A/D IP module. Below the status is a list of the A/Ds by function name. To the right of each A/D is the status and current value of that function. Values are listed in DC voltages. See Figure 5-15.

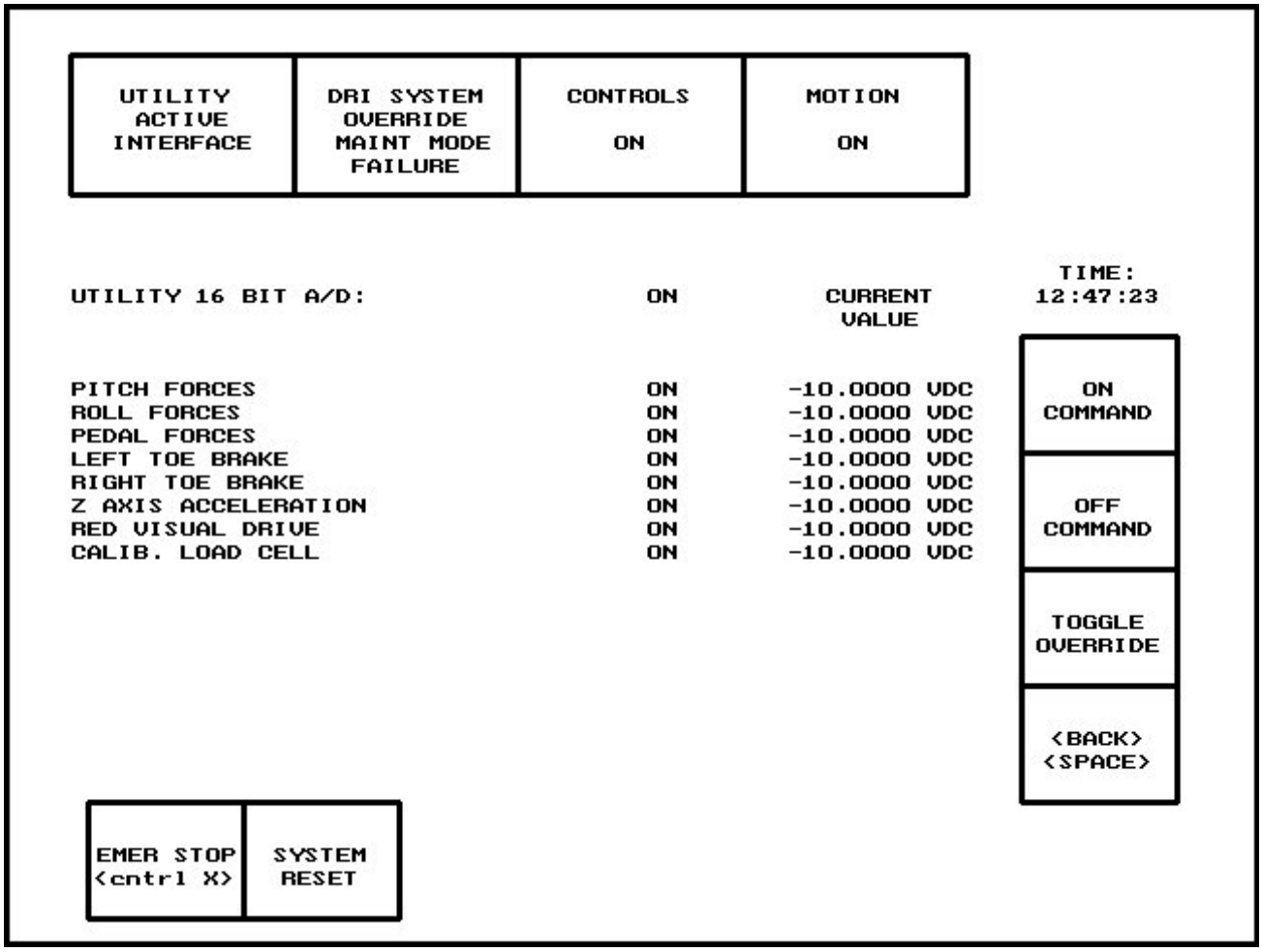


Figure 5-15. UTILITY 16-Bit A/D Page

5.6.6.1.6. Control 1 DRI Page

The Control 1 DRI (CLS-1) platform page displays the Status and Operating mode of the Control Loading 1 DRI system. It also displays the current condition of the Control 1DRI subsystems. The subsystem control pages are accessed by highlighting the appropriate item then pressing the Enter key. Use the Backspace key to return to the previous page. See Figure 5-16.

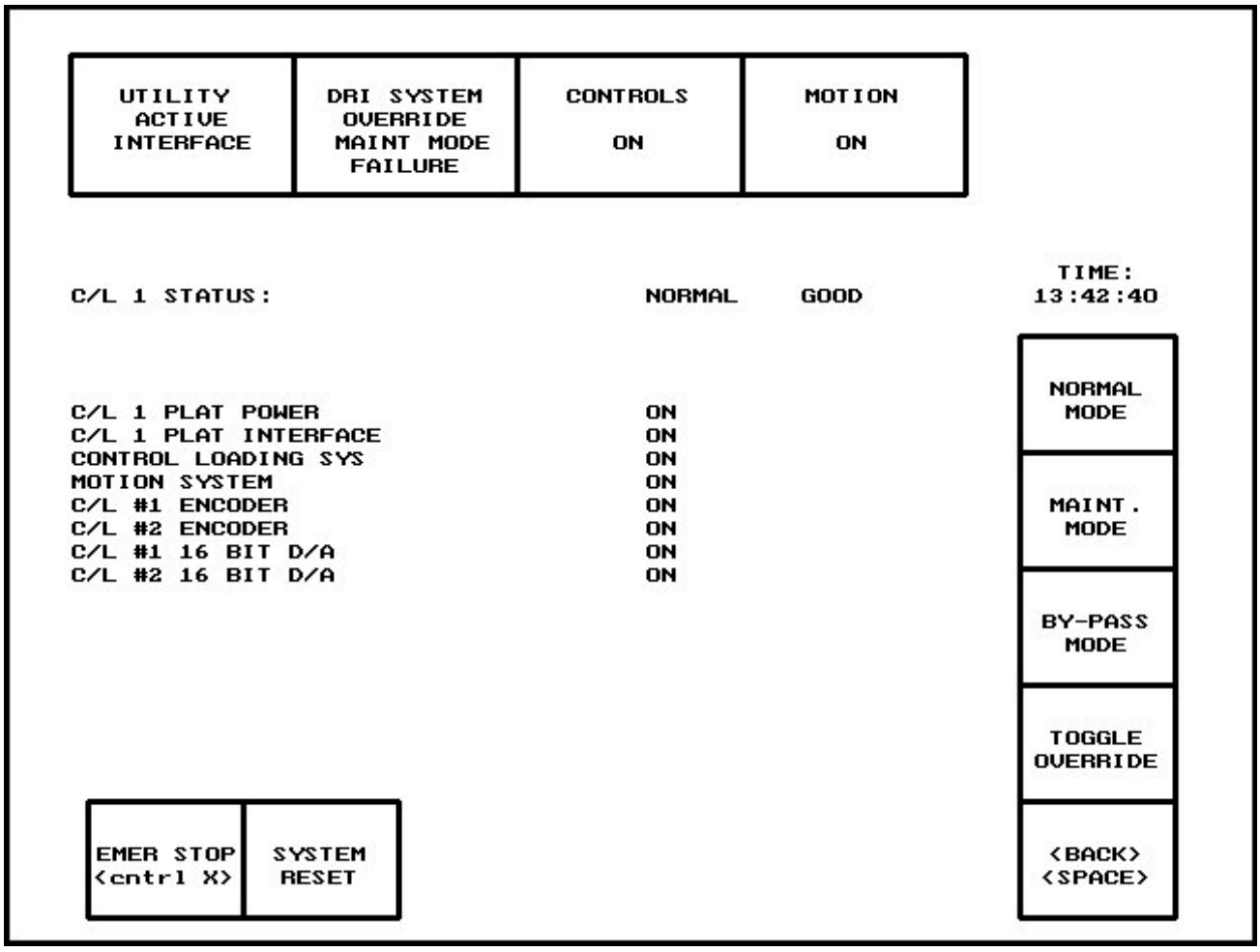


Figure 5-16. CONTROL 1 Status Page

5.6.6.1.6.1. CLS-1 Platform Power Page

The C/L Platform Power Status page displays the status and condition of the Control Loading 1 platform power system. It displays the voltage and the ON/OFF or Fail status of the battery, the voltages generated by the PSSCB and the 24VDC input to the PSSCB and the 24VDC Abort Power. Use the Backspace key to return to the previous page.

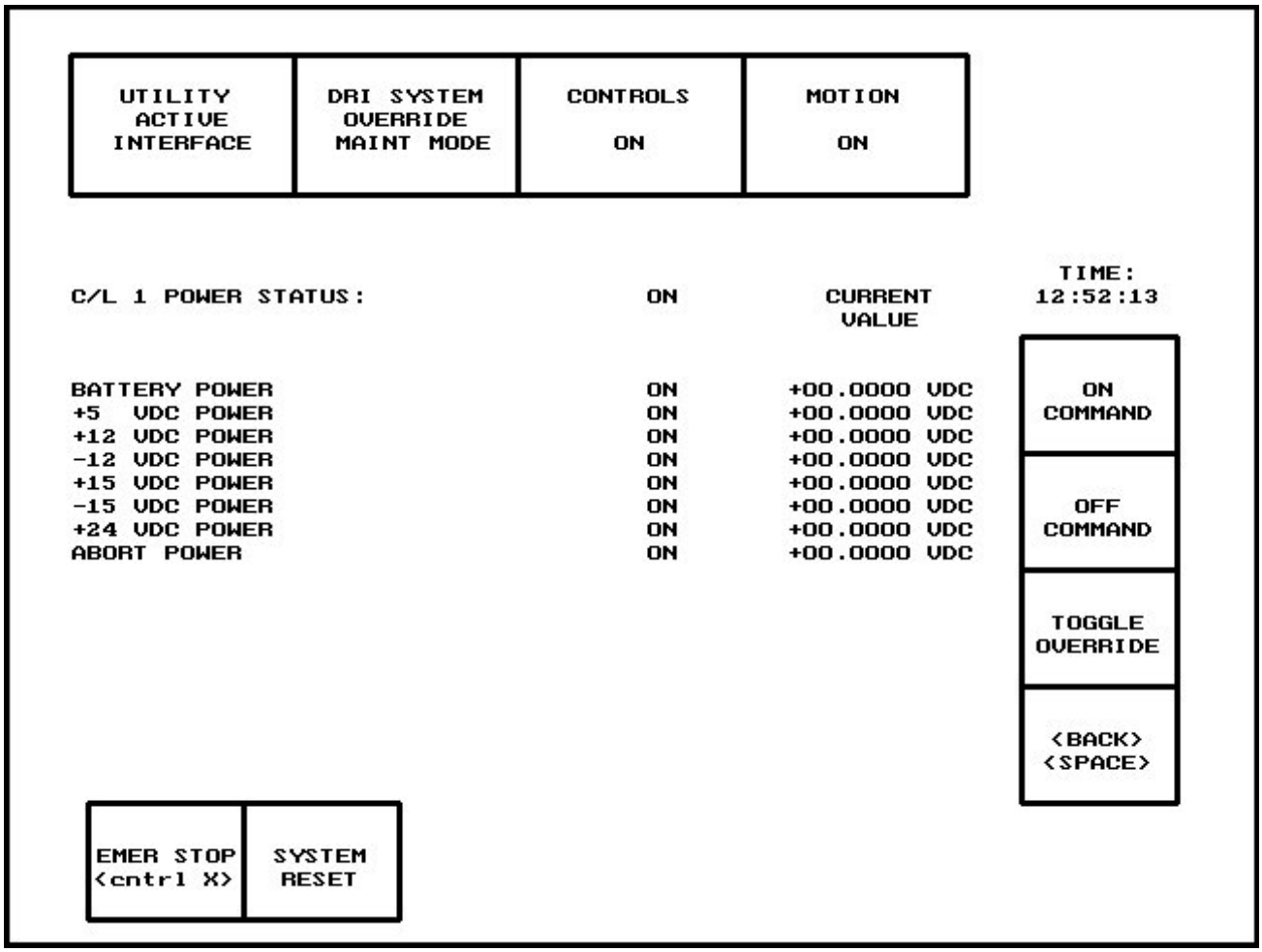


Figure 5-17. CONTROL 1 Power Status Page

5.6.6.1.6.2. CLS-1 Platform Interface Page

The C/L PIT #1 page displays the status and condition of the Control Loading #1 Platform Interface. It also displays the ON/OFF or FAIL status of the C/L 1 Watchdog, the Servo amp reset and the drive enable signals. See Figure 5-18.

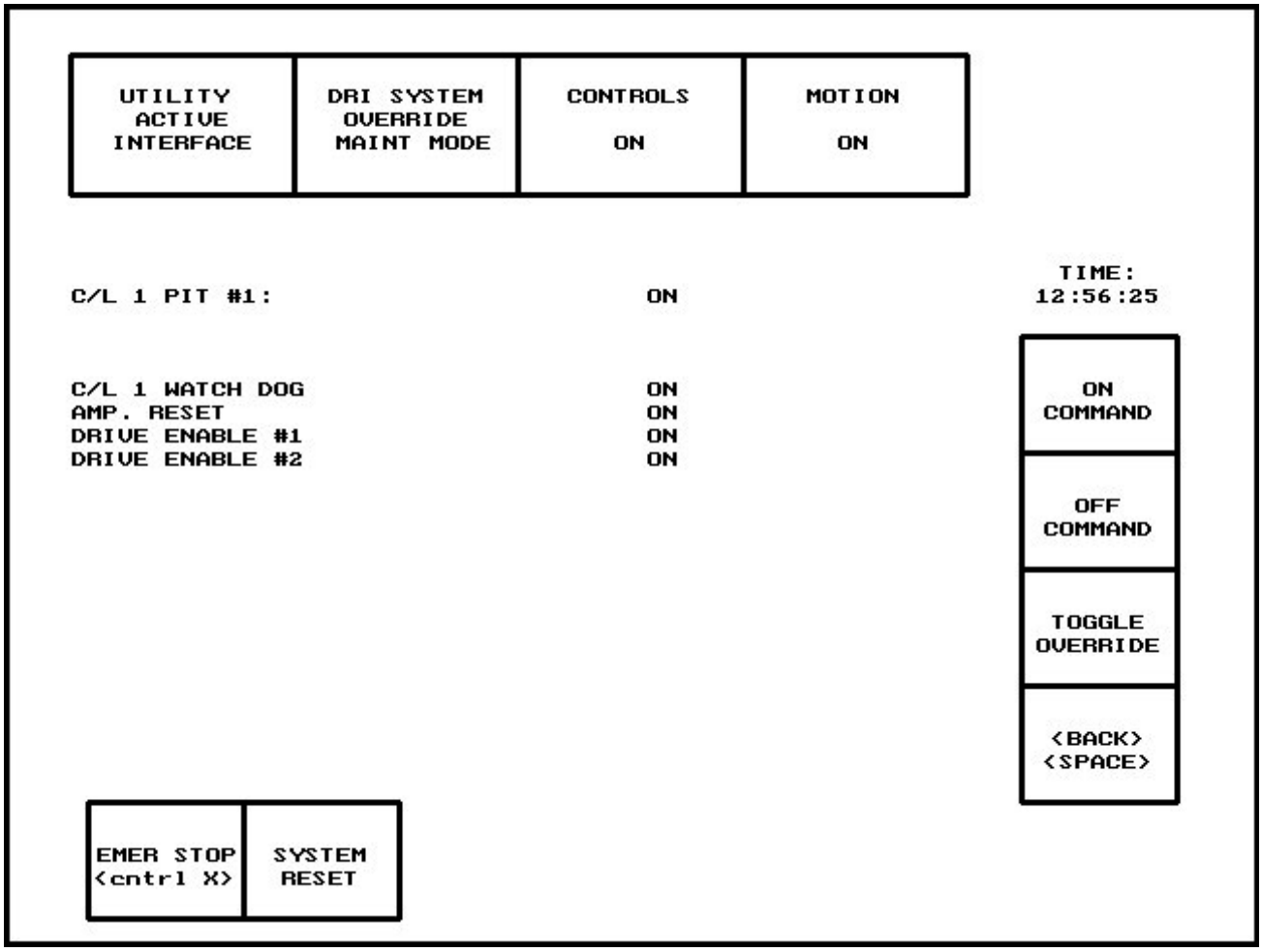


Figure 5-18. CONTROL 1 Platform Interface Page

5.6.6.1.6.3. CLS-1 Encoder pages

The CLS-1 Encoder pages display the status and condition of the actuator encoder signals. It displays the position value in counts and the ON/OFF or FAIL condition. Two pages support the encoder functions for the system. See Figure 5-19.

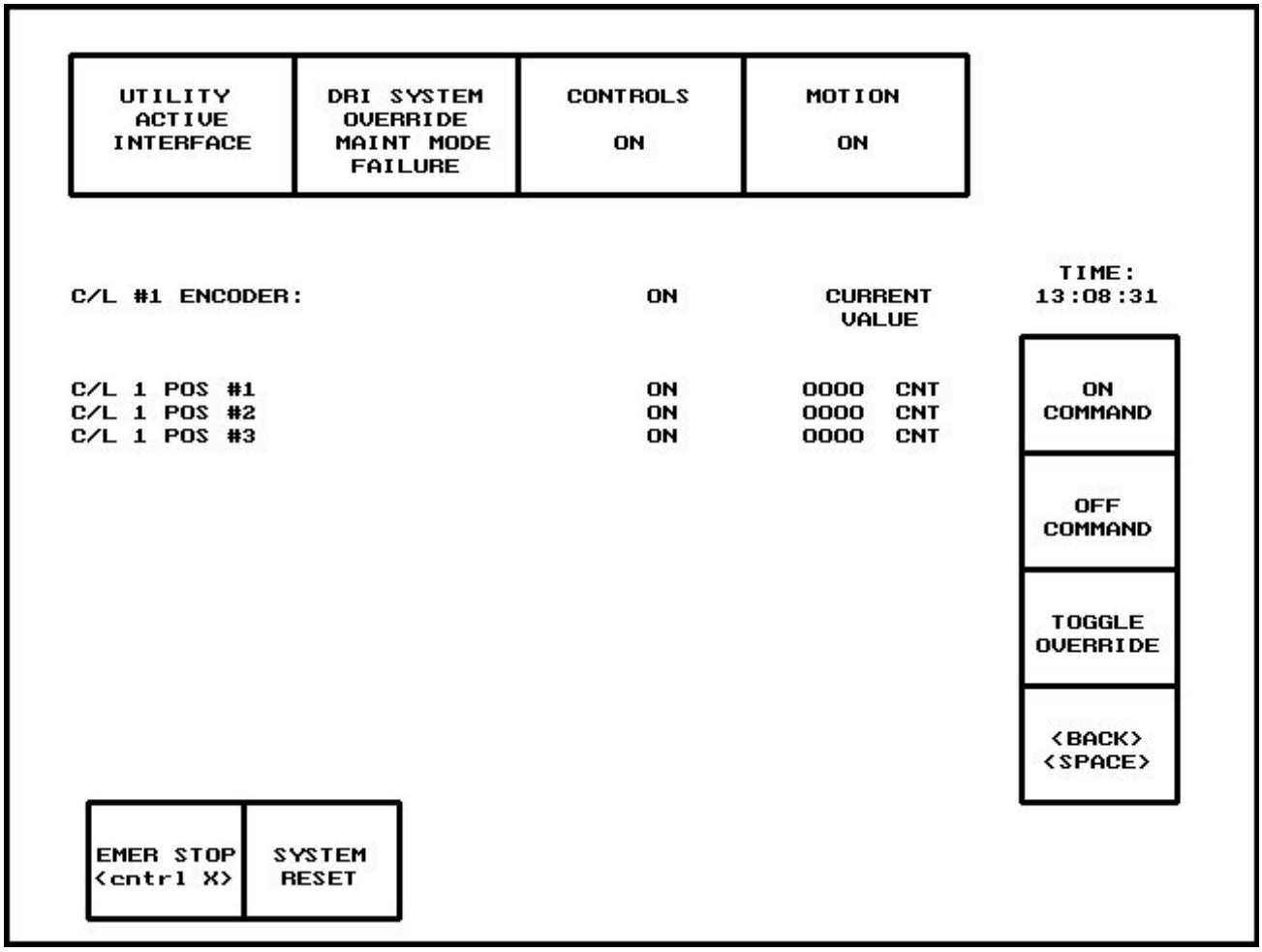


Figure 5-19. CONTROL 1 Encoder Page

5.6.6.1.6.4. CLS-1 16-Bit DAC Pages

The CLS-1 16-Bit DAC pages display the ON/OFF or Fail status of the Control Loading 16-Bit IP module. Below the Status, the actuator drive D/As are listed. To the right of each D/A are listed the status and current value. Values are listed in the DC voltage. Two pages support DAC functions. See Figure 5-20.

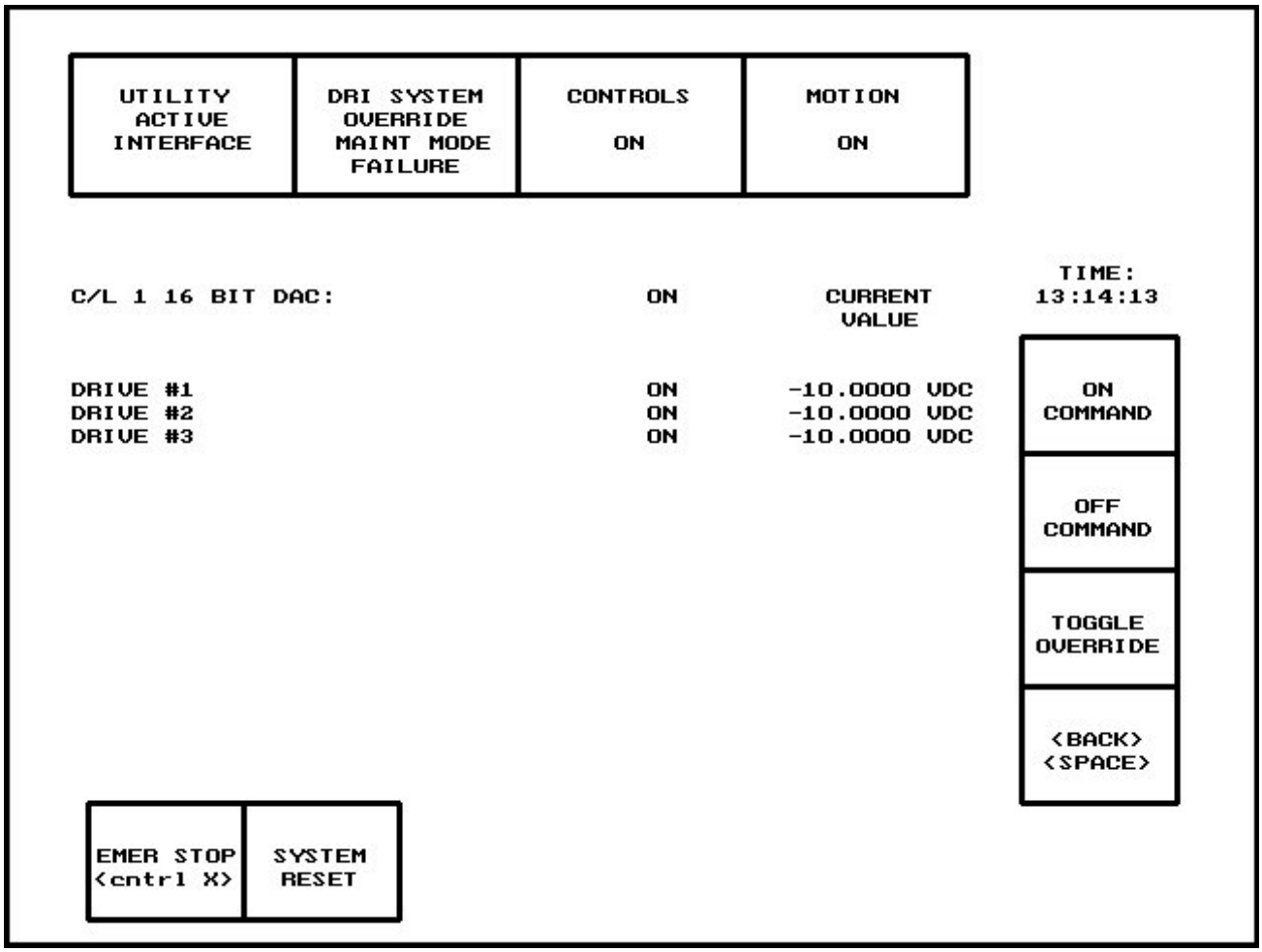


Figure 5-20. CONTROL 1 16-Bit DAC

5.6.6.1.7. Control Loading System Page

The Control Loading System page displays the status and condition of the Control Loading System. It also displays the status and condition of the Host and Control Loading software. Use the Backspace key to return to the previous page. See Figure 5-21.

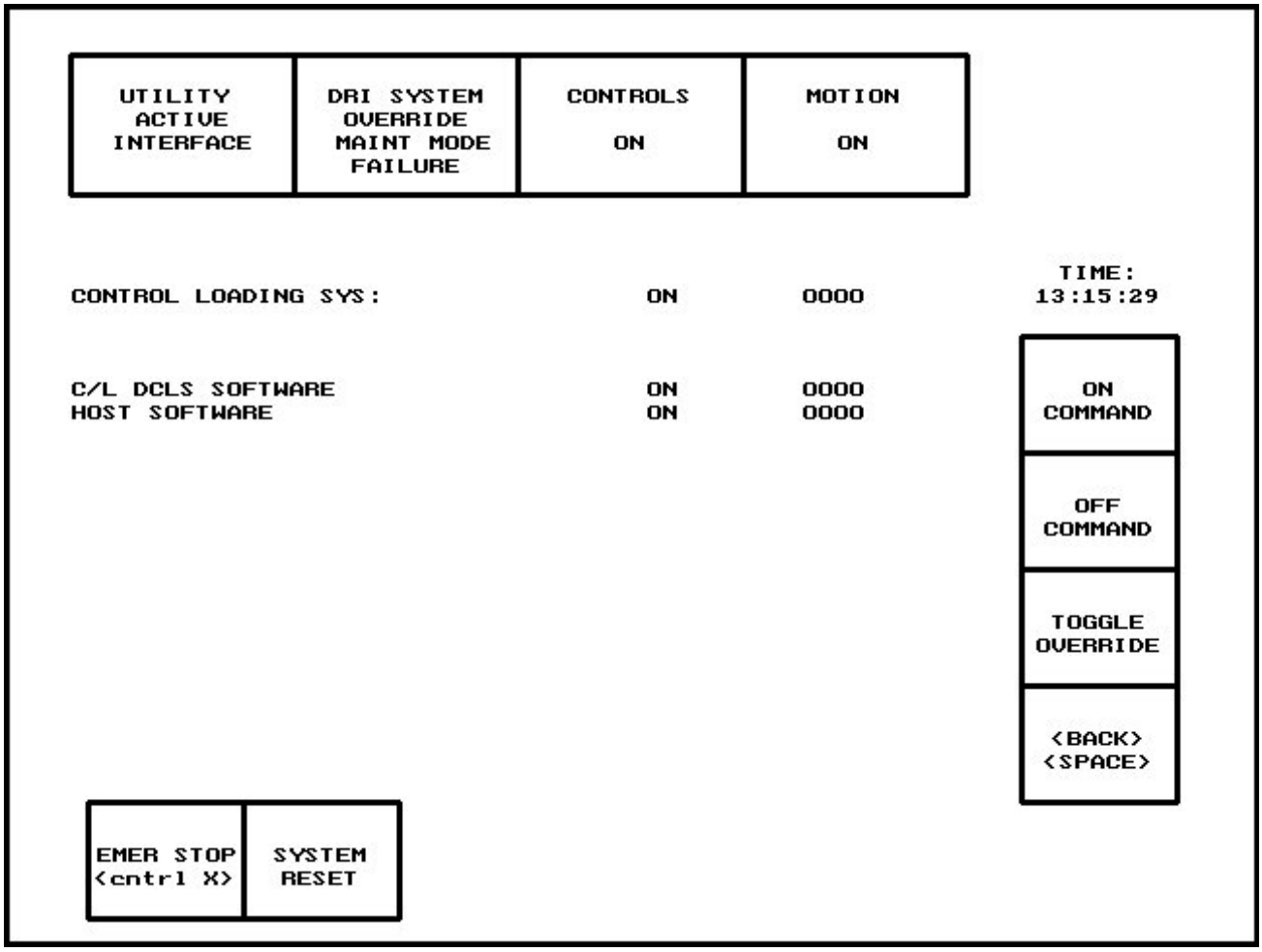


Figure 5-21. Control Loading System Page

5.6.6.1.8. DRI Motion Page

The DRI Motion page displays the status and condition of the Dynamic Seat Motion system (not used on UTD configurations). See Figure 5-22.

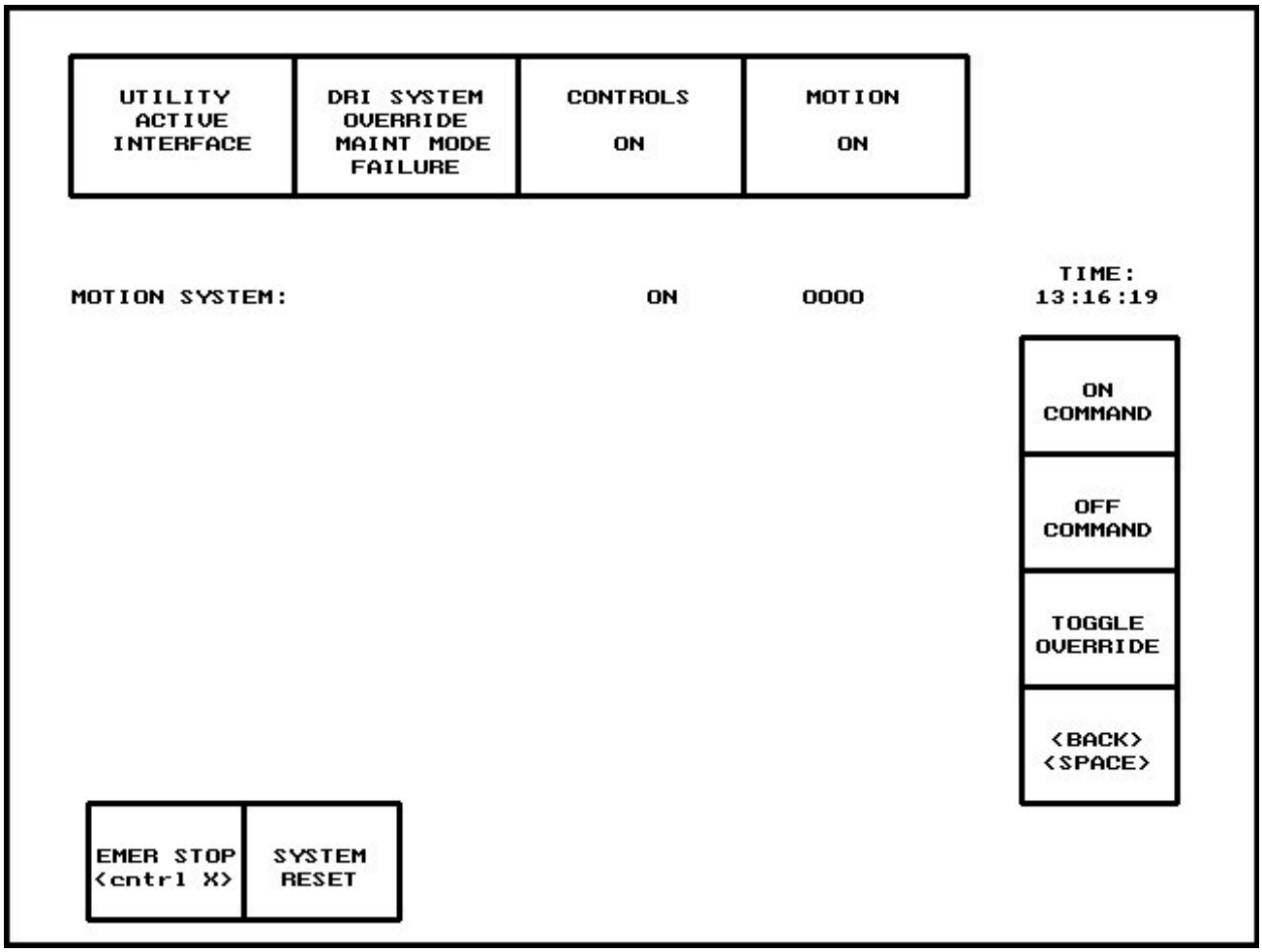


Figure 5-22. DRI Motion Page

5.6.6.2. Debug and Utility Manager

This section is a troubleshooting tool and is not intended as a guide to troubleshooting problems or failures. The following paragraphs describe the basic operation of the Debug and Utility Manager and describe the items available to the technician.

5.6.6.2.1. Debug and Utility Manager Page Access

To access the Debug and Utility Manager pages, highlight the “DEBUG AND UTILITY PAGE” selection from the DRI SYSTEM Page and press “Enter”. Refer to Figure 5-10 for the DRI SYSTEM page. See Figure 5-23 for the Debug and Utility Manager Page.

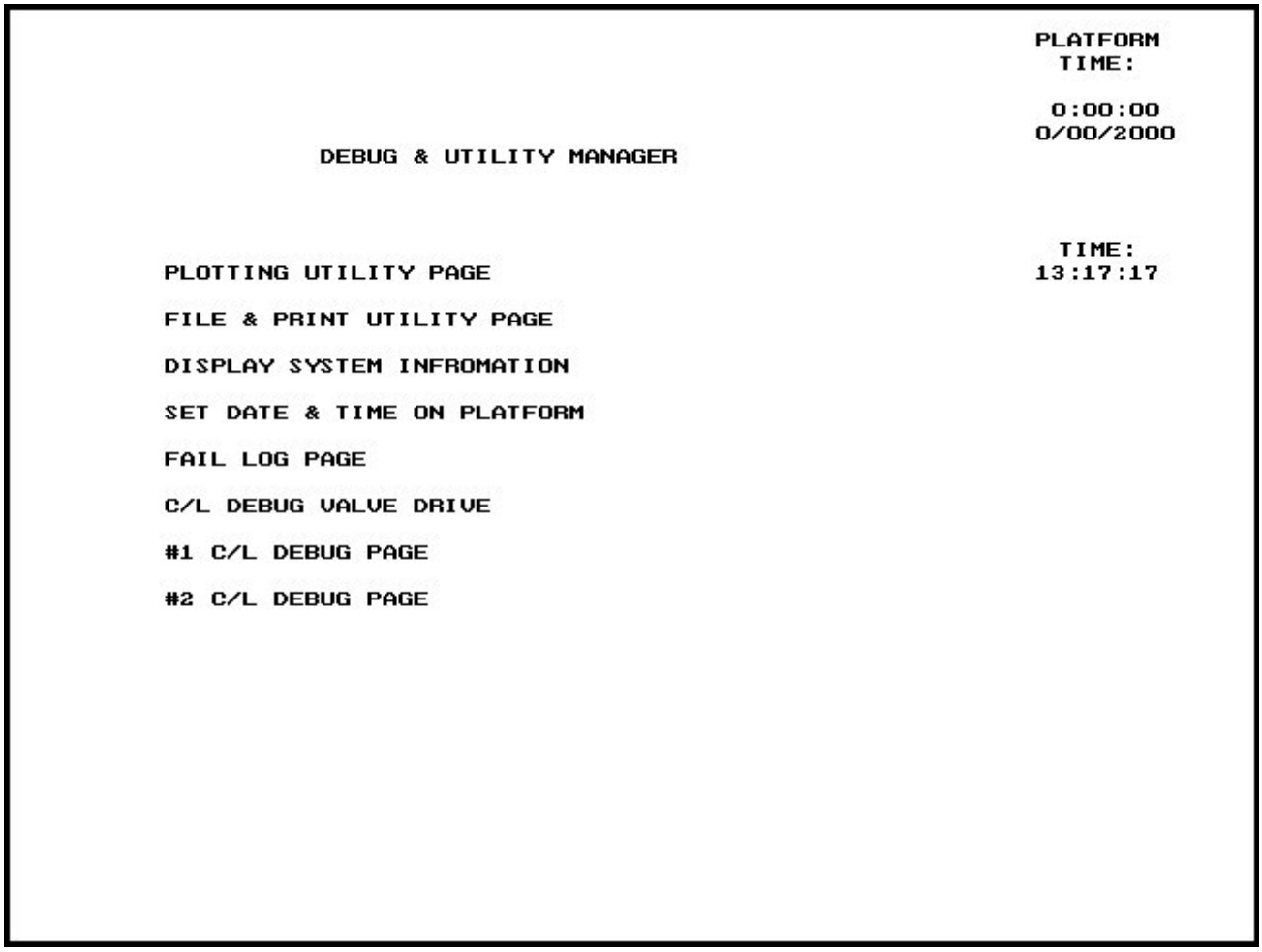


Figure 5-23. Debug and Utility Manager Page

5.6.6.2.2. Plotting Utility Page

The Plotting Utility page is used in conjunction with other pages so that as a test is running, the user can access this page to record and plot the test result. See Figure 5-24. Each of the menu options is briefly discussed in the following paragraphs.

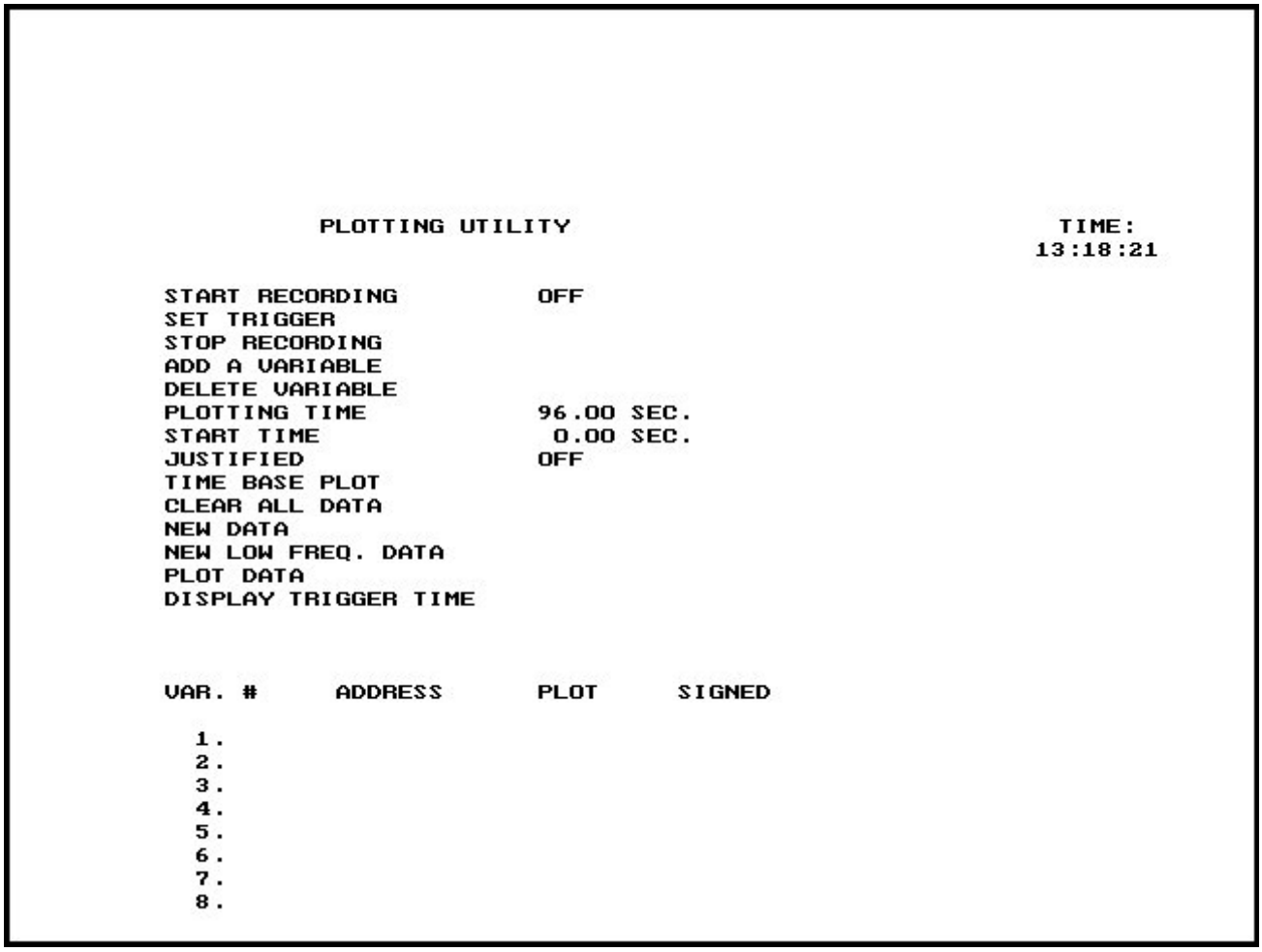


Figure 5-24. Plotting Utility Page

5.6.6.2.2.1. Start Recording

This option enables the software to begin recording the chosen variables. The variables that will be recorded will be listed at the bottom of the page. Highlight the “START RECORDING” line and press “Enter” to activate it. The status will indicate “ON” when this option is active and “OFF” when it is inactive. See Figure 5-24.

5.6.6.2.2.2. Set Trigger

This option enables the user to turn ON the “Trigger on Failure” option. This option is typically used to capture data of a random failure by setting up variables to be recorded in the buffer and letting the system run until the recording is stopped by the failure. The user can then go back and look at the plotted variables up to 90 seconds from the time of failure. See Figure 5-24.

5.6.6.2.2.3. Stop Recording

This option enables the user to stop the software recording the variables. Highlight the “STOP RECORDING” line and press Enter to activate it. The Status of the “START RECORDING” option will display “OFF” when “STOP RECORDING” is active. See Figure 5-24.

5.6.6.2.2.4. Add a Variable

This option allows the user to add variables to the list of variables to be recorded. Variables are added by using their addresses obtained from the memory map at the end of this section. The memory map lists all possible variables; select the ones applicable to your simulator. The current variables to be recorded are listed at the bottom of the page menu. A maximum of 8 variables can be recorded at one time. See Figure 5-24.

5.6.6.2.2.5. Delete Variable

This option allows the user to delete a variable from the list of variables to be recorded. The variable is deleted by using the variable number 1 through 8. The current variables are listed at the bottom of the page menu. See Figure 5-24.

5.6.6.2.2.6. Plotting Time

This option is used to set the amount of recorded time to be plotted. The current time selected is displayed in seconds. The plotting time is set by use of the L, I, and CTRL keys as follows. See Figure 5-24.

L -	Lower the plotting time by ¼ second
CTRL & L -	Lower the plotting time by 5 seconds
I -	Increase the plotting time by ¼ second
CTRL & I -	Increase plotting time by 5 seconds

5.6.6.2.2.7. Start Time

This option is used to set the Start Plotting time in reference to the start of the recorded time. Set the time to 0 seconds if plotting from the beginning of the recorded time or number of seconds into the recorded time if plotting is to begin later. The Start Time is set using the L, I and CTRL key as described in paragraph 5.6.6.2.2.6. See Figure 5-24.

5.6.6.2.2.8. Justified

This option is normally set to “OFF”. A justified plot may not present the data accurately depending on how it is arranged on the page. See Figure 5-24.

5.6.6.2.2.9. X – Y Plot

This option is used to plot one variable against another. Input the variable number for the X-axis from the list of variables at the bottom of the page, then input the variable number for the Y-axis. This option allows the user to plot the variables at the bottom of the page with respect to time when variable number 0 is selected. See Figure 5-24.

5.6.6.2.3. Clear All Data

This option clears all previously recorded data. See Figure 5-24.

5.6.6.2.3.1. New Data

This option accesses a list of variables so the user can select new data to be plotted. See Figure 5-24.

5.6.6.2.3.2. New Low Freq. Data

This option will access a list of low-frequency data that is available. The low-frequency data will show less noise on the plotted data. See Figure 5-24.

5.6.6.2.3.3. Plot Data

This option will plot the variables listed at the bottom of the page with respect to the PLOTTING TIME and the START TIME constraints set up. See Figure 5-24.

5.6.6.2.3.4. Display Trigger Time

This option displays the time of a triggered failure. See Figure 5-24.

5.6.6.2.4. File and Print Utility Page

The File and Print Utility page allows the user to access a previously saved plot file, save a plot file, or create various printer files from recorded data. The following paragraphs describe the various features of this page. See Figure 5-25.

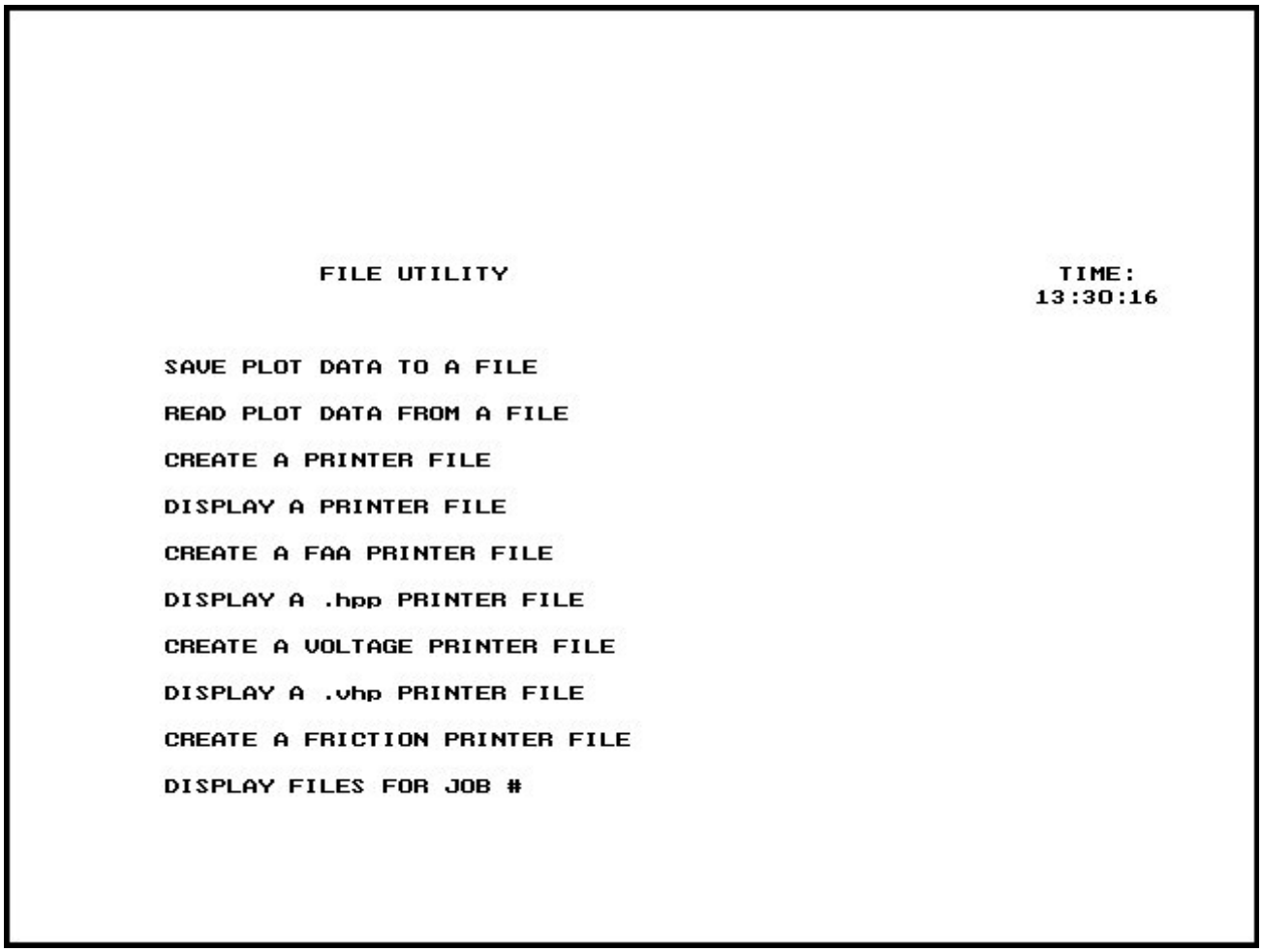


Figure 5-25. File Utility Page

5.6.6.2.4.1. Save Plot Data to a File

This option will save the current plot data to the filename specified. The first four characters should reflect the job number of the simulator (i.e., XXXXPLOT.dat).

5.6.6.2.4.2. Read Plot Data from a File

This option will read a previously saved .dat plot data from the filename specified.

5.6.6.2.4.3. Create a Printer File

This option will create and save a printer file from the current captured data, to the filename specified with a .dhp extension.

5.6.6.2.4.4. Display a Printer File

This option will read in a previously created .dhp printer file from the filename specified.

5.6.6.2.4.5. Create an FAA Printer File

This option will create and save an FAA printer file from the current plot data, to the filename specified with a .hpp extension.

5.6.6.2.4.6. Display a FAA Printer File

This option will read in a previously created .hpp FAA printer file from the filename specified.

5.6.6.2.4.7. Create a Voltage Printer file

This option will create and save a Voltage printer file from the current plot data, to the filename specified with a .vhp extension.

5.6.6.2.4.8. Display a Voltage Printer File

This option will read in a previously created .vhp voltage printer file from the filename specified.

5.6.6.2.4.9. Display Files for JOB #

This option is used to select the 4-digit Job number for file and print operations. This option allows multiple job files to be stored in the same directory location for later retrieval and use.

5.6.6.2.5. Display System Information

The Display System information page displays the Job and revision number. It also has an option to display the Control Loading Offsets data.

5.6.6.2.6. Set Date & Time on Platform Option

The Platform Date and Time are displayed at the top of the Debug and Utility Manager page and the time in the computer are displayed below that. Refer to Figure 5-23. The SET DATE & TIME ON PLATFORM option sets the date and time on the DRI platform to the date and time in the computer you are using. This needs to be set on the platform the user is connected to, in order for the Fail Log to have the correct failure time and date.

5.6.6.2.7. Fail Log Page

The Fail Log page displays a log of DRI System failures. See Figure 5-26.

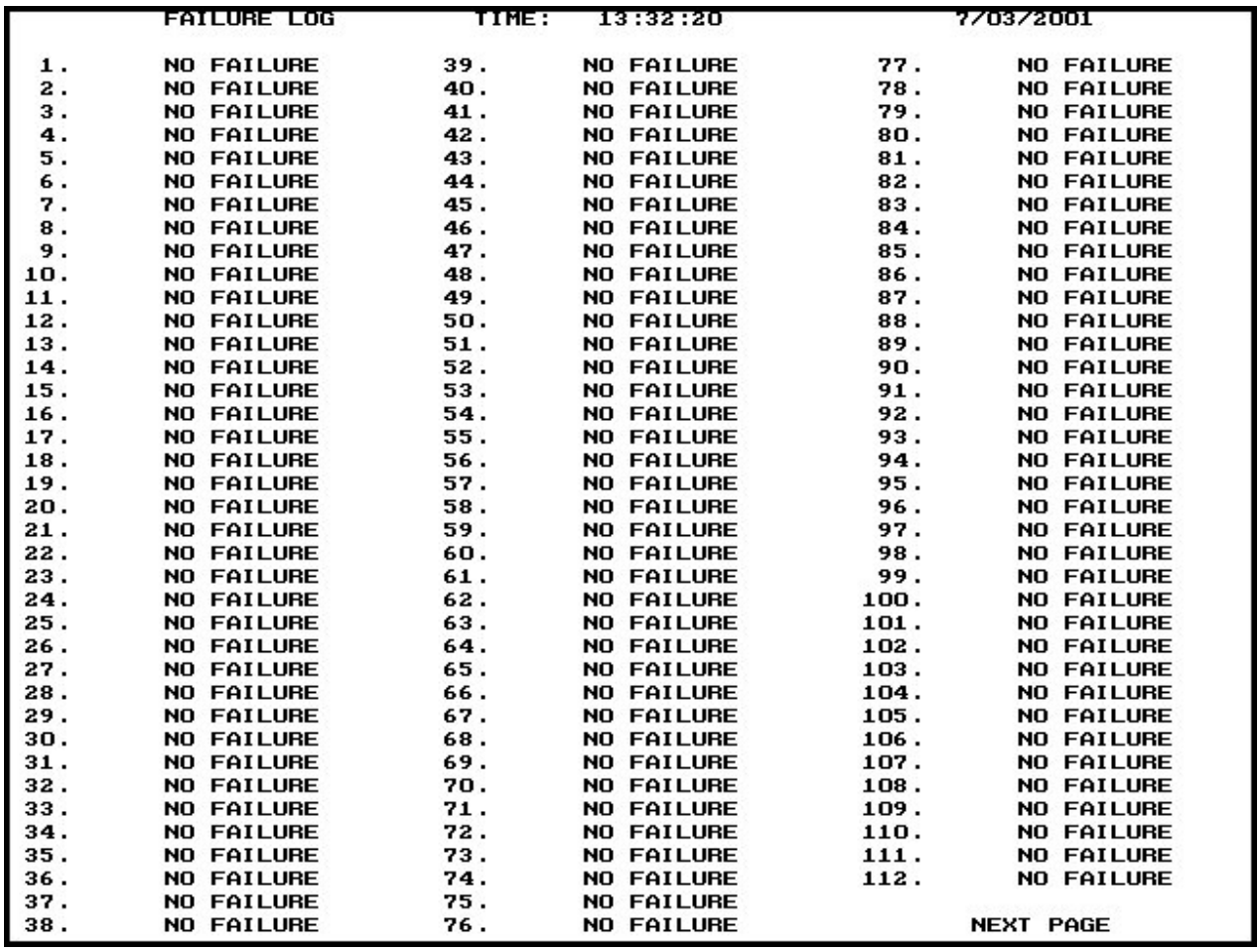


Figure 5-26. Fail Log Page

5.6.6.2.7.1. FAIL Page

The FAIL page for a failure listed is selected by using the arrow keys to highlight the failure and pressing Enter. The FAIL page displays the failure number and lists the DRI platforms and status of various parameters at the time of failure. See Figure 5-27. Items showing a RED number on the right are items that have logged a failure. Highlight the item and press Enter to proceed to the next lower level of FAIL page and repeat until the lowest level of FAIL page is displayed, to troubleshoot the failure. Since a given failure may cause a number of items to fail, it may be necessary to logically eliminate the items that failed due to the original failure.

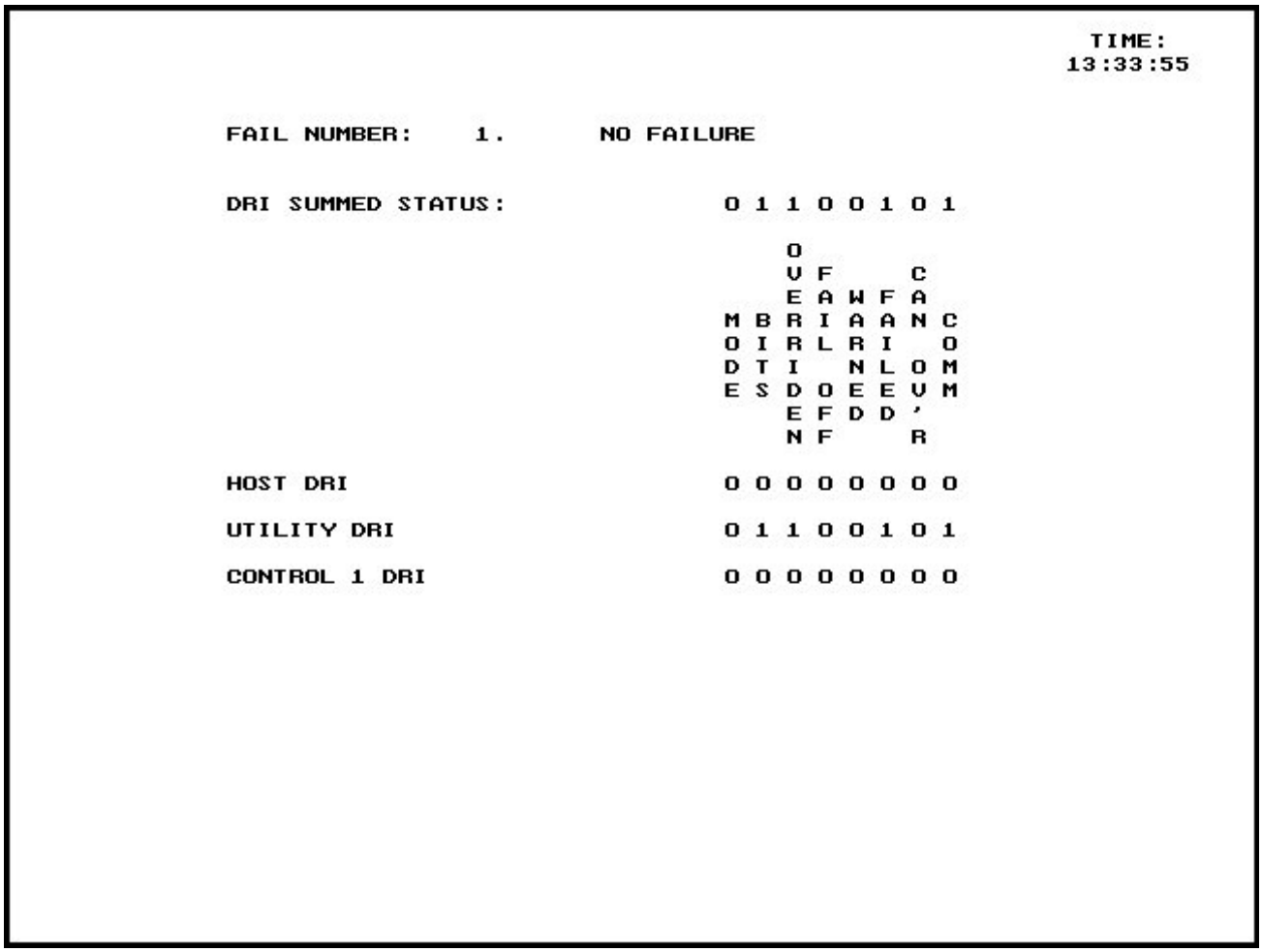


Figure 5-27. FAIL Page

5.6.6.2.7.2. Platform FAIL Page

A typical Platform FAIL page is shown in Figure 5-28. It displays the status of the various subsystems on the platform at the time the failure occurred. Any items showing a RED number on the right are the items that have logged a failure. Highlight the item and press Enter to proceed to the next lower level of FAIL page and repeat until the lowest level of FAIL page is displayed to troubleshoot the failure.

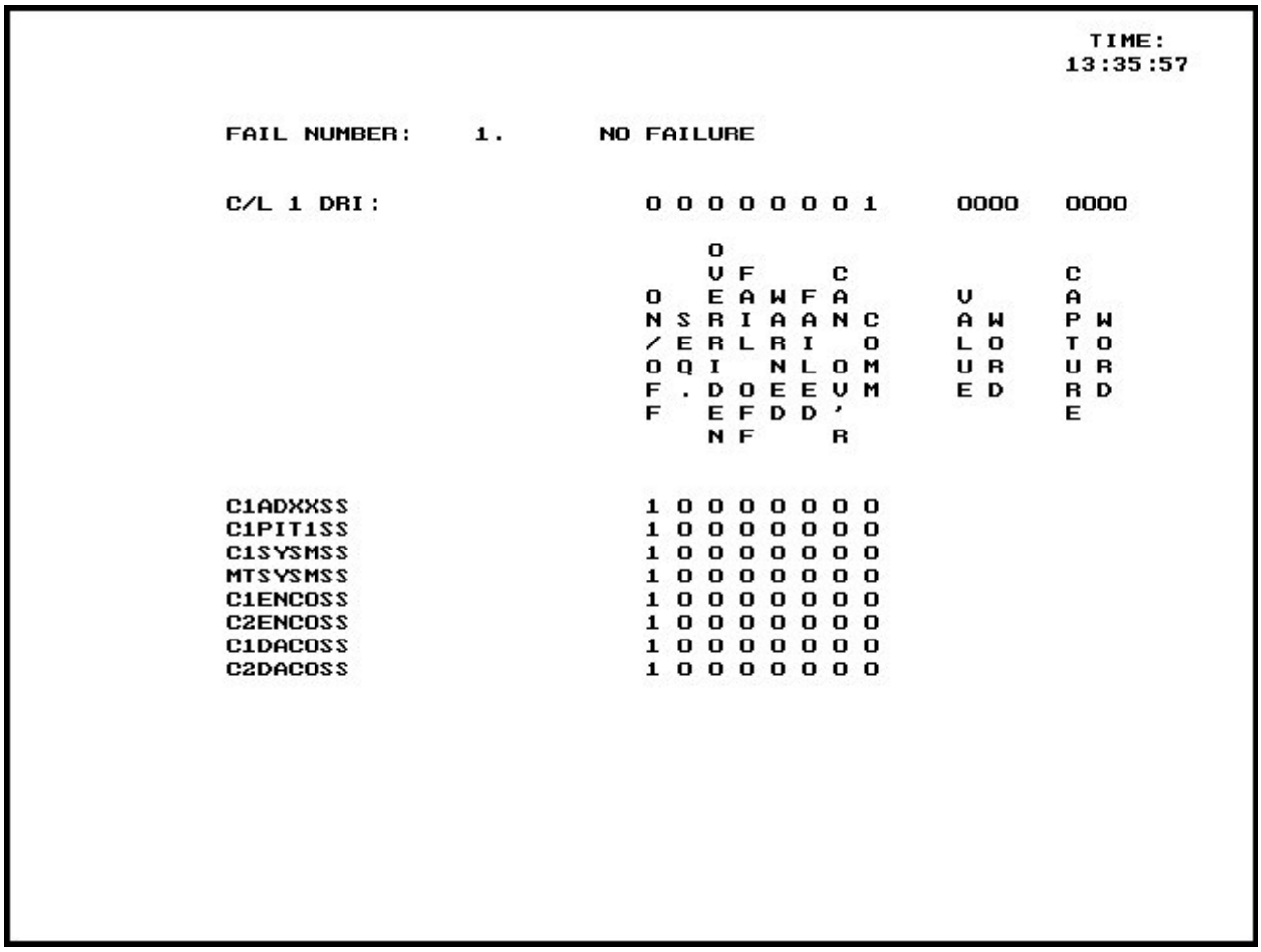


Figure 5-28. Typical Platform FAIL Page

5.6.6.2.7.3. Platform Subsystem FAIL Page

A typical Platform Subsystem FAIL page is shown in Figure 5-29. It displays the status of the various platform subsystem parameters at the time the failure occurred. Any item showing a RED number to the right is an item that has logged a failure. To troubleshoot the failure, highlight the item and press Enter to proceed to the next lower level of FAIL page and repeat until the lowest level of FAIL page is displayed.

```
                                                          TIME:
                                                        13:36:53

FAIL NUMBER:    1.      NO FAILURE

C/L 1 POWER STATUS:        1 0 0 0 0 0 0 0     0000    0000

                               O
                               V F       C                 C
                           O   E A W F A         V         A
                           N S R I A A N C       A W       P W
                           / E R L R I   O       L O       T O
                           O Q I   N L O M       U R       U R
                           F . D O E E V M       E D       R D
                           F   E F D D '                   E
                               N F       R

      C1AXBT               1 0 0 0 0 0 0 0     0000    0000
      C1AXP5               1 0 0 0 0 0 0 0     0000    0000
      C1AXPT               1 0 0 0 0 0 0 0     0000    0000
      C1AXMT               1 0 0 0 0 0 0 0     0000    0000
      C1AXPF               1 0 0 0 0 0 0 0     0000    0000
      C1AXMF               1 0 0 0 0 0 0 0     0000    0000
      C1AX24               1 0 0 0 0 0 0 0     0000    0000
      C1AXAB               1 0 0 0 0 0 0 0     0000    0000
```

Figure 5-29. Typical Platform Subsystem FAIL Page

5.6.6.2.8. Debug Valve Drive Page

The control loading Debug Valve Drive page is used to monitor and test the valve drive signals. This page is used to test all of the control loading drive signals for the platforms installed on the simulator. Only drive signals for the platforms on the simulator will be displayed. The options on the left are selectable and the Commanded Valve Drive can be input in hexadecimal format. The items on the right are hex display only. See Figure 5-30. The following paragraphs describe the various features of this page.

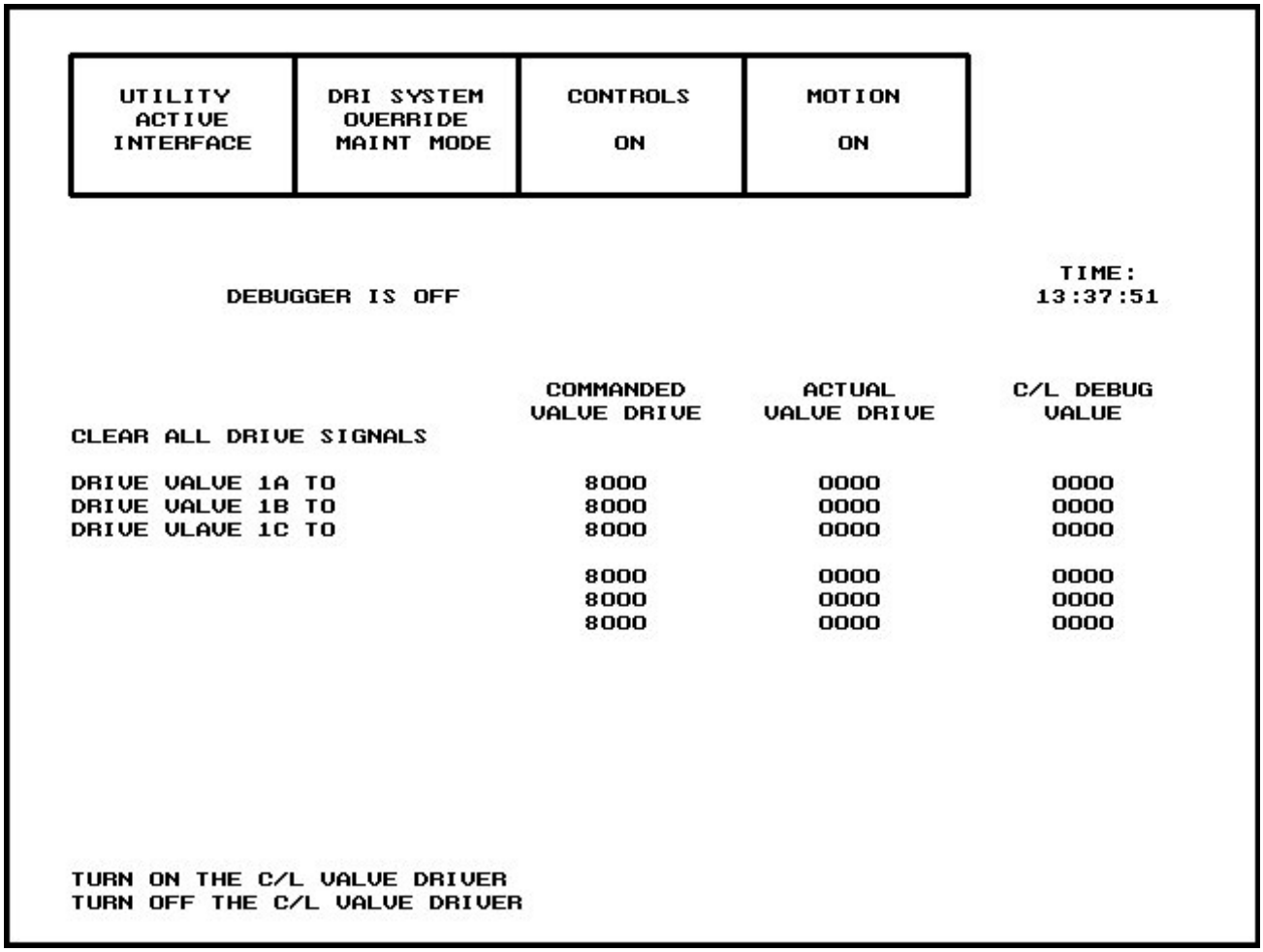


Figure 5-30. Debug Valve Drive Page

WARNING

ENSURE ALL PERSONNEL ARE CLEAR OF THE CONTROLS PRIOR TO ENERGIZING THE CONTROL LOADING SYSTEM.

5.6.6.2.8.1. Clear All Drive Signals

This option clears all drive signals previously input and returns the actuators to the neutral position.

5.6.6.2.8.2. Drive Valve X to YYYY

This option allows the user to input a COMMANDED VALVE DRIVE value in hexadecimal format. If everything is working correctly, the Commanded Valve Drive, Actual Valve Drive and the C/L Debug Value signals will all be identical.

5.6.6.2.8.3. Turn ON the C/L Valve Driver

This option turns the control loading valve driver ON.

5.6.6.2.8.4. Turn OFF the C/L Valve Driver

This option turns the control loading valve driver OFF.

5.6.6.2.9. #1 C/L Debug Pages

The #1 Control Loading Debug page is used to access the Control Loading DRI Platform to test the actuators for channels 1A, 1B and 1C. See Figure 5-31. The options on the left are selectable and are used to input parameters for testing. The items on the right are display parameters only. The displayed values are in hexadecimal format and are in real-time, so as the control is exercised, the data will be constantly updated. The last four items listed on the page are used for initial setup and calibration only; they cannot be used without special calibration equipment.

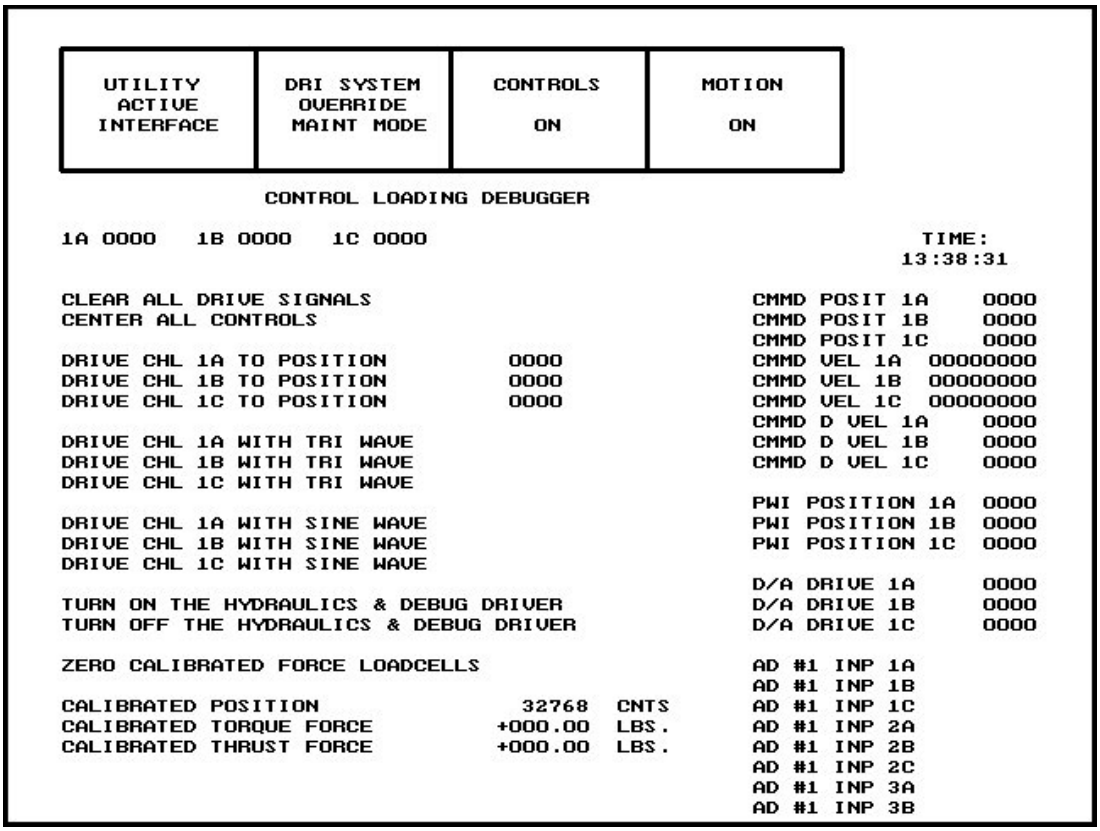


Figure 5-31. Control Loading #1 Debug Page

WARNING

ENSURE ALL PERSONNEL ARE CLEAR OF THE CONTROLS PRIOR TO ENERGIZING THE CONTROL LOADING SYSTEM.

CAUTION

DAMAGE TO THE CONTROLS AND SIMULATOR FRAME STRUCTURES CAN RESULT FROM FREQUENCY AND AMPLITUDE VALUES THAT ARE TOO HIGH. IF YOU ARE UNSURE OF THE CORRECT VALUES, START WITH LOWER VALUES AND INCREASE GRADUALLY UNTIL THE RESULT DESIRED IS REACHED.

5.6.6.2.9.1. Clear All Drive Signals

This option clears all drive signals previously input and returns the actuators to the neutral position. Refer to Figure 5-31.

5.6.6.2.9.2. Center All Controls

This option drives all control loading actuators to the neutral position (8,000 hex) and holds them at that position. Refer to Figure 5-31.

5.6.6.2.9.3. Drive Chl X to Position YYYY

This option drives the selected channel to the hexadecimal position entered. Refer to Figure 5-31.

5.6.6.2.9.4. Drive Chl X with Tri Wave

This option drives the selected channel with a triangular wave of the amplitude and frequency entered. Refer to Figure 5-31.

5.6.6.2.9.5. Drive Chl X with Sine Wave

This option drives the selected channel with a sine wave of the amplitude and frequency entered. Refer to Figure 5-31.

5.6.6.2.9.6. Turn ON the Hydraulics and Debug Driver

Though it states “Hydraulics”, this option for JPATS trainers turns the Servo Driver and the Debug driver ON. To activate this option, highlight it and press Enter. Refer to Figure 5-31.

5.6.6.2.9.7. Turn OFF the Hydraulics and Debug Driver

Though it states “Hydraulics”, this option for JPATS trainers turns the Servo Driver and the Debug driver OFF. To activate this option, highlight it and press Enter. Refer to Figure 5-31.

5.6.6.2.9.8. Zero Calibrated Force Loadcells

This option and the three below it are used for in-house initial setup and calibration only; they cannot be used without special calibration equipment. Refer to Figure 5-31.

5.6.6.2.10. DRI Memory Maps

The DRI Memory Maps are listed in Table 5-8. Only the most commonly used troubleshooting variables are listed in the table. The ones listed are the ones pertaining to hardware functions necessary for troubleshooting and plotting hardware functions. Not all listed variables will be functional on all simulators; only the ones applicable to the trainer hardware configuration installed will function.

Table 5-8. DRI Memory Map

Variable Name	Memory Address	Function
DCLCNT	E00090	Control loading counter
DCLSTAT	E00094	Control loading status
DCLERR	E00098	Control loading error
DCLCMD	E0009C	Control loading command
ACC_Z	E00124	Z-axis acceleration
VIS_X	E0012A	Visual red signal
IFORCEPR	E00204	Rudder tyco force
IFORCEPE	E0020C	Pilot elevator tyco force
IFORCEPA	E0020E	Pilot aileron tyco force
IPOSPE	E00218	Pilot elevator cylinder position
IPOSPA	E0021A	Pilot aileron cylinder position
IPOSPR	E0021C	Rudder cylinder position
IPOSLT	E00224	Left toe brake cylinder position
IFORCELT	E00226	Left toe brake force
IPOSRT	E00228	Right toe brake cylinder position
IFORCERT	E0022A	Right toe brake force
VOUTPE	E00230	Pilot elevator valve drive
VOUTPA	E00232	Pilot aileron vale drive
VOUTPR	E00234	Rudder valve drive
VOUTLT	E0023C	Left toe brake valve drive
VOUTRT	E0023A	Right toe brake valve drive
CALPOS	E00300	Calibrated position
CALFOR	E00302	Calibrated force
TESTAD1	E00304	Test A/D #1 input
TESTAD2	E00304	Test A/D #2 input
IVELPE	E00340	Pilot elevator cylinder velocity
IVELPA	E00342	Pilot aileron cylinder velocity
IVELPR	E00344	Rudder cylinder velocity

5.6.6.3. Control Loading Friction Test

The friction test is performed on the flight controls to determine if the mechanical linkages are creating excessive friction. The tools/test equipment required to perform this test are:

- Platform Test Cable (60001ACJ858-501)
- Laptop or Maintenance terminal with Platform Control Page Software loaded

WARNING

ENSURE ALL PERSONNEL ARE CLEAR OF THE FLIGHT CONTROLS PRIOR TO ENERGIZING THE CONTROL LOADING SYSTEM.

CAUTION

DAMAGE TO THE FLIGHT CONTROLS CAN RESULT FROM FREQUENCY AND AMPLITUDE VALUES THAT ARE SET TOO HIGH. IF YOU ARE UNSURE THAT THE VALUES YOU WANT TO USE ARE SAFE, START WITH LOWER VALUES AND INCREASE THEM GRADUALLY UNTIL THE DESIRED VALUES ARE REACHED.

NOTE

Ensure the actuators have reached normal operating temperatures prior to running this test.

If the computer is not already connected to a DRI Platform, perform steps 1 and 2. Otherwise begin with step 3.

1) Slide out the DRI platform assembly for the flight control on which the friction test is to be run. Either Platform can be used.

2) Connect the platform test cable (P/N-60001ACJ858-501) to J13 (Port A) on the DRI platform and to COMM PORT 1 on the computer. See Figure 5-32.

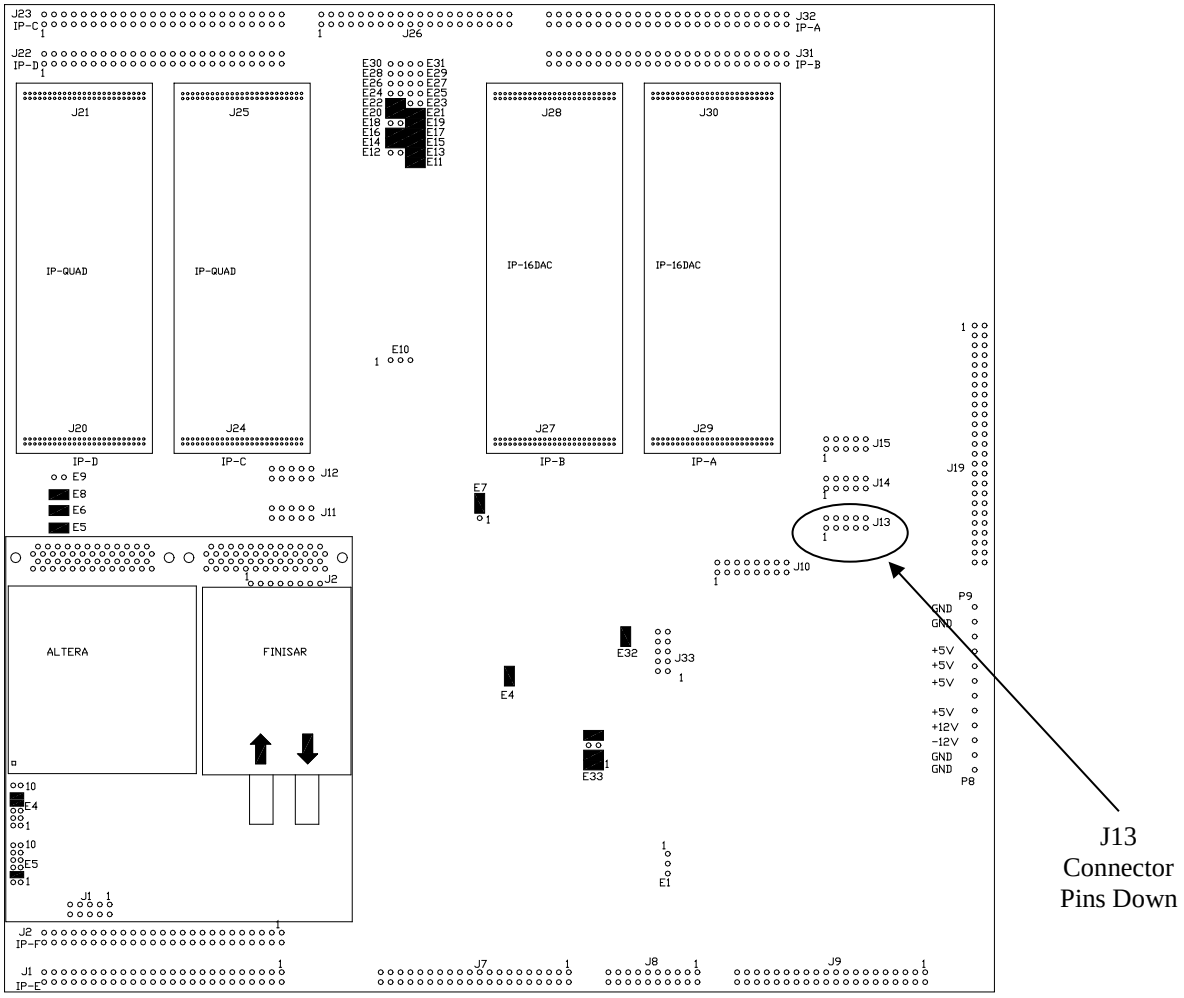


Figure 5-32. Friction Test - DRI Platform J13 Location

3) If the system is running Windows, get to the Command Prompt or reboot into DOS mode. On Windows 2000 operating systems you can get the Command Prompt by selecting Start, then Run, then type in CMD in the dialog box and select OK.

4) At the DOS prompt, type in the following.

>cd c:\work <ret>

>path c:\work <ret>

>start <ret> (This sets up the Comm port.)

>hcsjpat <ret>

The Platform Control Page GUI should start and display the START page momentarily then the DRI SYSTEM page should appear. See Figure 5-33.

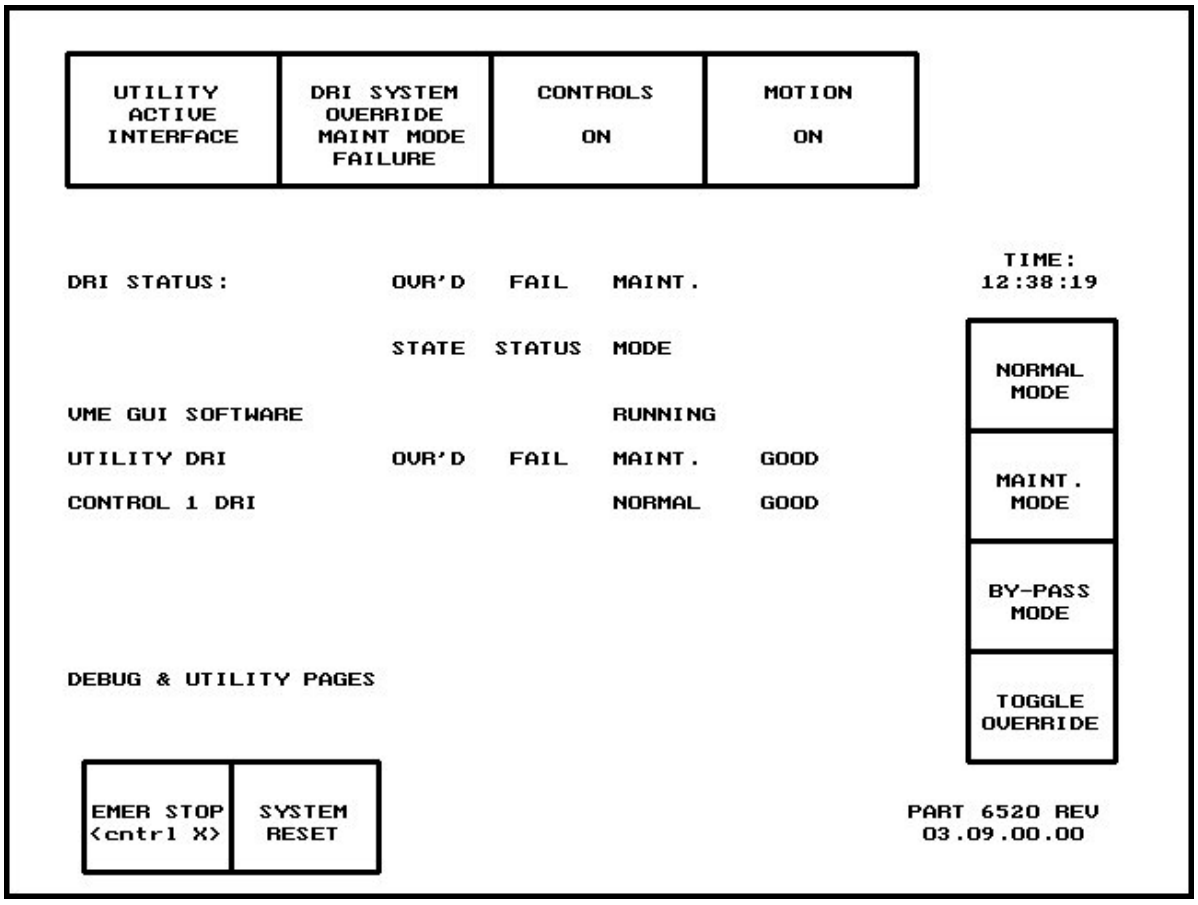


Figure 5-33. Friction Test - DRI System Page

5) Press the SYSTEM RESET switch to reset the system.

6) Turn Control Loading ON in the normal manner by either selecting the CONT LDG ARM switch on the IOS panel, or by selecting the Control System on the Controls page and enter. During the control loading ON cycle the control loading system goes through a calibration cycle, monitor the PWI Position 1A line on the CL-1 page and note the hex value when the elevator goes to mechanical center. It will only display for a few seconds before moving to control neutral. Record this value for later use when the elevator needs to be set to mechanical center.

7) After the control loading has completed its calibration cycle and is fully operational, check the controls to make sure they move freely and none of them are locked up or in a position other that neutral.

8) On the DRI SYSTEM page, select DEBUG & UTILITY PAGES. The DEBUG & UTILITY MANAGER page should display. See Figure 5-34.

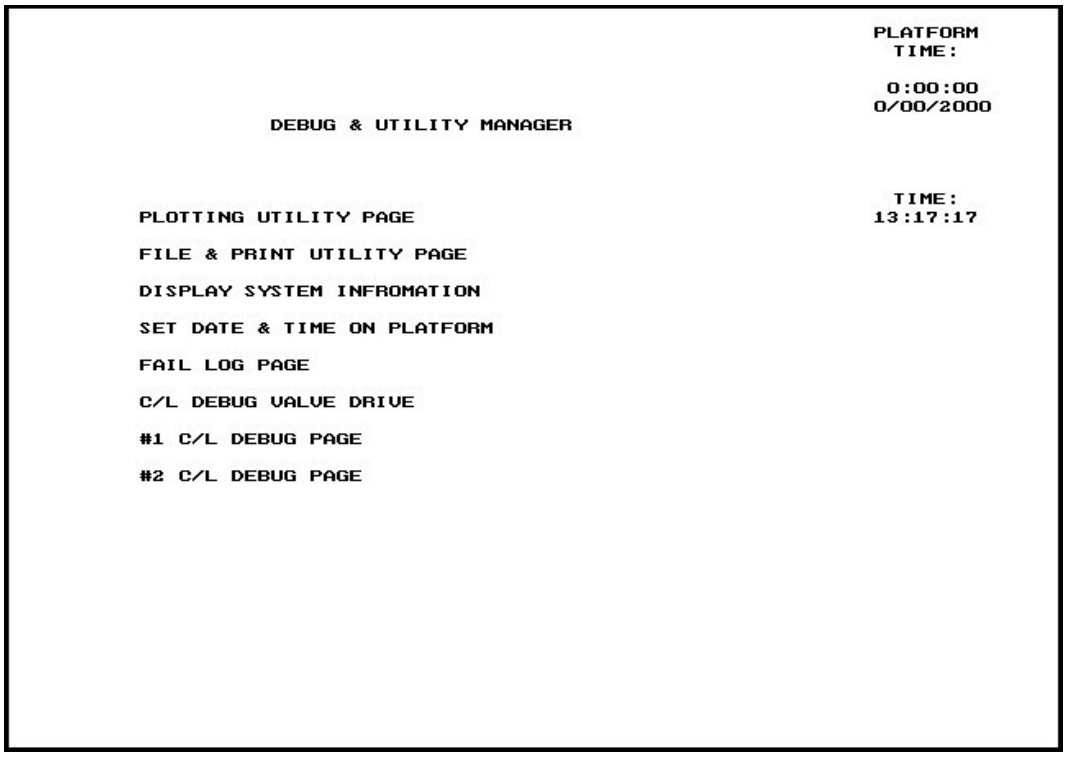
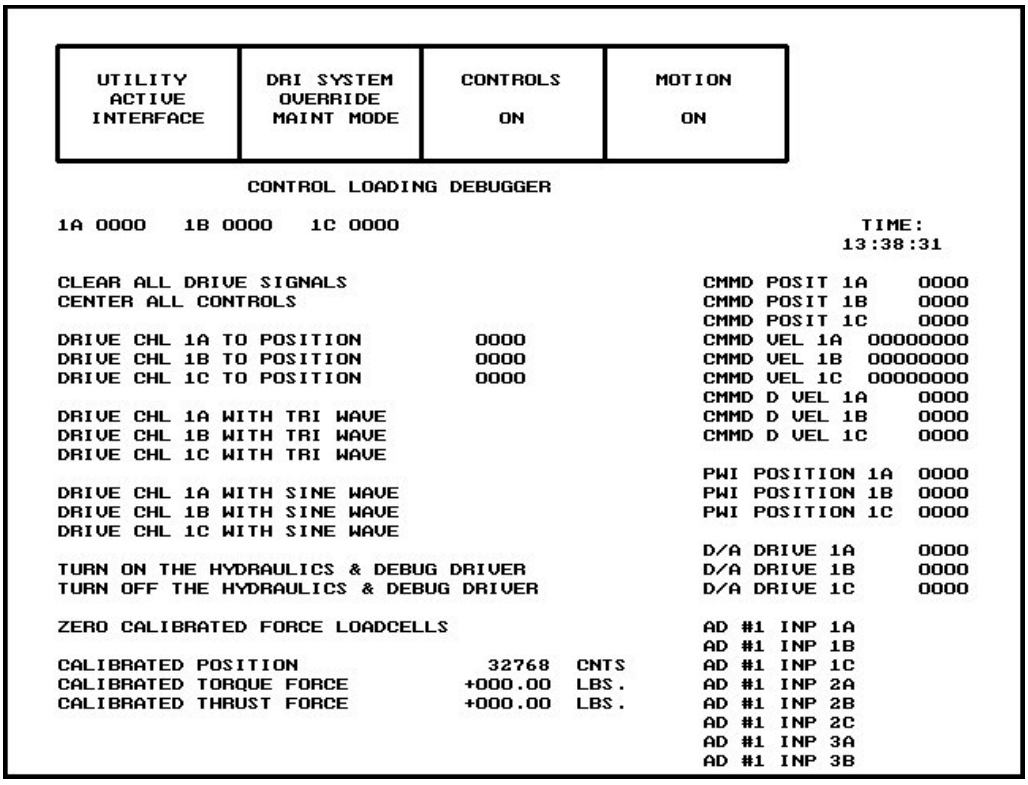


Figure 5-34. Friction Test - Debug & Utility Manager

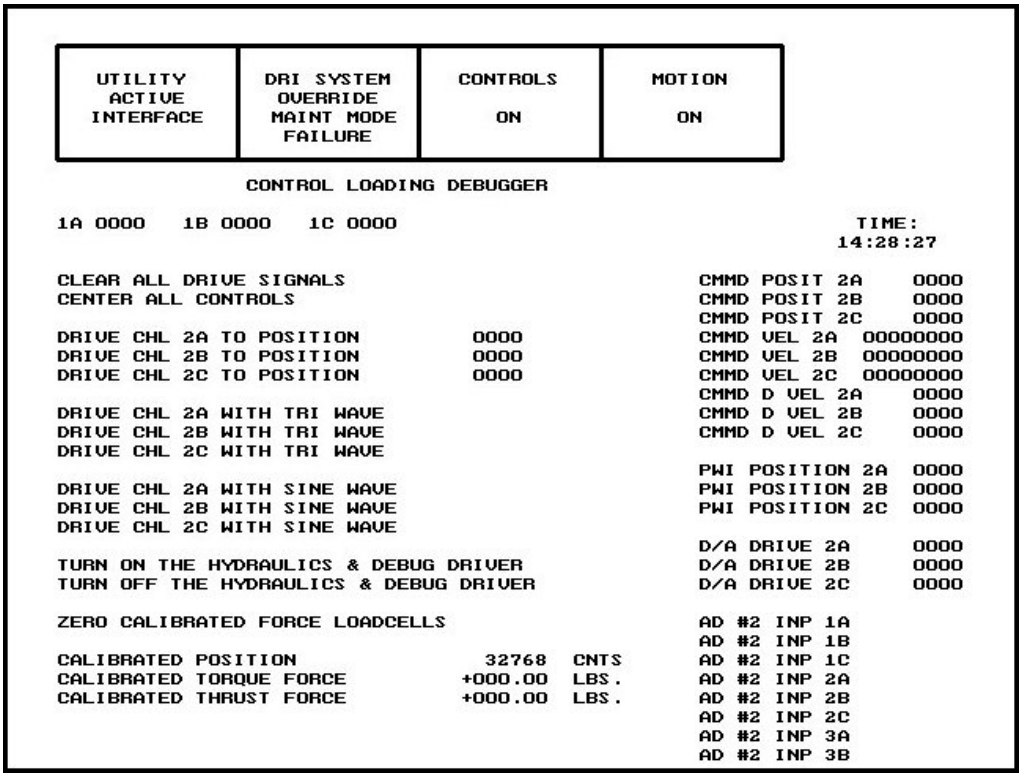
8) From the DEBUG & UTILITY MANAGER page, select the correct Control Loading Debug page for the control you are testing. See Figure 5-35.

   #1 C/L Debug Page – Elevator, Aileron, Rudder

   #2 C/L Debug Page – Left Toe Brake, Right Toe Brake, Dynamic Seat



CLS-1 Debug Page



CLS-2 Debug page

Figure 5-35. Friction Test - CLS Debug Pages

9) Select CENTER ALL CONTROLS. The control actuators will be driven to mid stroke (approximately 8,000 hex). Check control to verify that they are at mechanical center.

NOTE

The Elevator is at mechanical center when it is slightly aft of the upright position. It is at control neutral when it is forward of the upright position.

10) If the elevator is not at mechanical center, you can drive it to center by selecting the DRIVE CHL 1A TO POSITION line and entering the value you recorded in Step 5.

11) From the appropriate Control Loading Debug page, select DRIVE CHL XX WITH SINE WAVE (XX represents the channel of the control to be tested). Enter the desired amplitude and frequency to drive the control. Amplitude of 3,500 hex with a frequency of .05 should be adequate. This starts the test.

NOTE

The Amplitude should be such that when the test is implemented, the control being tested travels so that the actuator touches both mechanical stops. If it hits one stop and not the other, you did not start at the correct mechanical center of the actuator and you will need to Center All Controls again and start over. If the actuator is not touching both stops, increase the amplitude by 500 hex until it does. If it hits the stops too hard or remains in the stop for more than 3 to 4 seconds, decrease the amplitude in 50-hex increments until it is just hitting the stop without staying longer than 3 to 4 seconds.

12) Once the test has begun, select the <BACKSPACE> key to display the DEBUG & UTILITY MANAGER page. From this page, select the PLOTTING UTILITY PAGE. The Plotting Utility page should display. See Figure 5-36.

13) On the Plotting Utility page, select CLEAR ALL DATA.

14) From the Plotting Utility page, select ADD VARIABLE. Using the DRI Memory map, find and enter the desired flight control cylinder position address first and the actuator force address second (i.e., E0020C and E00218). Refer to Table 5-8 for memory map addresses. The memory map lists the description and address of each control’s force and position variable.

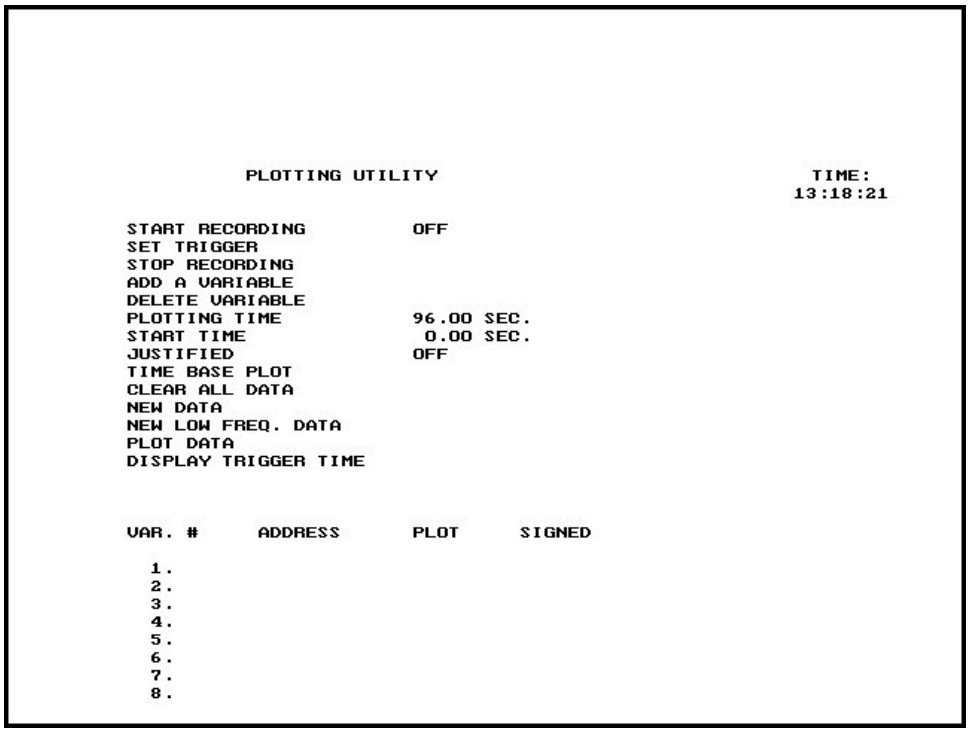


Figure 5-36. Friction Test - Plotting Utility

15) Once the force and cylinder position variables have been entered, highlight each and press <ENTER> to toggle it ON.

16) Set the PLOTTING TIME to 96 seconds and the START TIME to zero (0). Refer to paragraph 5.6.6.2.2.6.

17) Select START RECORDING from the Plotting Utility page. Allow it to record at least two full cycles of cylinder travel.

18) From the Plotting Utility page, select NEW DATA and <ENTER> to record the data to the plot. The time-based plot will appear on the screen when recording is complete. Select a time slice that encompasses a full cycle of cylinder travel. Use the following procedure.

    Press 1 to display the left line. This selects the beginning of the time slice.

    Move the line until it is positioned at the desired beginning point. Press HOME to move the line in large increments and PGUP to move the line is small increments.

    Press 2 to display the right line. This selects the end of the time slice.

    Move the line until it reaches the desired end of time slice position. Press END to move the line in large increments and the PGDN to move the line in small increments.

    Press Enter when finished with time slice selection.

19) Press the <BACKSPACE> key to return to the Plotting Utility page. Select X-Y PLOT to display the X-Y plot of the cylinder. If X-Y Plot does not display on the menu list, select TIME BASED PLOT. Once it is highlighted, it will change the menu selection to X-Y PLOT.

20) Select the cylinder Position variable as the X-axis and <ENTER>.

21) Select PLOT DATA and <ENTER>. The Plot will display on the screen.

5.6.6.3.1. Saving the Plot to a file

Once the desired plot is obtained, it should be saved to a file for future reference.

1) Press the <BACKSPACE> key until the Debug and Utility Manager page is displayed.
2) Select FILE & PRINT UTILITY PAGE. The Plotting Utility page should display.
3) From the Plotting Utility page, select SAVE THE PLOT TO A FILE. Enter the name that you want to name the file (example 6520Elev).

NOTE

The file name must be eight characters. The file will be placed in a subdirectory named whatever the first four characters of your file name are (6520 in the example above).

4) From the Plotting Utility page, select CREATE A FRICTION PRINTER FILE.

   Enter the name that you want to name the printer file (example 6520Elev).

   From here on out follow the screen prompts as shown below.

   Enter the Header you want to have printed on the Plot.

   Enter variable (1).

   Enter variable (2).

   Enter the scale factor. See Table 5-9.

   Enter the force scale. See Table 5-9.

   Enter units of force.

   Inches = Aileron, Elevator, and Rudder

   Degrees = Toe Brakes

   Press Enter to save the plot information.

   To view the plot, select DISPLAY A PRINTER FILE from the Plotting Utility page and enter the name of the plot.

Table 5-9. Friction Test Scale Factors

Signal Name	Memory Address	Scale Factor	Value
Aileron Position	E0021A	1.1573E-3	
Aileron Force	E0020E	3.7668E-3	12 lbs/volt
Elevator Position	E00218	+1.2882E-3	
Elevator Force	E0020C	+3.9710E-3	13 lbs/volt
Rudder Position	E0021C	-1.6764E-3	
Rudder Force	E00204	-8.1051E-3	26.5 lbs/volt
Left Toe Brake Position	E00224	+1.3732E-3	
Left Toe Brake Force	E00226	1.0323E-2	33.8 lbs/volt
Right Toe Brake Position	E00228	+1.3790E-3	
Right Toe Brake Force	E0022A	+1.0158W-2	33.2 lbs/volt

5.6.6.3.2. Stopping the Test

The Control Loading Friction Test can be stopped at any point after the plot is obtained.

1) Press the <BACKSPACE> key until the Debug and Utility Manager page is displayed.
2) From this page select the correct Control Loading Debug page for the actuator on which the test is being run.
3) From the Control Loading Debug page, select CLEAR ALL DRIVE SIGNALS.

NOTE

At this point, the Control Loading Friction Test has been stopped and the signal cleared. If no further testing is required, the Control Loading system can be turned off using the following step.

4) Select CENTER ALL CONTROLS.
5) Turn the control loading OFF.
6) Turn the control loading back ON and check the controls for freedom of movement and proper centering.

5.6.6.3.3. Analyzing the Plot

No tried and true method for analyzing a control loading friction test plot exists. It is, for the most part, accomplished by experience and knowledge of what to look for. The site should keep a set of the original friction test plots for comparison of freshly run plots. If the freshly run plots have large

spikes or the two bands are significantly farther apart than the originals, excessive friction may be present in the control linkage.

5.6.7. Electric Control Loading System (DRI and DAS systems unless otherwise noted)

Procedures regarding DAS II are in the DAS II supplement.

5.6.7.1. GSnet Board Operation Verification

The GSnet board can be checked for proper operation by performing the procedure below. The following test equipment is needed to perform the procedure.

- Fiber Optic test cable P/N SRA016-E0E00-05F.
- Chemtronics Optic Prep pre-saturated wipe CP410.

1) Remove the Fiber Optic cables from the GSnet board to be tested. See Figure 5-37 for the location.
2) Connect the test cable to the Transmit and Receive ports.
3) If not already installed, install shunts at the E4-10 and E5-10 locations.
4) If the GSnet board is performing properly, the LEDs on the board should illuminate in accordance with the following.

- LED 1 – System OK – Blinks green at 1Hz if optical transceiver is OK.
- LED 2 – Light Present – Illuminates green if light is being received by the optical transceiver.
- LED 3 – Received Good Message – Flashes green if a Good Message is received. Flashes red if a Bad Message is received.
- LED 4 – Flashes red and green. Green is message sent and received. Red is node online.

5) After this test is complete, remove the shunts and restore the GSnet to its original configuration. Remove the test cable. Prior to reinstalling the Fiber Optic cables, clean the cable ends with Chemtronics “Optic Prep” pre-saturated wipe CP410.

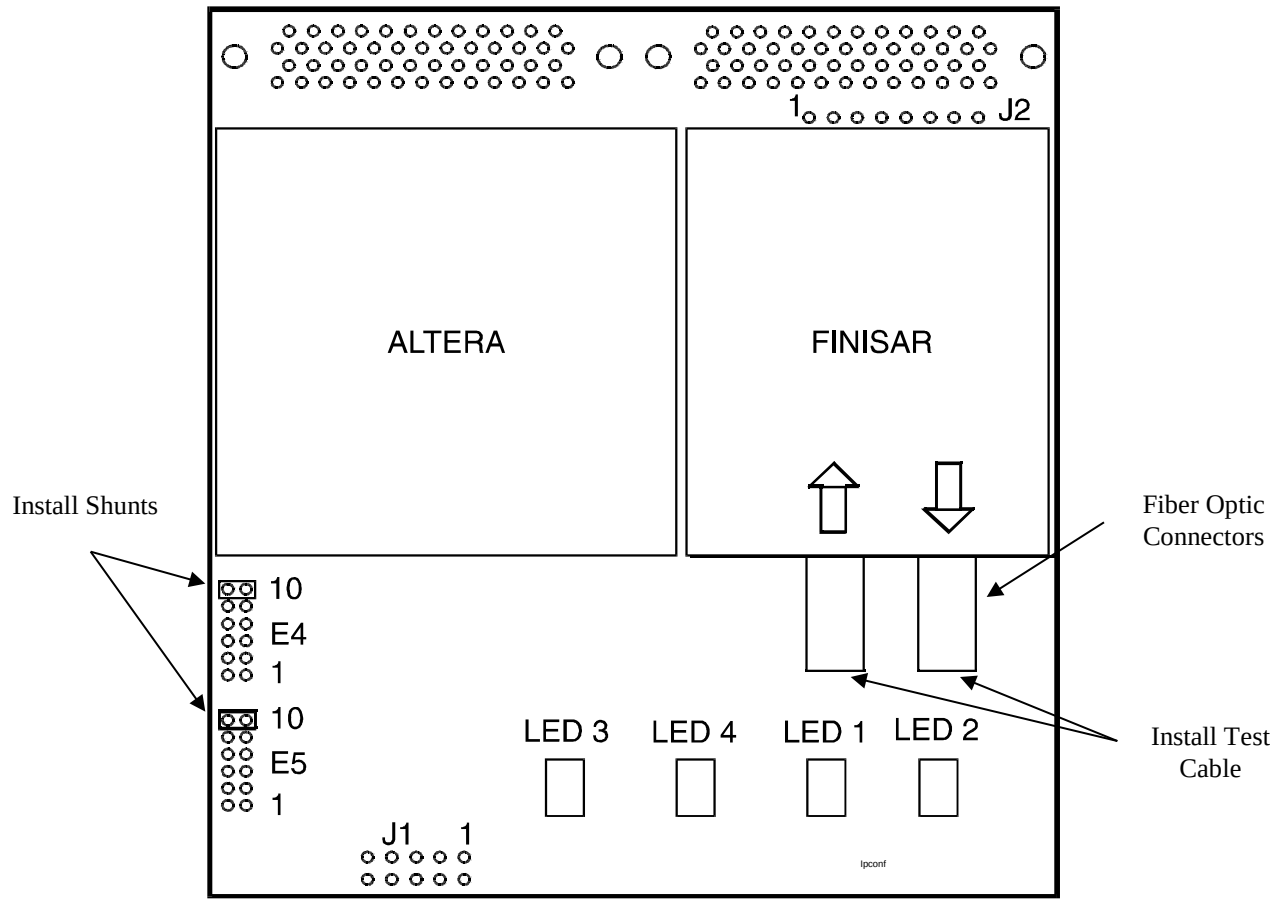


Figure 5-37. Gsnet Board Operation Verification

5.6.7.2. Fuse and Circuit Breaker Chart (DRI)

Table 5-10 lists the Fuses and Circuit Breakers for the Utility and CLS-1 DRI Platform Systems. The AC power to the DRI Platforms is located in the AC Power Controller (9A1A1).

Table 5-10. Fuse and Circuit Breaker Chart – Control Loading System

Function	Fuse/CB Location	Current Rating
AC Power Supply Input	Power Control System	15 Amp
UTIL-1 +24VDC Abort Power	7A2F1	5 Amp
UTIL-1 +24VDC System Power	7A2F2	5 Amp
CLS-1 +24VDC Abort Power	7A2F3	5 Amp
CLS-1 +24VDC System Power	7A2F4	5 Amp

5.6.7.3. Electric Actuator

This section provides you with guidelines and hints on troubleshooting various problems that may be encountered during installation and operation of the electric actuator. See Table 5-11.

Table 5-11. Electric Actuator Troubleshooting Chart

SYMPTOM / TROUBLE	POSSIBLE CAUSE / PROCEDURE
No response from actuator.	Check amplifier for faults that may indicate problem. Check to insure that amplifier is enabled. Check for proper wiring.
Actuator seems to be enabled (receiving current) but is not operating or is operating erratically.	Amplifier may be improperly tuned. Check all gain settings. Amplifier may be set up improperly for the particular motor being used. Check amplifier settings for number of poles, voltage, current, resistance, inductance, and inertia. Feedback wiring may be incorrect. Feedback conductors touching; or feedback cable may be damaged. Motor phases are wired incorrectly or in incorrect order. (R,S,T) Feedback (resolver or encoder) is improperly aligned. Contact EXLAR.
Actuator cannot move load.	Load is too large for the capacity of the actuator or too much friction is present. Excessive side load. Misalignment of output rod to load. Amplifier has too low of current capacity or is limited to too low of current capacity.
Actuator housing moves or vibrates when shaft is in motion.	Check actuator mounting. Insure that the actuator is securely mounted. Amplifier is improperly tuned (wrong gain settings). Tune amplifier.
Output rod rotates during motion and thus does not provide proper linear motion.	Tighten anti-rotation assembly clamp.
Brake does not hold load in place.	Load is larger than the capacity of the brake. • Check load level against actuator rating. • Oil lubricated units reduce holding capacity of the brake. Brake is not engaged. (Power is not removed from brake.) Brake is being used as other than a power loss holding brake.
Actuator is overheating.	Insufficient cooling for application requirements. See oil cooling section of Inspection Manual or EXLAR catalog or contact EXLAR engineering. Actuator is being operated outside of continuous ratings. Amplifier is poorly tuned causing excessive unnecessary current to be applied to motor. Check gain settings.

5.6.8. APS Sound System

This section provides the technician with the available troubleshooting aids for diagnosing problems with the APS Sound System. Troubleshooting the APS Sound System is based on the operational degradation the failure has caused. The sounds that are not working or responding are the first indication that a failure has occurred. Once a failure has occurred, the guidelines below must be followed to locate the faulty assembly/component.

1) Identify all sound functions that are not working.
2) Identify the commonality between the functions that are not working.
3) Using either a bus analyzer or an oscilloscope, verify if the applicable serial data buses are transferring data.

5.6.8.1. Beep Codes

Whenever a recoverable error occurs during the power-on self-test (POST) of the Sound Computer, the BIOS emits a beep code. One long tone followed by two short tones during POST will sound if the video configuration fails (a faulty video controller) or if an expansion card is not functioning correctly. One short beep indicates the BIOS will boot the operating system; no error was found.

The full list of beep codes can be found in the Beep Code table in the vendor documentation.

A PCI expansion card (for example, a RAID controller) can also issue audible errors by itself, usually consisting of one long tone followed by a series of short tones. For more information on the beep codes issued, check the vendor documentation for the RAID controller.

5.6.9. Student Station

5.6.9.1. Seat

The Seat Controller for raising and lowering the seat has the following troubleshooting charts. See Table 5-12, Table 5-13, and Table 5-14.

Table 5-12. Seat Actuator Will Not Extend or Retract

Checkpoint	Probable Cause	Possible Solution
Power Indicator OFF	Emergency Switch OFF No AC Power to Control	Turn switch ON Check power supply
No Output Voltage (When extended or retract switch is actuated.)	Fuses Blown Transformer Thermal Overload Tripped Open Limit Switch Dead Unit	Check fuses Allow to cool Check wiring Replace unit

Table 5-13. Seat Actuator Continues to Run

Checkpoint	Probable Cause	Possible Solution
Seat Adjustment Switch in down position continues to run actuator at full retraction.	Retract Limit Switch Defective Limit Switch	Adjust Limit Switch to activate when reaching lower limit. Replace Limit Switch
Seat Adjustment Switch in upper position continues to run actuator at full extension.	Extend Limit Switch Defective Limit Switch	Adjust Limit Switch to activate when reaching upper limit. Replace Limit Switch

Table 5-14. Seat Calibrates but Does Not Respond to Aircraft Movements

Checkpoint	Probable Cause	Possible Solution
Dynamic Seat Light flashing	Seat belt not connected Blown fuse F34 in 9A1A2 Defective Proximity Switch (Drawing # ACJ412, sheet 9)	Connect seat belt Replace fuse Check Proximity Switch for correct operation at connector JA9 in 9A1A2 Cabinet. Ground terminal 1 on relay K25, if relay transfers, switch is bad.

5.6.10. Fire Detection System

Table 5-15 may be used as an aid in troubleshooting the components of the Fire Detection System which are the responsibility of site personnel. The components include onboard and off-board smoke and temperature sensors and the Master Control panel indicator lights. Due to liability reasons, it is not recommended that maintenance personnel troubleshoot the fire protection system other than replacing fuses or known faulty smoke detectors or temperature sensors. All other component problems should be handled by a qualified outside contractor.

Table 5-15. Fire Detection Troubleshooting Chart

Number	Problem	Action
1	One or more circuit trouble lights on the Fire Alarm Control Unit illuminate without an alarm condition.	The Fire Alarm Control Unit contains LEDs that indicate trouble in the following circuits. Battery circuit Power supply circuit System ground fault (+ or -) Alarm signaling circuit Actuating circuit Signal circuit Zone detection circuits See Figure 5-37 and Figure 5-38 with the appropriate engineering drawings. Check fuses in Fire Alarm Control Unit. Check output voltage from Fire Alarm Control Unit. If no voltage from unit, call qualified contractor. If voltage is present from Fire Alarm Control Unit, check line continuity between unit and components. If line continuity is OK, check voltage between components. If resistance across wires when disconnected is approximately 3.9k Ohm, check for defective termination resistor on last unit in zone chain. If faulty component is a smoke detector or temperature sensor, remove and replace per instructions in paragraph 5.7.7 of this manual. If the faulty component is any other component, call a qualified outside contractor.

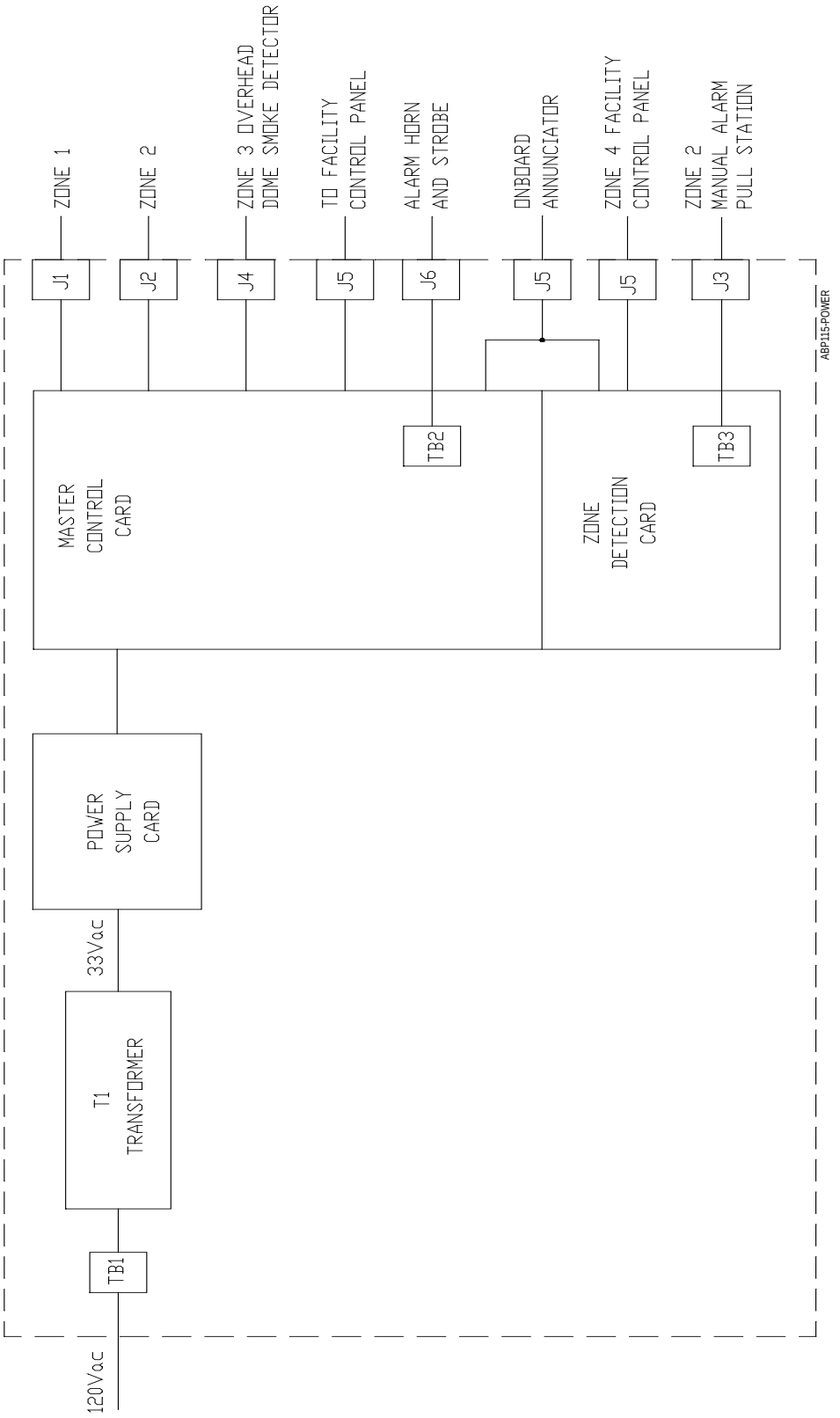


Figure 5-38. Fire Detection Distribution

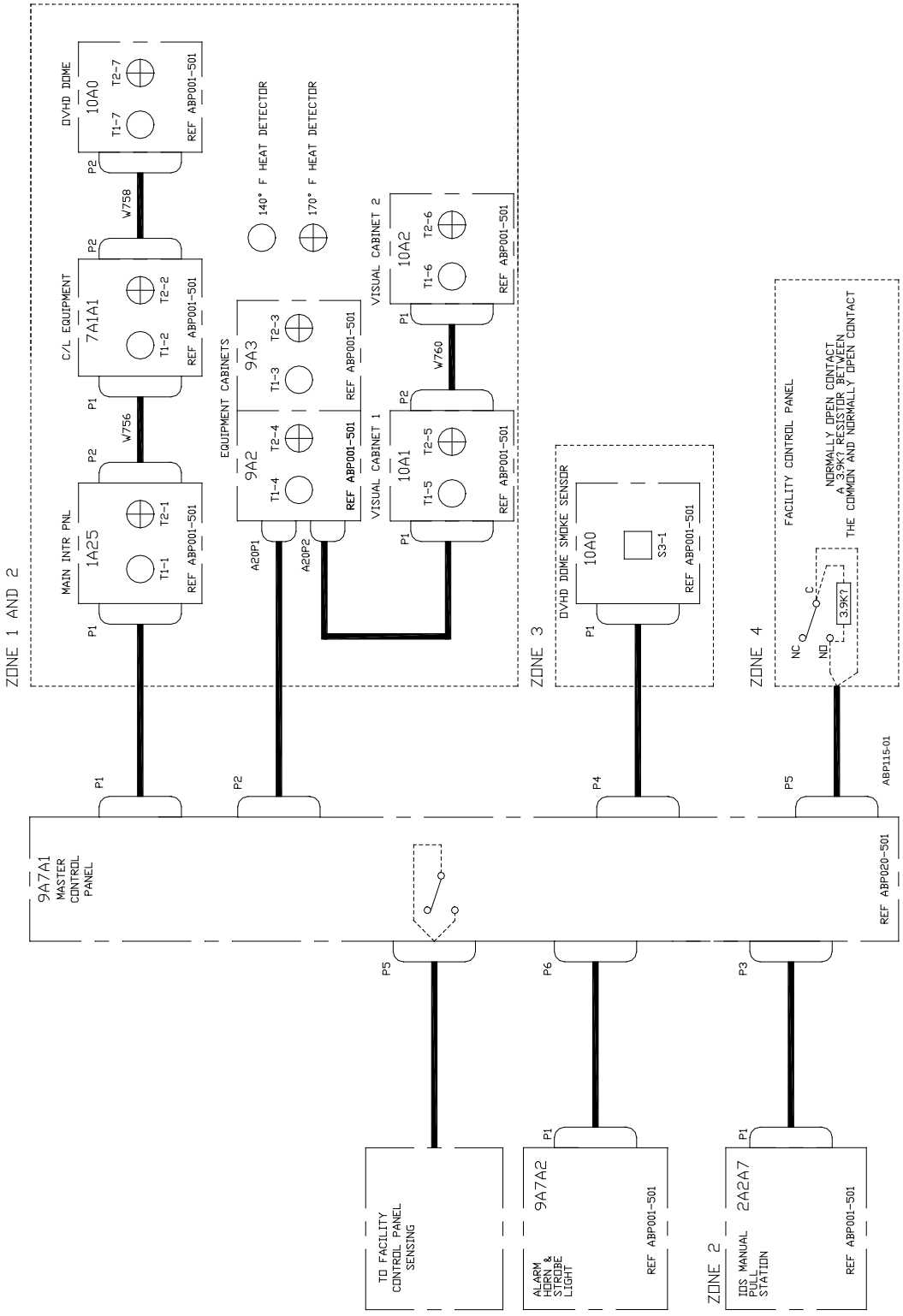


Figure 5-39. OFT Fire Detection Block Diagram

5.6.11. Fans

The following Table 5-16 may be used as an aid in troubleshooting the Fans.

Table 5-16. Fans Troubleshooting Chart

NUMBER	PROBLEM	ACTION
1	No airflow from any of the equipment cabinet fans.	Check circuit breaker of the AC Power Controller Assembly. See Figure 5-40 and Table 5-17. If circuit breaker is OK, check power output from the AC Power Controller Assembly per Section 4.
2	No airflow from one equipment cabinet fan.	Check input power to fan. If input power OK, replace fan. If no power, check circuit breaker of the AC Power Controller Assembly. See Figure 5-40 and Table 5-17. If circuit breaker is OK, check power output from the AC Power Controller Assembly per Section 4.
3	No airflow from the student station fans.	Check input power to fan. If input power OK, replace fan. If no power available, check circuit integrity. See Figure 5-40 and Table 5-17.
4	No airflow from one student station fan.	Check input power to fan. If input power OK, replace fan. If no power available, check circuit integrity. See Figure 5-40 and Table 5-17.
5	No airflow from any of the top cap or visual structural fans.	Check circuit breaker of the AC Power Controller Assembly. See Figure 5-40 and Table 5-17. If circuit breaker is OK, check power output from the AC Power Controller Assembly per Section 4.
6	No airflow from one of the top cap or visual structural fans.	Check input power to fan. If input power OK, replace fan. If no power, check circuit breaker of the AC Power Controller Assembly. See Figure 5-40 and Table 5-17. If circuit breaker is OK, check power output from the AC Power Controller Assembly per Section 4.

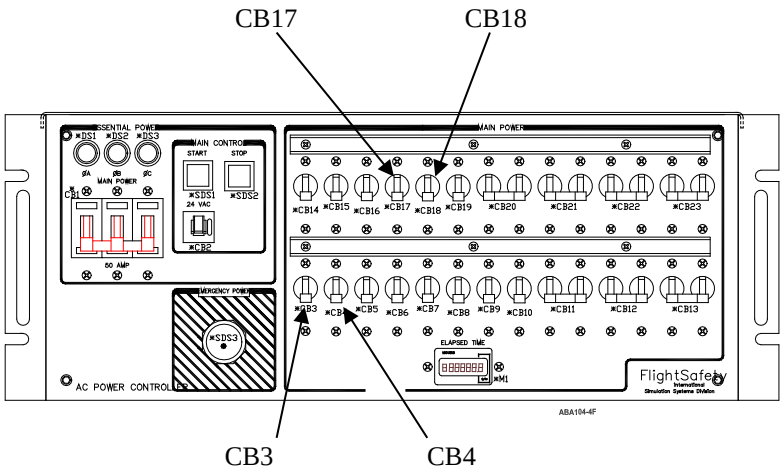


Figure 5-40. AC Power Controller Assembly – Fans Circuit Breakers

Table 5-17. Fan Circuit Breakers

CIRCUIT BREAKER	FAN(S)
CB03	Equipment Cabinet 9A2B1
CB05	Equipment Cabinet 9A3B1
CB16	Student Station DRI Equipment 6A2
CB18	Student Station DRI Equipment 6A2 Student Station Main Instrument Panel
CB17 OFT	OFT Top Cap Structure Four Fans B1, B2, B3, and B4
CB17 IFT	IFT Visual Structure Three Fans B1, B2, and B3

5.6.12. FTD Toe Brake Test Procedure

Described here is a procedure for testing the toe-brake system of the JPATS GBTS ATD FTD.

Assumption of this procedure is that the person performing the test is trained to maintain the OFT, IFT, and UTD variation of the FTDs. A good understanding of the sub-systems within the particular FTD is required.

5.6.12.1. Toe Brake System Overview

Each toe-brake is provided with its own electro-mechanical servo, ultimately designated left-brake (L-Brake) and right-brake (R-Brake).

Figure 5-41is a simplified block diagram of the system, showing a single brake.

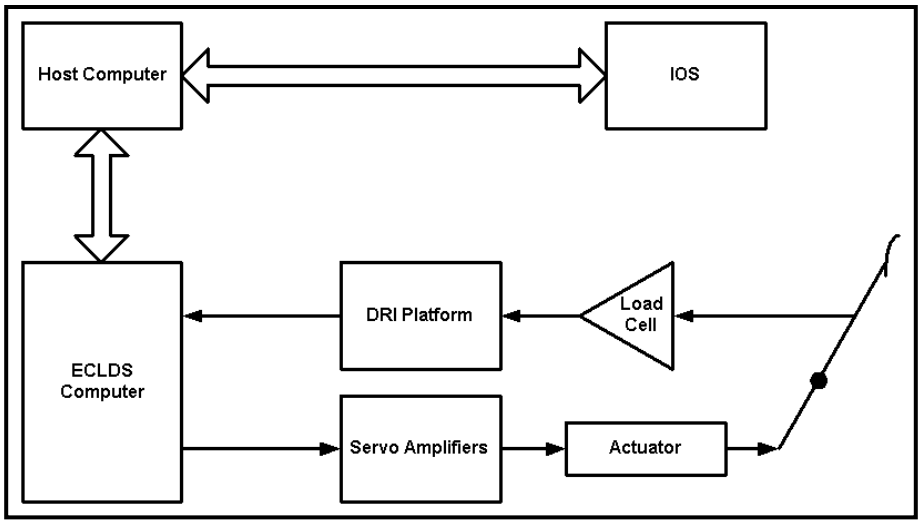


Figure 5-41. Block Diagram of Toe Brake System

In the brake system it is the load-cell that is controlling operation of the servo loop.

Pressure applied to the brake pedal produces an output from the load-cell that passes through the DRI platform to the servo model in the ECLDS computer.

Transfer function of the brake servo model software controls the characteristic feel of the system, driving the actuator to move the rudder pedal an amount appropriate to the force applied.

Rudder pedal position and force applied is transferred from the ECLDS computer to the Ground Handling software model, resident in the Host computer, where brake effectiveness is calculated and made available to the simulation as a whole.

In addition, brake pedal position and force applied are reported on the Flight Debug page of the IOS, as shown in Figure 5-42, highlighted by the red ellipse.

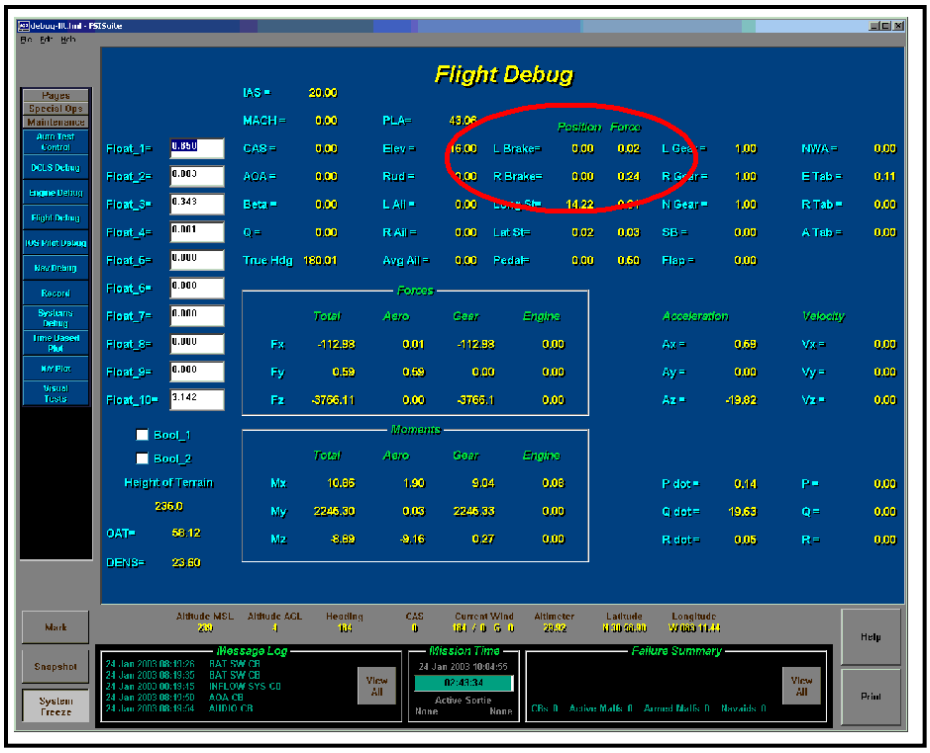


Figure 5-42. Flight Debug Page from IOS

Input to the DRI platform from the load-cells can be viewed as a voltage by looking at the Utility page with the control loading maintenance lap-top-computer.

Figure 5-43 is a screen shot of the Utility page.

Figure 5-43. Utility Page

5.6.12.2. Toe Brake System Testing

Testing of the toe-brake system consists in three parts: Auto-Test Guide (ATG), static, and dynamic tests.

- ATG tests verify match between the FSI-SSD implementation of the RAC software brake model in the FTD and the RAC POM[1]. These tests are conducted only during device Installation and Acceptance.
- Static tests verify that the output of the load cell is not skewed by a large offset, often caused by excessive side loads on the load cell.
- Dynamic tests verify that the load cell is producing an output from pressure applied to the brake pedals, that the output of the braking system is linear, and that the force applied to the pedals is the same as that reported on the Flight Debug page of the IOS.

5.6.12.2.1. ATG Toe Brake Tests (Installation and Acceptance)

ATG tests verify match between the FSI-SSD implementation of the RAC software brake model in the FTD and the RAC POM.

ATG tests stimulate the software brake model with sets of brake forces stored in a test configuration data file.

Results of these tests are plotted on a curve that is overlaid upon the curves produced by the RAC POM.

Results analysis is done by examining these curves to verify that they match within tolerance.

5.6.12.2.1.1. RESERVED

5.6.12.2.2. Static Toe Brake Tests

Static tests verify that the output of the load-cell is not skewed by a large offset, often caused by excessive side loads on the load-cell.

Follow this procedure for an end-to-end system test, no test equipment is required:

1) Reset the ECLDS system by pressing the reset button located just forward of the left-most servo amplifier behind the ejection seat.
2) Initialize the ECLDS system by pressing the *Control Loading Arm* button on the IOS control panel.
3) Select the *Maintenance* pages tab on the GUI collar of the IOS.
4) Select the *Flight Debug* page as shown in Figure 5-42.
5) Verify that the *L-Brake* & *R-Brake* positions are zero; these terms should be zero since the brake system is just initialized.
6) Verify that the *L-Brake* & *R-Brake* forces are less than 1 lb; the braking system software model has some hysteresis, about 10 lbs, before which there is no braking action.

1 RAC POM: RAC has a requirement to prove that their brake model matches the actual aircraft braking characteristics; result of this proof is the RAC POM.

If the preceding test failed, follow this procedure to test just the electro mechanical system, which is where any fault is most likely to be:

7) Connect the ECLDS lap-top computer to the DRI Platform.
8) Display the *Utility Interface* maintenance page.
9) Verify that the *Left Toe Brake* & *Right Toe Brake* A/D values are less than 0.6 VDC, preferably close to zero. These inputs are direct from the toe-brake load-cells and should show an offset voltage close to zero, but they will continue to work with an offset voltage of 0.6 VDC; anything greater than this, the load-cells should be replaced.

5.6.12.2.3. Dynamic Toe-brake Tests

Dynamic tests verify that the load-cell is producing an output from pressure applied to the brake pedals, that the output of the braking system is linear, and that the force applied to the pedals is the same as that reported on the Flight Debug page of the IOS.

A force gauge with a peak storage feature is required for this test.

Two persons are required to perform this test: one at the IOS, and one in the cockpit.

Follow this procedure to perform dynamic test of the toe-braking system.

1) Reset the ECLDS system by pressing the reset button located just forward of the left-most servo amplifier behind the ejection seat.
2) Initialize the ECLDS system by pressing the *Control Loading Arm* button on the IOS control panel.
3) Select the Maintenance pages tab on the GUI collar of the IOS.
4) Select the Flight Debug page as shown in Figure 5-41.
5) Set the rudder pedal stature adjustment to the center of its full-range of travel, which should be about 19 turns from either end.
6) Now insert two rigging pins[2] into the rigging points on the pedals; make sure that the pins go all the way through into the rigging points.
7) Now the pedals should be immobile.
8) Take the force gauge and activate the peak measurement feature.
9) Use the force gauge to apply pressure to the top of the pedal at about a 90-degree angle from the face of the pedal; apply pressure slowly and smoothly until the person at the IOS station calls "Mark[3]" when the force on the *L-Brake* or *R-Brake* reaches 10 lbs.
10) On "Mark" from the IOS person, remove the force gauge from the pedal and read the peak force from the gauge.
11) Note the reading in the appropriate place in Table 5-18, below, for *LBrakePeak* & *RBrakePeak*.

[2] ¼-inch bolts will work as rigging pins.
[3] *Mark*: Any method of signaling that works for the team doing the testing is good; this is just an example for exposition of the procedure.

12) Repeat this procedure for each test force in Table 5-18 below.

Table 5-18. Brake Test Results

Test Force lbs	Left Brake		Right Brake	
	LBrakePeak	IFORCE_LT	RBrakePeak	IFORCE_RT
10				
20				
30				
40				
50				
60				
70				
80				
	AvIFORCE_LT		AvIFORCE_RT	

13) <<< NOW REMOVE THE RIGGING PINS >>>

5.6.12.2.3.1. Analyzing the Test Results

Analyze the brake test results by following this procedure, using equations 1 & 2 when directed:

EQUATION-1	$IFORCE\_LT = \frac{LBrakePeak}{3276.7 \times LoadCell\_V\_Lbs \times TestForce\_Lbs}$
EQUATION-2	$IFORCE\_RT = \frac{RBrakePeak}{3276.7 \times LoadCell\_V\_Lbs \times TestForce\_Lbs}$
WHERE:	*IFORCE_LT* = Left brake force scaling factor in scientific notation, to 4 decimal places. *IFORCE_RT* = Right brake force scaling factor in scientific notation *TestForce_Lbs* = Value read at the IOS *LoadCell_V_Lbs* = Value set in DRI = 33 lbs/V = 0.0303 V/lbs *LBrakePeak* = Left brake peak value read from force gauge *RBrakePeak* = Right brake peak value read from force gauge

1) Compute *IFORCE_LT* in Table-1 for each *TestForce* by solving for Equation-1.
2) Compute *IFORCE_RT* in Table-1 for each *TestForce* by solving for Equation-2.
3) Compute the *AvIFORCE_LT* value by taking the average of the eight *IFORCE_LT* values.
4) Compute the *AvIFORCE_RT* value by taking the average of the eight *IFORCE_RT* values. Figure 5-44 is an example of the working expected from Table 5-18.

Example: Analysis of Brake Test Results				
Test Force Lbs	LBrakePeak	IFORCE_LT	RBrakePeak	IFORCE_RT
10	8	8.0569E-03	12	1.2085E-02
20	18	9.0640E-03	22	1.1078E-02
30	28	9.3997E-03	32	1.0743E-02
40	38	9.5676E-03	45	1.1330E-02
50	46	9.2654E-03	55	1.1078E-02
60	55	9.2318E-03	65	1.0910E-02
70	67	9.6395E-03	75	1.0790E-02
80	76	9.5676E-03	85	1.0701E-02
	AvIFORCE_LT	**9.2241E-03**	AvIFORCE_RT	**1.1089E-02**

Figure 5-44. Example: Analysis of Brake Test Results

5.6.12.2.3.2. Revising the ECLDS Configuration Data File

Revise the *IFORCE_LT* and *IFORCE_RT* scaling factors in the ECLDS configuration data file by following this procedure:

1) Verify that the rigging pins are removed from the brake pedal mechanism.
2) Copy the *hardware.cfg* file from the ECLDS computer to a floppy disk by executing the two commands listed here at the ECLDS computer command prompt:
   - usrFdConfig 0,0,"/Fd0"
   - copy "/ata0/hardware.cfg","/Fd0/hardware.cfg"
3) Make a backup copy of the *hardware.cfg* file to use in the event you corrupt by accident the working copy of the file.
4) Edit the *hardware.cfg* file with a plain text editer like Microsoft *notepad.exe*.
5) Locate the configuration data term *IFORCE_LT* and change the assigned value to the *AvIFORCE_LT* computed in Table-1 above.
6) Locate the configuration data term *IFORCE_RT* and change the assigned value to the *AvIFORCE_RT* computed in Table-1 above.
7) Save the changes and exit from the text editor.
8) Copy the changed *hardware.cfg* file from the floppy disk to the ECLDS computer by executing the two commands listed here at the ECLDS computer command prompt:
   - usrFdConfig 0,0,"/Fd0"
   - copy "/Fd0/hardware.cfg","hardware.cfg"
9) Remove the floppy disk.
10) Reboot the ECLDS computer.
11) Initialize the ECLDS system.

5.6.12.2.3.3. Testing the ECLDS Configuration Data Changes

Test your changes to the ECLDS configuration data file by following this procedure:

1) Perform a sample of the tests described in paragraph 5.6.12.2.3.
2) The peak force readings should match the values displayed by the Flight Debug page of the IOS, ±5 lbs.
3) Remember to remove the rigging pins when finished.

5.6.13. Troubleshooting Projector Network Connectivity

If, after retracing the installation steps in Section 2, connectivity remains an issue when the projector is in OFF/Standby mode, perform these troubleshooting steps.

1) Verify default projector settings (SETUP>STANDBY MODE>STANDARD 1).
2) Verify IP addresses.
    - *PRJ1=192.168.76.50
    - *PRJ2=192.168.76.51
    - *PRJ3=192.168.76.52
    - *PRJ4=192.168.76.53
    - *PRJ5=192.168.76.54
    - *PRJ6=192.168.76.55
    - *PRJ7=192.168.76.56

5.7. REMOVAL AND REPLACEMENT

5.7.1. Power Distribution System

Use the following procedures to remove and replace components in the Power Control System. It is assumed the technician has access to a standard tool kit; therefore, only special tools and required test equipment are listed at the beginning of each procedure.

NOTE

For installation specific details of any component in this section, reference the appropriate installation drawing.

5.7.1.1. AC Power Controller (9A1A1)

Use the following procedure to remove and replace the AC Power Controller. The following tools and equipment are required to perform the procedure.

- Two people
- Tags and Labels
- DVM

WARNING

ENSURE ALL SUB-SYSTEMS ARE PROPERLY SHUT DOWN BEFORE BEGINNING THESE PROCEDURES.

1) On the AC Power Controller Assembly place the MAIN POWER circuit breaker CB1 in the off position (down). This removes power to the internal components and the associated circuits. See Figure 5-45.

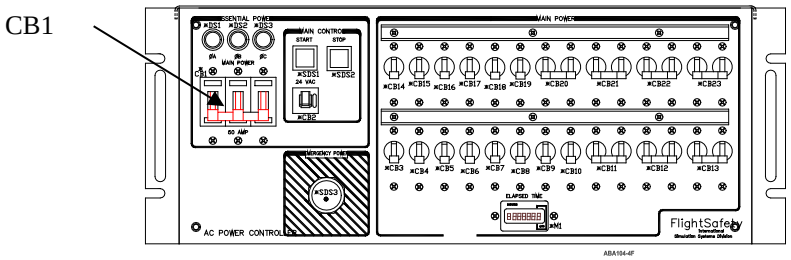


Figure 5-45. AC Power Controller Assembly

2) Ensure the facility site power AC circuit breaker, 3-Phase, 50-Amp, is turned off and locked with personal tag/lockout. This removes power to the AC Power Controller Assembly.

3) On the back of the AC Power Controller, unplug the power and interface cables from the rear panel, labeling them prior to disconnecting, if not already labeled. See Figure 5-46.

4) Using the digital voltmeter (DVM), ensure power has been removed by checking for power at J1 to GND, J2 to GND, and J3 to GND.

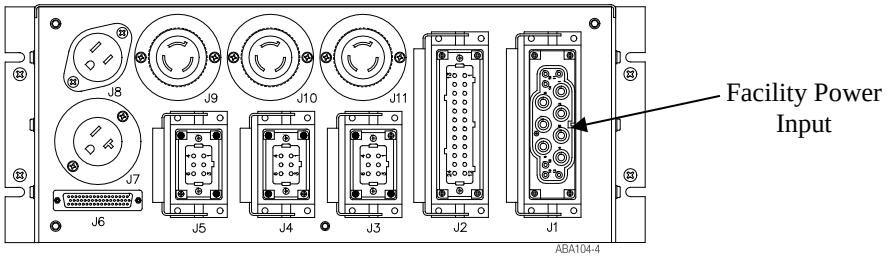


Figure 5-46. AC Power Controller Assembly-Rear View

5) Remove the retaining screws that hold the AC Power Controller in place in the equipment cabinet.

WARNING

THE AC POWER CONTROLLER WEIGHS APPROXIMATELY 49 LBS. USE TWO PEOPLE TO REMOVE IT FROM THE CABINET.

6) Using two people, slide the AC Power Controller chassis out of the cabinet rack.

7) Place the chassis on a workbench or other flat surface.

8) Install the AC Power Controller using these procedures in reverse order.

5.7.1.1.1. AC Power Controller Transformer T1

Use the following procedure to remove and replace transformer T1 in the AC Power Controller. The following special tools and equipment are required to perform the procedure.

- DVM
- Tags and Labels
- Two people

WARNING

DISCONNECT POWER TO COMPONENTS BEFORE REMOVING OR REPLACING. AFTER POWER IS DISCONNECTED, USE A METER OR OTHER APPROPRIATE TESTING DEVICE TO ENSURE POWER HAS BEEN REMOVED FROM THE EQUIPMENT.

1) Remove the AC Power Controller from the equipment cabinets using the procedures in paragraph 5.7.1.1.

WARNING

THE AC POWER CONTROLLER WEIGHS APPROXIMATELY 49 LBS. USE TWO PEOPLE TO REMOVE IT FROM THE CABINET.

2) Place the chassis on a workbench or other flat surface.

3) Remove the screws that secure the top cover and locate transformer T1. See Figure 5-47.

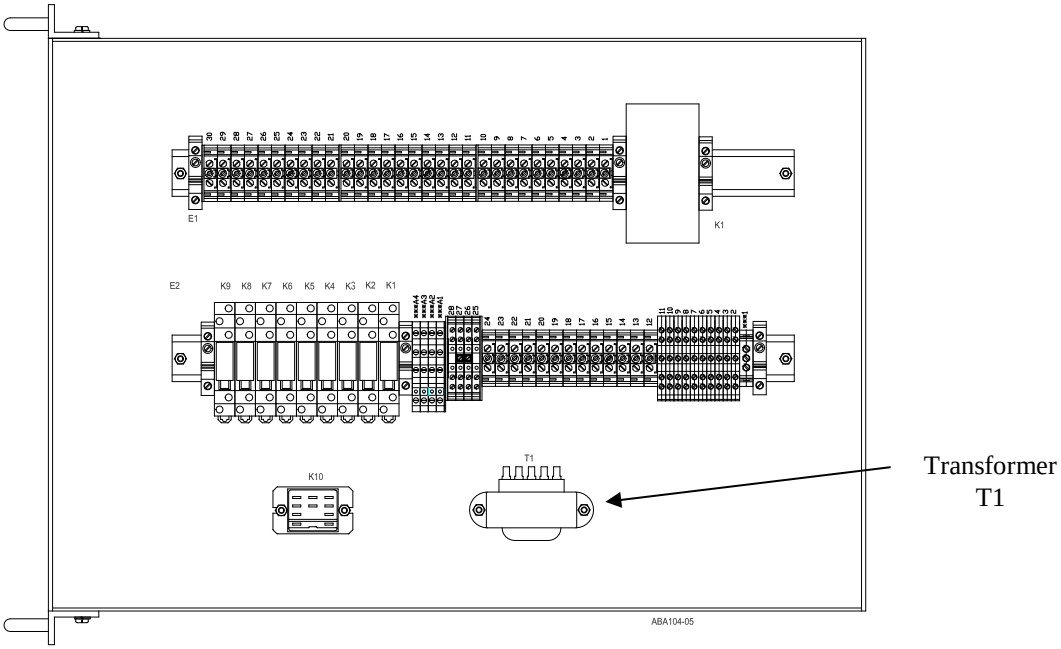


Figure 5-47. Transformer T1 Location

4) Disconnect the AC input lines and the AC output lines from the 24VAC transformer, labeling them as needed.

5) Turn the AC Power Controller over and remove the screws that secure transformer T1 to the chassis, ensuring it does not fall when the last screw is removed. This may require two people.

6) Install the new transformer and replace the retaining screws.

7) Reconnect the AC input and output wiring to the 24VAC transformer.

8) Replace the top cover and the retaining screws.

9) Using two people replace the AC Power Controller and reconnect all cables removed from the rear panel.

10) Turn the facility site AC Power, 3-Phase, 50-Amp circuit breaker ON.

11) On the front of the AC Power Controller Assembly, place the MAIN POWER circuit breaker CB1 in the ON position (up). All three power phase indicators A, B, and C will indicate green.

12) On the front of the AC Power Controller, press the MAIN CONTROL START button. Verify AC power is applied to each computer in the equipment cabinets by the power indicators showing green and utility lighting being ON in the simulator.

5.7.1.1.2. AC Power Controller Solid State Relay

Use the following procedure to remove and replace the solid-state relay located in the AC Power Controller. The following special tools and equipment are required to perform the procedure.

- DVM
- Tags and Labels
- Two people

WARNING

DISCONNECT POWER TO COMPONENTS BEFORE REMOVING OR REPLACING. AFTER POWER IS DISCONNECTED, USE A METER OR OTHER APPROPRIATE TESTING DEVICE TO ENSURE POWER HAS BEEN REMOVED FROM THE EQUIPMENT.

1) Remove the AC Power Controller from the equipment cabinets using the procedures in paragraph 5.7.1.1.

WARNING

THE AC POWER CONTROLLER WEIGHS APPROXIMATELY 49 LBS. USE TWO PEOPLE TO REMOVE IT FROM THE CABINET.

2) Place the chassis on a workbench or other flat surface.
3) Remove the Phillips head screws that secure the top cover and locate solid-state relays located on the side of the AC Power Controller. See Figure 5-48.

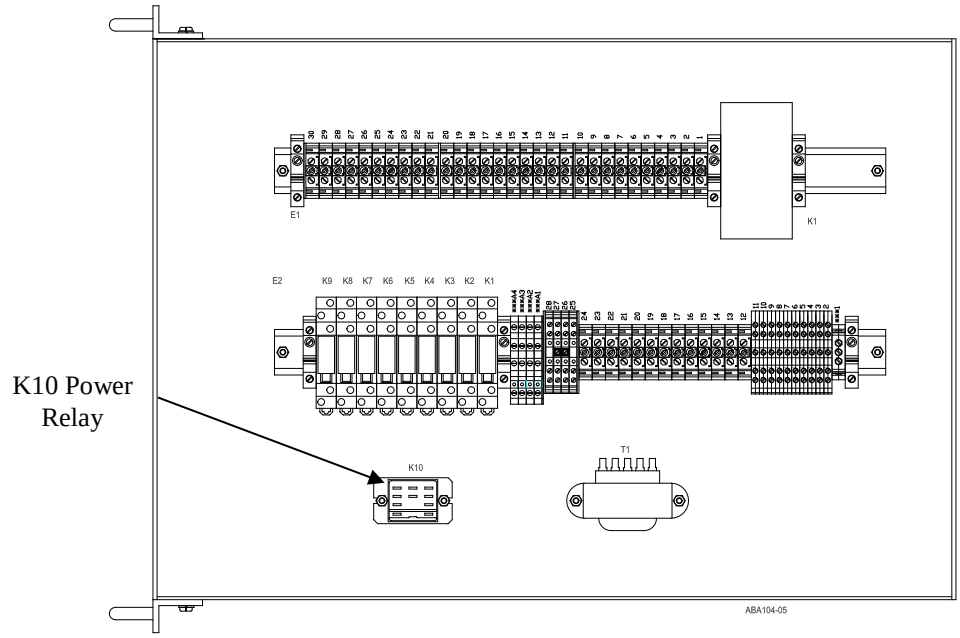


Figure 5-48. Relay K10 Location

4) Disconnect the AC input lines and the AC output lines from the solid-state relay to be removed, labeling them as needed.

5) Remove the two retaining screws that secure the solid-state relay to the side of the AC Power Controller.

6) Install the new solid-state relay and replace the retaining screws.

7) Reconnect the AC input and output wiring to the solid-state relay.

8) Replace the top cover and the retaining screws.

9) Using two people replace the AC Power Controller and reconnect all cables removed from the rear panel.

10) Turn the facility site AC Power, 3-Phase, 50-Amp circuit breaker ON.

11) On the front of the AC Power Controller Assembly, place the MAIN POWER circuit breaker CB1 in the ON position (up). All three power phase indicators A, B, and C will indicate green.

12) On the front of the AC Power Controller, press the MAIN CONTROL START button. Verify AC power is applied to each computer in the equipment cabinets by the power indicators showing green and utility lighting being ON in the simulator.

5.7.1.1.3. AC Power Controller Power Relay

Use the following procedure to remove and replace the power relay located in the AC Power Controller. The following special tools and equipment are required to perform the procedure.

- DVM
- Tags and Labels
- Two people

WARNING

ENSURE ALL SUB-SYSTEMS ARE PROPERLY SHUTDOWN PRIOR TO BEGINNING THESE PROCEDURES.

1) Remove the AC Power Controller from the equipment cabinets using the procedure in paragraph 5.7.1.1.

WARNING

THE AC POWER CONTROLLER WEIGHS APPROXIMATELY 49 LBS. USE TWO PEOPLE TO REMOVE IT FROM THE CABINET.

2) Place the chassis on a workbench or other flat surface.
3) Remove the screws that retain the top cover and locate the power relays located inside the AC Power Controller. See Figure 5-49.

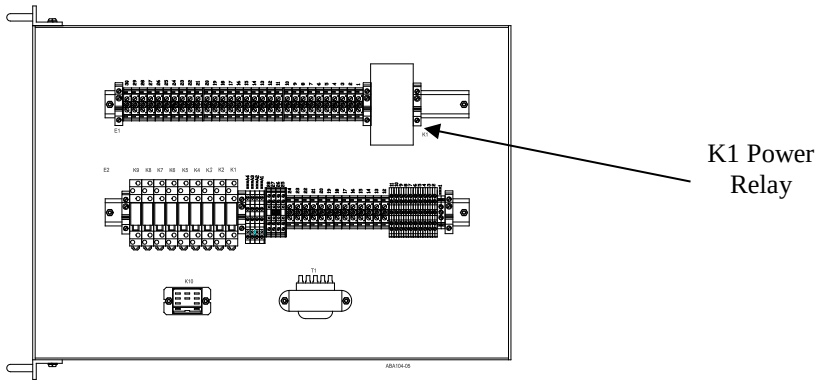


Figure 5-49. Power Relay Location

4) Disconnect the AC input lines and the AC output lines from the power relay to be replaced, labeling them as needed.
5) Use a screwdriver to pull out locking tab and lift relay from the component rail.
6) Install the new power relay and replace the locking tab that secures it to the terminal strip.
7) Reconnect the AC input and output wiring to the power relay.
8) Replace the top cover and the retaining screws.

9) Using two people, replace the AC Power Controller and reconnect all cables removed from the rear panel.

10) Turn the facility site AC Power, 3-Phase, 50-Amp circuit breaker ON.

11) On the front of the AC Power Controller Assembly, place the MAIN POWER circuit breaker CB1 in the ON position (up). All three power phase indicators A, B, and C will illuminate green.

12) On the front of the AC Power Controller, press the MAIN CONTROL START button and verify AC power is applied to each computer in the equipment cabinets by the power indicators showing green and utility lighting being ON in the simulator.

5.7.1.2. Digital Servo Remote Power Controller (9A2A5)

Use the following procedure to remove and replace the Digital Servo Remote Power Controller. No special tools or equipment are needed to perform the procedure; however, it does require two people.

- Two people
- Tags and Labels

WARNING

ENSURE ALL SUB-SYSTEMS ARE PROPERLY SHUTDOWN BEFORE BEGINNING THESE PROCEDURES.

1) On the AC Power Controller Assembly, place the MAIN POWER circuit breaker CB1 in the off position (down). This removes power to the internal components and the associated circuits. See Figure 5-50.

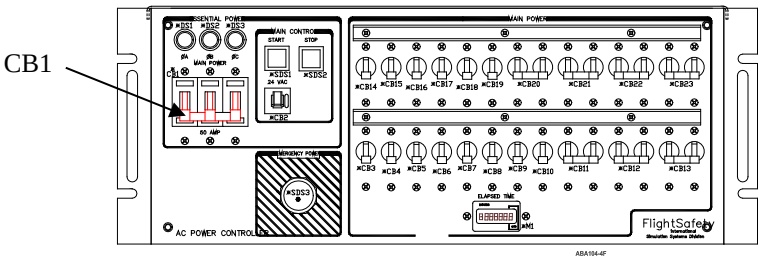


Figure 5-50. AC Power Controller Assembly

2) Ensure the facility site power AC circuit breaker, 3-Phase, 80-Amp, is turned off and locked with personal tag/lockout. This removes power to the Digital Servo Remote Power Controller.

3) On the back of the Digital Servo Remote Power Controller, unplug the power and interface cables from the rear panel, labeling them prior to disconnecting if not already labeled. See Figure 5-51.

4) Using the DVM, ensure power has been removed by checking for power at J1 to GND.

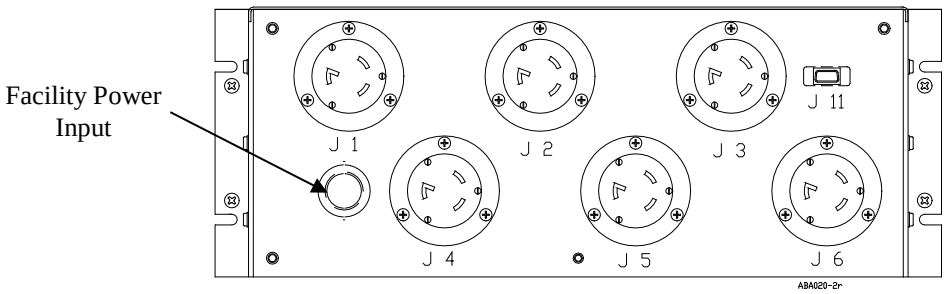


Figure 5-51. Digital Servo Remote Power Controller -Rear View

5) Remove the retaining screws that hold the Digital Servo Remote Power Controller in place in the equipment cabinet.

WARNING

THE AC POWER CONTROLLER WEIGHS APPROXIMATELY 49 LBS. USE TWO PEOPLE TO REMOVE IT FROM THE CABINET.

6) Using two people, slide the Digital Servo Remote Power Controller chassis out of the cabinet rack.

7) Place the chassis on a workbench or other flat surface.

8) Install the Digital Servo Remote Power Controller using these procedures in reverse order.

5.7.1.2.1. Digital Servo Remote Power Controller Solid State Relay

Use the following procedure to remove and replace the Solid State Relay (K2) located in the Digital Servo Remote Power Controller. The following special tools and equipment are required to perform the procedure.

- DVM
- Tags and Labels
- Two people

WARNING

DISCONNECT POWER TO COMPONENTS BEFORE REMOVING OR REPLACING. AFTER POWER IS DISCONNECTED, USE A METER OR OTHER APPROPRIATE TESTING DEVICE TO ENSURE POWER HAS BEEN REMOVED FROM THE EQUIPMENT.

1) Remove the Digital Servo Remote Power Controller from the equipment cabinets using the procedures in paragraph 5.7.1.2.

WARNING

THE AC POWER CONTROLLER WEIGHS APPROXIMATELY 49 LBS. USE TWO PEOPLE TO REMOVE IT FROM THE CABINET.

2) Place the chassis on a workbench or other flat surface.

3) Remove the screws that secure the top cover and locate solid-state relay located on the dim rail of the Digital Servo Remote Power Controller. See Figure 5-52.

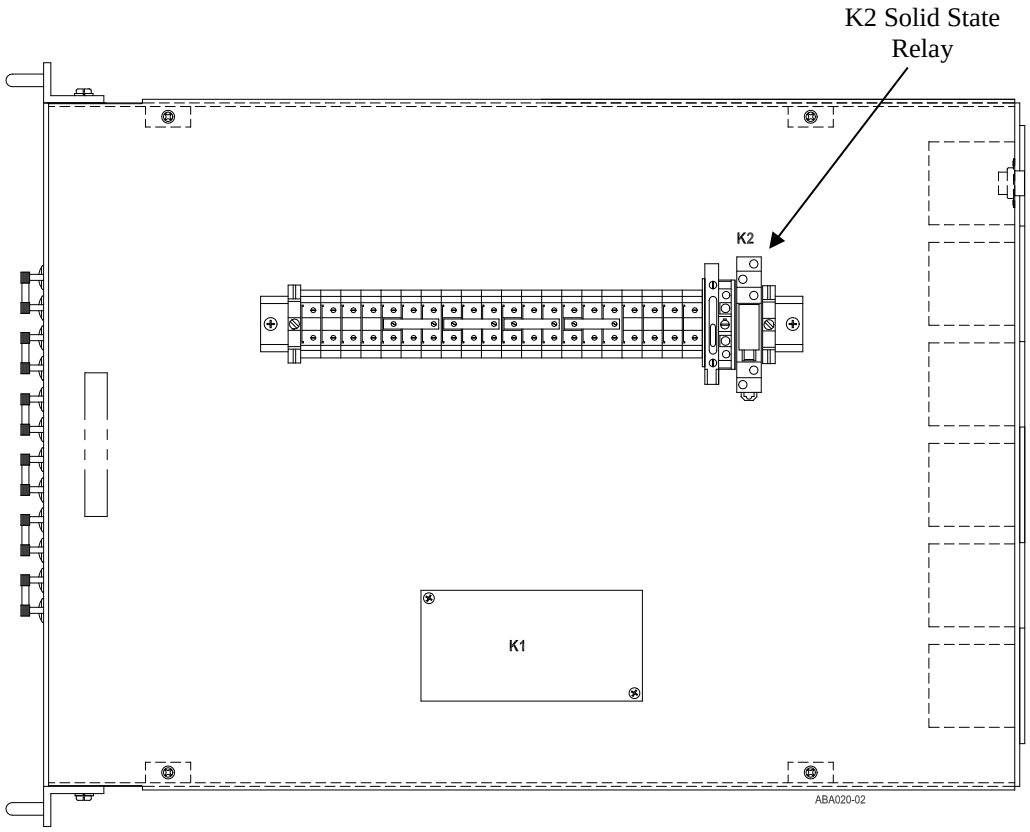


Figure 5-52. Relay K2 Location

4) Disconnect the AC input lines and the AC output lines from the solid-state relay to be removed, labeling them as needed.

5) Remove the two retaining screws that secure the solid-state relay to the side of the Digital Servo Remote Power Controller.

6) Install the new solid-state relay and replace the retaining screws.

7) Reconnect the AC input and output wiring removed in from the solid-state relay.

8) Replace the top cover and install the retaining screws.

9) Using two people, replace the Digital Servo Remote Power Controller and reconnect all cables removed from the rear panel.

10) Turn the facility site AC Power, 3-Phase, 80-Amp circuit breaker ON.

11) On the front of the AC Power Controller Assembly, place the MAIN POWER circuit breaker CB1 in the ON position (up). All three power phase indicators A, B, and C will illuminate green.

12) On the front of the AC Power Controller, press the MAIN CONTROL START button and verify AC power is applied to each computer in the equipment cabinets by the power indicators showing green and utility lighting being ON in the simulator.

13) Using a digital voltmeter (DVM), check each digital servo for power at L1 to GND, and L2 to GND.

5.7.1.2.2. Digital Servo Remote Power Controller Power Contactor

Use the following procedure to remove and replace the Power Contactor (K1) located in the Digital Servo Remote Power Controller. The following special tools and equipment are required to perform the procedure.

- DVM
- Tags and Labels
- Two people

WARNING

ENSURE ALL SUB-SYSTEMS ARE PROPERLY SHUTDOWN PRIOR TO BEGINNING THESE PROCEDURES.

1) Remove the Digital Servo Remote Power Controller from the equipment cabinets using the procedure in paragraph 5.7.1.2.

WARNING

THE AC POWER CONTROLLER WEIGHS APPROXIMATELY 49 LBS. USE TWO PEOPLE TO REMOVE IT FROM THE CABINET.

2) Place the chassis on a workbench or other flat surface.

3) Remove the screws that retain the power contactor located inside the Digital Servo Remote Power Controller. See Figure 5-53.

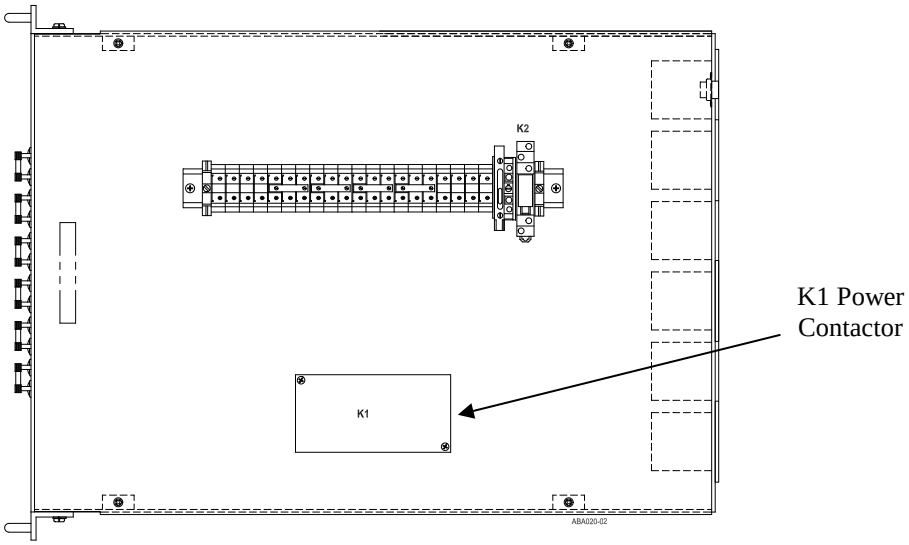


Figure 5-53. K1 Power Contactor Location

4) Disconnect the AC input lines and the AC output lines from the power contactor to be replaced, labeling them as needed.
5) Install the new power relay and replace the locking tab that secures it to the terminal strip.
6) Reconnect the AC input and output wiring to the power contactor.
7) Using two people, replace the Digital Servo Remote Power Controller and reconnect all cables removed from the rear panel.
8) Turn the facility site AC Power, 3-Phase, 80-Amp circuit breaker ON.
9) On the front of the AC Power Controller Assembly, place the MAIN POWER circuit breaker CB1 in the ON position (up).
10) On the front of the AC Power Controller, press the MAIN CONTROL START button and verify AC power is applied to each computer in the equipment cabinets by the power indicators showing green and utility lighting being ON in the simulator.
11) Using a digital voltmeter (DVM), check each digital servo for power at L1 to GND, and L2 to GND.

5.7.1.3. Power Supplies

The Host Computer, IOS Computer, ECL Computer, and the FDKIO Computer all have power supplies which are hot-swappable and dual-redundant. All the other power supplies require disconnecting power to the components before removing or replacing.

For replacement of the hot-swappable power supplies, unplug the AC power cord to the power supply to be replaced and pull the latch above the AC connector to the right while pulling out with the power supply handle. Install the new power supply ensuring it is the proper replacement. Reconnect AC power cord. Ensure the power supply red failure indicator is off and no audible alarm sounds. See Figure 5-54.

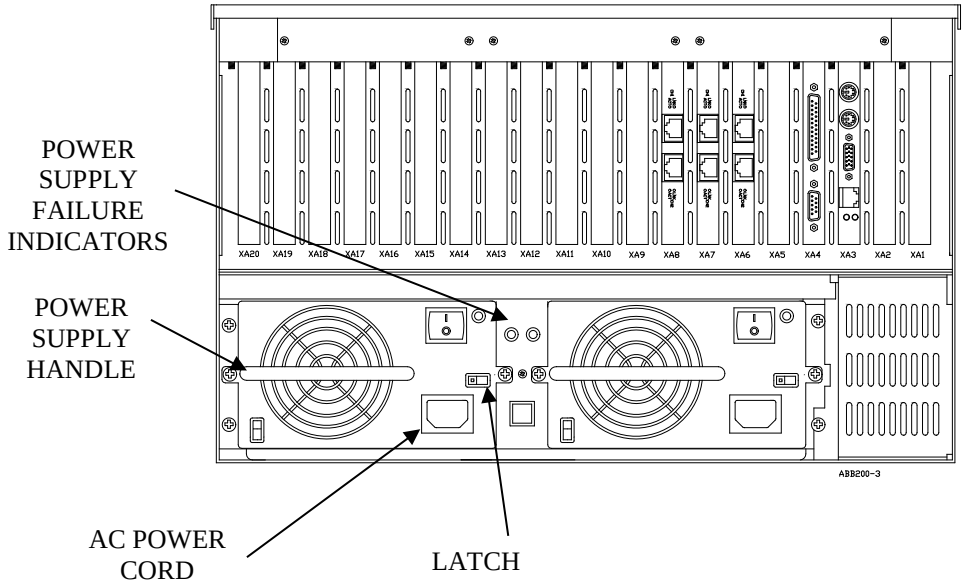


Figure 5-54. Computer Power Supplies

5.7.1.3.1. Uninterruptible Power Supply (UPS)(9A2A2)

Use the following procedure to remove and replace the entire UPS. For replacing only the battery, see paragraph 5.7.1.3.1.1. The tools and equipment below are required for replacing the entire UPS.

- DVM
- Two people
- Tags and Labels

WARNING

DISCONNECT POWER TO COMPONENTS BEFORE REMOVING OR REPLACING. AFTER POWER IS DISCONNECTED, USE A METER OR OTHER APPROPRIATE TESTING DEVICE TO ENSURE POWER HAS BEEN REMOVED FROM THE EQUIPMENT.

1) At the AC Power Controller Assembly, remove power from the UPS by placing the CB9 Circuit Breaker in the OFF (down) position. Figure 5-55 shows the location of the circuit breaker.

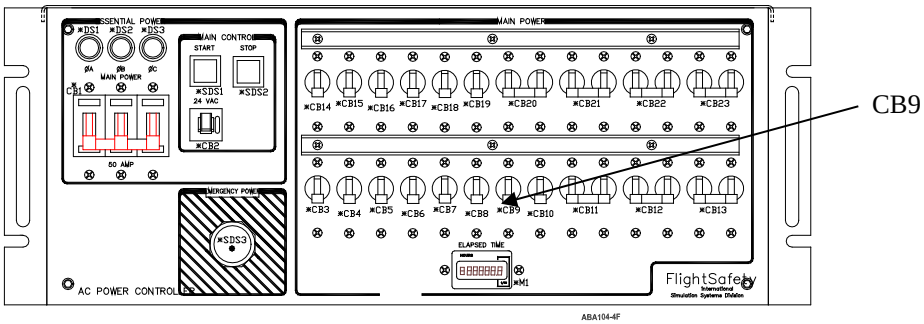


Figure 5-55. AC Power Controller Assembly

2) On the back of the UPS, unplug the power and interface cables from the rear panel, labeling them prior to disconnecting if not already labeled. See Figure 5-56.

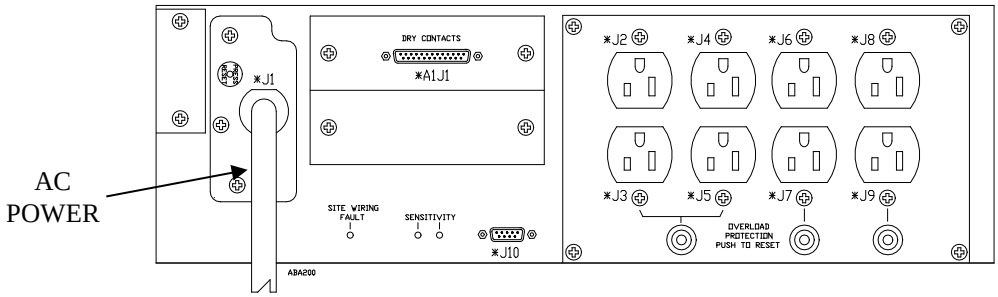


Figure 5-56. UPS Cable Locations

3) Using the digital voltmeter (DVM), ensure power has been removed by checking for power at the J2 outlet.

4) Remove the retaining screws that hold the UPS in place in the equipment cabinet.

WARNING

THE UPS WEIGHS APPROXIMATELY 105 LBS. USE TWO PEOPLE TO REMOVE IT FROM THE CABINET.

5) Using two people, slide the UPS chassis out of the cabinet rack.

6) Place the chassis on a workbench or other flat surface.

7) Install the UPS using these procedures in reverse order.

8) Verify UPS is fully operational.

5.7.1.3.1.1. UPS Battery

The UPS may be running and the loads ON for the following procedure.

1) On the front of the UPS, reach into the finger pull and open the front cover. Swing the cover open and remove.

2) Unhook the side of the cover from the chassis and lift it away to expose the battery door.

3) Remove the two battery door screws and open the door.

4) Grip the wires for the front set of batteries and pull firmly to disconnect the wires. Remove the batteries. Set aside the foam spacer located between the batteries. Now reach into the battery compartment and grasp either the white cord (if it is present), or the wires for the other set of batteries. Again, pull firmly to disconnect the wires. Remove the second set of batteries.

NOTE

Be careful removing the batteries: they are heavy.

CAUTION

DO NOT TRY TO INSTALL BATTERY PACKS WITH CONNECTORS THAT ARE A DIFFERENT COLOR FROM THE BATTERY PACK CONNECTOR IN THE UPS.

5) Slide the first set of new batteries into the unit. Hold the connector down below the top of the batteries and toward the door; otherwise, the assembly will not fit. Guide the connector over the top of the batteries and connect it to the rear connector of the battery compartment. Set the foam spacer against the rear batteries to prevent the wires from being pinched. Slide the second set of batteries in, then guide the connector over the batteries and connect it to the front connector of the battery compartment.

NOTE

Small sparks from the battery connectors are normal during battery connection.

6) Close the battery compartment door, making sure that no wires are pinched.

7) Replace the battery compartment screws and replace the front cover.

8) Dispose of the battery in accordance with site and local procedures.

5.7.1.3.2. 24VDC DRI Power Supply (7A2PS1)

Use the following procedure to remove and replace the 24VDC DRI Power Supply. The tools and equipment below are required to perform the procedure.

- DVM
- Tags and Labels

WARNING

DISCONNECT POWER TO COMPONENTS BEFORE REMOVING OR REPLACING. AFTER POWER IS DISCONNECTED, USE A METER OR OTHER APPROPRIATE TESTING DEVICE TO ENSURE POWER HAS BEEN REMOVED FROM THE EQUIPMENT.

1) At the AC Power Controller Assembly, remove power from the 24VDC Power Supply by placing the CB21 Circuit Breaker in the OFF (down) position. Figure 5-57 shows the location of the circuit breaker.

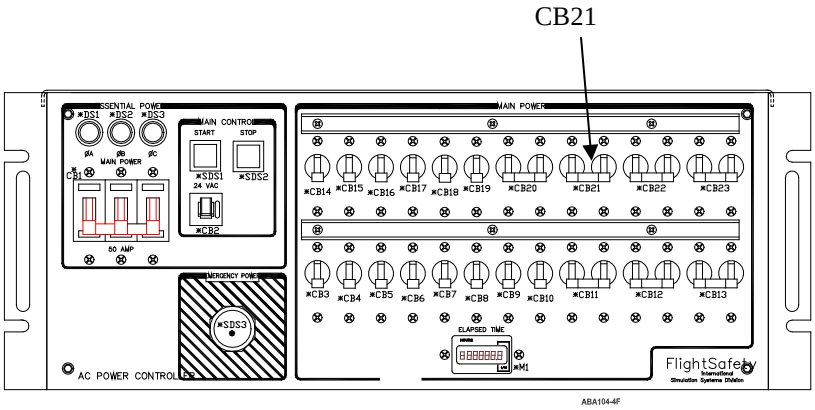


Figure 5-57. AC Power Controller Assembly

2) Using the digital voltmeter (DVM), ensure power has been removed by checking 7A2PS1 power supply terminals L to GND and N to GND.

3) Disconnect the AC input lines and the DC output lines from the power supply, labeling them as needed.

4) Remove the four mounting bolts holding the power supply to the mounting plate. See Figure 5-58.

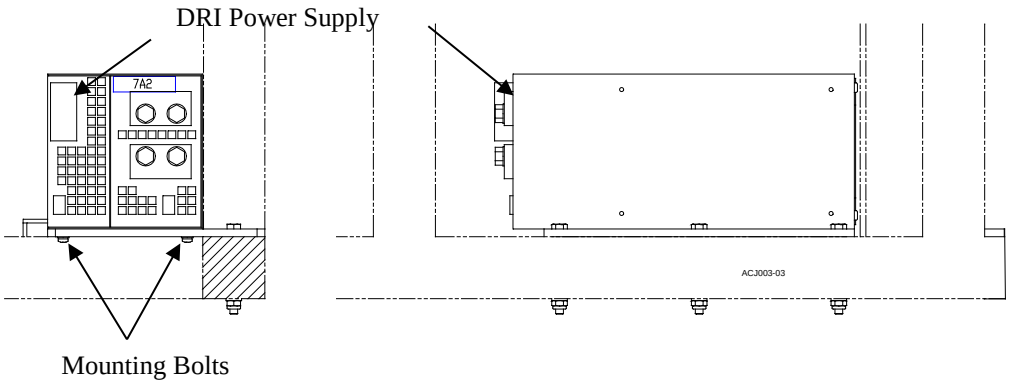


Figure 5-58. DRI Power Supply Mounting

5) Slide the power supply out of the student station frame and place it on a workbench or other flat surface.

6) Install the power supply using these procedures in reverse order.

7) Install the wiring harnesses on the new power supply ensuring they are connected to the proper terminals in accordance with their tags.

8) On the front of the AC Power Controller Assembly, place the CB21 circuit breaker in the ON (up) position.

9) Check the power supply input at the power supply AC input terminal block. Adjust the power supply output to the proper voltage measuring the voltage at the 7A2 fan out F1 input connection.

5.7.1.3.3. 28VDC System Power Supply (9A2A6PS1)

Use the following procedure to remove and replace the 28VDC Power Supply. The tools and equipment below are required to perform the procedure.

- DVM
- Tags and Labels

WARNING

DISCONNECT POWER TO COMPONENTS BEFORE REMOVING OR REPLACING. AFTER POWER IS DISCONNECTED, USE A METER OR OTHER APPROPRIATE TESTING DEVICE TO ENSURE POWER HAS BEEN REMOVED FROM THE EQUIPMENT.

1) At the AC Power Controller Assembly, remove power from the 28VDC Power Supply by placing the CB12 circuit breaker in the OFF (down) position. Figure 5-59 shows the location of the circuit breaker.

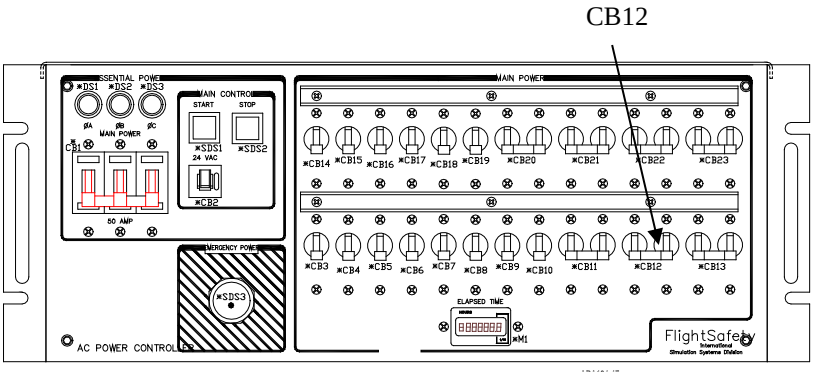


Figure 5-59. AC Power Controller Assembly

2) The power supply is mounted on the bottom of the 9A2A6-patch panel in the equipment cabinet.

3) Using the digital voltmeter (DVM), ensure power has been removed by checking 9A2A6PS1 power supply terminals L to GND and N to GND.

4) Prior to disconnecting the wiring harnesses from the power supply, tag each wire for its terminal connection if not already labeled.

5) Remove the two mounting bolts holding the power supply to the mounting plate. See Figure 5-60.

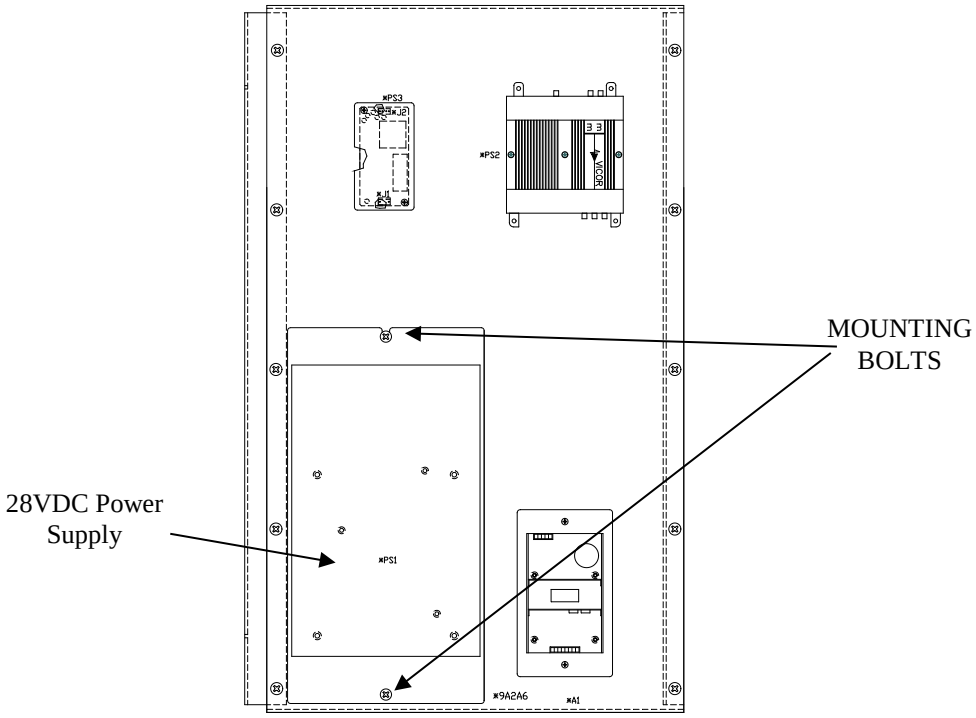


Figure 5-60. 28VDC System Power Supply

6) Remove the 28VDC Power Supply from the equipment cabinet and place it on a workbench or other flat surface.

7) Install the new power supply ensuring it is the proper replacement.

8) Install the wiring harnesses on the new power supply ensuring they are connected to the proper terminals in accordance with their tags.

9) Apply power to the power supply by placing the CB12 circuit breaker in the ON (up) position.

10) Adjust the power supply output to the proper voltage measuring the voltage on the positive and negative bus bars. Verify the bus bar using the vendor drawings provided with the simulator.

5.7.1.3.4. DC-DC Converter (28VDC to ±15VDC) (9A2A6PS2)

Use the following procedure to remove and replace the 28VDC to ±15VDC DC-DC Converter. The tools and equipment below are required to perform the procedure:

- DVM
- Tags and Labels

WARNING

DISCONNECT POWER TO COMPONENTS BEFORE REMOVING OR REPLACING. AFTER POWER IS DISCONNECTED, USE A METER OR OTHER APPROPRIATE TESTING DEVICE TO ENSURE POWER HAS BEEN REMOVED FROM THE EQUIPMENT.

1) At the AC Power Controller Assembly, remove power from the DC-DC Converter by placing the CB12 circuit breaker in the OFF (down) position. Figure 5-61 shows the location of the circuit breaker.

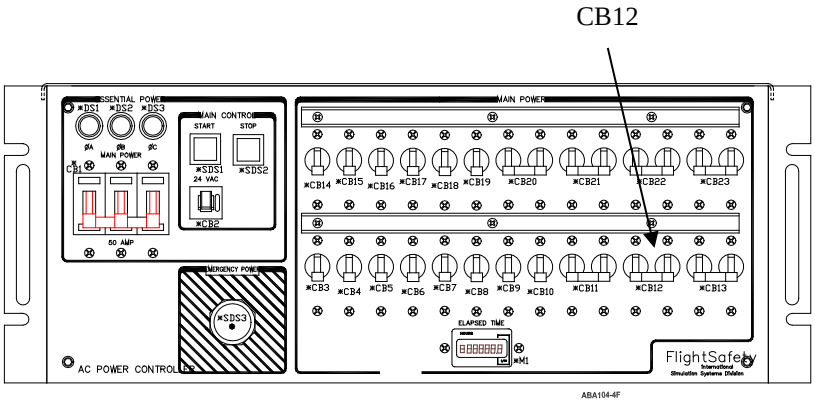


Figure 5-61. AC Power Controller Assembly

2) The converter is mounted on the bottom of the 9A2A6 patch panel in the equipment cabinet.

3) Using the DVM, ensure power has been removed by checking 9A2A6PS1 power supply terminals L to GND and N to GND. Then check the 9A2A6PS2 power supply terminals 28VDC positive to 28VDC negative.

4) Prior to disconnecting the wiring harnesses from the converter, tag each wire for its terminal connection if not already labeled.

5) Remove the three mounting bolts holding the converter to the mounting plate. See Figure 5-62.

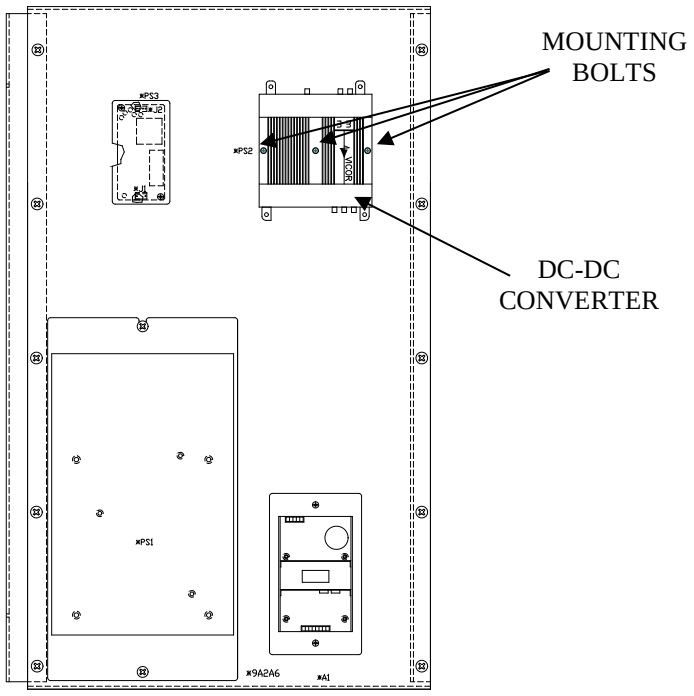


Figure 5-62. DC-DC Converter Location

6) Remove the DC-DC Converter chassis from the equipment cabinet and place the chassis on a workbench or other flat surface.

7) Verify the new converter is the proper replacement then install it.

8) Install the wiring harnesses on the new converter ensuring they are connected to the proper terminals in accordance with their tags.

9) Apply power to the power supply by placing the CB12 circuit breaker in the ON (up) position.

10) Adjust the unit for proper output voltage. Measure the input voltage at +28VDC to 28VDC return. Verify the output voltages, output #1 A negative 15VDC ± .5 VDC to E positive 15VDC ± .5 VDC and output #2 F negative 15VDC ± .5 VDC to K positive 15VDC± .5 VDC.

5.7.1.3.5. MIC PreAmp 24 Volt Power Supply

Use the following procedure to remove and replace the MIC PreAmp 24-Volt Power Supply. The tools and equipment below are required to perform the procedure.

- DVM
- Tags and Labels

1) At the 9A2A2 UPS, remove the power cable for the 24VDC Power Supply by disconnecting it from the back of the UPS.
2) The power supply is mounted on the bottom of the 9A2A6 patch panel in the equipment cabinet. See Figure 5-63.
3) Using the DVM, ensure power has been removed by checking 9A2A6PS3 Power Supply.
4) Prior to disconnecting the wiring harnesses from the converter, tag each wire for its terminal connection if not already labeled.
5) Remove the mounting bolts holding the preamp power supply to the mounting plate.

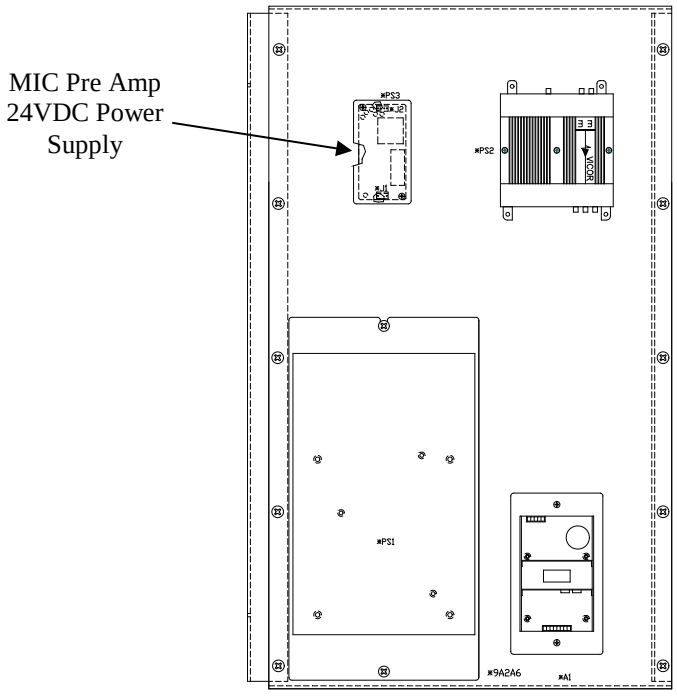


Figure 5-63. MIC Pre Amp Power Supply

6) Remove the Power Supply from the equipment cabinet and place the chassis on a workbench or other flat surface.
7) Verify the new Power Supply is the proper replacement then install it.
8) Install the wiring harnesses on the new Power Supply ensuring they are connected to the proper terminals in accordance with their tags.
9) Apply power to the power supply by reconnecting the power cable on the UPS.

10) Using the DVM, check the output voltage for 24VDC± .5 VDC. Adjust the unit for proper output voltage if necessary. Be careful to not trip the over-volt protection.

5.7.1.3.6. RMU DC-DC Converter (9A2A6A1)

Use the following procedure to remove and replace the RMU 28VDC to 28V, 16V, 5V, -6.3V, -12V Converter. The tools and equipment below are required to perform the procedure.

- DVM
- Oscilloscope
- Tags and Labels

WARNING

DISCONNECT POWER TO COMPONENTS BEFORE REMOVING OR REPLACING. AFTER POWER IS DISCONNECTED, USE A METER OR OTHER APPROPRIATE TESTING DEVICE TO ENSURE POWER HAS BEEN REMOVED FROM THE EQUIPMENT.

1) At the AC Power Controller Assembly, remove power from the RMU DC-DC Converter by placing the CB12 circuit breaker in the off (down) position. Figure 5-64 shows the location of the circuit breaker.

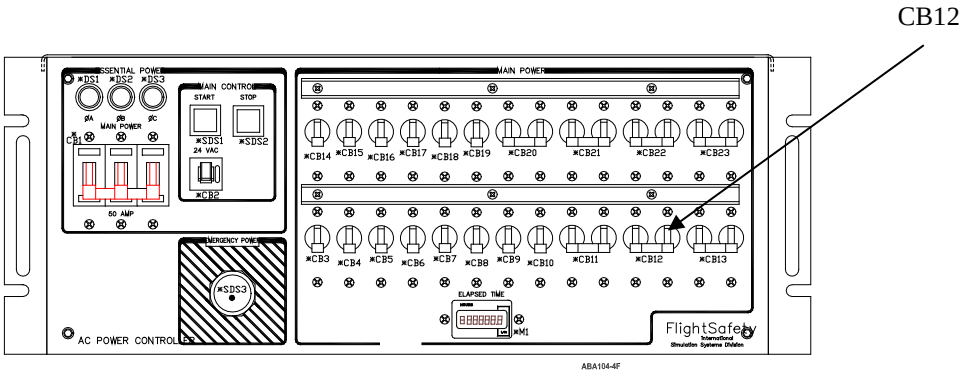


Figure 5-64. AC Power Controller Assembly

2) The converter is mounted on the bottom of the 9A2A6 patch panel in the 9A2 equipment cabinet.

3) Using the DVM, measure 9A1A2K32-3 for 0 Volts to ensure power has been removed.

4) Prior to disconnecting the wiring harnesses from the converter, tag each wire for its terminal connection if not already labeled.

5) Remove the three mounting bolts holding the converter to the mounting plate. See Figure 5-65.

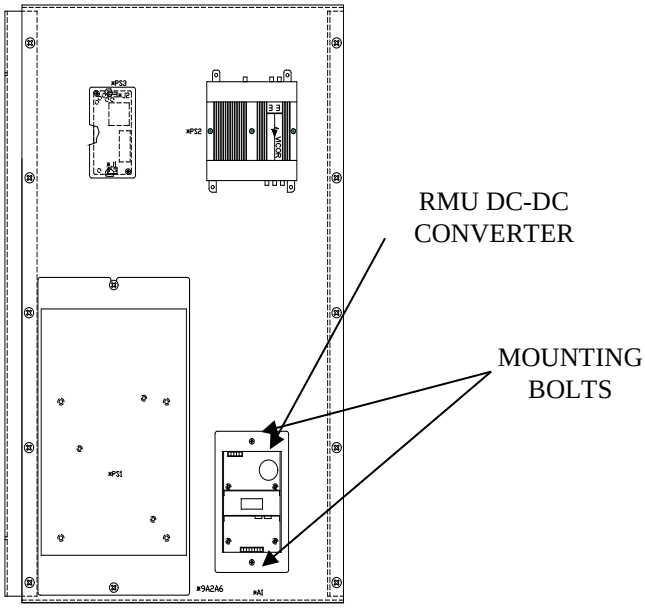


Figure 5-65. RMU DC-DC Converter Location

6) Remove the RMU DC-DC Converter chassis from the equipment cabinet and place the chassis on a workbench or other flat surface.

7) After verifying the new converter is the correct replacement, install it.

8) Install the wiring harnesses on the new converter ensuring they are connected to the proper terminals in accordance with their tags.

9) Disconnect RMU wiring. (JF25)

10) Turn on CB12 power and check for 28VDC at 9A1A2K32-3 (28V input side of relay contact).

11) Verify power-on timing using an oscilloscope. Use system print AGA063 as required.

12) After verifying power levels and power-on timing, reconnect RMU. (JF25)

5.7.1.3.7. UHF DC-DC Converter (9A1A2A7)

Use the following procedure to remove and replace the UHF 28VDC to 185V, -26V Converter. The tools and equipment below are required to perform the procedure.

- DVM
- Tags and Labels

WARNING

DISCONNECT POWER TO COMPONENTS BEFORE REMOVING OR REPLACING. AFTER POWER IS DISCONNECTED, USE A METER OR OTHER APPROPRIATE TESTING DEVICE TO ENSURE POWER HAS BEEN REMOVED FROM THE EQUIPMENT.

1) At the AC Power Controller Assembly, remove power from the UHF DC-DC Converter by placing the CB12 circuit breaker in the off (down) position. Figure 5-66 shows the location of the circuit breaker.

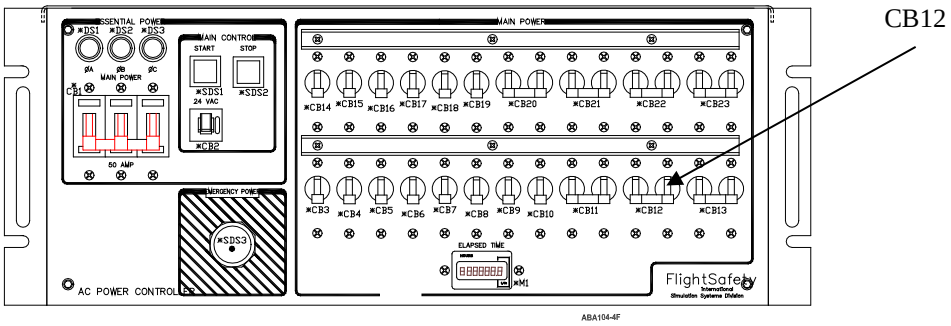


Figure 5-66. AC Power Controller Assembly

2) The converter is mounted on the top corner of the 9A1A2 patch panel in the equipment cabinet at location A7. See Figure 5-67.

3) Using the DVM, ensure power has been removed by checking 9A1A2K21-4 for 0 Volts (28VDC into DC/DC converter).

4) Prior to disconnecting the wiring harnesses from the converter, tag each wire for its terminal connection if not already labeled.

5) Remove the four mounting screws holding the converter to the mounting plate. See Figure 5-67.

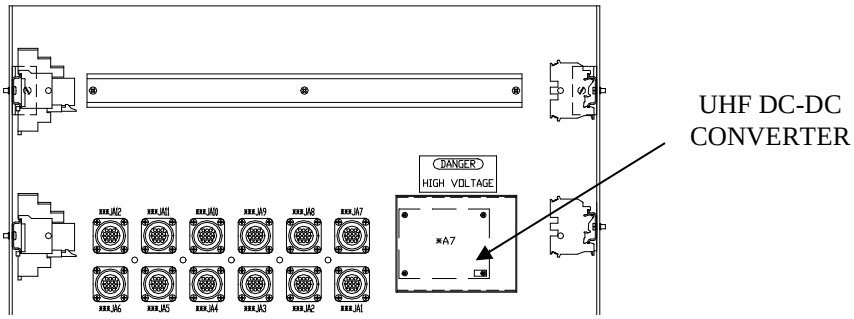


Figure 5-67. UHF DC-DC Converter

6) Remove the DC-DC Converter chassis from the equipment cabinet and place the chassis on a workbench or other flat surface.
7) Install the new converter ensuring the insulating washers are installed correctly to prevent damage to the converter.
8) Install the wiring harnesses on the new converter ensuring they are connected to the proper terminals in accordance with their tags.
9) Turn on CB12 power and check for 28VDC at 9A1A2K21-3 (28Volt input side of relay contacts).

5.7.2. Computer

Use the following procedures to remove and replace the computers. It is assumed the technician has access to a standard tool kit. The tools or equipment below are required to perform the procedure.

- DVM
- Two people
- Tags and Labels

NOTE

For installation specific details of any component in this section, reference the appropriate installation drawing.

WARNING

ENSURE ALL SUB-SYSTEMS ARE PROPERLY SHUTDOWN BEFORE BEGINNING THESE PROCEDURES.

1) On the AC Power Controller Assembly, place the MAIN POWER circuit breaker CB1 in the off position (down). This removes power to the internal components and the associated circuits. See Figure 5-68.

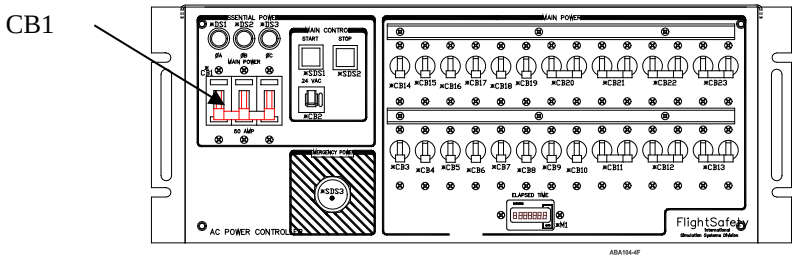


Figure 5-68. AC Power Controller Assembly

2) The UPS will maintain power to the computers for 5 to 15 minutes and must be shut down after all necessary simulator data has been saved.

3) Using the DVM, ensure power has been removed by checking 9A2A6PS1 power supply terminals L to GND and N to GND. Then check the 9A2A6PS2 power supply terminals 28VDC positive to 28VDC negative.

4) On the front of the computer being removed, turn off the power switch. See Figure 5-69.

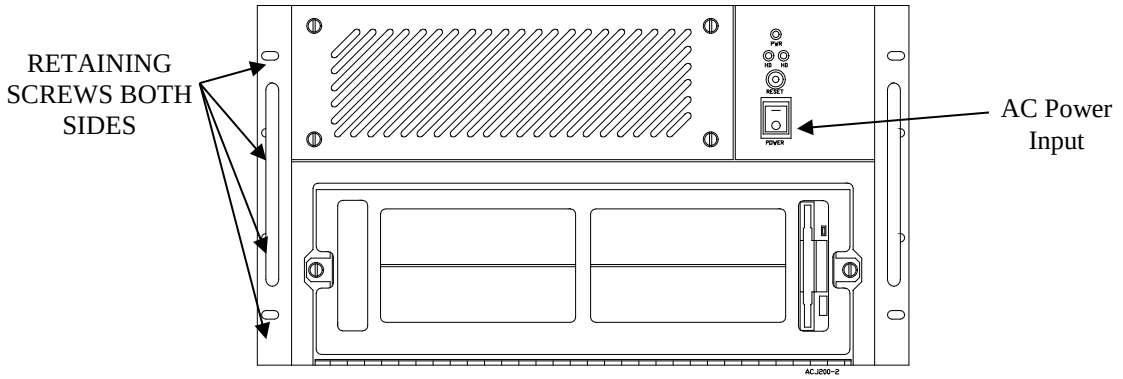


Figure 5-69. Computer Front View

5) On the back of the computer being removed, unplug the power and interface cables from the rear panel, labeling them prior to disconnecting if not already labeled. See Figure 5-70.

6) Remove the retaining screws on the front that hold the computer in place in the equipment cabinet. Refer to Figure 5-69.

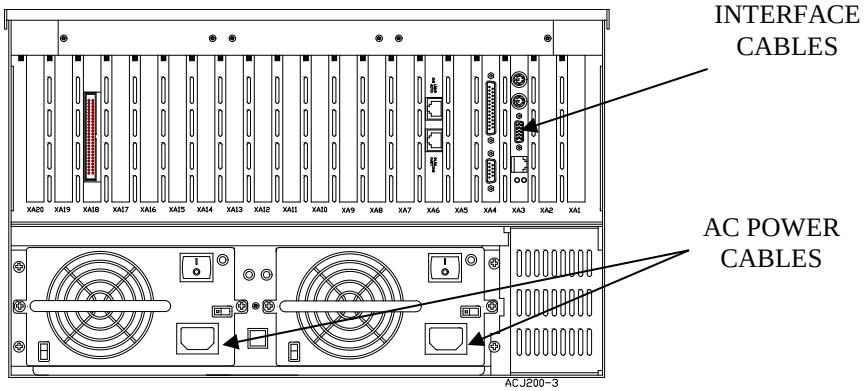


Figure 5-70. Computer Rear View

WARNING

THE COMPUTERS WEIGH APPROXIMATELY 50 LBS. USE TWO PEOPLE TO REMOVE THEM FROM THE CABINET.

7) Using two people, slide the computer chassis out of the cabinet rack by pushing in on the side rail buttons.

8) Place the chassis on a workbench or other flat surface.

9) Reinstall the computer using these procedures in reverse order.

5.7.2.1. Chassis Fans and Filter

1) The fan and filter may be serviced without removing the computer chassis. Power must be removed as described in paragraph 5.7.2 prior to replacing or servicing the fan.

2) Remove retaining screws as shown in Figure 5-71.

3) The filter can be replaced or cleaned as required per the Inspection Manual.

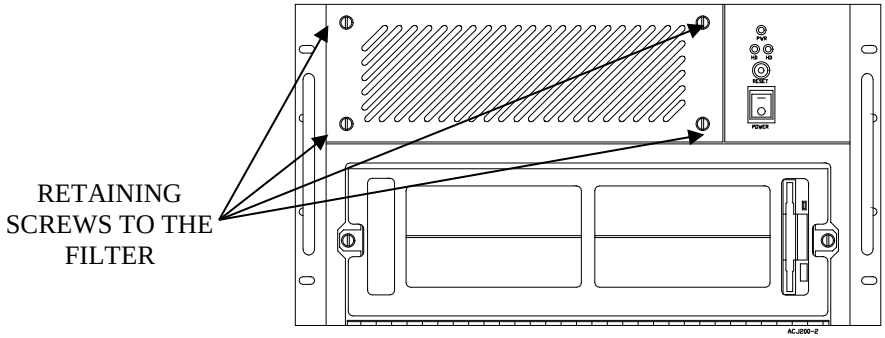


Figure 5-71. Computer Chassis

4) The fan(s) replacement requires the removal of the top cover to the chassis.

5) Remove the retaining screws on the front that hold the computer in place in the equipment cabinet. Refer to Figure 5-69.

6) Pull the chassis forward until the side rails lock.

7) Remove the two rear screws of the top cover. See Figure 5-72.

8) Loosen the four screws on each side which secure the top cover. It is not necessary to remove the screws. See Figure 5-72.

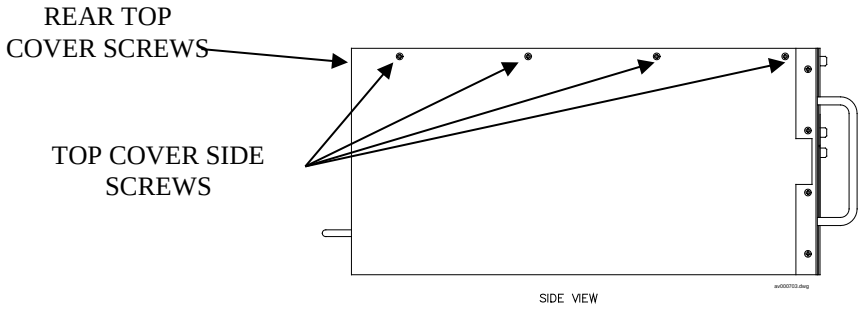


Figure 5-72. Computer Chassis Side View

9) Slide top cover back and upward for removal.

10) The bracket holding the three fans needs to be removed to allow fan wiring removal. Remove bracket side screws, two on each side. Unplug fan wiring connector and place assembly on a flat workbench. See Figure 5-73.

11) Remove the four fan screws and disconnect the wiring. See Figure 5-74.

12) Replace components as required and reinstall using these procedures in reverse order.

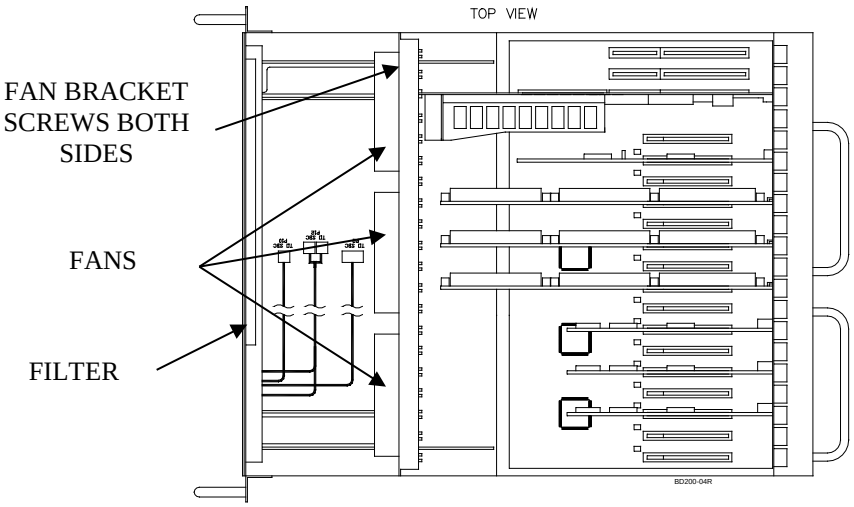


Figure 5-73. Computer Chassis Inside View

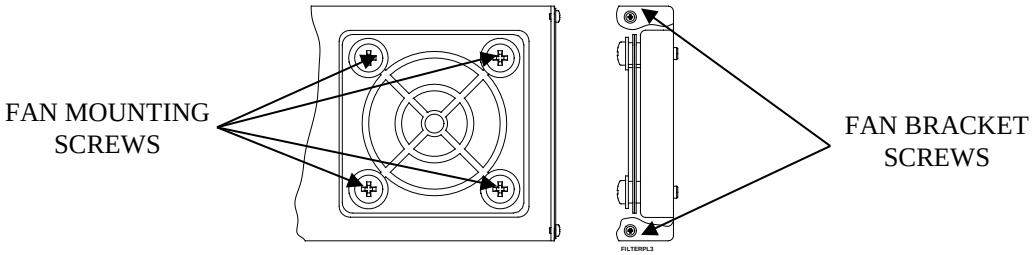


Figure 5-74. Computer Chassis Fan

5.7.2.2. Boards

5.7.2.2.1. System Boards

1) With power removed per paragraph 5.7.2, pull the computer chassis forward until the side rails lock.

2) Remove the top cover per paragraph 5.7.2.1.

3) The circuit board(s) can be removed and replaced from the PCI CPU board by removing the one screw on the board bracket, then pull the circuit board upward. See Figure 5-75.

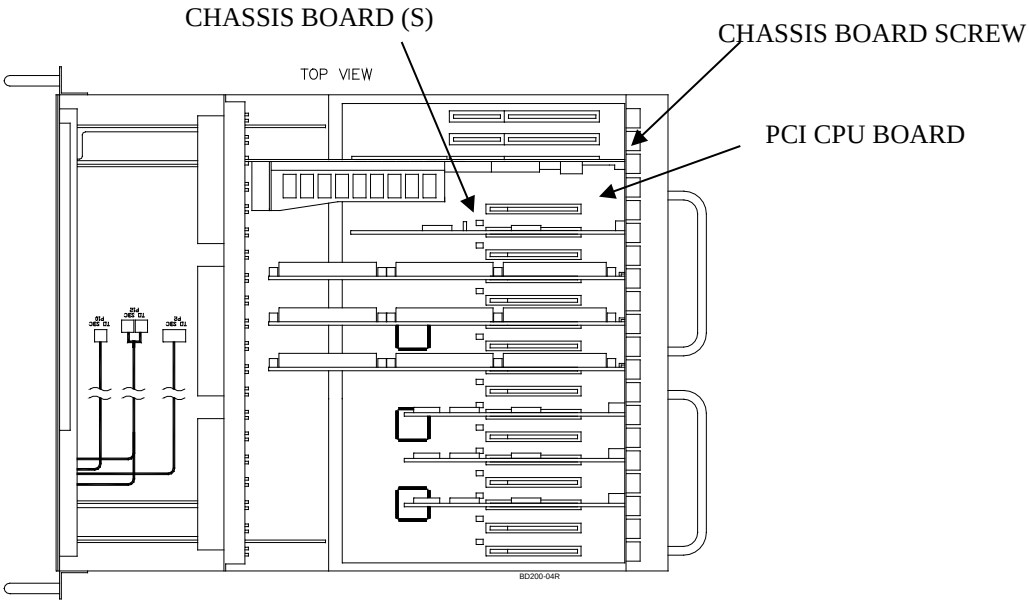


Figure 5-75. Circuit Board Removal

4) Replace components as required and ensure proper configuration per Section 2. Reinstall circuit boards using these procedures in reverse order.

5.7.2.2.2. PCI CPU Board

1) Remove the entire computer per paragraph 5.7.2.
2) Remove the top cover per paragraph 5.7.2.1.
3) Remove the top chassis support bracket. See Figure 5-76.
4) Remove the circuit system boards from the PCI CPU board by loosening the one screw on each of the boards' bracket then pull the system boards upward.
5) To remove the PCI CPU Board, remove six side screws on each side of the computer chassis and three rear screws on the computer chassis. Pull the entire board and sub-chassis out of the computer chassis. See Figure 5-76.

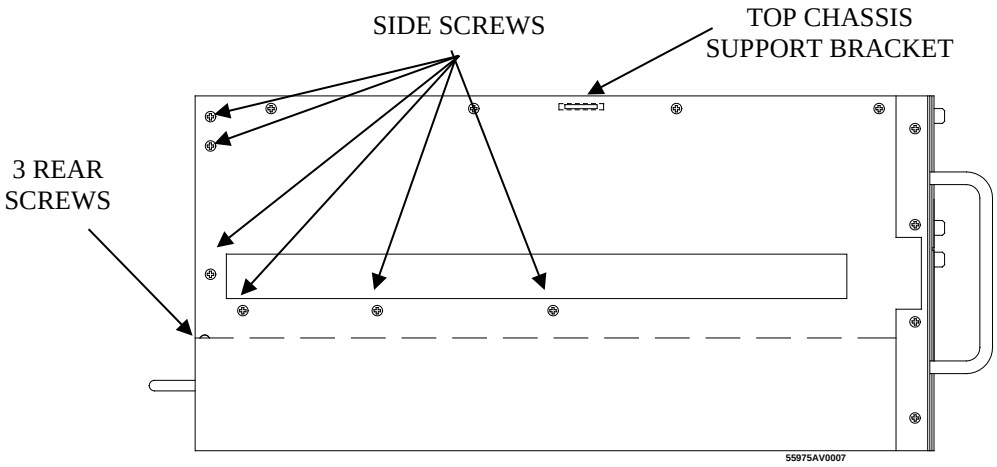


Figure 5-76. Computer Chassis Side View

6) Replace components as required and ensure proper configuration per Section 2. Reinstall PCI CPU board with chassis and circuit boards using these procedures in reverse order.

5.7.2.3. Floppy Disk Drive

1) With power removed per paragraph 5.7.2, pull the chassis rack drawer outward.
2) Remove the top cover per paragraph 5.7.2.1.
3) Gain access to the Floppy Disk Drive by dropping down the front lower chassis door, then loosening the side screws to the drive panel cover. See Figure 5-77.

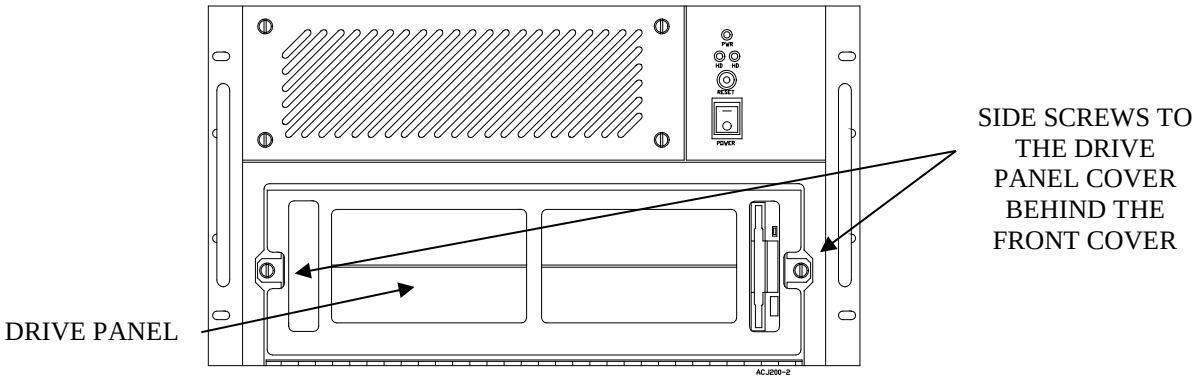


Figure 5-77. Floppy Disk Drive Removal

4) Very carefully pull the drive panel out and disconnect the electrical connections marking connectors before removal if not already labeled.
5) Place drive panel on a flat table for removal of the front plate. Two screws on each side hold the front drive panel to the drive chassis. See Figure 5-78.

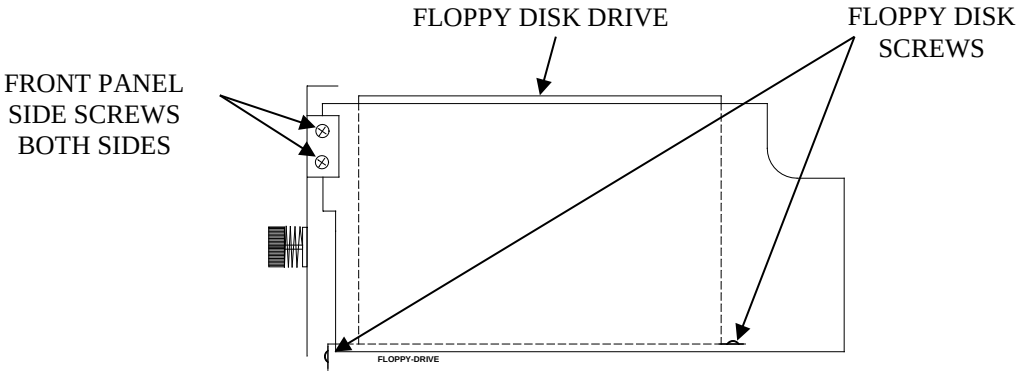


Figure 5-78. Floppy Disk Drive

6) Loosen the front screw and the back screw to the Floppy Disk Drive.
7) Pull the Floppy Disk Drive upward and outward.
8) Replace components as required and ensure proper configuration per Section 2.
9) Reinstall the Floppy Disk Drive using these procedures in reverse order.

5.7.2.4. Hard Drive

Use the Floppy Disk Drive removal and replacement procedure to replace or remove the Hard Drive.

5.7.2.5. CD ROM (Instructor Operating System only)

Use the Floppy Disk Drive removal and replacement procedure to replace or remove the CD-ROM Drive.

5.7.2.6. Power Supplies

Two dual-redundant, 300-watt, hot-swappable power supplies are on the back of the chassis. One may be removed with the chassis in operation with no adverse effect; the other supply immediately takes over. A red light between the two power supplies turns on showing which power supply has failed, and an audible alarm sounds. The switch below the lights will turn off the alarm. For replacement of the power supply, unplug the AC power cord; pull the latch above the AC connector to the right while pulling out on the power supply handle. Replace the power supply after repair or replacement of any defective components. See Figure 5-79.

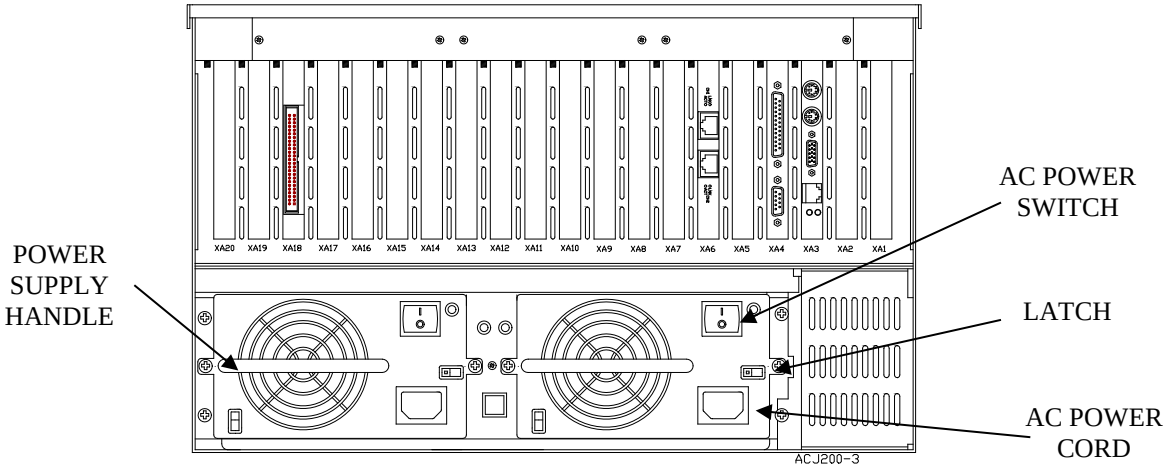


Figure 5-79. Computer Power Supplies

5.7.3. Electric Control Loading System

The following procedures contain instructions for the replacement of components of the Electric Control Loading System. These components include:

- Servo Amp
- Power Supply/Signal Conditioning (PSSC) Board
- Platform332 Board
    - Industry Packs (IPs)
    - GSnet Cooling Fans
    - Lithium Batteries
- Actuators
- Load Cells

5.7.3.1. Servo Amp (DRI and DAS)

Use the following procedure to remove and replace the servo amp. The items below are needed to accomplish the procedure.

- Serial Cable - P/N -5416ABH803-501
- Power tools software
- PC/Laptop computer

1) DRI: Turn off the AC power to the DRI Platform Assemblies by opening the CB21 circuit breaker on the AC Power Controller Assembly (9A1A1). See Figure 5-81.

   DAS: Turn off input power to the servo amp by opening CB on the Digital Servo Remote Power Controller 9A2A5 for the servo amp being replaced.

2) DRI: Unplug the servo amp power cord from the Digital Servo Remote Power Controller, 9A2A5.

DAS: Turn off DAS computer 9A3A6.

3) Disconnect cables from the Servo Amp.

   J1-AC power

   J5-Command

   J7-Motor feedback

   J8-Motor power

4) Disconnect any tie wraps holding cables in place.

5) Remove the old Servo Amp by removing four mounting screws. See Figure 5-80.

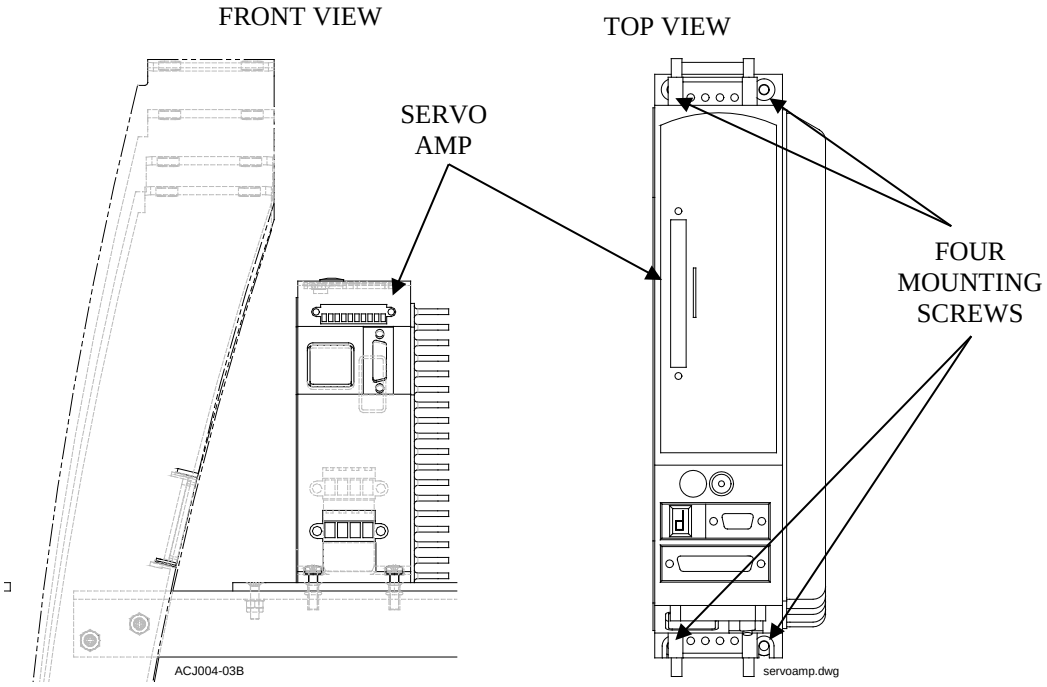


Figure 5-80. Servo Amp

6) Install new Servo Amp and tighten in place with four mounting screws.

7) Reconnect cables on Servo Amp.

   J1-AC power

   J5-Command

   J7-Motor feedback

   J8-Motor power

8) Reconnect power cable at 9A2A5.

9) Apply power to the Platform Assemblies by setting CB21 to the ON position at the AC Power Controller Assembly, 9A1A1.

10) Connect the serial cable to J4 of the Servo Amp and serial port of the PC/Laptop computer.

11) Open the Power Tools program. Check the firmware revision of the replaced servo amp. If there is a lower firmware revision, update the firmware using the procedure in paragraph 5.7.3.1.2. If there is a higher revision of firmware, contact FSI-SSD Engineering.

12) Load the Secondary Motion setup file from the laptop/desktop computer to the new servo amp using the procedure in paragraph 5.7.3.1.3.

13) If necessary, update the firmware for the remaining servo amps. All servo amps must be operating on the same revision level of firmware.

14) Perform the Servo Amp Calibration procedure in paragraph 5.2.4.2.

5.7.3.1.1. Downgrading the Servo Amp Firmware

New servo amplifiers arriving from the factory are equipped with a revision of firmware incompatible with the JPATS ECLDS system; therefore, it is necessary to replace the delivered firmware with revision B9. Use the following procedure to downgrade the firmware in the servo amp. The items below are needed to accomplish the procedure.

- Serial Cable - P/N -5416ABH803-501
- Power tools software
- PC/Laptop computer

1) Open the Power Tools Software program.
2) Connect the serial cable.
3) Select the Tools tab at top and then select Program Flash.
4) The screen will come up "Flash Upgrade". It will display an Address, Product Description, Base Revision, and FM Revision. If the Base Revision does not have a B9 under it, then a firmware degrade needs to be performed.
5) Press the Select File tab.
6) Locate the file labeled en_b9.fsh and open it.
7) Select the line that is in the box that needs to be degraded.
8) Now select the Upgrade tab. Once you select it, an “Updating Device” screen will appear with a countdown of how long the whole process will take.
9) After the time has finished, follow the instructions to remove the AC power.
10) Now there should be a B9 under the Base Revision on the “Flash Upgrade” page.
11) Exit out and this completes the firmware degrade.

5.7.3.1.2. Updating the Servo Amp Firmware

Use the following procedure to update the firmware in the servo amp only if the updated firmware is compatible with JPATS ECLDS. The items below are needed to accomplish the procedure.

- Serial Cable - P/N -5416ABH803-501
- Power tools software

- PC/Laptop computer

1) Open the Power Tools Software program.
2) Go to the Tools menu and select Update or Program Flash. The current firmware revision residing on the servo amp shows in the window. See the Servo Amp Current Firmware figure below.

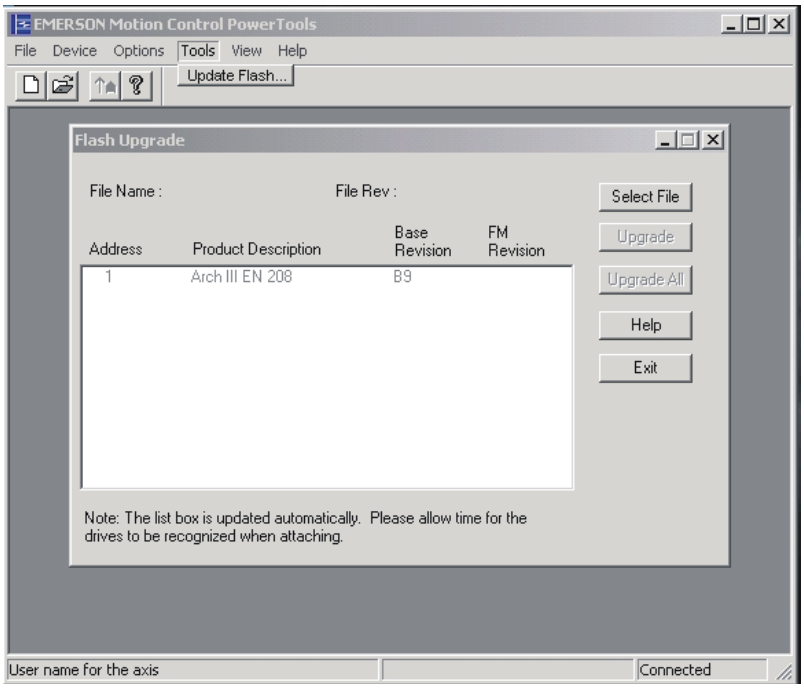


Figure 5-80.1. Servo Amp Current Firmware

3) Click on the "Select File" button. Find the Flash Input File (*.fsh) for the most current firmware load in the Power Tools Program (B9 in this case - if this is the same revision as what step 2 shows, no update is necessary). See the Select the Input File figure below.

NOTE

If the firmware revisions available are older than those on the servo amps, the current revision must be downloaded from the Emerson web site:

www.emersonmotioncontrol.com

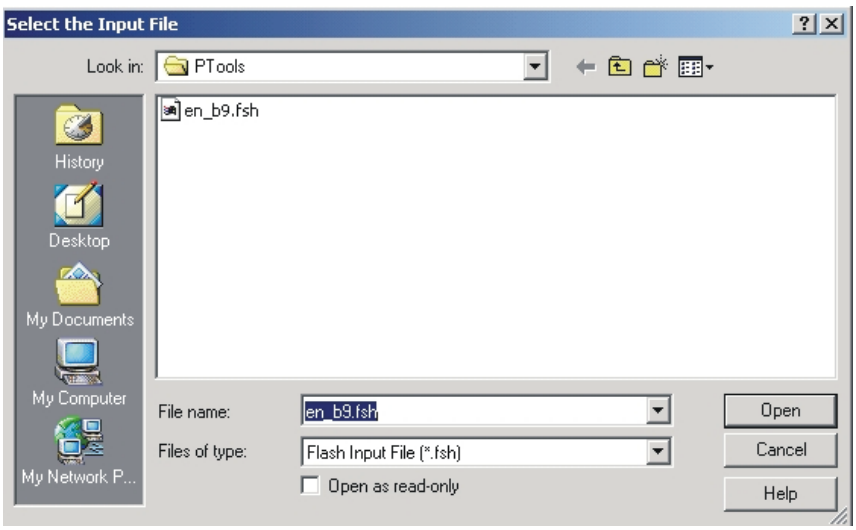


Figure 5-80.2. Select the Input File

4) Select the file then click on Open. The Flash Upgrade window displays with the firmware revision file.

5) Highlight the file and click on the Upgrade button. See the Flash Upgrade figure below. This updates the firmware on the amp with the file that was highlighted.

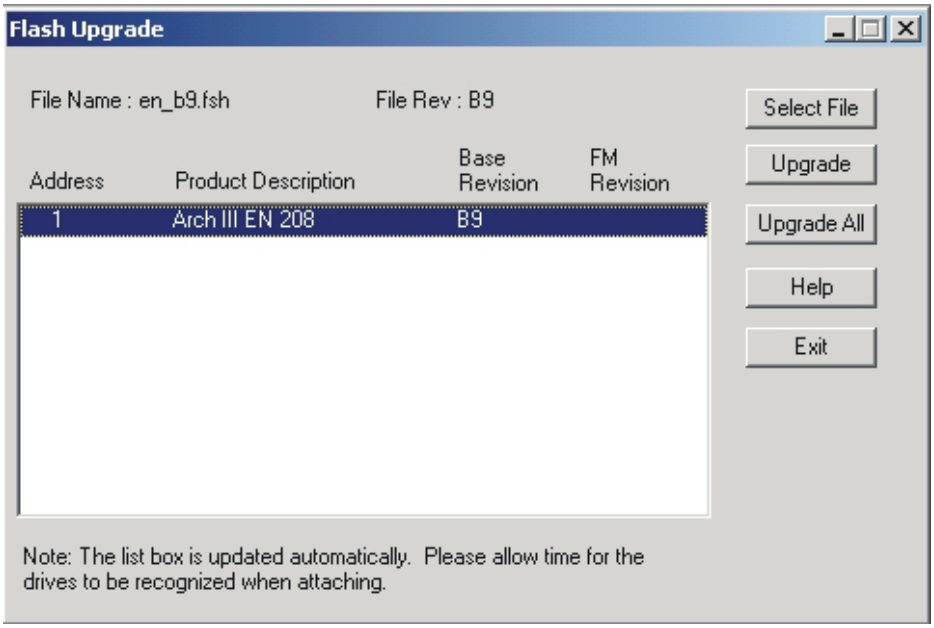


Figure 5-80.3. Flash Upgrade

6) As the firmware is updating, a progress window will display showing the progress of the update. See the Updating Device figure below.

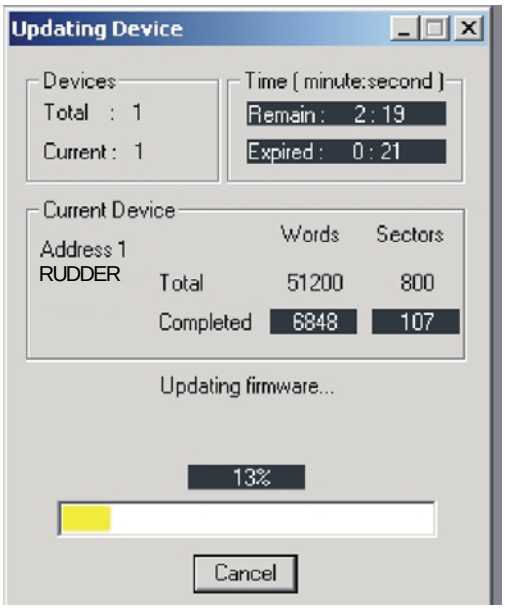


Figure 5-80.4. Updating Device

7) Once the update has completed, Power Tools prompts the user to turn off the amp for several seconds. Follow all prompts.

8) Update the servo amp file using the procedure in paragraph 5.7.3.1.3.

9) Disconnect the serial cable from the current servo amp and connect to the next. Continue checking the firmware revision on all servo amps and update if necessary.

5.7.3.1.3. Downloading a New Setup File to the Servo Amp

Use the following procedure to download a new setup file to the servo amp. The items below are needed to accomplish the procedure.

- Serial Cable - P/N -5416ABH803-501
- Power tools software
- PC/Laptop computer

1) Open the Power Tools Software program.

2) Go to the File menu and select Open. Browse to the folder on the PC/Laptop computer where the Setup File for the secondary motion system is located. See the Open Setup File Figure below.

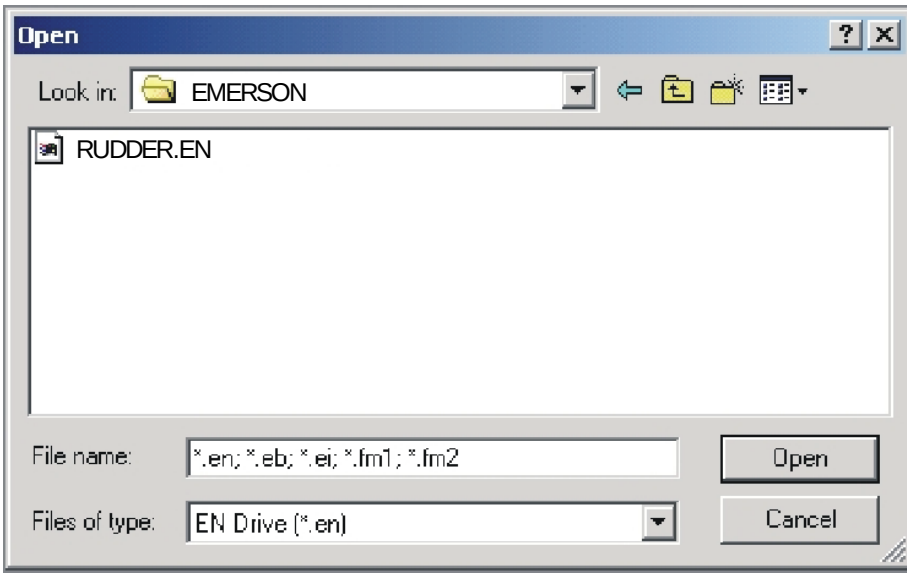


Figure 5-80.5. Open Setup File

10) Select the file and click on Open. The Detailed Setup page of the Setup File displays. (If it does not, select the Detailed Setup tab.) See the Download Setup File figure below.

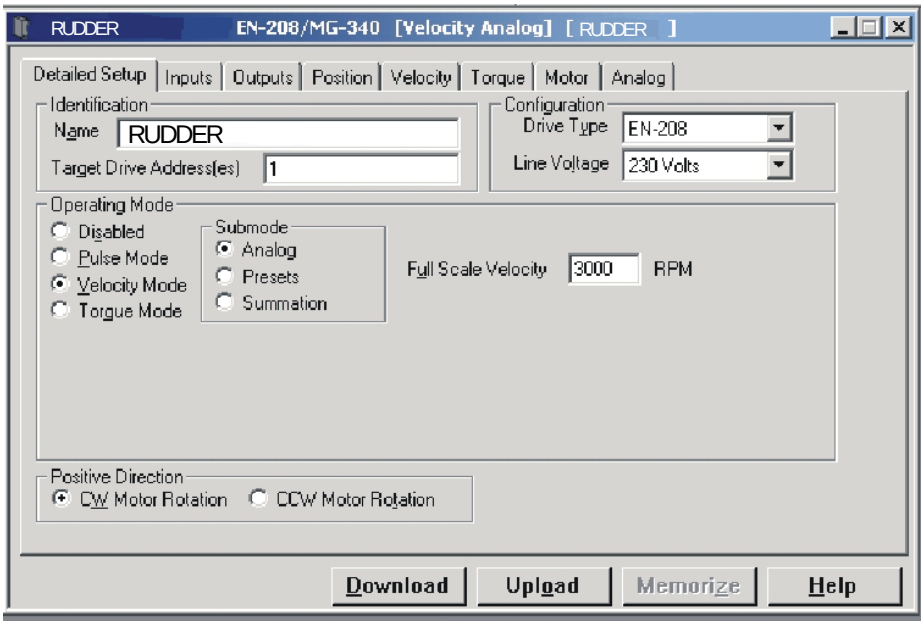


Figure 5-80.6. Download Setup File

11) From this page, select the Download button. Select Yes when asked to reboot. See the Reboot Drive figure below.

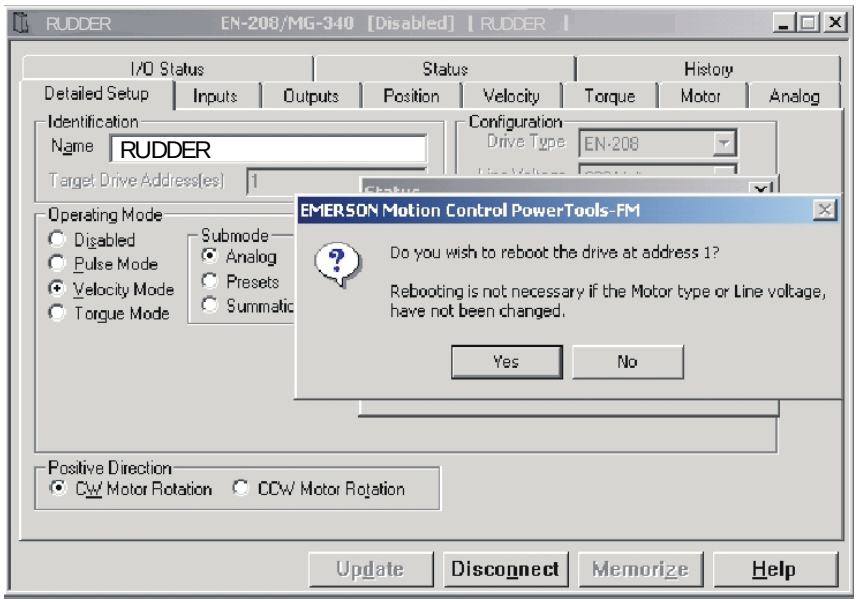


Figure 5-80.7. Reboot Drive

12) Once the reboot is complete, select Disconnect from the Detailed Setup page. When prompted to save changes select 'No' then close the setup file.

5.7.3.2. Power Supply and Signal Conditioning Board (PSSCB) (DRI systems only)

Replace the PSSCB in the DRI Platform Assembly following the steps below. (See paragraph 5.7.3.4.2 for DAS PSSCB procedures.)

WARNING

DISCONNECT ALL INCOMING POWER TO DRI PLATFORMS PRIOR TO PERFORMING THE REPLACEMENT PROCEDURE.

1) Remove power by opening CB21 on the AC Power Controller (9A1A1) before disconnecting J1 on the DRI Assembly. See Figure 5-81.

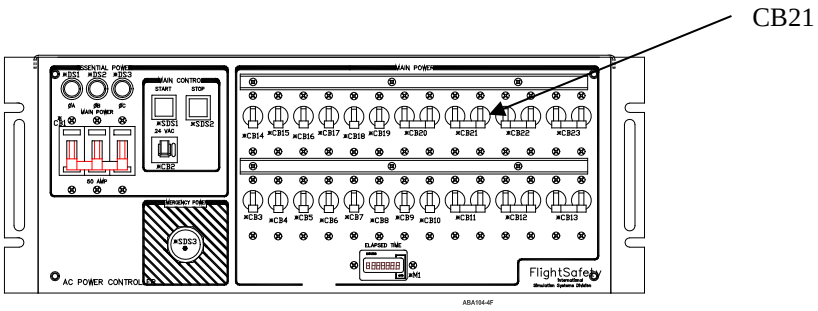


Figure 5-81. DRI Platform Power CB

2) Slide out the Control Loading or Utility Platform frame assembly.

3) Disconnect all the cables connected to the PSSCB and tag each wire for its terminal connection if not already labeled.

4) Remove the four screws holding the PSSCB in the DRI platform rack. See Figure 5-82.

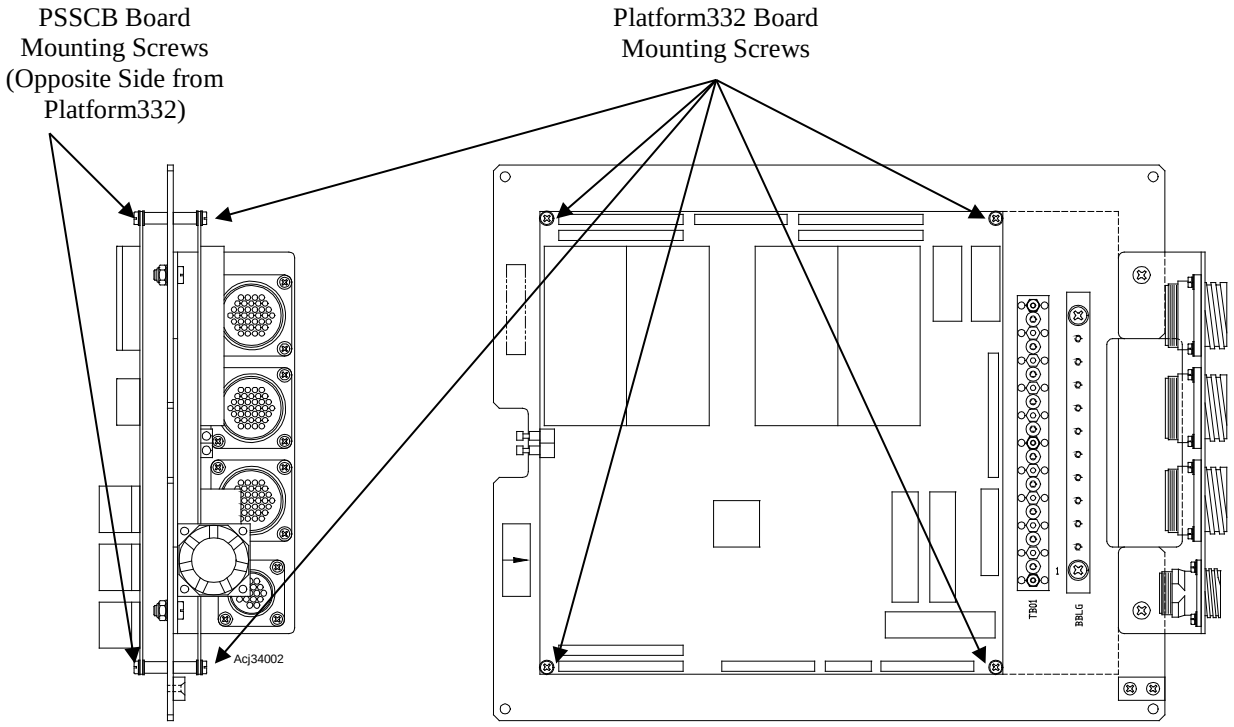


Figure 5-82. DRI Board Mounting

5) Configure the replacement board in accordance with the procedures in Section 2 of this manual.

6) Install the new board in the DRI Platform rack with screws at the four corners.

7) Reconnect the cables to the PSSCB.

8) Apply power to the flight simulator, control loading, and utility systems.

9) Adjust the +5VDC power in accordance with the procedure in paragraph 5.8.2.1.1.

10) Ensure that the voltages generated by the PSSCB are correct using the vendor drawing as a guide.

11) Verify proper operation of the new PSSCB Board by operating the flight simulator.

5.7.3.3. Platform332 Board

Replace the Platform332 board in the DRI Platform assembly following the steps below.

WARNING

DISCONNECT ALL INCOMING POWER TO DRI PLATFORMS PRIOR TO PERFORMING THE REPLACEMENT PROCEDURE.

1) Remove power by opening CB21 on the AC Power Controller (9A1A1) before disconnecting J1 on the DRI Assembly. Refer to Figure 5-81.
2) Slide out the Control Loading or Utility Platform frame assembly.
3) Disconnect the two fiber optic connectors and install the fiber optic dust covers. See Figure 5-83.

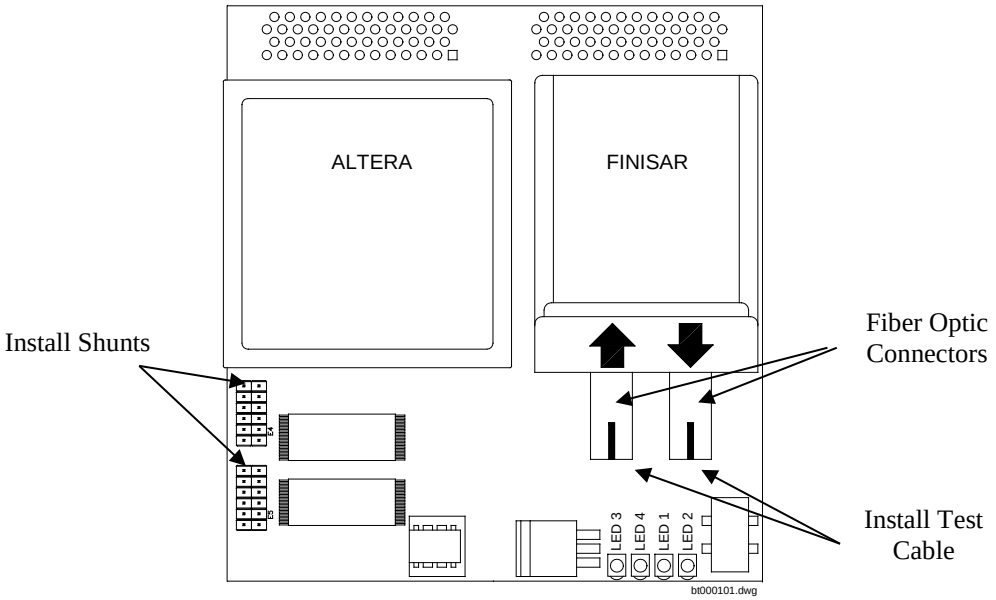


Figure 5-83. GSnet Board Fiber Optic Connections

4) Disconnect the remaining cables from the Platform332 Board.
5) Remove the four screws holding the Platform332 board in the DRI Platform rack. Refer to Figure 5-82.
6) Configure the replacement board in accordance with the procedures in Section 2 of this manual.
7) Remove the industry packs from Slots A through D and the IP-GSnet Module from Slots E and F on the old board. Carefully note from which slots the individual packs are removed.
8) Install the industry packs and the IP-GSnet Module on the replacement board, taking care that they are placed into the same slots as before removal. Refer to Section 2 of this manual for IP configuration.

9) Mount the new board on the DRI Platform rack using the removed screws.

10) Reconnect the cables to the Platform332 board. Prior to reinstalling the Fiber Optic cables, clean the cable ends with Chemtronics “Optic Prep” pre-saturated wipe CP410.

11) Reconnect the Fiber Optic cables to the IP-GSnet transceiver.

12) Connect the Laptop Computer to the serial port on the DRI platform Assembly.

13) Apply power to the flight simulator and control loading systems.

14) Download the DRI Platform software to the Platform332 board using the procedures in the Software Utilities section of this manual.

15) Verify proper operation of the new Platform332 Board by operating the flight simulator.

5.7.3.3.1. Industry Packs and Gsnet Transceiver

NOTE

Replacement of industry packs may be done without removing the Platform332 Board.

Follow this procedure to replace Industry Packs and the GSnet Transceiver.

WARNING

DISCONNECT ALL INCOMING POWER TO DRI PLATFORMS PRIOR TO PERFORMING THE REPLACEMENT PROCEDURE.

1) Remove power by opening CB21 on the AC Power Controller (9A1A1) before disconnecting J1 on the DRI Assembly. Refer to Figure 5-81.

2) Remove the screws holding the pack to the board and remove the failed pack from its slot on the Platform332 Board.

3) Install jumpers on the replacement pack in accordance with the configuration procedures in Section 2 of this manual.

4) Install the new pack into the proper slot on the Platform332 Board and install the screws removed in Step 2.

5) Apply power to the flight simulator and verify DRI platform operation.

5.7.3.3.2. GSnet Cooling Fan

Use the following procedure to replace the GSnet cooling fan. See Figure 5-84.

WARNING

DISCONNECT ALL INCOMING POWER TO DRI PLATFORM PRIOR TO PERFORMING THIS PROCEDURE.

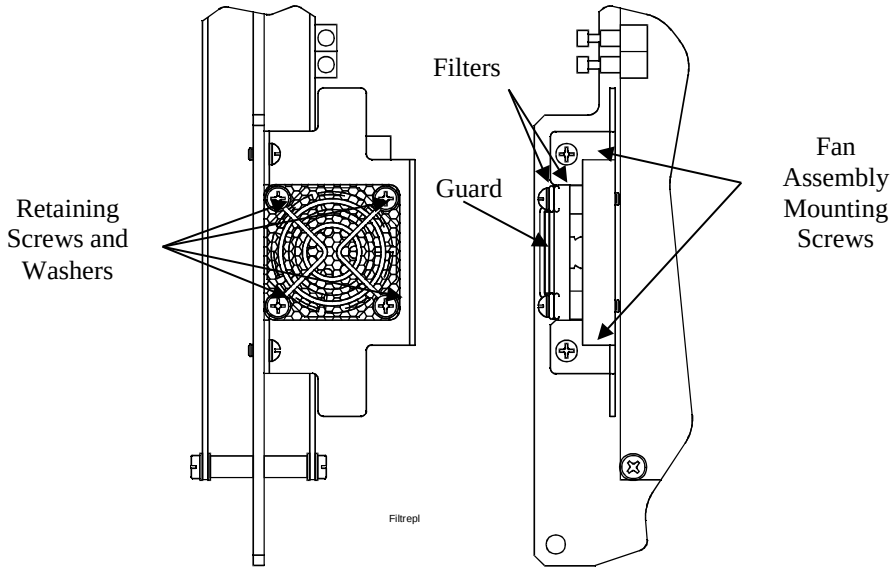


Figure 5-84. GSnet Cooling Fan

1) Remove power by opening CB21 on the AC Power Controller (9A1A1) before disconnecting J1 on the DRI Assembly. Refer to Figure 5-**81**.
2) Disconnect the fan wires from the board.
3) Remove the fan assembly from the frame by removing the two screws.
4) Remove the fan by removing the four retaining screws, washers, outer guard, and filter.
5) Install the new fan assembly, outer guard, and filter with the retaining washers and screws making sure the airflow is towards the GSnet IP.
6) Install the fan assembly on the frame with the attaching screws.
7) Reconnect the fan wires to the board.
8) Apply power to the platform.
9) Verify correct operation of the fan.

5.7.3.3.3. Lithium Battery on Platform332 Board

Replace the lithium battery on the Platform332 Board every ten years, or sooner, if required. Refer to Figure 5-85 for location.

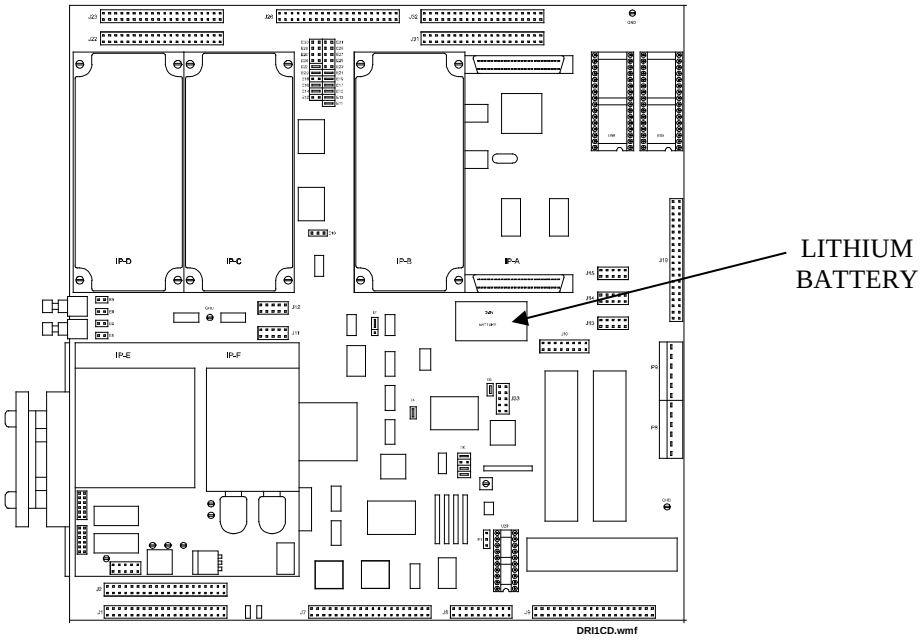


Figure 5-85. Platform332 Board

WARNING

DISCONNECT ALL INCOMING POWER TO DRI PLATFORMS PRIOR TO PERFORMING THE REPLACEMENT PROCEDURE.

Follow this procedure to replace the Lithium battery.

1) Remove the Platform332 Board from the DRI platform assembly as described in paragraph 5.7.3.3.
2) Using a low wattage soldering iron, carefully remove the lithium battery from the Platform332 Board.
3) Install the new battery.
4) Install the Platform332 Board on the DRI platform as described in paragraph 5.7.3.3.
5) Dispose of the old battery in accordance with local procedures.

5.7.3.4. DAS Chassis

Replace the components in the DAS chassis using the following procedures.

WARNING

DISCONNECT ALL INCOMING POWER TO THE 9A2 CABINET PRIOR TO PERFORMING THE REMOVAL AND REPLACEMENT PROCEDURE. AFTER POWER IS DISCONNECTED, USE A METER OR OTHER APPROPRIATE TESTING DEVICE TO ENSURE POWER HAS BEEN REMOVED FROM THE EQUIPMENT.

NOTE

Most components mounted in the DAS chassis can be replaced without removing the assembly from the cabinet. If it is necessary to remove it from the cabinet, follow the procedure in the Remove and Replace Assemblies on Slide Rails paragraph.

1) Remove power to the 9A2 cabinet by performing the power down procedure in Section 3 of this manual.
2) Remove the top cover by removing the top retaining screws. Keep the screws.
3) Remove and replace components in the DAS chassis in accordance with the following paragraphs.
   - CPU Board and Modules, paragraph 5.7.3.4.1.
   - PSSCB, paragraph 5.7.3.4.2.
   - Power Supply, paragraph 5.7.3.4.3.
   - Cooling Fans, paragraph 5.7.3.4.4.
4) Install the top cover using the screws that were kept in Step 2.
5) Release the two slide locks and carefully push the assembly back into the cabinet being careful not to pinch or kink any of the cables while doing so.
6) Reinstall the screws that secure the assembly to the rack.
7) Power up the system in accordance with the power up procedure in Section 3 of this manual.

5.7.3.4.1. CPU Board and Modules

The CPU board and modules are stacked on top of each other, each plugging into the one below it and retained with screws and stand-offs. Figure 5-86 illustrates the assembled configuration and Figure 5-87 illustrates the stacking method. The components are stacked in the following order.

- CPU Board
    - Video Card
    - PCI Master IP Carrier Board
        - Unidig IP Packs
        - PCI Slave IP Carrier Board
            - A/D IP Packs

The Unidig and A/D IP Packs can be replaced without un-stacking any of the components.

Replace any of the components using the procedure below. The following materials are required to perform this procedure.

- Paper Tags

1) Remove and label the connectors from the PCI Master or Slave IP Carrier modules only if replacing these modules. These modules can be laid over on top of the PSSCB board with their cables attached if replacing components beneath them.
2) Remove the retaining screws starting with the top component. Keep screws. Remove retaining screws from the next component, etc., until the component that needs replacing is exposed.
3) Remove and label the connectors from the component being replaced.
4) Remove the retaining screws from the component.
5) Configure the component in accordance with the procedures in Section 2 of this manual.

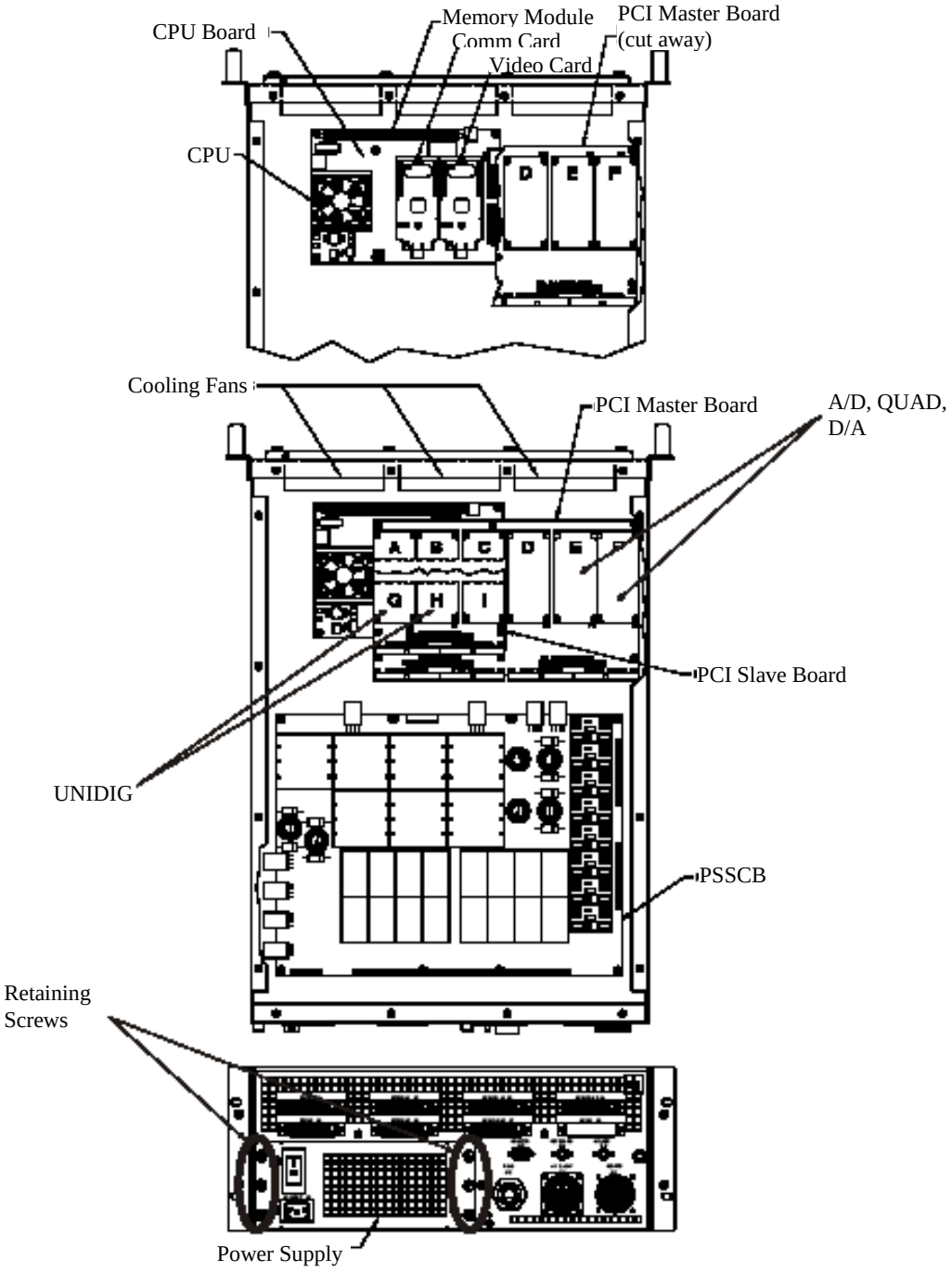


Figure 5-86. DAS Chassis Components

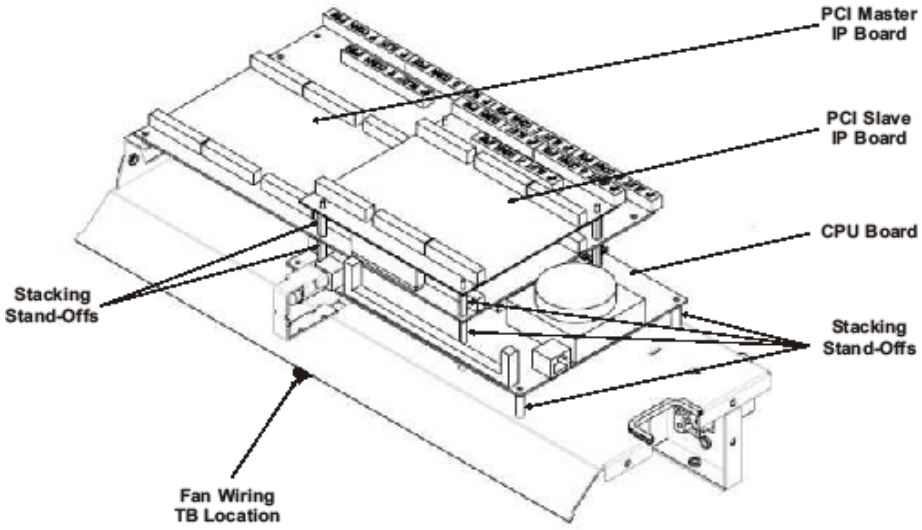


Figure 5-87. DAS Chassis CPU Component Stacking

6) Remove any stand-offs and other hardware from the removed component and install on the replacement component.
7) Install the component and join the connectors previously removed.
8) Re-stack components following the above procedure in reverse.

5.7.3.4.2. PSSCB

Replace the PSSCB using the procedures below. Refer to Figure 5-86. The following materials are required to perform this procedure.

- Paper Tags

1) Remove and label the connectors from the PSSCB.
2) Remove the retaining screws from the PSSCB. Keep the screws.
3) Configure the replacement PSSCB in accordance with the procedures in Section 2 of this manual.
4) Install the replacement PSSCB with the original retaining screws.
5) Reconnect the cables to the PSSCB.
6) Check the +5VDC in accordance with the PSSCB +5VDC Adjustment paragraph in this manual.

5.7.3.4.3. Power Supply

Replace the Power Supply using the following procedures. Refer to Figure 5-86.

1) Unplug the power cord.
2) Remove the retaining screws from the power supply.
3) Slide the power supply out of the DAS chassis.
4) Slide replacement power supply into the DAS chassis.

5) Re-install the retaining screws.

6) Place the power switch in the On (1) position.

5.7.3.4.4. Cooling Fans

Replace the cooling fans using the following procedures. Refer to Figure 5-5, Figure 5-86, and Figure 5-87.

1) Remove the filter retainer from the front of the DAS chassis by unscrewing the retaining screws below the filter, then pulling the bottom of the retainer out and down until the tabs are clear of the holes in the chassis. The screws are captive screws and will stay in the retainer.

2) Remove the four retaining screws holding the fan to be replaced. Keep the screws.

3) Disconnect the fan wiring making note which color wire connects to each TB post.

NOTE

It may be necessary to remove the CPU, PCI Master, and PCI Slave Boards and the bracket they mount on in order to gain access to the fan wires that are connected to the TB.

4) Slide the fan up, out of the chassis.

5) Install the replacement fan following the above steps in reverse order.

5.7.3.5. Actuators

Actuator build up is covered as a separate procedure from actuator removal and installation.

NOTE

Keep actuator trunnion in place at all times, DO NOT LOOSEN. If loosened, a lower level alignment of the actuator assembly will be required. If not properly aligned, side load could be induced on the load cell causing false indications and inaccurate calibrations of the control-loading axis being worked on.

The items below are needed to accomplish the actuator procedures covered in this section.

- Mechanic’s tool kit
- PRO360 digital level
- 24-inch steel rule or steel tape measure

NOTE

Accuracy test of the PRO360 should be performed before use in accordance with PRO360 owner's manual. Ensure steel rule or tape is readable and free of defects.

5.7.3.5.1. Actuator Buildup

1) With the actuator rod fully extended, install the anti-rotation clamp with the Allen head gap centered on the flat portion of the rod. Use 609 Loctite, or similar product, as necessary on the inside surface of the collar to prevent rotation and 222 Loctite, or similar product, on Allen threads.
2) Install the anti-rotation tray with a $1/16^{th}$ inch gap between it and the collar bearing.
3) Install a 7/16 X 20 thread pitch jam nut on the rod and tighten against anti-rotation clamp.
4) Install the load cell adapter on the rod and tighten against the jam nut.
5) Install a ½ X 20 thread pitch jam nut onto the adapter.
6) Install the load cell onto the adapter, bottom out, then back off just enough to level with the tray.
7) Install a ½ X 20 thread pitch jam nut on the push rod and screw it into the load cell, bottoming it out, then tighten the jam nut.
8) Install a 3/8 X 24 thread pitch L/H thread jam nut on the rod end all the way, then screw the rod end into the push rod, bottoming it out. Tighten the jam nut.

5.7.3.5.2. Actuator Removal and Installation

Listed below are overall guidelines on removal and installation of actuators. These guidelines are to be used in conjunction with the specific actuator procedures for each axis.

Removal of actuators:

1) Remove the Expando bolt from the bell-crank assembly. Ease the eyebolt and load cell assembly from the bell-crank.

NOTE

Be extremely careful not to damage the Expando bolt and load cell assembly when removing and installing.

2) At the actuator trunnion, loosen the jam nuts on both sides of the actuator. Loosen the setscrews to free the pivot pins.
3) While supporting the actuator assembly, slide pivot pins out of the trunnion housing. If the pin does not slide easily, use a size 10/32-thread screw and thread it into the pivot pin, this will allow better grip on the pin and should ease pin removal.
4) Remove the actuator assembly as a whole unit. Do not remove any of the load cell assembly.

Installation of actuators:

1) Place the actuator assembly into the trunnion and insert pivot pins. Do not tighten any hardware at this time.
2) Align eyebolt into bell-crank. The eyebolt should move with minimal resistance into the bell-crank. Resistance can induce side loads onto the load cell, causing false indications and calibrations. Once the proper alignment is achieved, bottom out the pivot pins by pushing them all the way in. If they are not at bottom, side play will result, again causing inaccurate calibration.
3) The soft-tip setscrews on both sides of the trunnion should be snug against the pivot pin.
4) Tighten jam nuts to lock setscrews in place.
5) Reinstall Expando bolt. ENSURE the highest ridge of the bullet-shaped tip seats onto the meat of the bell-crank bracket seat. It should not protrude beyond bell-crank bracket. This can cause damage to the Expando bolt and bell-crank assemblies when removed during the next cycle.
6) Ensure the anti-rotation device is installed both square and parallel to the actuator rod, and does not contact the bottom of the tray. This may require the use of shims at the point where the anti-rotation tray mounts to the actuator housing.
7) Calibrate the flight controls.

5.7.3.5.2.1. Aileron Actuator Removal and Replacement

1) Remove the load cell pins from the connector.
2) Remove and cap the actuator oil lines and unions.
3) Remove the Expando bolt from the bell crank and pushrod.
4) Loosen the check nut, then the setscrew on the pivot pins. Remove the pins and actuator.
5) On the new actuator, pull the actuator rod out until a measurement of 4.00 inches ± 1/16 inch is obtained measuring from the actuator front faceplate to the anti-rotation collar.
6) Install the actuator in the mount with pivot pins. Reconnect oil lines.
7) Align the actuator in the mount vertically to allow the rod end to freely enter the bell crank. This will remove side loads. Ensure the pivot pins are inserted all the way, then tighten the setscrew and check nut. Recheck the rod end/bell crank.
8) Install the Expando bolt ensuring the largest part of bullet is centered in the bell crank clevis. Tighten the Expando bolt only enough to prevent the Allen wrench from turning it.
9) Set the X-Dimension by loosening jam nuts on the push rod and adjusting the rod to obtain 15-7/8 inches ± 1/16 inch from the actuator front faceplate to the center of the Expando bolt. Tighten the jam nuts.
10) Zero the PRO360 in bay floor, then place on the left or right side of the control stick tube in the cockpit and verify it is at $90^{o} \pm .5^{o}$. If not, adjust the push rod accordingly to arrive at $90^{o} \pm .5^{o}$.
11) Reinstall the load cell pins in the connector.

12) Perform an operation check.

5.7.3.5.2.2. Elevator Actuator Removal and Replacement

1) Remove the load cell pins from the connector.
2) Remove and cap the actuator oil lines and unions.
3) Remove the Expando bolt from the bell crank and pushrod.
4) Loosen the check nut, then the setscrew on the pivot pins. Remove the pins and actuator.
5) On the new actuator, pull the actuator rod out until a measurement of 4.00 inches ± 1/16 inch is obtained measuring from the actuator front faceplate to the anti-rotation collar.
6) Install the actuator in the mount with pivot pins and reconnect oil lines.
7) Align the actuator in the mount horizontally to allow the rod end to freely enter the bell crank. This will remove side loads. Ensure the pivot pins are inserted all the way, then tighten the setscrew and check nut. Recheck the rod end/bell crank.
8) Install the Expando bolt ensuring the largest part of bullet is centered in the bell crank clevis. Tighten Expando bolt only enough to prevent the Allen wrench from turning it.
9) Set the X-Dimension by loosening jam nuts on the push rod and adjusting the rod to obtain 14 inches ± 1/16 inch from the actuator front faceplate to the center of the Expando bolt. Tighten the jam nuts.
10) Place a digital level on the front or rear side of the control stick tube in the cockpit and verify it is at 6.1º ± .5º aft of vertical. If not, adjust the push rod accordingly to arrive at 6.1º aft ± .5º.
11) Reinstall the load cell pins in the connector.
12) Perform an operation check.

5.7.3.5.2.3. Rudder Actuator Removal and Replacement

1) Remove the load cell pins from the connector.
2) Remove and cap the actuator oil lines and unions.
3) Remove the Expando bolt from the bell crank and pushrod.
4) Loosen the check nut, then the setscrew on the pivot pins. Remove the pins and actuator.
5) On the new actuator, pull the actuator rod out until a measurement of 4.00 inches ± 1/16 inch is obtained measuring from the actuator front faceplate to the anti-rotation collar.
6) Install the actuator in the mount with pivot pins and reconnect oil lines.
7) Align the actuator in the mount vertically to allow the rod end to freely enter the bell crank. This will remove side loads. Ensure the pivot pins are inserted all the way, then tighten the setscrew and check nut. Recheck the rod end/bell crank.
8) Install the Expando bolt ensuring the largest part of bullet is centered in the bell crank clevis. Tighten Expando bolt only enough to prevent the Allen wrench from turning it.

9) Set the X-Dimension by loosening jam nuts on the push rod and adjusting the rod to obtain 21-1/2 inches ± 1/16 inch from the actuator front faceplate to the center of the Expando bolt. Tighten the jam nuts.

10) Check system for proper rigging by pinning both rudder pedals at the output arm assembly. If pins cannot be inserted, loosen jam nuts on the pushrod and adjust pushrod until pins can be inserted, then tighten the jam nuts. If only one pin can be inserted, proceed with the rudder pedal alignment procedures. Remove rig pins.

11) Reinstall the load cell pins in the connector.

12) Perform an operation check.

5.7.3.5.2.4. Toe Brake Actuator Removal and Replacement

1) Remove and cap oil lines and unions.

2) Remove the pin from the upper pushrod and the toe brake output arm.

3) Remove the upper pushrod from the actuator shaft.

4) Remove the snap ring from the lower mount pivot pin and drive the pin out of the mount.

5) Install the new actuator in mount with pivot pin and install the snap ring. Install oil lines.

6) On the new actuator, pull the actuator rod out until a measurement of 6-3/4 inches ± 1/16 inch is obtained measuring from the actuator front faceplate to the anti-rotation collar.

7) Install the upper pushrod on the actuator rod threading it completely down to the jam nut.

8) Connect the upper pushrod to the brake output arm with the pin and retaining ring.

9) Place an electronic level on the flat portion of the output arm and adjust the pushrod to obtain $4.4^{o} \pm .5^{o}$ downward. Tighten the jam nuts.

10) Move the actuator rod to allow the installation of the remaining retaining ring.

11) Perform an operation check.

5.7.3.5.3. GS-to-GSX Primary Controls Actuator Hardware Upgrade

The procedures described here will augment those currently under 5.7.3.5.2 once all GS-series actuators are replaced by the new GSX series. See the respective instructions under 5.7.3.5.2 for greater detail regarding installation of specific actuators.

CAUTION

GSX unit (PN: GSX30-0605-MDM-EM2-238) requires a new feedback cable. If cable is not provided, installation cannot be completed.

CAUTION

The new GSX series (PN: GSX30-0605-MDM-EM2-238) will not pass calibration test until the amplifier is programmed to identify the new equipment. Servo amplifier "motor.ddf" file installation instructions are provided in 5.2.4.3.

NOTE

The two original threaded rods at the bottom of the GSX unit are not long enough to install the anti-rotation assembly guide. (DO NOT DRILL ANYWHERE ON THE NEW GSX ACTUATOR.) Solution: Cut two 10" pieces of ¼"-20 threaded rod (PCN: 47190). Replace the original short threaded rods with the new 10" threaded rods.

1) Power Down control loading power supply and Servo Amp circuit breakers.
2) Drain oil using peristatic pump.
3) Disconnect cable connectors to load cell, Motor Unit, and Encoder Unit.
4) Remove small grounding strap attached to the Motor Unit connector.
5) Unscrew load cell connector bracket from simulator frame.
6) Loosen pivot pin set screws on both sides of the actuator.
7) Loosen and remove Expando bolt to detach actuator linkage to bell crank.
8) Use Caution when removing actuator pivot pins.
9) With the actuator assembly free from the simulator frame, remove both oil lines.
10) Transfer the entire assembly to a safe area with plenty of working space.

NOTE

No modification to the GSX-series actuator is required when installing original hardware. However, the GSX unit has no receiving hole for the alignment pin on the trunnion plates. Knock alignment pins flush with the trunnion plate surface before attaching mounting plates to the unit.

11) Install anti-rotation device, load cell, jam nuts, and tie rod to the new GSX actuator.

12) Once assembly is complete, install the GSX unit to the simulator frame.

13) Install the new feedback cable by connecting end A (See Figure 5-88) to the corresponding servo amplifier.

14) Run the length of the cable through the simulator frame and connect end B (See Figure 5-88) to the new GSX actuator.

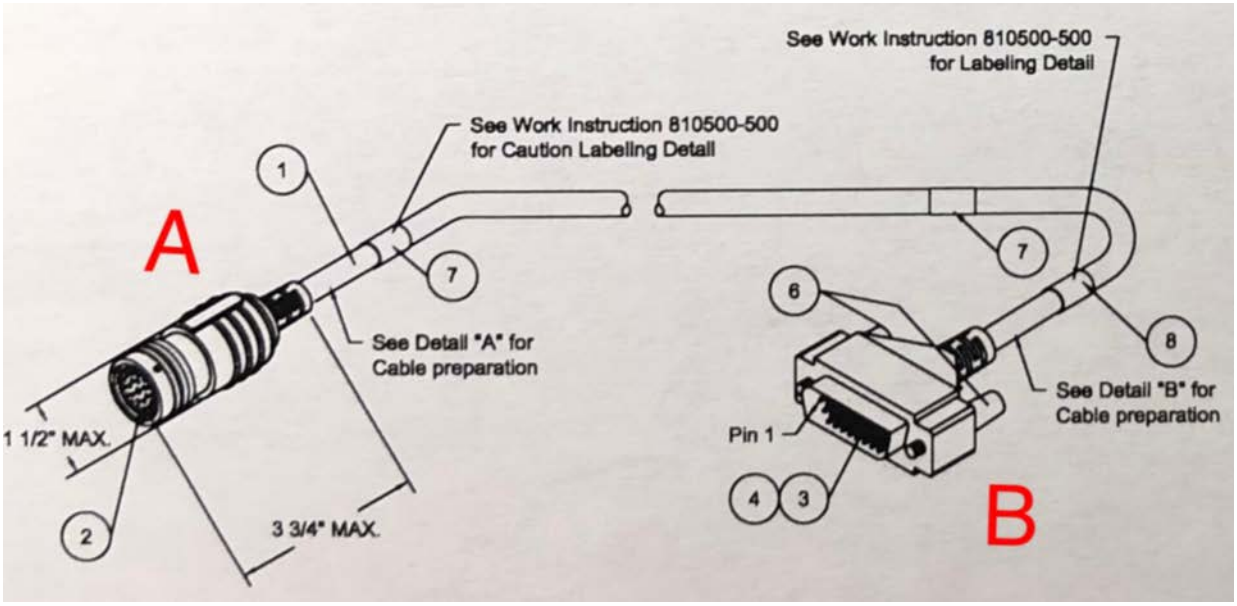


Figure 5-88. Feedback Cable

5.7.3.5.4. GS to GSX Toe Brake Actuator Hardware Upgrade

The procedures described here will augment those currently under 5.7.3.5.2 once all GS-series actuators are replaced by the new GSX series. See the respective under 5.7.3.5.2 for greater detail regarding installation of specific actuators.

CAUTION

GSX unit (PN: GSX30-0605-MCM-EM2-238) requires a new feedback cable. If cable is not provided, installation cannot be completed.

CAUTION

The new GSX series (PN: GSX30-0605-MCM-EM2-238) will not pass calibration test until the amplifier is programmed to identify the new equipment. Servo amplifier "motor.ddf" file installation instructions are provided in 2.4.3.5.

NOTE

The two original threaded rods at the bottom of the GSX unit are not long enough to install the anti-rotation assembly guide. (DO NOT DRILL ANYWHERE ON THE NEW GSX ACTUATOR.) Solution: Cut two 13" pieces of ¼"-20 threaded rod (PCN: 47190). Replace the original short threaded rods with the new 13" threaded rods.

1) Power Down control loading power supply and Servo Amp circuit breakers.
2) Drain oil using peristatic pump.
3) Disconnect cable connectors to load cell, Motor Unit, and Encoder Unit.
4) Remove small grounding strap attached to the Motor Unit connector.
5) Unscrew load cell connector bracket from simulator frame.
6) Carefully, remove actuator pivot pins. There are big and small "C" clips holding the pivot pins in place.
7) With the actuator assembly free from the simulator frame, remove both oil lines.
8) Transfer the entire assembly to a safe area with plenty of working space.

NOTE

No modification to the GSX-series actuator is required when installing original hardware.

9) Install anti-rotation device, load cell, jam nuts, and tie rod to the new GSX actuator.
10) Once assembly is complete, install the GSX unit to the simulator frame.
11) Install the new feedback cable by connecting end A (See Figure 5-88.) to the corresponding servo amplifier.
12) Run the length of the cable through the simulator frame and connect end B (See Figure 5-88) to the new GSX actuator.

5.7.3.6. Load Cells

All load cells on this system are In-Line or Linkage load cells. It is very important all measurements taken in this procedure are made accurately. A poor measurement could result in the dynamic of the control axis changing when reassembled, causing the system plots for that control axis to be inaccurate.

WARNING

DISCONNECT POWER TO COMPONENTS BEFORE REMOVING OR REPLACING. AFTER POWER IS DISCONNECTED, USE A METER OR OTHER APPROPRIATE TESTING DEVICE TO ENSURE POWER HAS BEEN REMOVED FROM THE COMPONENT.

The following tools are needed for completion of this procedure.

- AMP pin extraction tool
- Mechanics Tool Kit
- Digital Voltmeter

1) Remove power to the DRI platforms by tripping CB21.
2) Remove power to the servo amplifier(s) by tripping associated CBs on the appropriate control system.
3) Using the AMP pin extraction tool, remove the in-line load cell cable connector pins from the AMP connector while noting the location of each color-coded wire.
4) Accurately measure the length of the actuator assembly:

   From the base end of the load cell stud to the center of the tie rod end for elevator, aileron and rudder actuators. See Figure 5-89.

   From the top end of the lower rod assembly (where the load cell mounts into the lower rod) to the center of the upper load cell rod end bolt for the right and left toe brake actuators. See Figure 5-90.

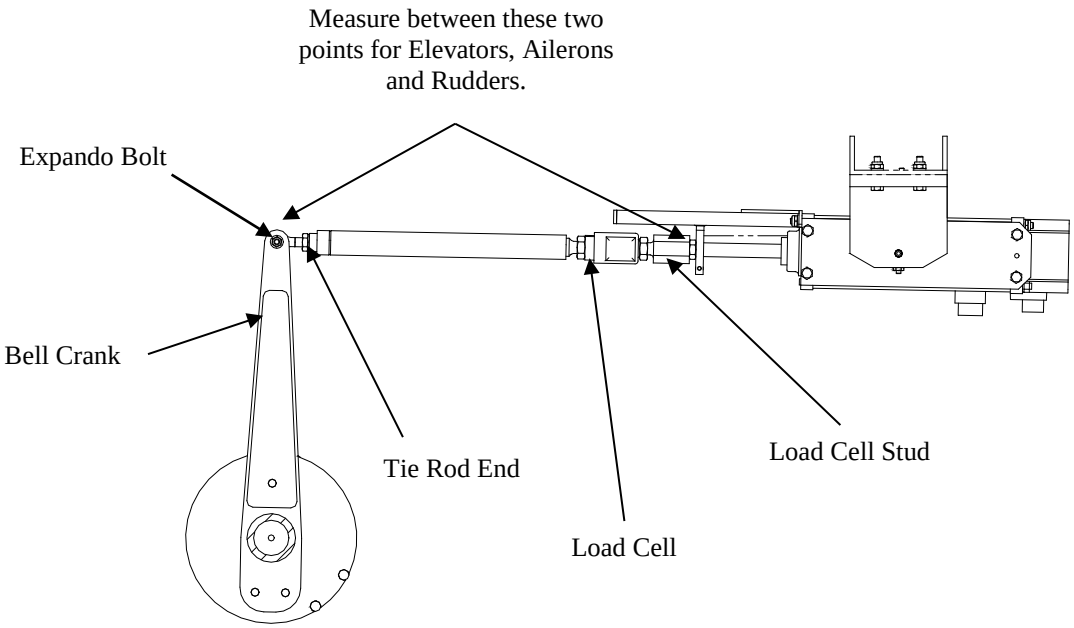


Figure 5-89. Load Cell Linkage Assembly

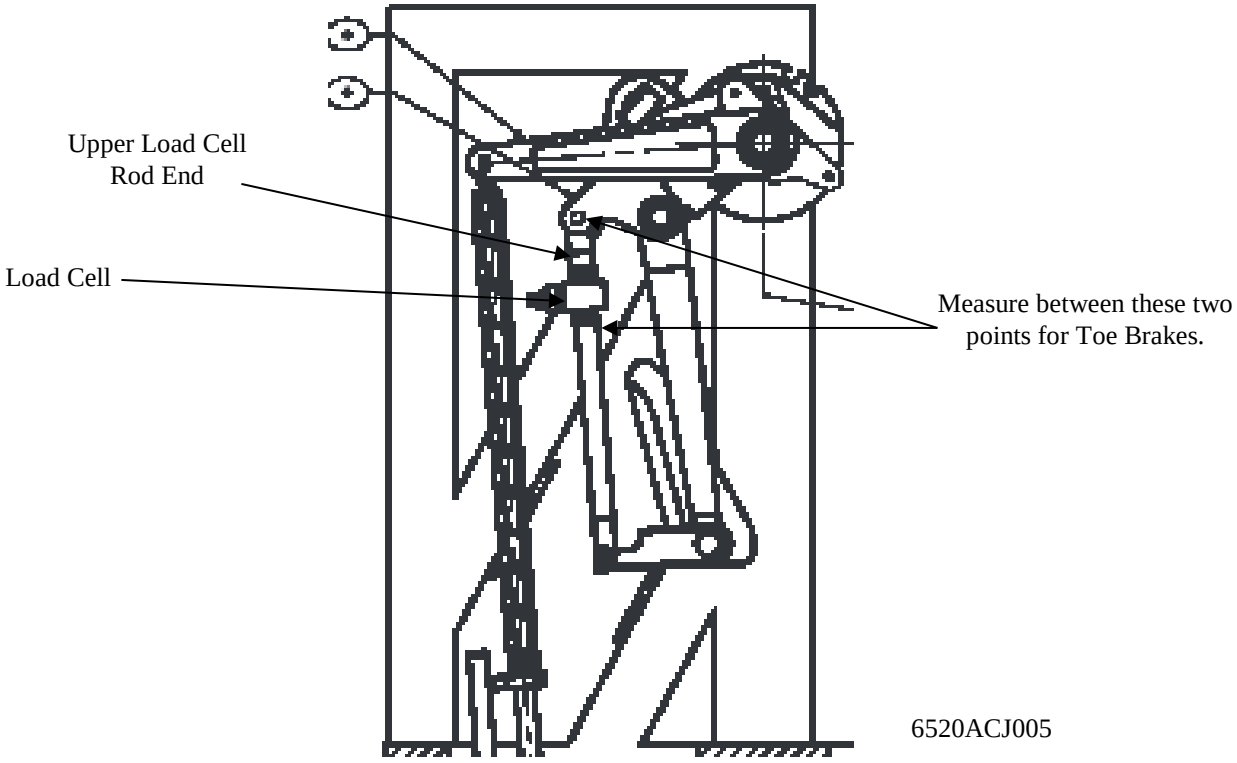


Figure 5-90. Toe Brake Load Cell Assembly

5) Note the orientation of the load cell with respect to the rod end. Loosen the jam nuts at the actuator rod and tie rod end.

6) Remove the bolt, nut, and washer from the lower load cell rod end, noting the position of the lower rod end, and unscrew it from the load cell.

7) Remove the load cell from the upper rod end.

8) Install jam nuts on the new load cell and screw the load cell onto the upper rod end approximately the same distance used by the replaced load cell.

9) Screw the lower rod end onto the load cell the same as in the previous step.

10) Restore the assembly to the original dimensions obtained in Step 4.

11) Tighten the jam nuts on the load cell and recheck the measurement on the load cell assembly.

12) Reattach the tie rod end into the bell-crank assembly. For the toe brake, reinstall the pin. For the other load cells, reinstall the Expando bolt. ENSURE the highest ridge of the bullet-shaped tip seats onto the meat of the bell-crank bracket seat. It should not protrude beyond the bell-crank bracket. This can cause damage to the Expando bolt and bell-crank assemblies when removed during the next cycle.

13) Ensure the anti-rotation device is installed both square and parallel to the actuator rod, and does not contact the bottom of the tray. This may require the use of shims at the point where the anti-rotation tray mounts to the actuator housing.

14) If necessary, cut the cable length and crimp replacement AMP pins to the ends of the wires.

15) Insert the load cell cable wires into the AMP connector as previously noted in Step 1 for the correct wire replacement.

16) Re-establish power to the servo amplifier(s) and DRI platforms by pushing in previously tripped CBs.

5.7.3.7. Wire Rope Replacement

Replacement of the wire rope used in the pulley systems of the rudder and aileron channels is somewhat problematic because the lengths vary from one device to the next. This is why no cable lengths are specified on the manufacturer’s drawings. In order to maintain uniformity throughout the JPATS program, we are specifying lengths in this O&M.

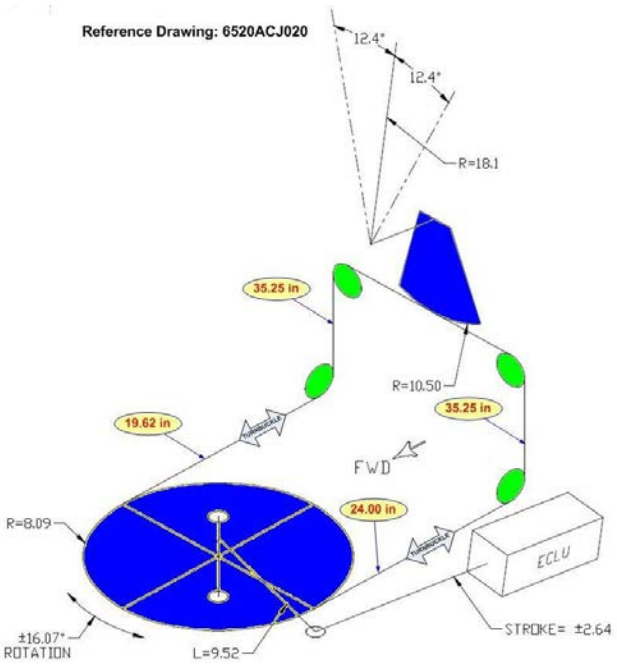


Figure 5-91. ECLS Aileron Wire-rope Lengths

- Aileron:

1) Figure 5-91 shows a detail from drawing 6520ACJ020 of the mechanical schematic, annotated with the lengths for the sections of aileron cables.
2) **35.25** inches of wire-rope with one half of a turnbuckle on one end and a cable barrel on the other, passes over the two green idler pulleys shown on the left of Figure 5-91. The cable barrel end slots into a hole machined into the vertical blue aileron output arm, 6520ACJ035-001.
3) **19.62** inches of wire-rope with one half of a turnbuckle connects to the 35.25-inch wire-rope by joining the turnbuckle halves. The cable-barrel-end of this cable slots into the hole machined into the blue aileron pulley assembly, 6520ACJ038-501.
4) **35.25** inches of wire-rope with one half of a turnbuckle on one end and a cable barrel on the other, passes over the two green idler pulleys shown on the right of Figure 5-91. The cable-barrel-end slots into a second hole machined into the vertical blue aileron output arm, 6520ACJ035-001.
5) **24.00** inches of wire-rope with one half of a turnbuckle connects to the Figure 5-91 right-hand side 35.25-inch wire-rope by joining the turnbuckle halves. The cable-barrel-end of this cable slots into a second hole machined into the blue aileron pulley assembly, 6520ACJ038-501.

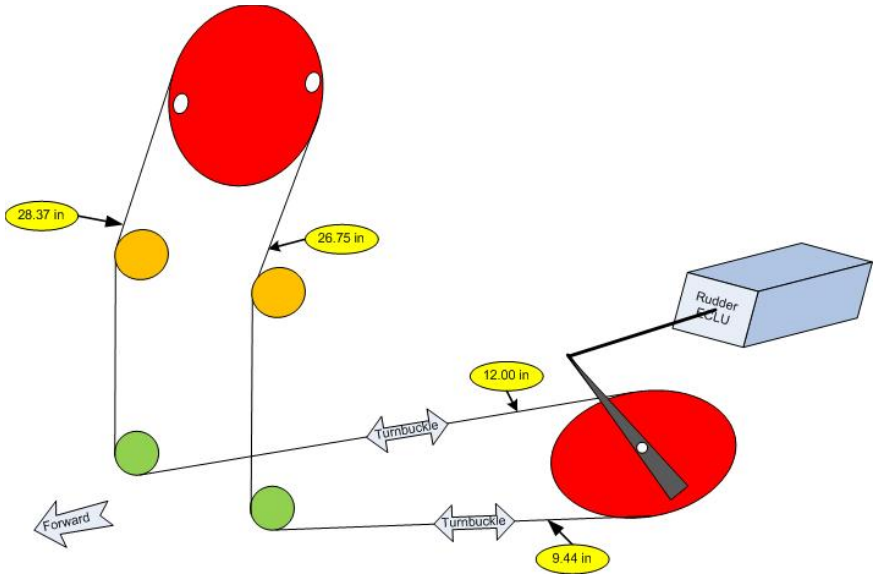


Figure 5-92. ECLS Rudder Wire-rope Lengths

- Rudder:

1) The rudder controls depicted in drawing 6520ACJ020 are not accurate. Figure 5-92 shows a modified detail from drawing 6520ACJ020 of the mechanical schematic, annotated with the lengths for each cable section.
2) **28.37** inches of wire-rope with one half of a turnbuckle on one end and a cable barrel on the other passes over the green idler pulley shown on the left-hand side of Figure 5-92. The cable-barrel-end slots into a hole machined into the red pedal interconnect assembly, 6520ACJ062-501.
3) **12.00** inches of wire-rope join with the turnbuckle on the end of the 28.37-inch cable and connects to the red rudder pulley assembly idler wheel, 6520ACJ034-501, where the cable-barrel-end of the cable slots into a machined hole.
4) **26.75** inches of wire-rope with one half of a turnbuckle on one end and a cable barrel on the other passes over the green idler pulley shown on the right-hand side of Figure 5-92. The cable-barrel-end slots into a second hole machined into the red pedal interconnect assembly, 6520ACJ062-501.
5) **9.44** inches of wire-rope join with the turnbuckle on the end of the 26.75 inches of wire-rope and connects to the red rudder pulley assembly idler wheel, 6520ACJ034-501, where the bullet-end of the cable slots into a second machined hole.

Making these cables locally is not practical as it requires special swaging tools. Best practice is to order them from FlightSafety Simulation by specifying the cable length required and these drawing numbers:

- 6520ACJ020 Mechanical Schematic (Use for ailerons only).
- 6520ACJ002-501 Primary Controls Installation.

The cable lengths specified herein are the cut-length of each piece of wire rope. Once the fittings are swaged to the ends of each piece of wire rope, the combined cable assembly should engage the first

few threads of the turnbuckles, leaving the remaining threads available for removing slack until the correct tension is reached.

5.7.4. Instructor Operator Station (IOS)

5.7.4.1. Control Panel Assembly

1) Remove four screws of the Control Panel Assembly as shown in Figure 5-94.
2) Pull assembly outward and disconnect all wiring connectors. Label the wiring prior to disconnecting if not already labeled.
3) Reinstall the Control Panel Assembly using these procedures in reverse order.

5.7.4.2. Control Panel Assembly Components

1) Remove Control Panel Assembly per paragraph 5.7.4.1.
2) Replace components as required and reinstall the Control Panel Assembly using these procedures in reverse order.

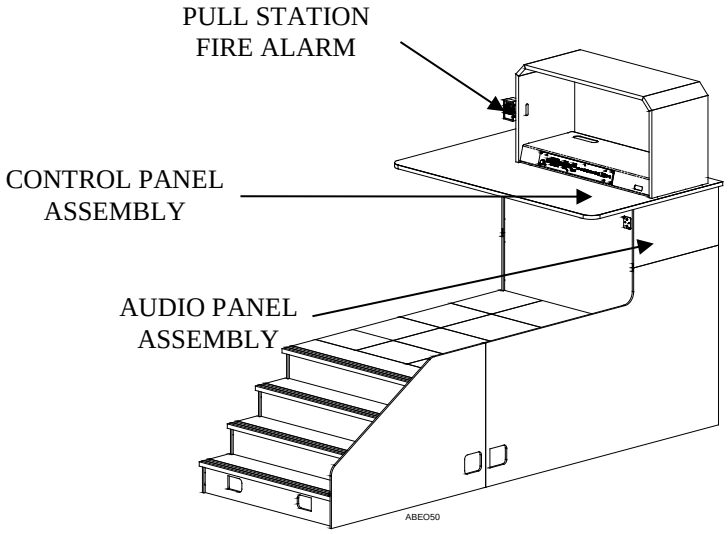


Figure 5-93. Instructor Operator Station Platform

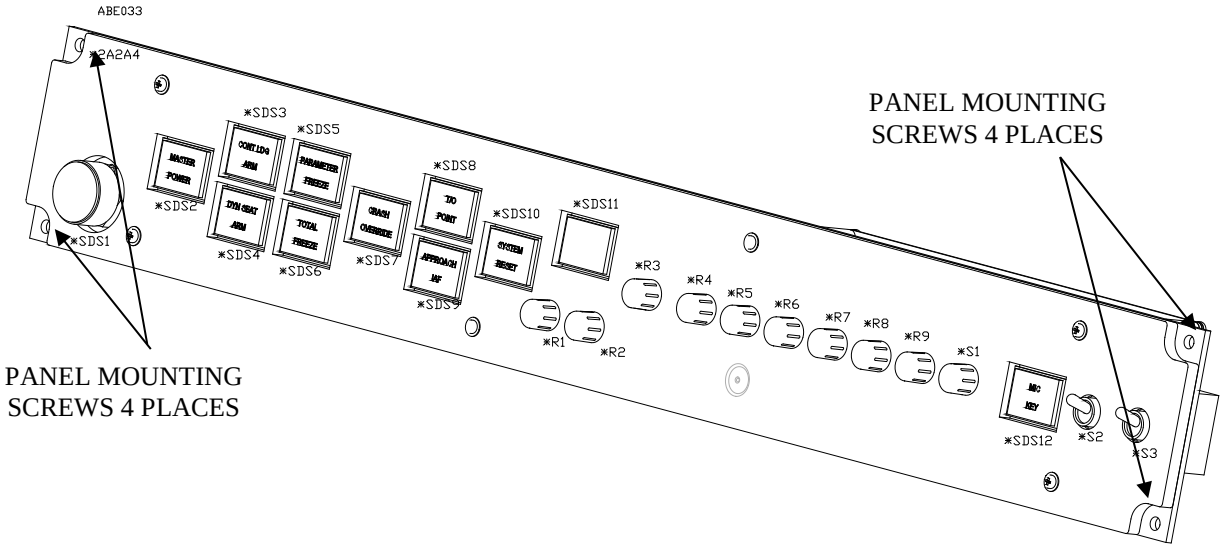


Figure 5-94. Instructor Operator Station Panel Assembly

5.7.4.3. Instructor Operator Station Audio Panel Assembly

1) The Audio Panel Assembly can be removed by disconnecting the diagonally opposite screws. See Figure 5-95.
2) Pull panel out from the main structure platform. Disconnect the wiring connectors, labeling the wiring prior to disconnecting if not already labeled.
3) Replace components as required and reinstall the Audio Panel using these procedures in reverse order.

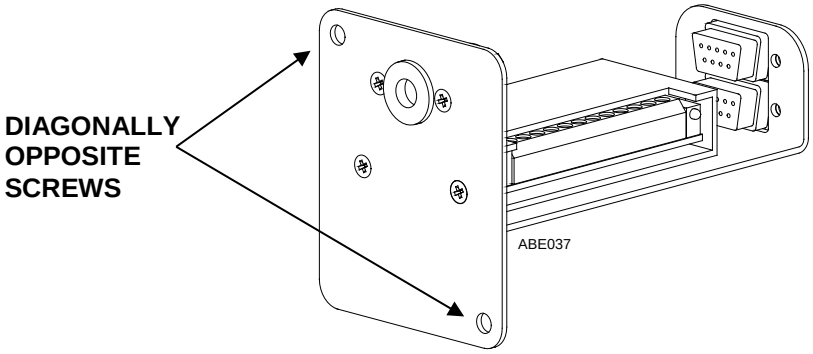


Figure 5-95. Audio Panel Assembly

5.7.4.4. Handheld IOS Terminal Setup

1) Hold down CTRL and SHIFT keys and press the F1 key. This activates the Setup menu.
2) Follow the on-screen instructions for changing and selecting the different setup parameters.
3) Select baud rate and set to 19200.
4) Select screen size and set to 32x16.
5) Press F5 to “Save and Exit”. Answer “Yes” to the prompt.

Handheld terminal is now set up properly. You may have to press ENTER key once or twice to refresh the screen.

5.7.5. Student Station

5.7.5.1. Seat

The seat can be removed by the following procedures.

1) Disconnect electrical power to the simulator frame prior to removal of seat.
2) Disconnect the multi-plug wiring connectors at the rear of the seat. See Figure 5-96.

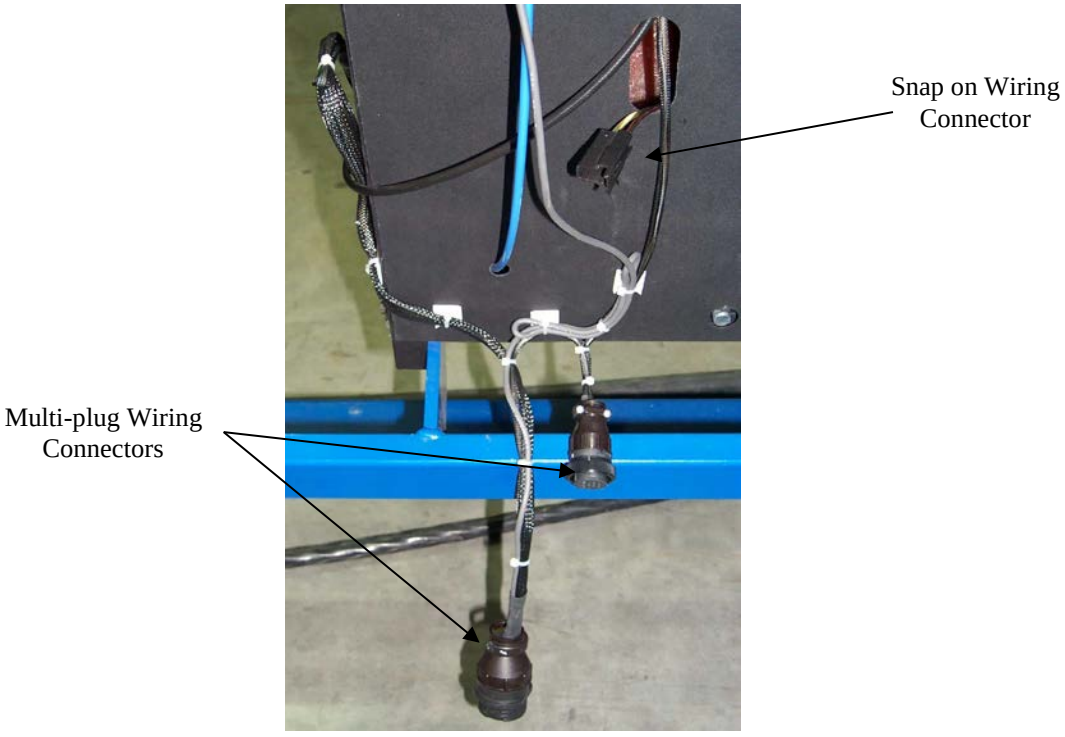


Figure 5-96. Seat Connectors

3) Cut tie-raps holding any seat wiring which is attached to the student station frame.
4) Remove two top bolts and nuts at the top backside of the seat as shown in Figure 5-97.

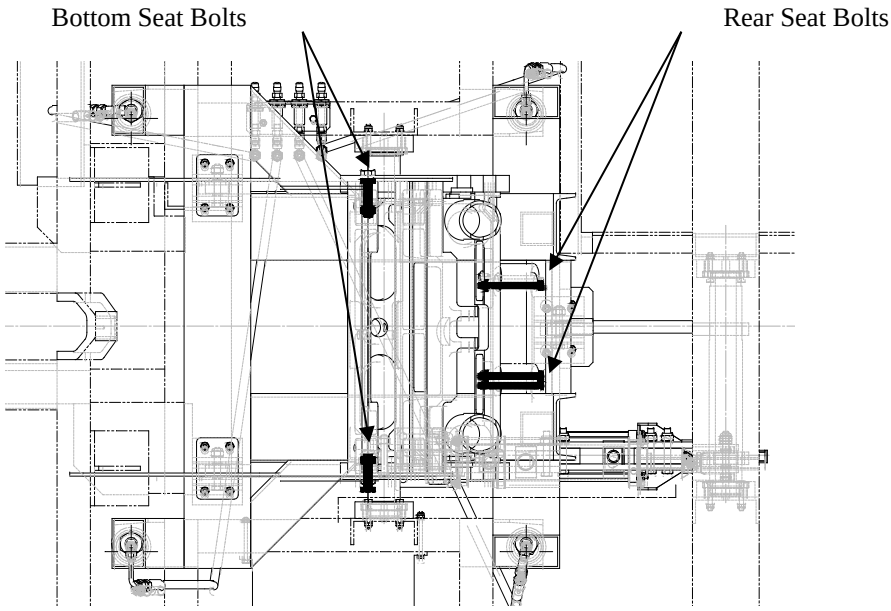


Figure 5-97. Seat Bolt Removal Plan

5) Remove the nuts but not the bolts from the bottom of the seat under the seat cushion. See Figure 5-98.

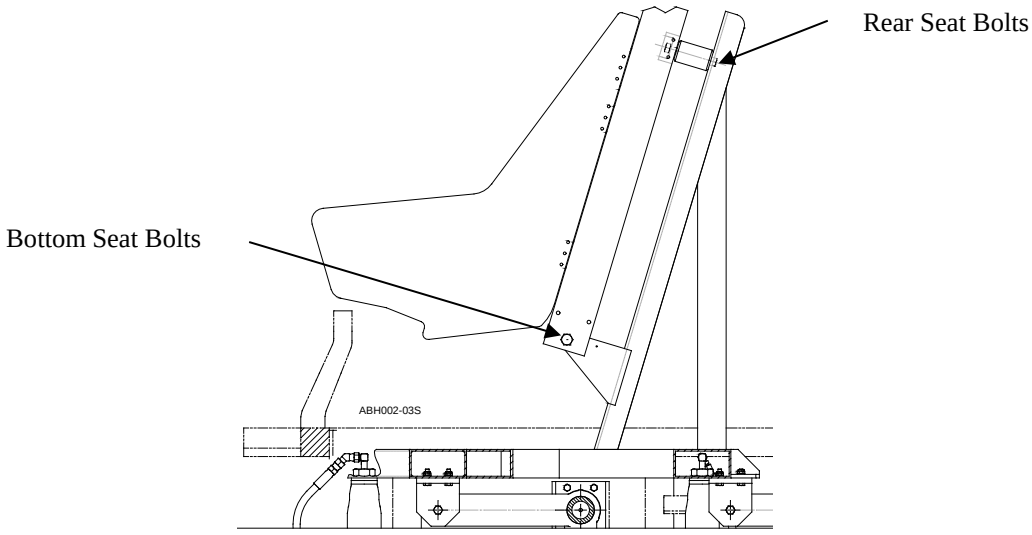


Figure 5-98. Seat Bolt Removal Elevation

WARNING

THE SEAT IS HEAVY AND DIFFICULT TO REMOVE FROM THE FRAME. THREE PEOPLE ARE REQUIRED TO REMOVE SEAT.

CAUTION

THE IFT HAS A PROJECTOR DIRECTLY OVERHEAD. COVER LENS WITH CAPS. SWING SEAT SIDEWAYS TO CLEAR PROJECTOR AS SEAT IS RAISED.

6) The seat weighs approximately 150 pounds. Three people will be needed to raise the entire seat out of the student station.
7) With two people holding the seat, the third person can remove the bottom side pins and ensure all attachments to the seat clear the frame as the seat is removed.
8) Place seat on an upright fixture for future activity.
9) Replace seat in reverse order of above procedures.

5.7.5.2. Power Control Lever

The Power Control Lever can be removed by the following procedures.

1) Remove outboard skin on right side of trainer.
2) Remove inboard skin on right side of trainer.

NOTE

Disconnect the panel lighting connections from the 1A5A9J1 and 1A5A10J1 lighting panels prior to removal.

3) Disconnect Power Control Lever Rod assembly from the Power Control Lever Bell Crank assembly. See Figure 5-99.

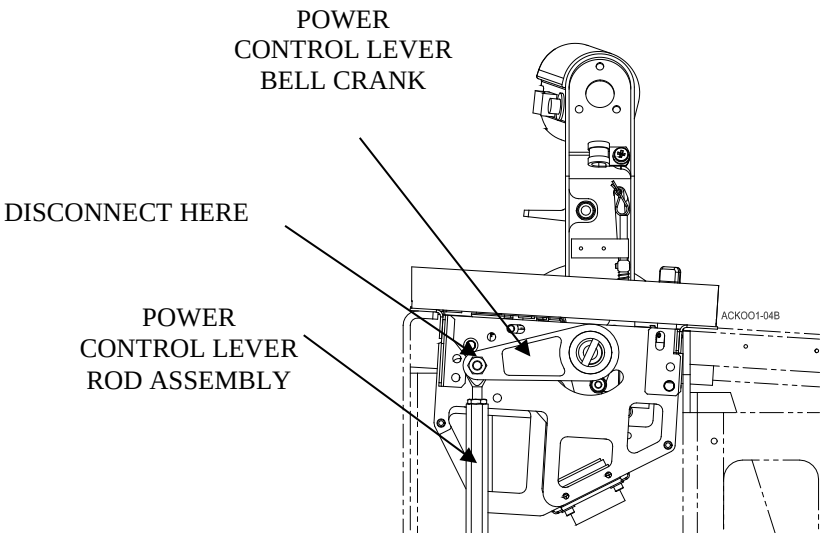


Figure 5-99. Power Control Lever Assembly Side View

4) Loosen the Power Control Lever shroud mounting plate screws and remove shroud. See Figure 5-100.

5) Loosen the Power Control Lever quadrant mounting plate screws.

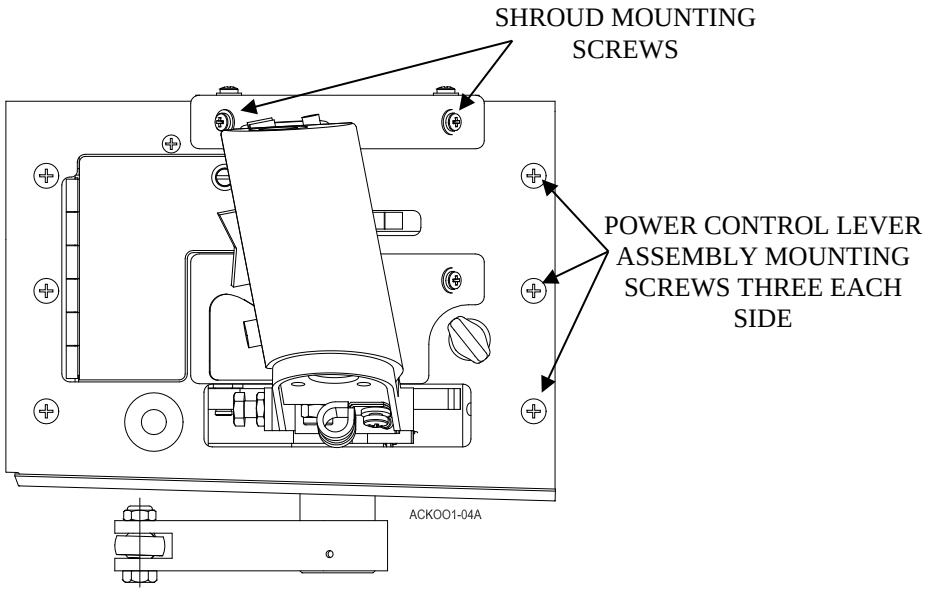


Figure 5-100. Power Control Lever Assembly Top View

6) While carefully lifting Power Control Lever assembly, disconnect J1 cable from Power Control Lever assembly.

7) Carefully remove the Power Control Lever assembly from of the console.

8) Reinstall by carefully easing the Power Control Lever assembly into the console watching for framework hangs or snagging. Carefully connect J1 connector to assembly.

9) Reconnect Power Control Lever shroud and rod assembly to the Power Control Lever Bell Crank assembly.
10) Tighten Power Control Lever console mounting screws.
11) Test Power Control Lever assembly for rough or improper operation.
12) Install inboard skin on right side of trainer.
13) Connect lighting connections for 1A59J1 and 1A5A10J1 lighting panels.
14) Install outboard skin on right side of trainer.

5.7.5.3. Gas Springs

1) Place a support block (4" x 4" x 5 ½") between the seat frame and the base frame structures on both sides at the rear of the pilot seat. This is for support of the weight of the seat frame and the ejection seat.
2) Bleed all pressure off the gas springs.
3) Loosen hose fitting from gas spring completely but do not remove at this point. See Figure 5-101.
4) Loosen the 1-1/8" nut from the top of the gas spring.
5) Loosen the retaining bolt from the bottom of the gas spring.
6) Compress the spring just enough to remove air fittings and clear the framework.
7) Remove gas spring.
8) Install new gas spring. Ensure not to damage any material upon installation. Over compression of the gas spring can damage it. DO NOT over compress.
9) Install 1-1/8" nut and air fittings, tighten air fittings snug, then tighten nut. Be sure to use Teflon™ tape on the threads of the air fittings to seal them.
10) Tighten the retaining bolt at the bottom of the gas spring.

5.7.5.4. Mylar Covers for Circuit Breaker and Seat Adjust Panels

Prior to beginning this procedure, ensure the appropriate Mylar cover(s) is/are available.

1) Remove 4 ea. 4/40 light plate cover screws.
2) Position Mylar cover over panel.
3) Align 4/40 screw holes with holes in cover and replace light plate cover screws.

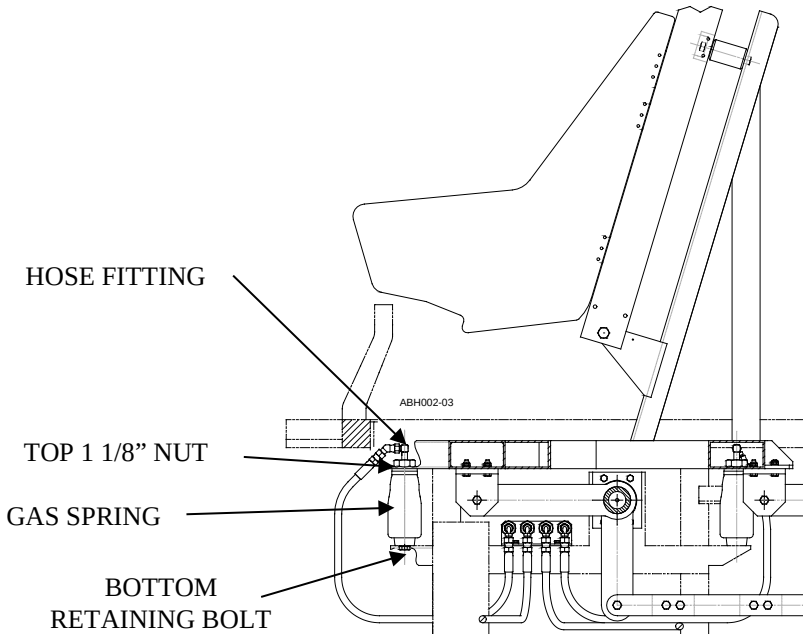


Figure 5-101. Seat Gas Springs

11) Charge gas springs and test them for leaks in accordance with Paragraph 5.2.4.1.

12) Remove block.

5.7.6. Visual Image Generator System (VIS)

Use the following procedure to remove and replace the contactor, relay and fuse in the Remote Visual Projector Power Controller Assembly. The tools or equipment below are required to perform the procedure.

- DVM
- Two people
- Tags and Labels

WARNING

ENSURE ALL SUB-SYSTEMS ARE PROPERLY SHUTDOWN BEFORE BEGINNING THESE PROCEDURES.

5.7.6.1. Remote Visual Projector Power Controller Assembly Contactor

1) On the AC Power Controller Assembly place the MAIN POWER circuit breaker CB1 in the off position (down). This removes power to the internal components and the associated circuits. Refer to Figure 5-68.

2) Ensure the facility site power AC circuit breaker, 3-phase, 80-Amp, is turned OFF and locked in compliance with local Lockout/Tagout procedures. This removes the power to the Remote Visual Projector Power Controller Assembly.

3) Using the digital voltmeter (DVM), ensure power has been removed from the Remote Visual Projector Power Controller Assembly. Remove the Remote Visual Projector Power Controller access cover and place in a position to keep it from falling off the dome top, then meter J1 pins 1, 2 and 3 separately to chassis.

4) On the side of the Remote Visual Projector Power Controller Assembly, unplug the J1 power input connector and the J11 signal cable as a secondary safety precaution from arbitrary power up. See Figure 5-102.

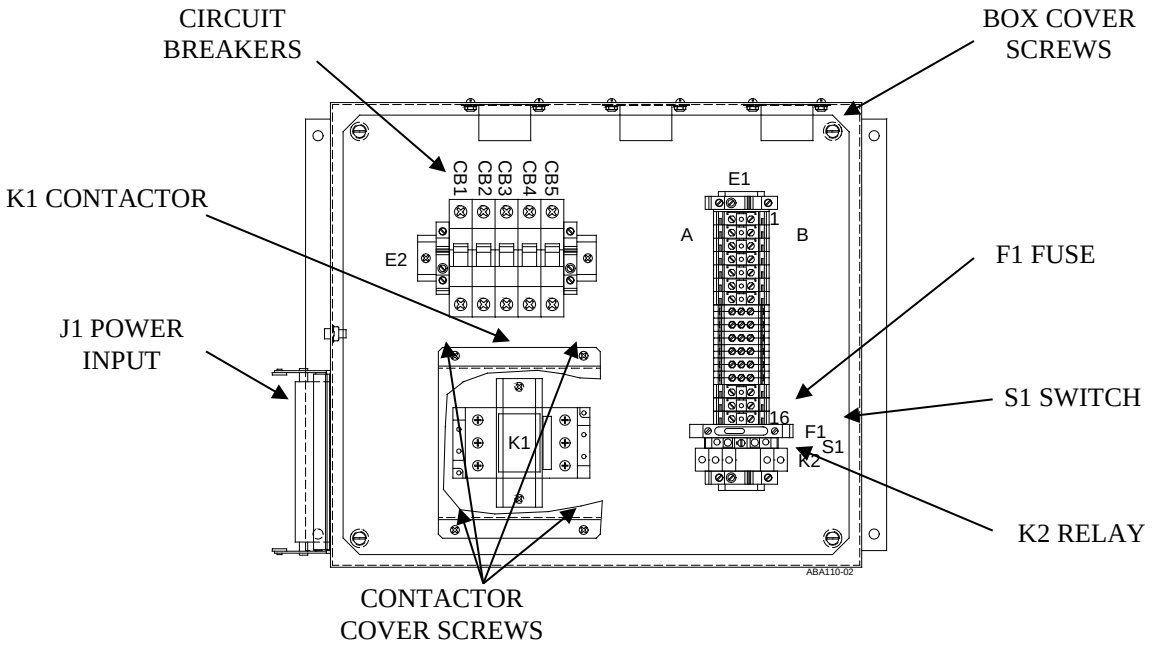


Figure 5-102. Remote Visual Projector Power Controller Assembly

5) Remove the contactor cover screws and cover.

6) Disconnect the AC input lines and the AC output lines from the contactor to be removed, labeling them as needed.

7) Remove the two retaining screws that secure the contactor to the box.

8) Install the new contactor and replace the retaining screws.

9) Reconnect the AC input and output wiring removed from the contactor.

10) Replace the top cover and the retaining screws.

11) Reconnect the J1 power input connector and the J11 signal cable on the Remote Visual Projector Power Controller.

12) Turn the facility site AC Power, 3-phase, 80-Amp circuit breaker ON.

13) On the front of the AC Power Controller Assembly, place the MAIN POWER circuit breaker CB1 in the ON position (up).

14) Verify AC power is available to the each of the projectors on the simulator by verifying the power indications on the DCU.

5.7.6.2. Remote Visual Projector Power Controller Assembly Solid State Relay

1) Follow steps 1 through 4 in paragraph 5.7.6.1.

WARNING

ENSURE ALL SUB-SYSTEMS ARE PROPERLY SHUTDOWN BEFORE BEGINNING THESE PROCEDURES.

2) Disconnect the AC input lines and the AC output lines from the solid-state relay to be removed, labeling them as needed.

3) Remove the two retaining screws that secure the solid-state relay to the DIN rail of the Remote Visual Projector Power Controller Assembly. Refer to Figure 5-102.

4) Install the new solid-state relay and replace the retaining screws.

5) Reconnect the AC input and output wiring removed from the solid-state relay.

6) Replace the retaining screws.

7) Reconnect the J1 power input connector and the J11 signal cable on the Remote Visual Projector Power Controller.

8) Turn the facility site AC Power, 3-Phase, 80-Amp circuit breaker ON.

9) On the front of the AC Power Controller Assembly, place the MAIN POWER circuit breaker CB1 in the ON position (up).

10) Verify AC power is available to the each of the projectors on the simulator by verifying the power indications on the DCU.

5.7.6.3. Remote Visual Projector Power Controller Assembly S1 Switch

1) Follow steps 1 through 4 in paragraph 5.7.6.1.

WARNING

ENSURE ALL SUB-SYSTEMS ARE PROPERLY SHUTDOWN BEFORE BEGINNING THESE PROCEDURES.

2) Disconnect the AC input lines and the AC output lines from the S1 switch to be removed, labeling them as needed.

3) Remove the two retaining screws that secure the S1 switch to the DIN rail of the Remote Visual Projector Power Controller Assembly. Refer to Figure 5-102.

4) Install the new switch and replace the retaining screws.

5) Reconnect the AC input and output wiring removed in from the switch.

6) Replace the retaining screws.

7) Reconnect the J1 power input connector and the J11 signal cable on the Remote Visual Projector Power Controller.

8) Turn the facility site AC Power, 3-phase, 80-Amp circuit breaker ON.

9) On the front of the AC Power Controller Assembly, place the MAIN POWER circuit breaker CB1 in the ON position (up).

10) Verify AC power is available to the each of the projectors on the simulator by verifying the power indications on the DCU.

5.7.6.4. Remote Visual Projector Power Controller Assembly F1 Fuse

1) Follow steps 1 through 6 in paragraph 5.7.6.1.

WARNING

ENSURE ALL SUB-SYSTEMS ARE PROPERLY SHUTDOWN BEFORE BEGINNING THESE PROCEDURES.

2) Disconnect the AC input lines and the AC output lines from the F1 fuse to be removed, labeling them as needed.

3) Remove the two retaining screws that secure the fuse to the dim rail of the Remote Visual Projector Power Controller Assembly. Refer to Figure 5-102.

4) Install the new fuse and replace the retaining screws.

5) Reconnect the AC input and output wiring removed in from the fuse.

6) Replace the retaining screws.

7) Reconnect the J1 power input connector and the J11 signal cable on the Remote Visual Projector Power Controller.

8) Turn the facility site AC Power, 3-phase, 80-Amp circuit breaker ON.

9) On the front of the AC Power Controller Assembly, place the MAIN POWER circuit breaker CB1 in the ON position (up).

10) Confirm AC power is available to the each of the projectors on the simulator by verifying the power indications on the DCU.

5.7.7. Fire Detection System

Most components in the Fire Detection System are to be maintained by a qualified outside contractor. The contractor should perform any removal or replacement procedures of these components. The only components which may be removed and replaced by site personnel are the smoke detectors and temperature sensors. The following procedures describe the removal and replacement of these components.

5.7.7.1. Smoke Detectors

The smoke detectors are located in the OFT top cap structure (10A0) and the IFT visual structure (9A12). Section 1 shows the general location of the smoke and temperature sensors. Figure 5-103 is an illustration of the smoke detector.

- Use a Digital Voltmeter to perform this procedure.

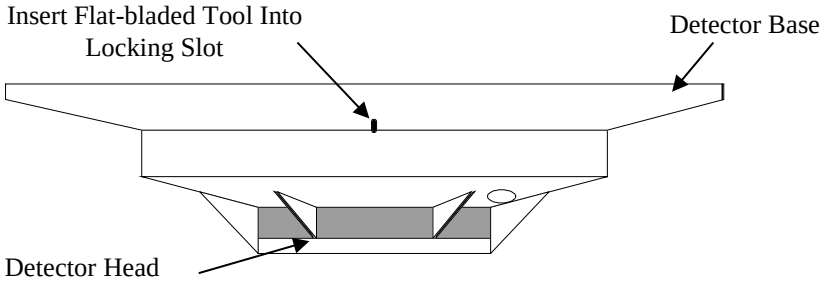


Figure 5-103. Smoke Detector

WARNING

DISCONNECT POWER TO COMPONENTS BEFORE REMOVING OR REPLACING. AFTER POWER IS DISCONNECTED, USE A METER OR OTHER APPROPRIATE TESTING DEVICE TO ENSURE POWER HAS BEEN REMOVED FROM THE COMPONENT.

WARNING

REMOVING POWER FROM THE FIRE DETECTION SYSTEM CREATES A RISK TO PERSONNEL AND THE FACILITY BY LEAVING THEM UNPROTECTED AND VULNERABLE TO THE DANGER OF A FIRE.

1) Remove facility power from the Fire Detection System.
2) Disconnect the backup batteries located inside the simulator Fire Alarm Control Unit.
3) Gain access to the smoke detector.
4) Remove the detector head from its base by inserting a small, flat-bladed tool in the locking slot on the smoke detector base and pushing with moderate pressure while rotating the detector head counterclockwise until a stop is reached. Refer to Figure 5-103.
5) Pull the detector head downward to disengage from the base.
6) Label the wires and terminal lugs in the base for reassembly and disconnect the wires.

7) Remove and retain the base mounting hardware and remove the base.
8) Install the new smoke detector using the above procedure in reverse order.
9) Restore power to the system.

5.7.7.2. Temperature Sensor

Temperature sensors are located in the cockpit behind the main instrument panel, under the cockpit floor adjacent to the control loading equipment, the equipment cabinets (9A2 and 9A3), on the OFT visual cabinets 1 and 2 (10A1 and 10A2), and the IFT visual cabinet (10A1). Section 1 shows the general location of the smoke detectors and temperature sensors. Figure 5-104 is an illustration of the temperature sensor. Use the following procedure to remove and replace the temperature sensors in the simulator.

- Use a Digital Voltmeter to perform this procedure.

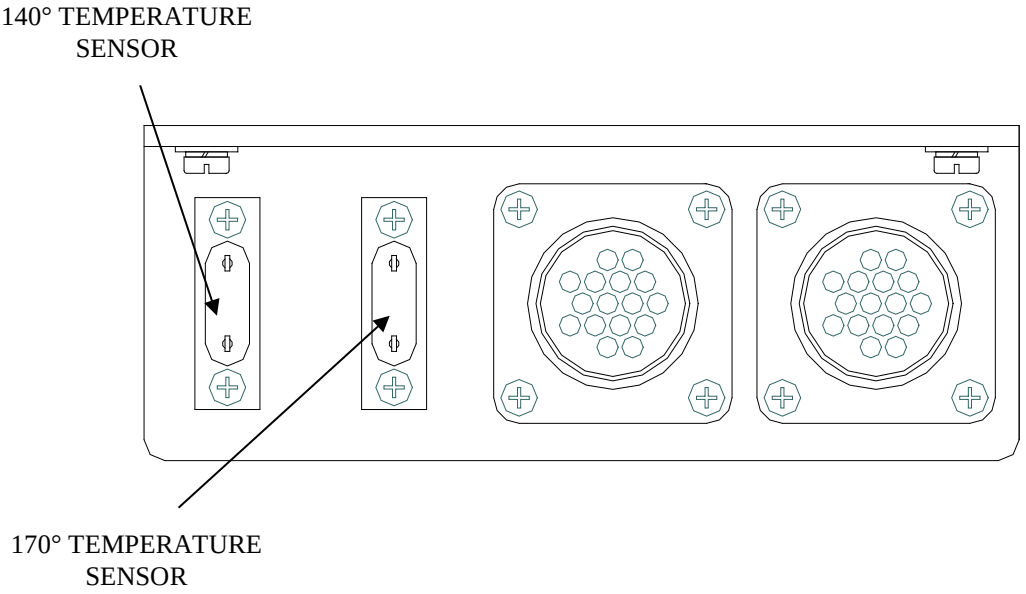


Figure 5-104. Temperature Sensors

WARNING

DISCONNECT POWER TO COMPONENTS BEFORE REMOVING OR REPLACING. AFTER POWER IS DISCONNECTED, USE A METER OR OTHER APPROPRIATE TESTING DEVICE TO ENSURE POWER HAS BEEN REMOVED FROM THE COMPONENT.

WARNING

REMOVING POWER FROM THE FIRE DETECTION SYSTEM CREATES A RISK TO PERSONNEL AND THE FACILITY BY LEAVING THEM UNPROTECTED AND VULNERABLE TO THE DANGER OF A FIRE.

1) Remove facility power from the Fire Detection System.
2) Disconnect the backup batteries located inside the simulator Fire Alarm Control Unit.
3) Gain access to the temperature sensor.
4) After gaining access, remove and retain the mounting hardware allowing access to the wiring behind the sensor.
5) Label the wires for reassembly and disconnect them from the temperature sensor.
6) The sensor is now free and can be removed.
7) Remove the sensor and install a new one using the above procedure in reverse order.
8) Restore power to the system.

5.7.8. Equipment Cooling Removal and Replacement

5.7.8.1. Fans

The cooling fans are located in the Equipment Cabinets, Student Station, Top Cap and Visual Structure. The removal and replacement of these fans is straightforward. Turn off the appropriate circuit breakers on the AC Power Controller Assembly. Gain access to the fan and unwire or unplug the 110VAC. Loosen the four front plate screws and pull the entire fan chassis from the equipment. Remove the fan, and install a new one. Table 5-19 describes how to remove power from and gain access to each fan. Use the following test equipment to perform the procedure.

- Use a Digital Voltmeter to perform this procedure.

WARNING

DISCONNECT POWER TO COMPONENTS BEFORE REMOVING OR REPLACING. AFTER POWER IS DISCONNECTED, USE A METER OR OTHER APPROPRIATE TESTING DEVICE TO ENSURE POWER HAS BEEN REMOVED FROM THE EQUIPMENT.

CAUTION

WHEN REMOVING FANS BE CAREFUL NOT TO DROP HARDWARE IN SENSITIVE ELECTRONIC EQUIPMENT. DAMAGE TO EQUIPMENT COULD OCCUR.

Table 5-19. Fans Power and Removal

FAN	POWER REMOVAL	REMOVAL
Equipment Cabinets 9A2B1, 9A3B1	Circuit breaker CB03 for 9A2B1 and CB05 for 9A3B1 on the AC Power Controller Assembly. See Figure 5-105 for the locations.	Open the front door of the equipment cabinet with the defective fan pack. Fan pack is located at the top of the equipment cabinet. See Figure 5-106. Unplug the AC cord from the AC Power Distribution Box. Remove the fan.
Student Station 6A2 Main Instrument area and rear of Seat.	Circuit breakers CB18 for main instrument area and rear of seat (Right side). Circuit breaker CB16 for rear of seat (right side). See Figure 5-105 for the locations.	Gain access to the main instrument area fan through the cockpit area. See Figure 5-107. Unplug the AC cord from the AC Frame Distribution Box (6A2A1). Remove the fan. Gain access to the seat area fans through the backside of the student station. See Figure 5-108. Unplug the AC cord from the AC Frame Distribution Box (6A2A1). Remove the fan(s).
OFT Top Cap Structure 10A0	Circuit breaker CB17 for all five fans. See Figure 5-105 for the locations.	Gain access to the top cap structure area fan(s) through the dome structure. See Figure 5-109 and Figure 5-110. Unplug the AC cord from the Fan Junction Box (10A0A8). Remove the fan(s).
IFT Visual Structure 9A12	Circuit breaker CB17 for all three fans. See Figure 5-105 for the locations.	Gain access to the visual structure area fan through the top of the visual structure. See Figure 5-111 and Figure 5-112. Unplug the AC cord from the Frame Distribution Box (6A2A1). Remove the fan(s).

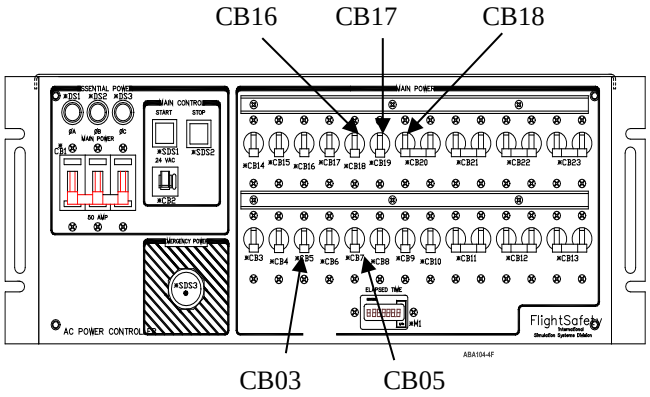


Figure 5-105. AC Power Controller Assembly

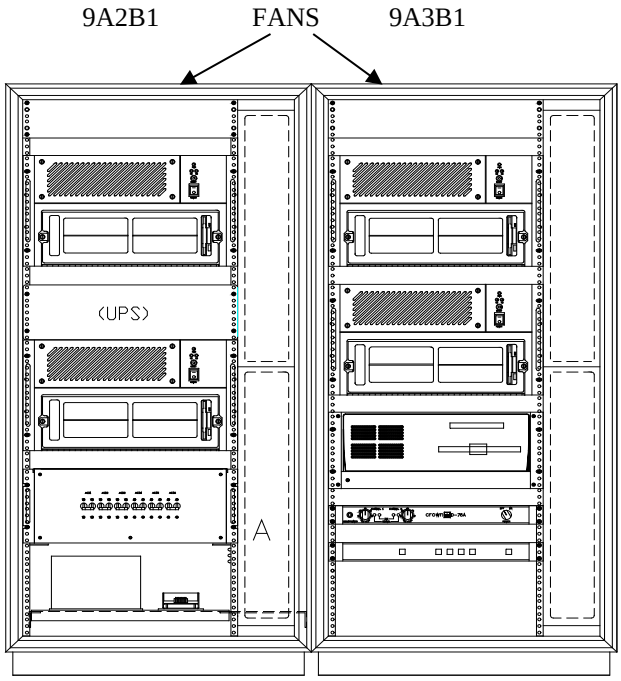


Figure 5-106. Equipment Cabinet Fans

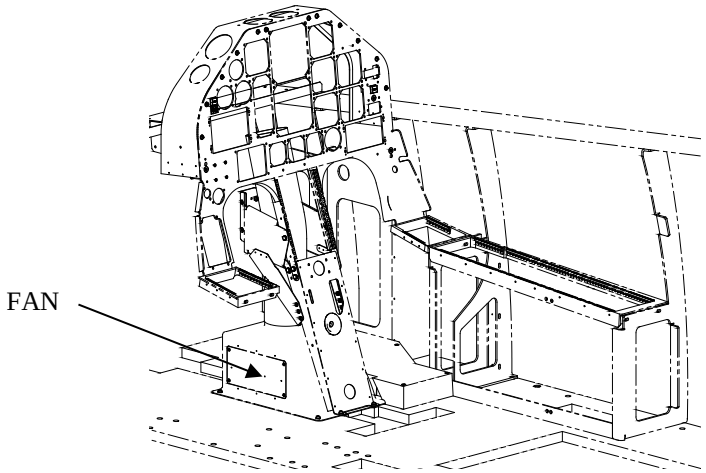


Figure 5-107. Main Instrument Panel Fan

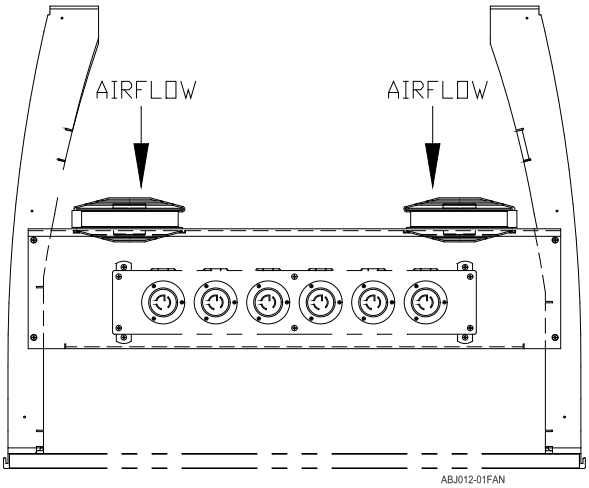


Figure 5-108. Student Station Amplifier Fans–Rear of Seat

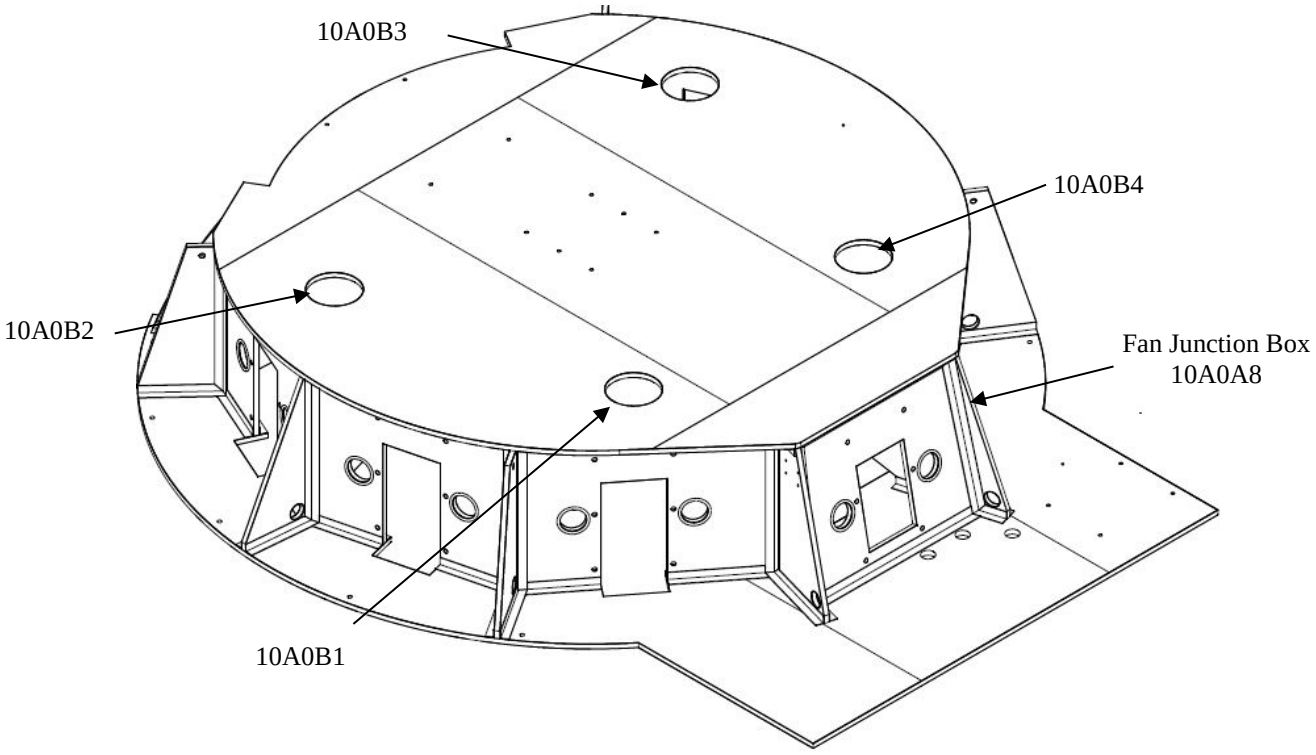


Figure 5-109. OFT Top Cap Structure Fans

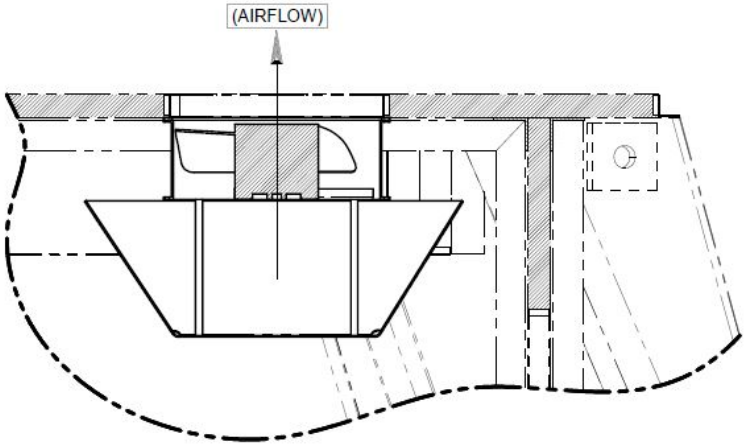


Figure 5-110. Typical Fan View

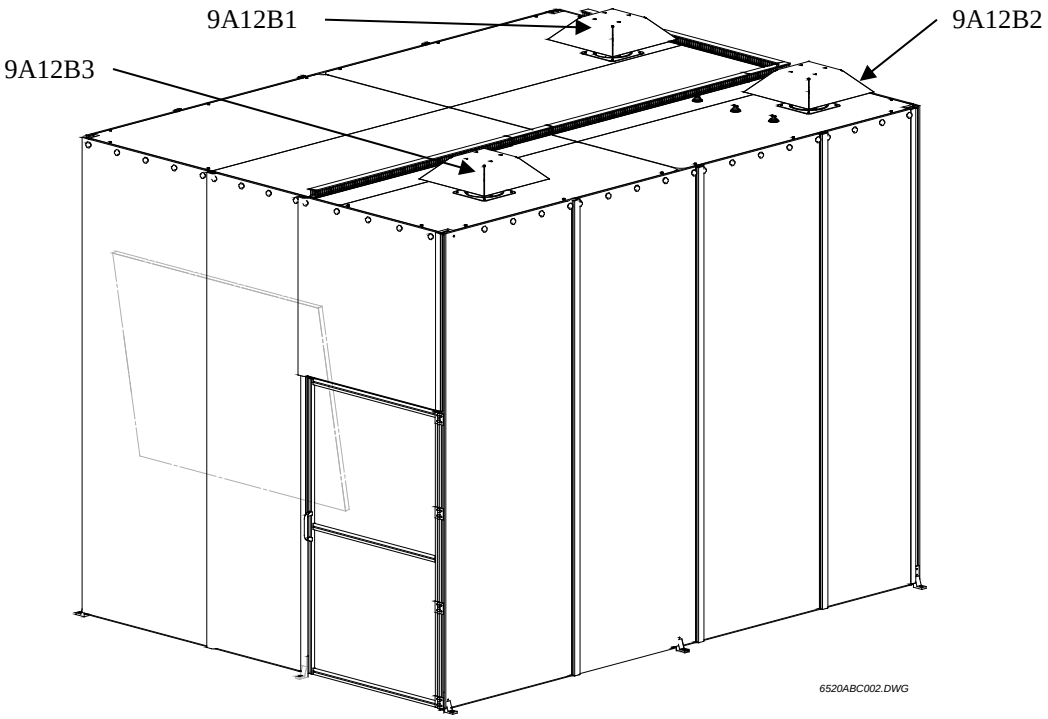


Figure 5-111. IFT Visual Structure Fans

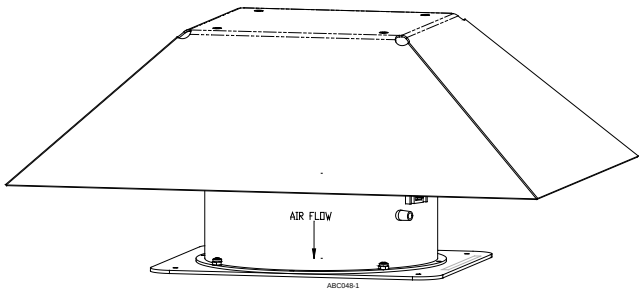


Figure 5-112. IFT Fan Assembly

5.7.9. APS Sound System

The following procedures can be used to remove and replace components of the APS Sound System. Although an alternate method to perform each procedure may exist, these procedures have been written to provide safety to personnel and to avoid damage to equipment.

5.7.9.1. Sound System Computer

Use the following procedure to remove and replace the Sound System Computer located in the 9A3 Equipment Cabinet. See Figure 5-113 for the location. No special tools are required to perform this procedure; however, because of the weight of the chassis, it requires two people. The material and test equipment below are required to accomplish this procedure.

- Digital Multimeter
- Paper Tags

WARNING

ENSURE POWER TO THE SOUND COMPUTER ASSEMBLY HAS BEEN REMOVED BEFORE PERFORMING ANY MAINTENANCE PROCEDURE ON IT.

CAUTION

TO AVOID DAMAGE TO ELETRICAL COMPONENTS, OBSERVE THE ESD AND HANDLING PRECAUTIONS IN SECTION 2 OF THIS MANUAL.

1) If the system is powered up, refer to Section 3 of this appendix for shutting down the Sound System Computer.
2) Be sure all power is removed from the assembly before going to the next step.
3) From the rear of the equipment cabinet, gain access to the rear of the assembly.
4) Remove all cabling from the rear of the assembly, labeling them as they are removed.
5) On the front and sides of the assembly, remove the four screws securing the assembly to the equipment cabinet.
6) Pull the assembly out as far as it will travel on its slides.
7) Release the two slide stop-keepers located on either side of the assembly. Slide the assembly out one more inch to clear the stop-keepers, and STOP.

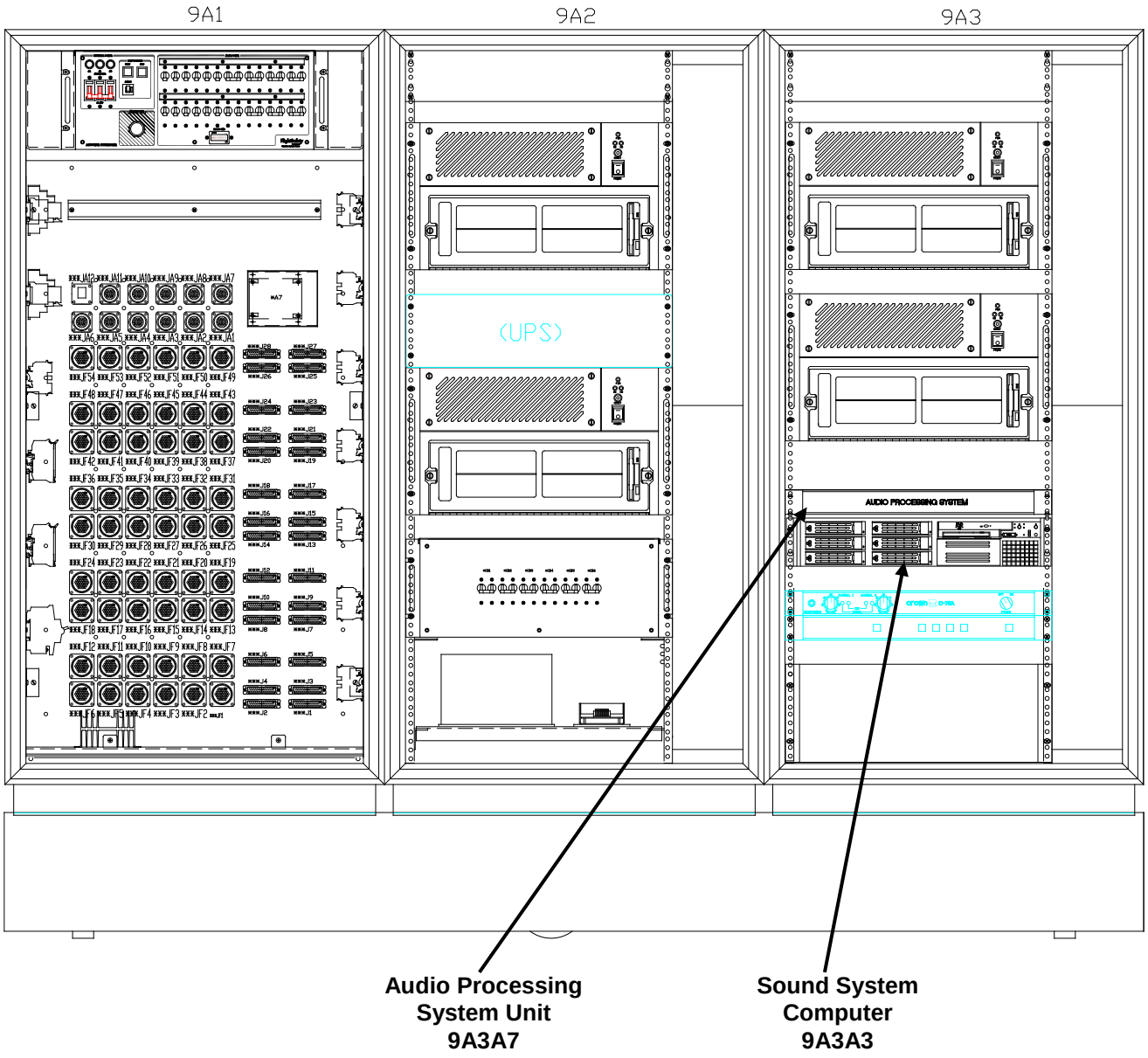


Figure 5-113. APS Sound System Component Locations

WARNING

USE TWO PEOPLE TO LIFT THE AURAL CUE SYSTEM COMPUTER ASSEMBLY FROM THE EQUIPMENT CABINET.

8) Use two people to lift the Sound System Computer assembly and slide the assembly out of the equipment cabinet. Place on an ESD-safe work bench or other flat surface.

CAUTION

OBSERVE ALL ELECTROSTATIC DISCHARGE PRECAUTIONS WHEN HANDLING INTERNAL CPU COMPONENTS.

9) Remove the disk drives, tape drive, and any adapter cards not in the new Sound System Computer assembly from the failed Sound System Computer assembly and install them in the new one.
10) Install the new Sound System Computer assembly by performing the procedure in reverse order.
11) Refer to Section 2 of this appendix for setup procedures.

5.7.9.2. APS Unit

The following paragraphs cover removal and replacement of the APS unit. Refer to Figure 5-113 for the location. The test equipment and materials below are required to perform this procedure.

- Digital Multimeter
- Paper Tags

WARNING

REMOVE POWER TO THE APS BEFORE REMOVING OR REPLACING IT.

CAUTION

TO AVOID DAMAGE TO ELECTRICAL COMPONENTS, OBSERVE THE ESD AND HANDLING PRECAUTIONS IN SECTION 2 OF THIS MANUAL.

1) If the system is powered up, refer to Section 3 for shutting down the sound system.
2) Be sure all power is removed from the APS unit before going to the next step.
3) From the rear of the equipment cabinet, gain access to the rear of the assembly.
4) Remove all cabling from the rear of the assembly, labeling them as they are removed.
5) On the front and sides of the assembly, remove the four screws securing the assembly to the equipment cabinet.
6) Remove the APS unit from the equipment cabinet and place on a flat ESD-safe surface.
7) To replace the APS unit, perform the procedures in reverse order.

5.8. ALIGNMENTS AND ADJUSTMENTS

5.8.1. Power Distribution System

The various power supplies in the power distribution system should be checked and adjusted to the specifications for the type and model of power supply installed. Vendor documentation is listed in the List of Related Publications in Section 1 of this manual and is found in Volume 2 of this manual.

The voltage tolerance in most cases is listed as Load Regulation under the Output section of the Vendor Documentation specifications for the supply.

5.8.1.1. 28VDC System Power Supply (9A2A6PS1)

Several supplies are compatible for this application. Characteristics of these power supplies are similar; however, they are not exactly the same. The Vendor Documentation should be researched prior to adjusting the supply installed in your trainer.

5.8.1.2. ±10.000 VDC Instrument Reference Power Supply (9A1A2PS1)

The ±10.000 VDC Instrument Reference Power Supply requires a precision voltage adjustment. Refer to engineering drawing 60001ABD027 for adjustment information.

5.8.1.3. DC-DC Converter (28VDC to ±15VDC) (9A2A6PS2)

The ±15VDC DC converter is a sealed unit and has no adjustments. Refer to vendor documentation for specifications.

5.8.1.4. MIC Pre-Amp Power Supply (9A2A6PS3)

The 24VDC MIC Pre-Amp power supply has no adjustments. Refer to vendor documentation for specifications.

5.8.1.5. UHF DC-DC Converter (9A1A2A7)

The UHF DC-to-DC converter has no adjustments. Refer to vendor documentation for specifications.

5.8.1.6. RMU DC-DC Converter (9A2A6A1)

The RMU DC-to-DC converter requires an output voltage adjustment prior to connection with the Radio Management Unit (RMU). Refer to the vendor documentation and engineering drawing AGA063 for specifications and adjustment information. See Figure 5-114.

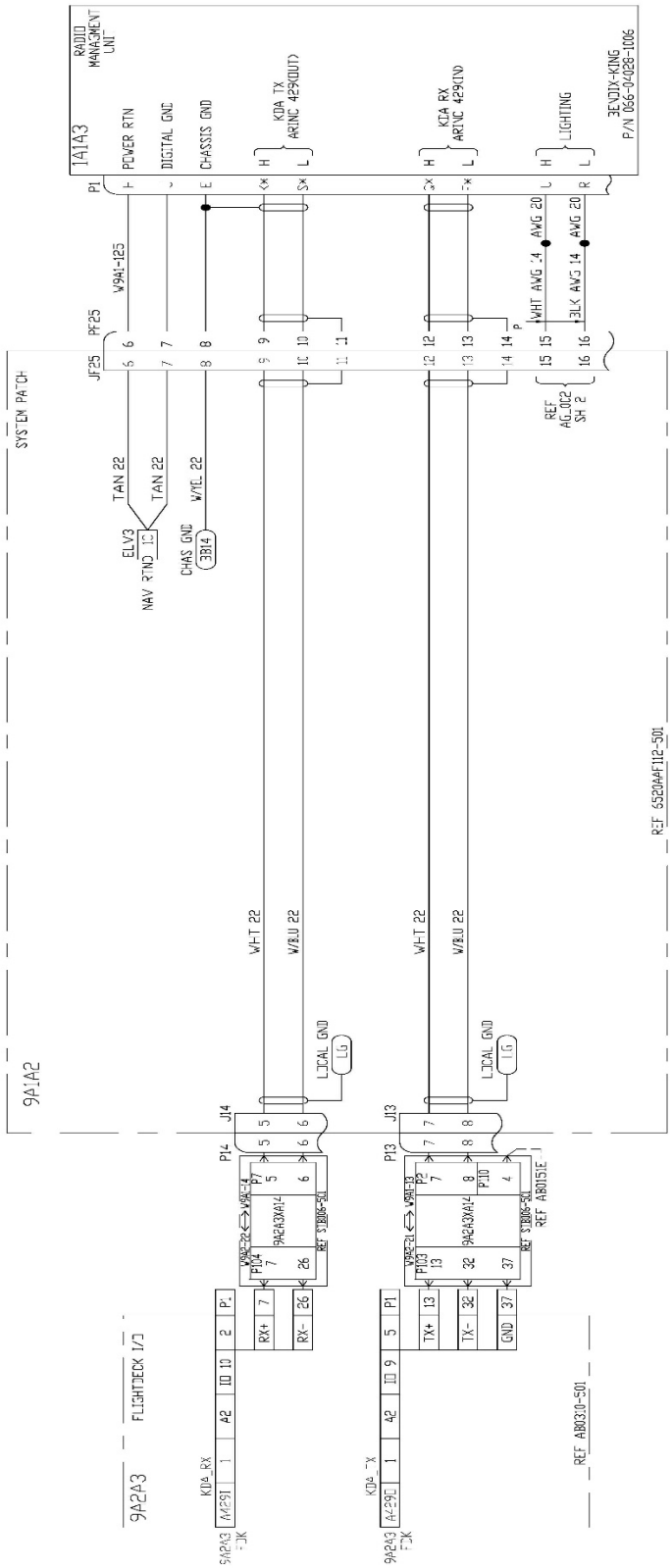


Figure 5-114. RMU System Diagram

5.8.2. Electric Control Loading System (ECLS)

5.8.2.1. DRI Platform

The following procedures contain instructions for the alignment or adjustment of components of the DRI platform system. These components include:

- PSSCB +5 VDC
- DRI Platform +24VDC Power Supply

5.8.2.1.1. PSSCB +5VDC Adjustment

The following equipment is required for this procedure.

- Digital Voltmeter
- Trimpot Adjustment Tool

Perform the following procedure to adjust the PSSCB +5VDC output voltage to the Platform332 Board. See Figure 5-115.

1) Attach the ground (black) lead to "GND" and attach the red lead to "+5 VDC" on the P9 Connector of the Platform332 board. See Figure 5-116.
2) Adjust Trimpot 1 for +5.15 VDC, tolerance +/- .10 VDC (+5.05 to +5.25 VDC).

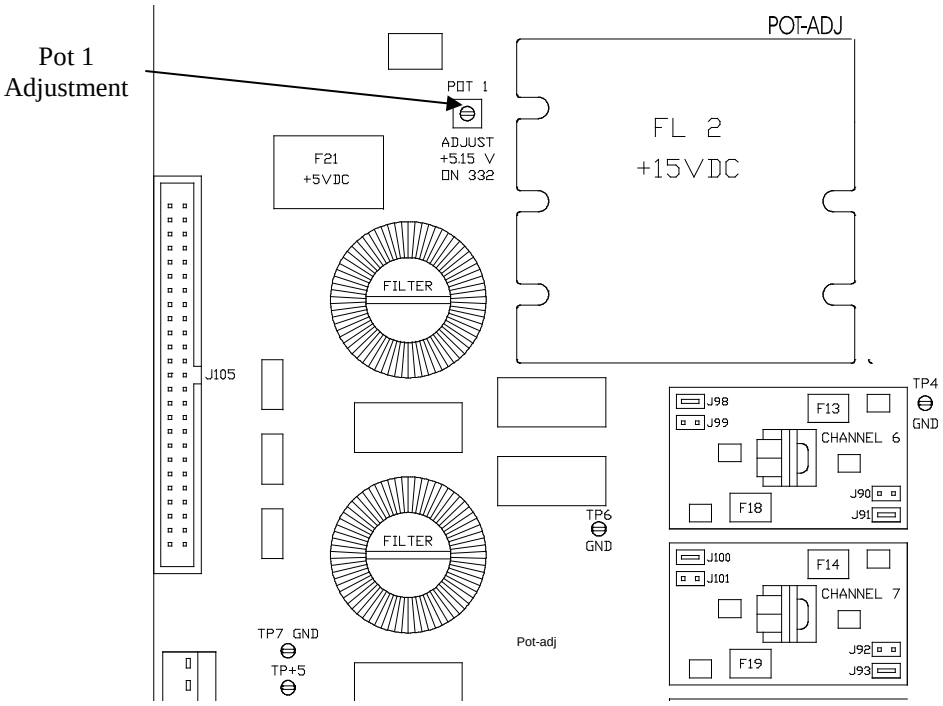


Figure 5-115. PSSCB +5VDC Adjustment

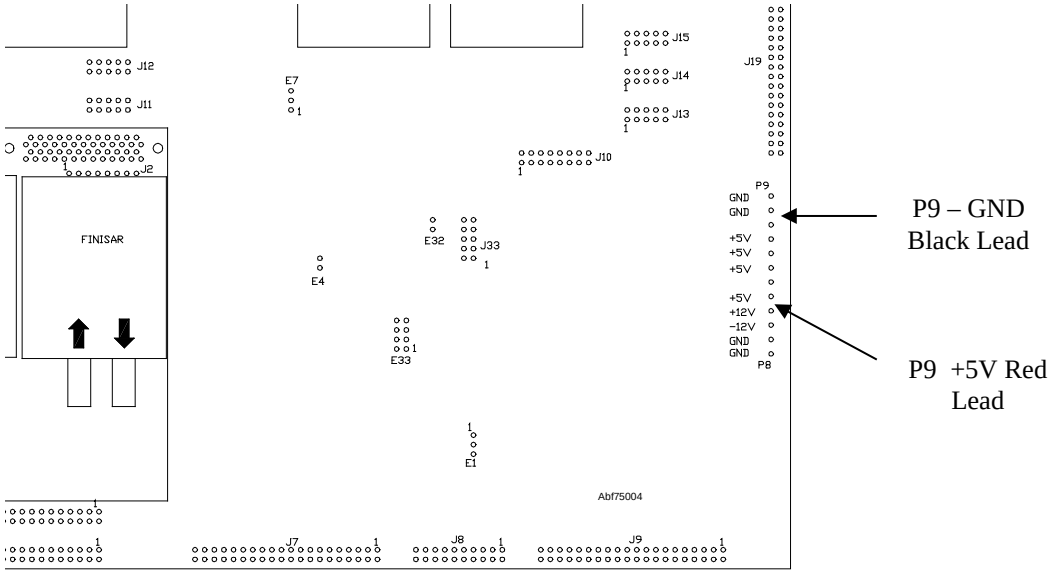


Figure 5-116. Platform332 +5VDC Measurement

5.8.2.1.2. DRI Platform +24VDC Power Supply (7A2PS1)

Several supplies are compatible for this application. Characteristics of these power supplies are similar; however, they are not exactly the same. The Vendor Documentation should be researched prior to adjusting the supply installed in your trainer.

The voltage tolerance in most cases is listed as Load Regulation under the Output section of the specifications for the supply.

5.8.2.2. DAS Chassis

The following procedures contain instructions for the alignment or adjustment the Power Supply/Signal Conditioning (PSSC) Board +5VDC.

5.8.2.2.1. PSSCB +5VDC Adjustment

The following equipment is required for this procedure.

- Digital Multimeter
- TrimPot Adjustment Tool

Perform the following procedure to adjust the PSSCB Board +5 VDC voltage. See Figure 5-117.

1) Attach the ground (black) lead to the “TPGND2” test point and attach the red lead to the “TP+5” test point near the P8 Connector of the PSSCB.
2) Adjust the trimpot Pot1 for +5.00 VDC ± .2VDC.

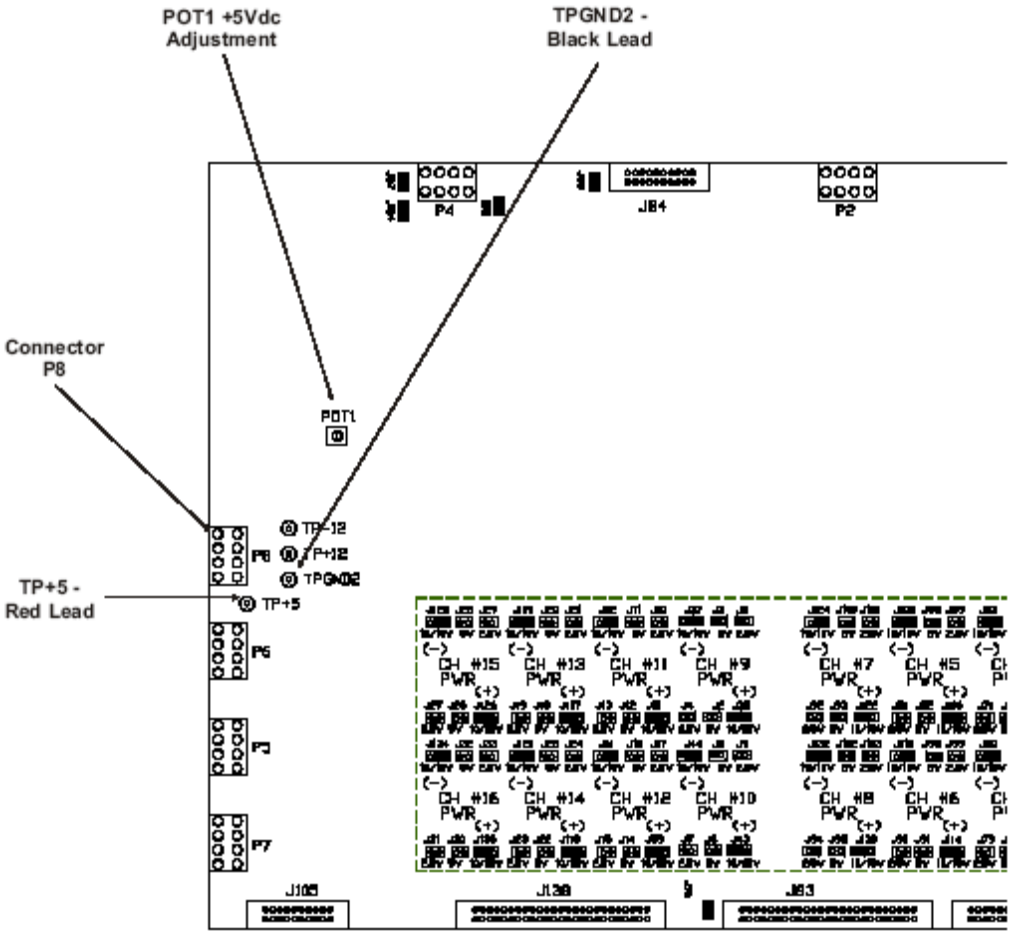


Figure 5-117. PSSCB

5.8.3. Student Station

5.8.3.1. Power Control Lever

5.8.3.1.1. Smart Motor Encoder Alignment

1) The Smart motor performs an automatic calibration upon boot up. The counts will be interpreted and the PCL will move to a given angle position. Full = 53°, Idle = 18° and Cutoff = 0°. During the calibration, the Smart Motor will execute a subroutine stored in its onboard EEPROM. The subroutine will cause the Smart Motor to rotate CW until a position error occurs. At this point, the PCL will be at FULL throttle. The Smart will zero the encoder shaft and then begin rotating CCW until a position error occurs at which time it will stop. At this point, the PCL will be at the IDLE position. The Smart Motor will send the FDKIO shaft encoder position and the FDKIO will use this information to generate a new calibration file name “throt_rx.cal”.
2) To manually perform the PCL calibration, perform the following.

NOTE

The FDKIO will temporarily lose communication with the Host as it must be placed in the "Debug" mode for this process.

At the FDKIO GUI open the "Variables" window.

Put the FDKIO into "DEBUG" mode by clicking the "Debug is Off" button once.

Find the "RS422_TX_MOTOR_10_COMMAND" label. Leave the cursor on this row.

Using the tab key, tab to the "VALUE" field, type 0x00000002, and press the Enter key. This will command the Smart Motor to execute its calibration procedure.

When the calibration is complete, type 0x000000 in the "VALUE" field, and press the Enter key.

Place the FDKIO back on-line by clicking the "Debug is On" button once.

Table 5-20. Smart Motor Calibration Table

PCL ANGLE	DATA
Cutoff (0 degrees)	0x34332D50 0x0D2C3632
Idle (18 degrees)	0x33322D50 0x0D2C3230
Full (53 degrees)	0x37312D50 0x000D2C34

NOTE

The above data will only work properly if the calibration file "throt_rx.cal" contains the correct data. This file is system specific, meaning it is different for each simulator.

Table 5-21. FDKIO PCL Calibration file

	X1	Y1	X2	Y2	SLOPE	OFFSET	COMMENT
1	-9999	0	-3466.2	0	0	0	"Cutoff"
2	-3466.2	0	-2289	18	0.0152905	53	"Cutoff-idle"
3	-2289	18	0	53	0.0152905	53	"Idle-full"
4	0	53	9999	53	0	53	"Full"

3) Should it be necessary to change the "throt_rx.cal" file, perform the following.

   At the FlightDeck I/O Window GUI page, open the "TOOLS > EDIT" window.

   Select "FILES > OPEN".

   Double click on the folder named "CAL".

   Double click on the file named "throt_rx.cal".

   Edit the file as necessary.

   Save the file and close the editor.

   Reboot the FDKIO chassis for the changes to take effect.

5.8.3.2. Seat

5.8.3.2.1. Gas Spring

1) Check and adjust pressure of each gas spring with a calibrated air gauge. Pressure should read 25 psi ± 5 psi.
2) With regulated air supply, charge each spring to 25 psi ± 5 psi.
3) Check system for leaks.

5.8.3.3. TAS/VSI Display

5.8.3.3.1. Light Sensor

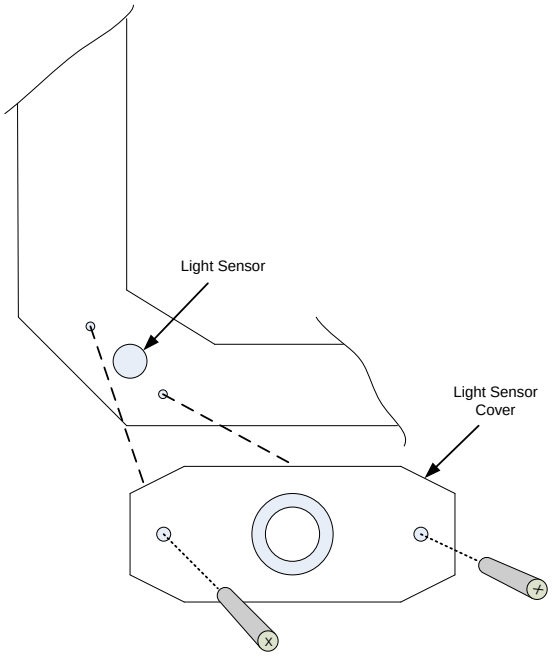


Figure 5-118. Light Sensor

Use the following procedure to remove the light sensor cover on the TAS/VSI display, cover the light sensor, and re-install the cover. See Figure 5-118 for the location. The tool and material below are required to accomplish this procedure.

- #1 tip screw driver
- Teflon tape (P/N 4591K12)

1) Remove light sensor cover by removing the two mounting screws.
2) Apply a 3/8" piece of Teflon tape to the light sensor. Mold tape around sensor to fit.
3) Re-install light sensor cover with the two each mounting screws.

5.8.4. Instructor Station

5.8.4.1. Setting the GPS Clock

The software model for the GPS uses the real-time clock in the host computer as its source for the timing signals from the simulated satellites.

To set the GPS time:

1) Display the console of the Host computer at the left-hand IOS screen.
2) Press the reset button on the front of the Host computer.

3) Interrupt the boot process by pressing the DEL key on the keyboard. This will display the BIOS configuration menu.
4) Select the first menu item in the list. This will display a page for changing the real-time clock date and time settings.
5) Dial DSN 762-1401 to hear the time signal.
6) Set the Host computer real-time clock according to the NIST UTC time signal.
7) Exit and save the new BIOS settings.
8) Reboot the Host computer.

The GPS should now display UTC time. To change the GPS display to a different time:

1) Select Setup page 2 (SET 2) using the left-hand knobs.
2) Press the CRSR button to activate the highlight in the left-hand display.
3) Turn the outer knob until the zone time field is highlighted.
4) Turn the inner knob until the desired time zone is selected.
5) Press the CRSR button again to deselect the highlight.
6) Local time should be displayed by the GPS.

It is recommended that the real-time clock (RTC) of the Host computer be set to UTC.

5.8.5. Sound System Computer and Audio Processing System

No hardware alignments or adjustments are necessary.

5.9. SOFTWARE UTILITIES

5.9.1. Host Computer Procedures

The Master Software Library will be available via the JPATS LOAP. These masters will reside on the ATDSS file server at the JPATS-GBTS MUSS, Randolph AFB. Updates and recovery of file systems will be accomplished over the network. Having the Masters at the MUSS affords the JPATS Training Program the integrity of configuration control of the software package as a whole.

5.9.1.1. Building a Hot Spare

Refer to the manuals listed in paragraph 5.10.

5.9.2. Aural Cue System (ACS)

5.9.2.1. APS

5.9.2.2. vxWorks Operating System

The vxWorks operating system runs on the APS unit. Specific knowledge of vxWorks is not required to operate the system.

5.9.2.3. Windows Operating System

The Windows operating system runs on the Sound System computer. Basic knowledge of using Windows is required.

5.9.2.4. Diagnostics

Software utilities are available for verification of the APS Sound System components. For explanation of these utilities, refer to the Troubleshooting paragraph in Section 5 of this manual.

5.9.3. ECLS

5.9.3.1. ECLS Computer

5.9.3.1.1. Building a Hot Spare

Refer to the manuals listed in paragraph 5.10.

5.9.3.2. DRI Platform Procedures

Refer to the Platform Control Pages portion of the Diagnostics, section 5.6.6 of this manual.

5.9.3.3. DRI Platform332 Firmware Download

Use the following procedure to download the firmware to the DRI Platform332 board. The tools/test equipment required to perform this procedure are:

- Platform Test Cable (60001ACJ858-501)
- Laptop or Maintenance terminal with PC Bridge and Platform Control Page Software loaded, and a current 6520.o Platform Firmware file.

1) Connect the platform test cable (P/N-60001ACJ858-501) to J13 (Port A) on the DRI platform and to COMM PORT 1 on the computer. See Figure 5-119.

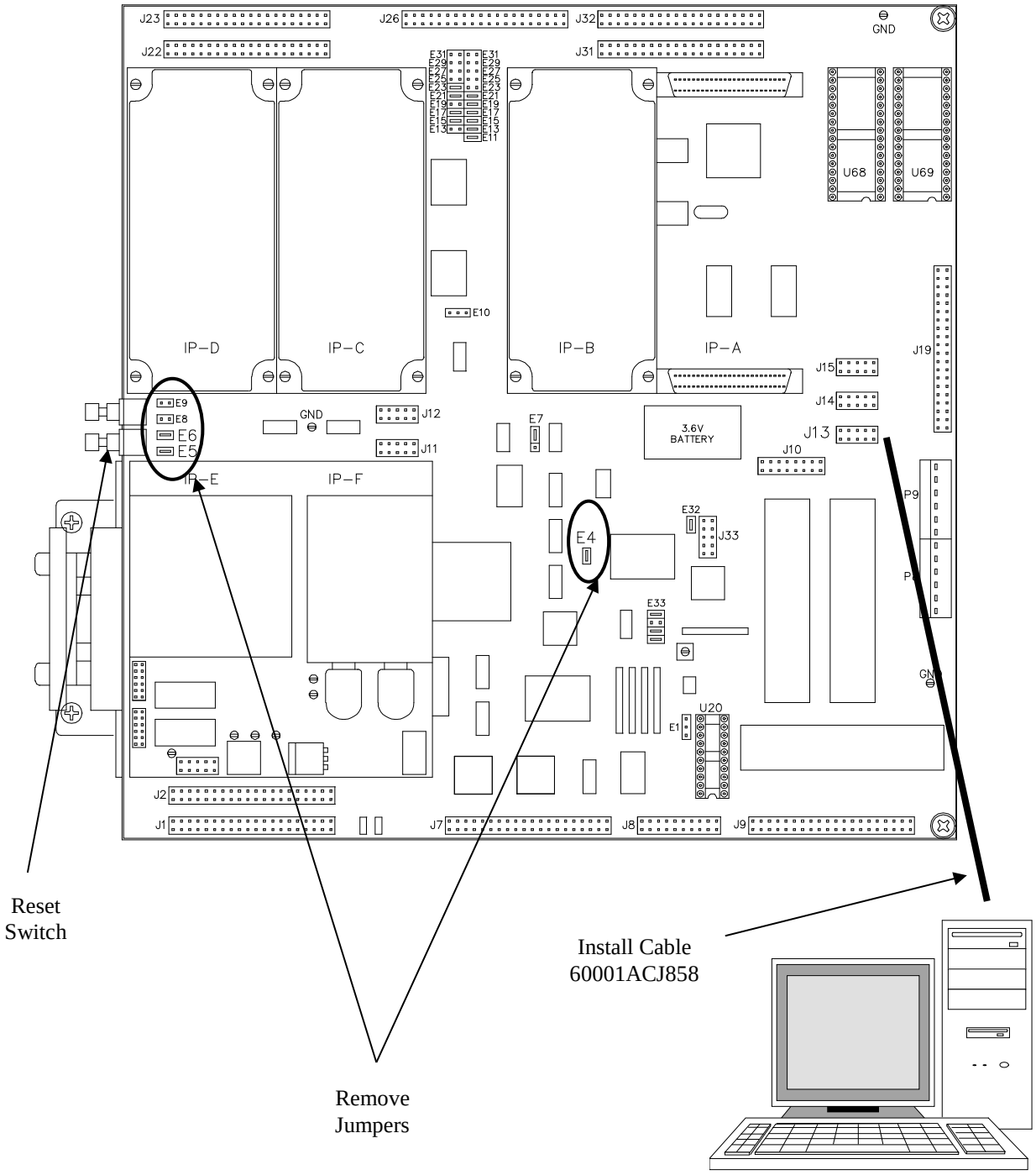


Figure 5-119. Platform332 Board Firmware Download Connections

2) At the DRI platform to which the firmware will be downloaded, remove the jumper from E4 and the address jumpers E5, E6, E8, and E9 located next to the Reset switch. Make note of the jumper locations so they can be reinstalled once the download is complete.

3) If the system is running Windows, get to the Command Prompt or reboot into DOS mode. On Windows 2000 operating systems you can get the Command Prompt by selecting Start, then Run, then type in CMD in the dialog box and select OK.

4) At the DOS prompt, type:

   >cd c:\work <ret>

   >path c:\work <ret>

   >start <ret> (This sets up the Comm port.)

   >pcb <ret>

   7. The OS/9 menu will appear. See Figure 5-120 for a typical OS/9 menu screen.

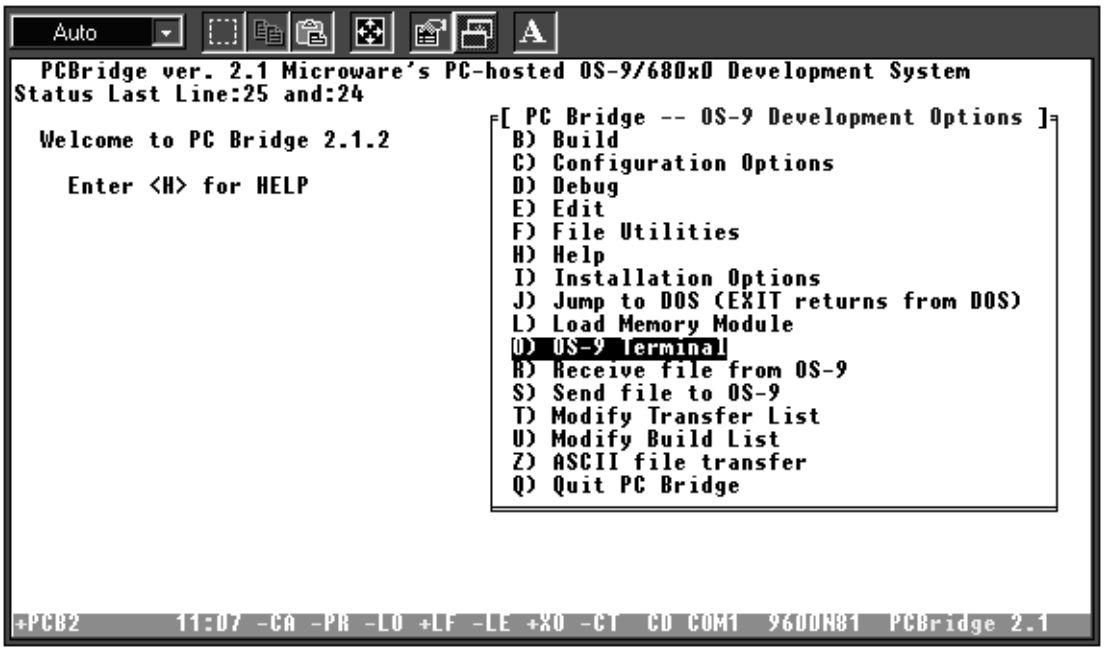


Figure 5-120. OS/9 Menu

5) Type “O” and <ret> for the OS/9 prompt ($). This ensures that the test cable on J13 (PortA) is installed correctly and communications is established.

6) If the “$” prompt does not appear, reset the DRI platform you are connected to by pressing the red Reset button (bottom button) on the front of the platform. The “$” prompt should appear.

7) Press the F1 key to enter PC Bridge and display the PC Bridge menu.

8) Type “L” for Load Memory Module.

9) Enter “6520.o” as the file. This will start the download; it takes about 4 minutes.

10) After the download is complete, type “O” for the OS/9 prompt ($), then enter MDIR (Module Directory).

11) The file “6520.o” should show up in the directory.

12) At the OS/9 prompt ($), enter “6520.o” again to “self execute” the file.

13) When the file executes correctly, the message displays “Error #000:104”. It takes approximately 3 minutes to complete.

14) Press the F1 key to enter PC Bridge, then select “Q) Quit PC Bridge”.

15) Reinstall the address jumpers E5, E6, E8, and E9, as applicable, next to the Reset switch ensuring that they are installed correctly as they were prior to beginning this procedure. Reinstall the jumper on E4.

16) Reset the DRI platform you are connected to by pressing the red Reset button (bottom button) on the front of the platform. Refer to Figure 5-119.

17) Shutdown all power to the simulator and power it back up in accordance with the procedures in Section 3 of this manual.

18) On the HCS computer, start the Platform Control pages by following the instructions in steps 3 and 4 except type “hcsJPAT” at the c:\work prompt instead of “pcb”. Check to see that the platform you are plugged into shows up as the active interface.

19) Verify that the Platform332 load version is correct on the lower right corner of the DRI System page. Refer to Figure 5-9.

20) Turn the control loading ON and check the controls for freedom of movement and proper centering.

21) If any of the controls are locked up, turn the control loading OFF and manually center the controls.

22) Bring up the controls in debug and exercise the malfunctioning channel with a sine wave using the procedures in the Diagnostics Section of this manual. After 4 or 5 cycles of the sine wave, exit the debug driver and turn the control loading ON in the normal mode.

23) Recheck the controls for freedom of movement and proper centering.

5.9.3.4. Digital Servo Amplifier

Refer to 5.2.4.3 for the Servo Amp Calibration procedures.

5.9.3.4.1. PowerTools Utility Pages

The PowerTools Utility application software has a few pages that will prove to be useful in troubleshooting and system diagnosis.

5.9.3.4.1.1. Status Page

The Status page shows the overall system status for the channel. See Figure 5-121.

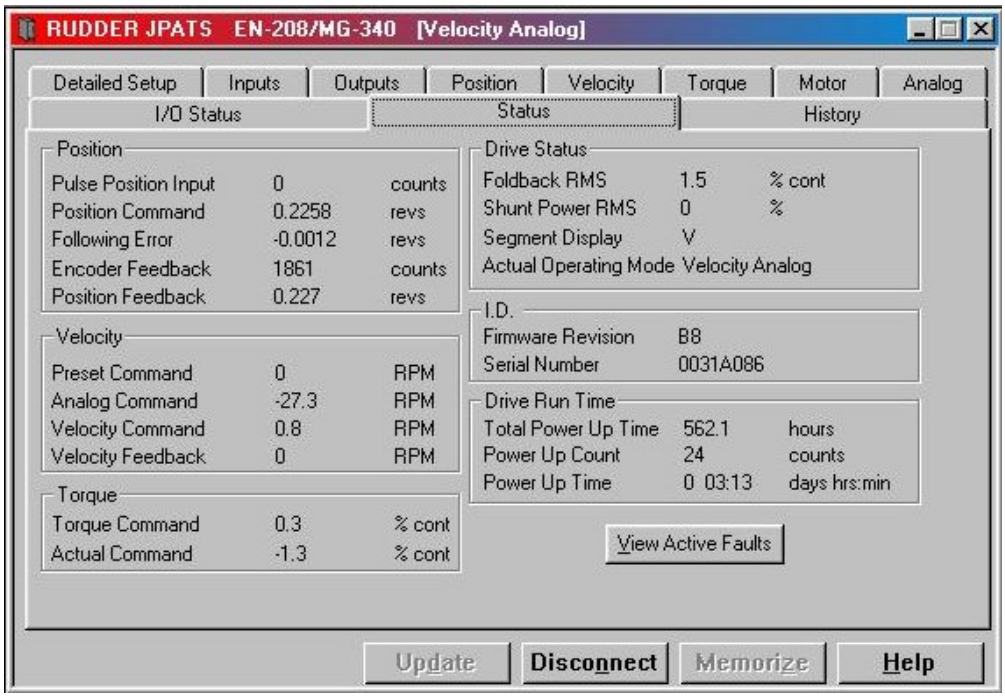


Figure 5-121. Power Tools Status Page

5.9.3.4.1.2. History Page

The History page shows the history of the channel. It displays the logging file for the channel. See Figure 5-122.

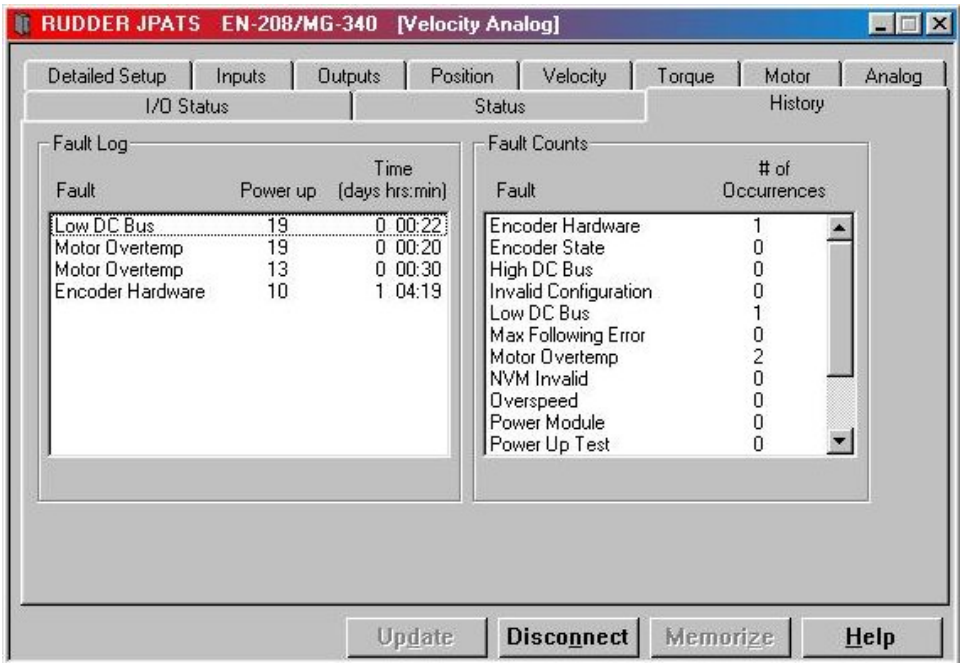


Figure 5-122. PowerTools History Page

5.9.4. FDKIO System

5.9.4.1. Building a Hot Spare

Refer to the manuals listed in paragraph 5.10.

5.9.4.2. Using the FDKIO GUI

The FDKIO GUI is a system tool which allows the technician to manipulate the FDKIO system for purposes of troubleshooting as well as testing system components in real-time or stand-alone operational conditions. The following procedure will assist the technician in getting into the GUI environment. It will give an overview of its capabilities. It is not all encompassing, but will aid the technician in familiarity of the system well enough to learn its overall capability. Hands-on training is recommended to become proficient in its utilization. The cockpit must be powered up for some variables to display data.

5.9.4.2.1. Debug and Test

1) From the VxWorks shell prompt, type the following

   ->_gui_ _Fv <ret>

2) The GUI application window titled “FlightDeck I/O Computer” should appear. See Figure 5-123.

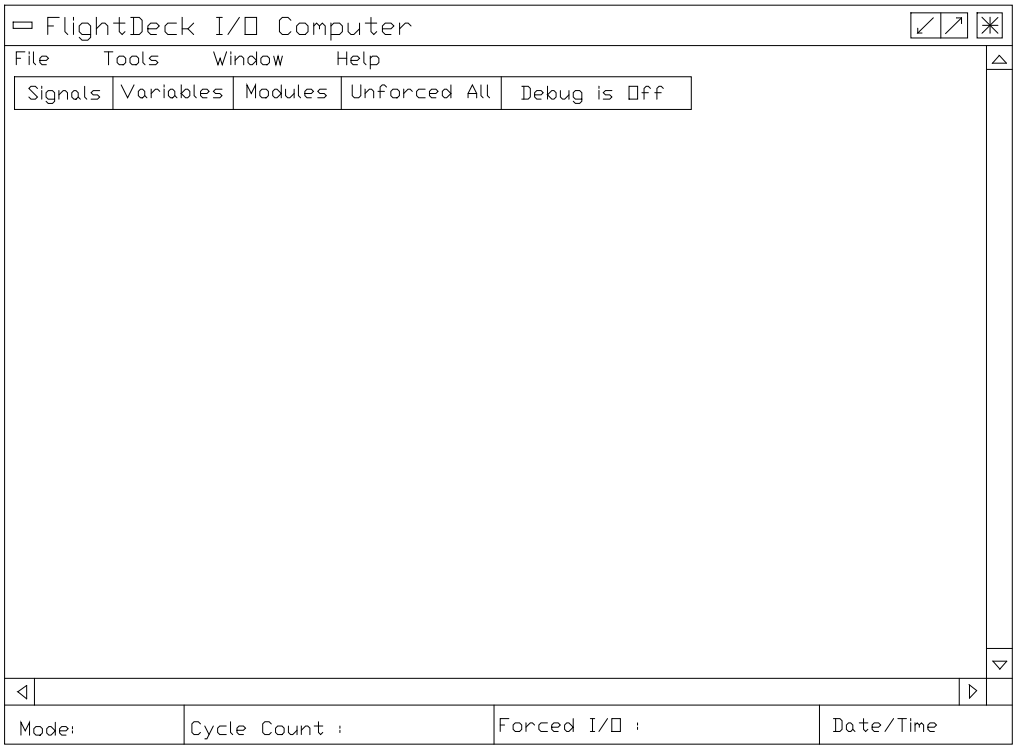


Figure 5-123. FlightDeck I/O Computer GUI Page

3) The two ways of looking at the I/O variables are as “Signals” and as “Variables”.

8. The “Signals” window will display information by Type, ID, Rack, Slot, Port, Pin, Label, Status and Forced. See Figure 5-124.

   Type – Describes the type of action, i.e. – DI/DO/AI/AO.

   ID – Describes the ID address of the variable.

   Rack – The rack Reference Designator location of the PCB it is controlled by.

   Slot – The Reference Designator of the slot in the Rack

   Port – The connection port in the slot

   Pin – The pin in the connection port

   Label – The label name for the given action

   Status – Shows the status of the variable

   Forced – Informs the technician if that variable is forced on, meaning it is in a forced condition while the Debug mode is in an off condition.

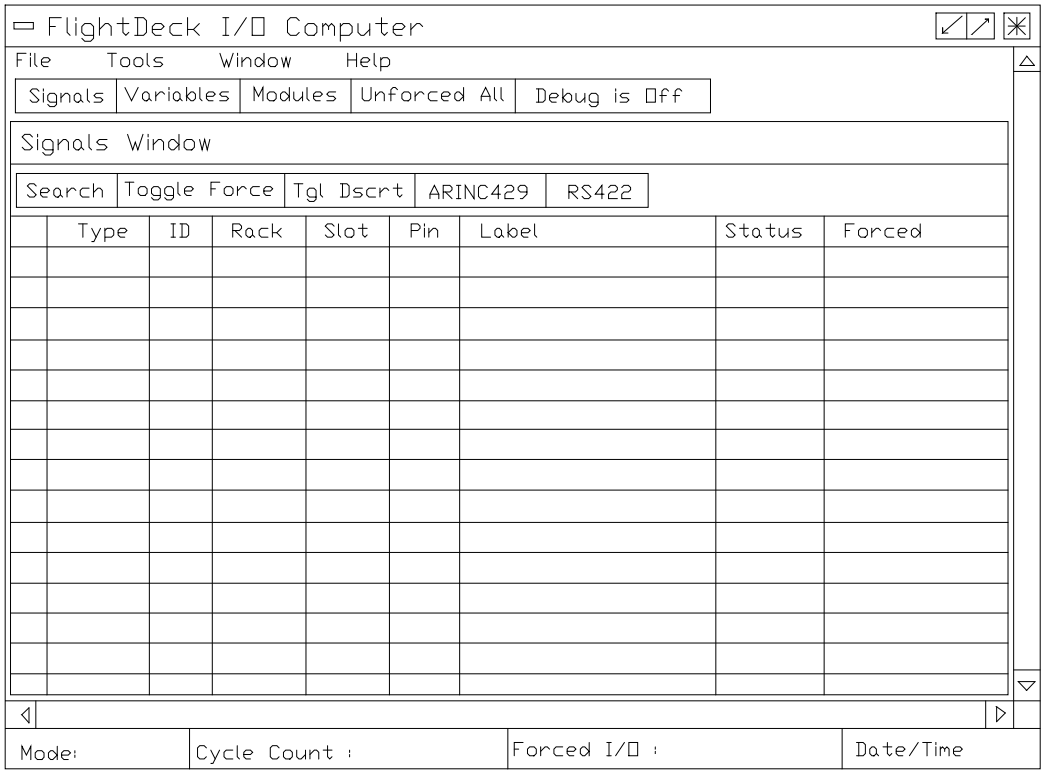


Figure 5-124. FDKIO Signals GUI Page

9. The “Variables” window will display information by Label, Drawing, Dimension, Direction and Value. See Figure 5-125.

   Label – The label given to a specific item; describes what the function is, i.e. – The “Total Amber” label describes the “Total Freeze” switch “Amber” lighting.

Drawing Number – The FSI Drawing Number that contains the information for the given Label Name, i.e. – 6520ABE095 sh. 5 for the “Total Amber” label.

Dimension – Describes the I/O action of the label, i.e. – The “Total Amber” label is a Discrete Output (DO).

Direction – Describes the direction of the action; an Input to the Host or an Output from the Host.

Value – Shows the value of the variable in either an analog voltage level or a discrete set state where 1 is true or set, and 0 is untrue or not set. This field will also show the buffer contents for labels that utilize buffered actions, such as RS-422, and ARINC-429 formatted actions.

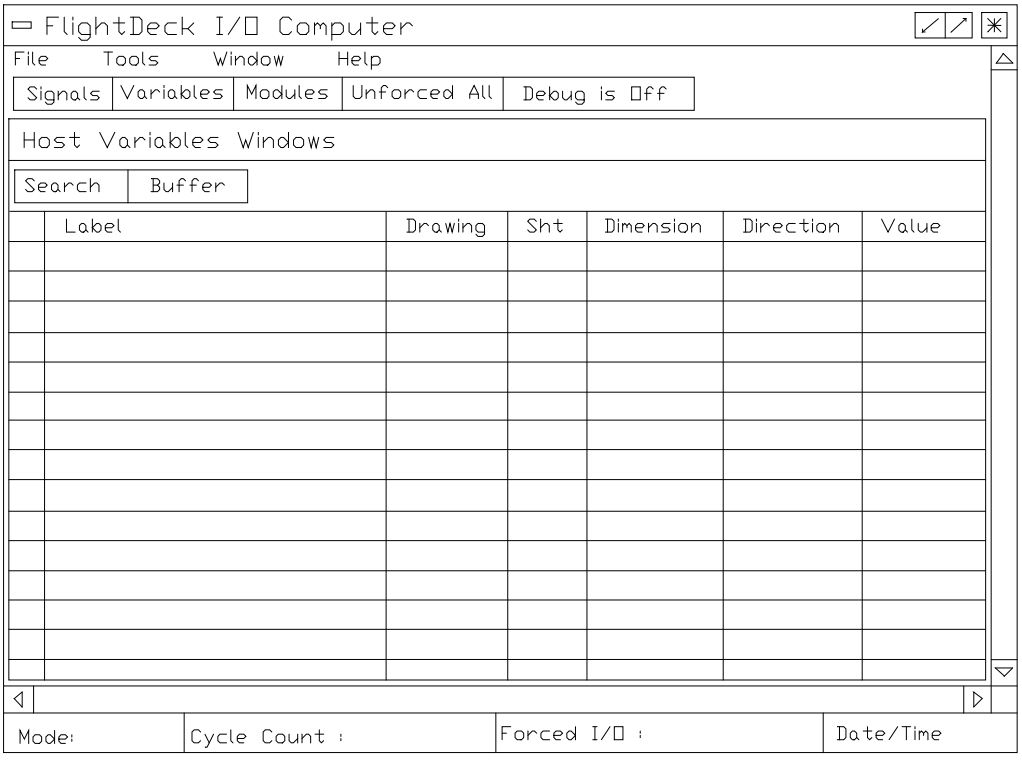


Figure 5-125. FDKIO Variables GUI Page

5.9.4.2.2. Using the Ramp Function

The Ramp function enables the technician to ramp an analog signal to flight instrumentation in a controlled fashion. It is designed to ramp both a sine and a cosine signal simultaneously to any given instrument that requires both signals in order to drive and display accurately. It can be used to drive one analog signal; however, the technician needs to be aware that the second variable will also drive, resulting in another instrument changing its readout or display.

The Debug Mode must be in the “ON” state for the ramp function to operate. The ramp rate is subject to three variables: Scale, Angle and Delta.

1) To get to the “Debug Mode”, go to click on “Debug is Off” button at the top of the “FlightDeck I/O Computer” window.

2) From the “FlightDeck I/O Computer” window, click on the Tools pull-down menu and click “Ramp”. The Ramp window should appear. See Figure 5-126.

3) Set the ramp variables to the rate desired.

10. Scale – Sets the scale; can be set between 1 and 10. (1 slower – 10 faster)

11. Angle – Sets the Angle and can be set in the range of 0 – 359 degrees. The UP and DOWN arrows will increment in 1-degree steps when clicked on with the mouse.

12. Delta – Changes the increment and is recommended to be set between 1 and 5. A higher value may be used; however, the reliability becomes less accurate as computer cycle times become more critical.

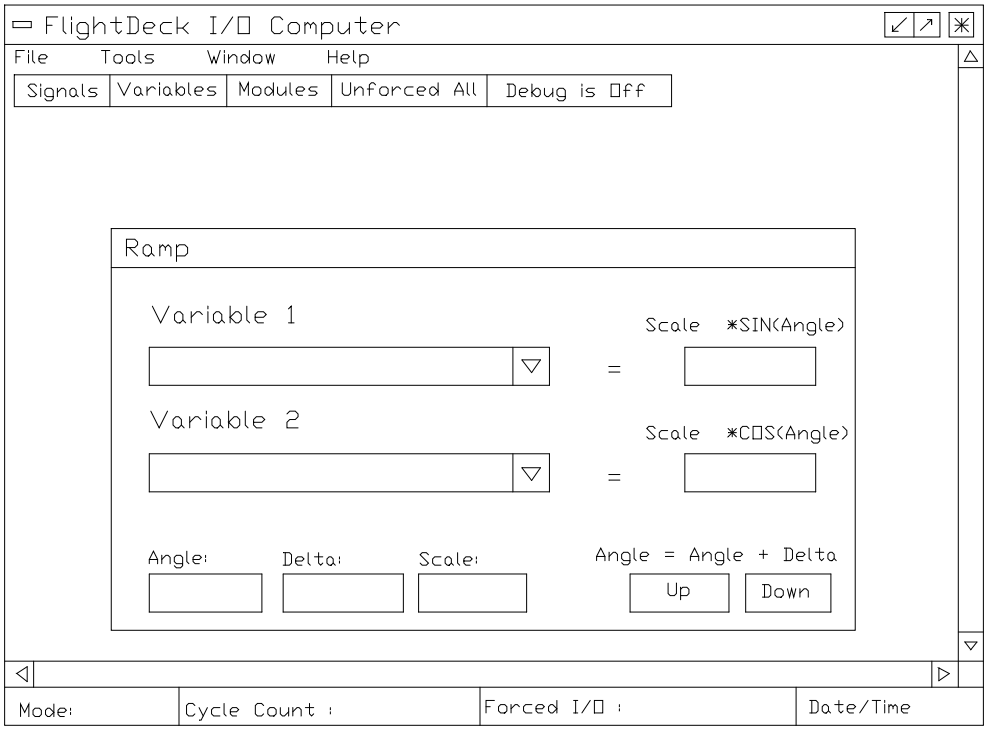


Figure 5-126. FDKIO Ramp GUI Page

5.9.4.2.3. Using Profiles

During training or maintenance activity the condition of a training scenario or a given state of the training device can be saved off as a “Profile”. These Profiles can then be used to duplicate a condition for troubleshooting purposes. A Profile can be used to set up a condition for lamp illumination for preflight activities. The Profiles save all DO and AO information, in 32-bit format. No buffered variables are saved; therefore, instrumentation utilizing the RS-422 and ARINC-429 formats will not be saved.

5.9.4.2.3.1. Saving a Profile

The following procedure will enable the technician to save a Profile.

1) From the FDKIO Window GUI page, use the File pull-down menu and select SAVE. This will save the current condition of the trainer.
2) Name the file in a format that describes the scenario or its intended use, i.e. – lesson4.pro or preflite.pro. This will save time when loading the profile later.

5.9.4.2.3.2. Loading a Profile

The following procedure will enable the technician to load a previously saved Profile. Debug Mode must be in the ON mode for a profile to be loaded.

1) From the FDKIO Computer window, use the File pull-down menu and select OPEN, a window with a list of saved files will appear. These should contain the .pro extension.
2) Double Click on the file to be loaded.
3) The trainer should change state to the given Profile.

5.9.4.2.4. Checking Status using the Modules window

1) From the FDKIO Computer window click on the Modules button. See Figure 5-123.
2) The Modules window will display the following information.

   Rack – Reference designation of the PCB.

   Slot – Slot in the rack of the PCB.

   Port – Connection port of the variable, within the Slot.

   Model – Model type of the variable.

   Description – Description of the Variable type.

   Status – Shows present status of the module.

5.9.4.2.5. Calibration Table

See Appendix C for FlightDeck I/O Calibration Table procedures.

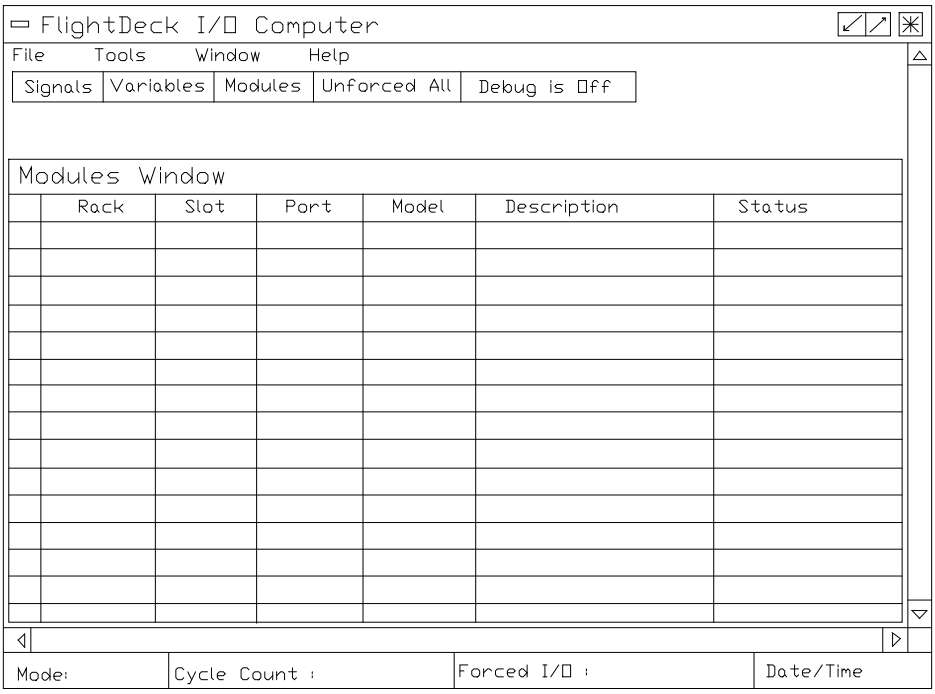


Figure 5-127. Modules Window GUI page

5.9.5. Instructor Operating System

5.9.5.1. Building a Hot Spare

Refer to the manuals listed in paragraph 5.10.

5.9.6. Hands On Throttle and Stick (HOTAS) (HOTAS-installed devices only)

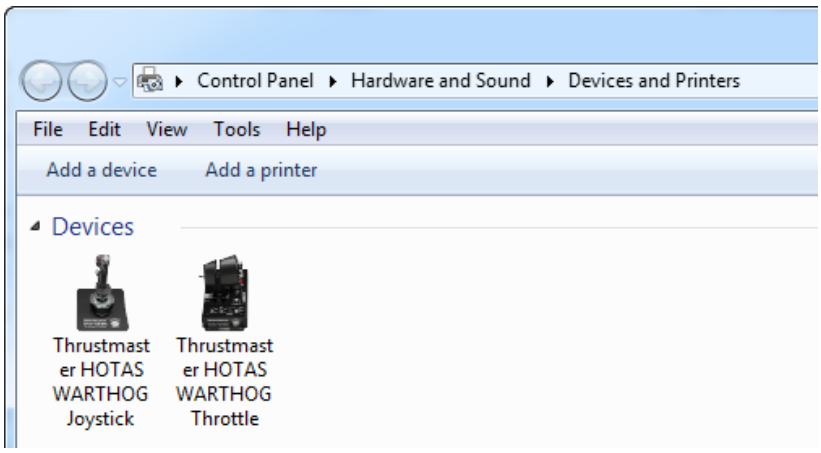
5.9.6.1. Recalibration

Should the HOTAS joystick or throttle require recalibration:

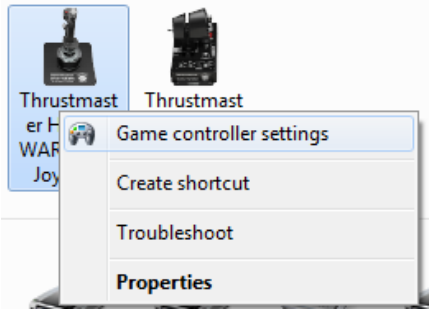
1) On the Windows desktop, go to Start->Devices and Printers.

NOTE

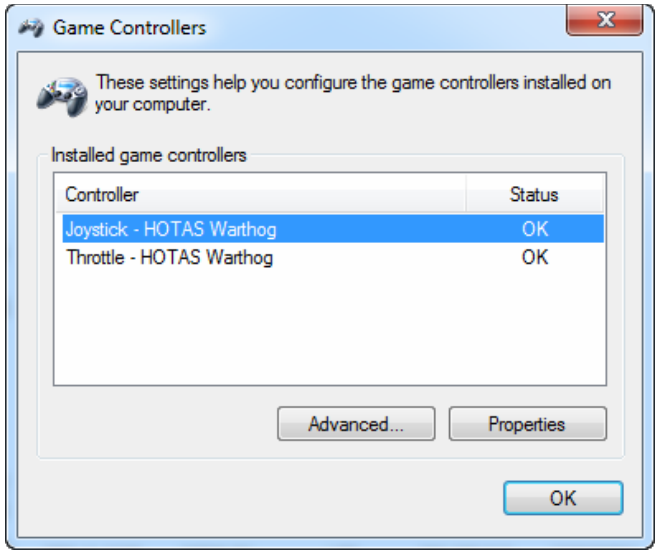
If either "Thrustmaster HOTAS WARTHOG Joystick" or "Thrustmaster HOTAS WARTHOG Throttle" is missing, then either the original installation was not completed successfully, or the unit may be unplugged.



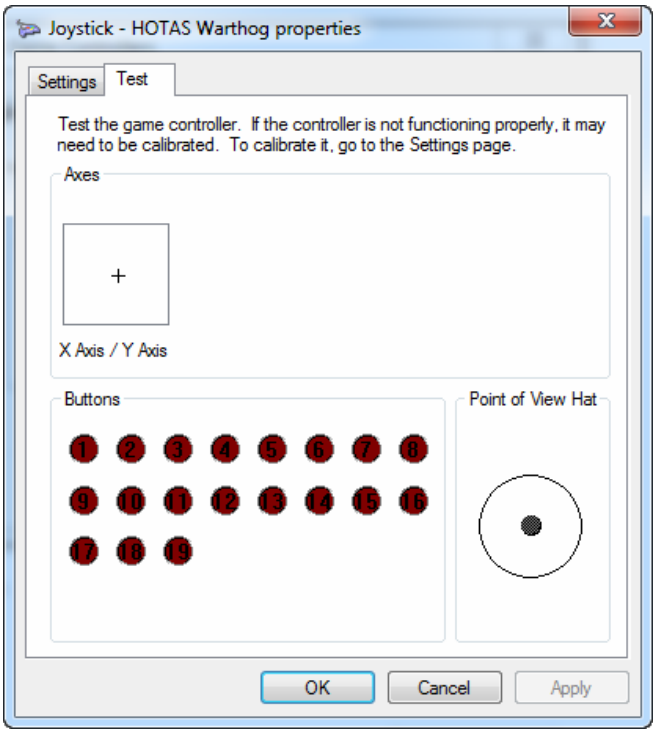
2) Right-click on either of the icons, and choose “Game controller settings”:



This will bring up:

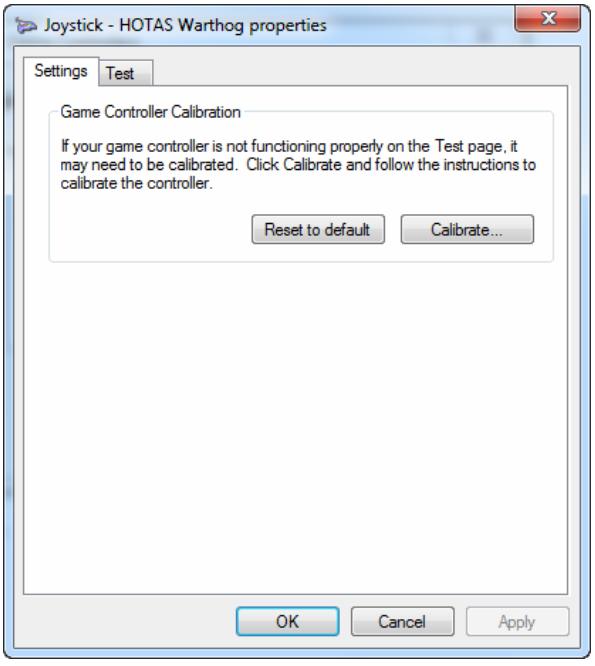


3) In the Game controller settings dialog, you should see both controllers listed. Select which controller you want to calibrate, then choose Properties. It will bring up a Test tab and a Settings tab:

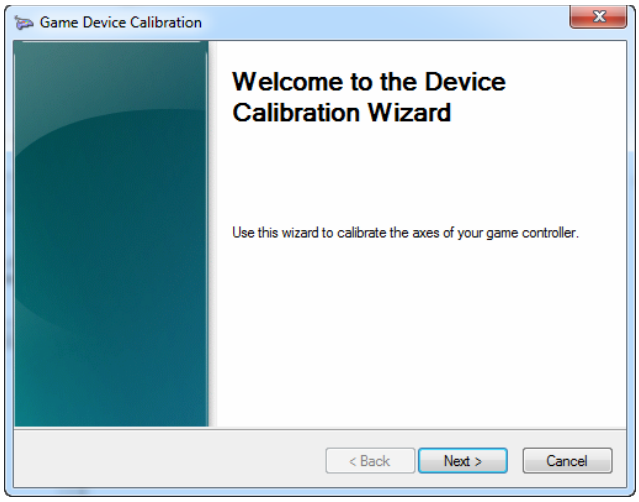


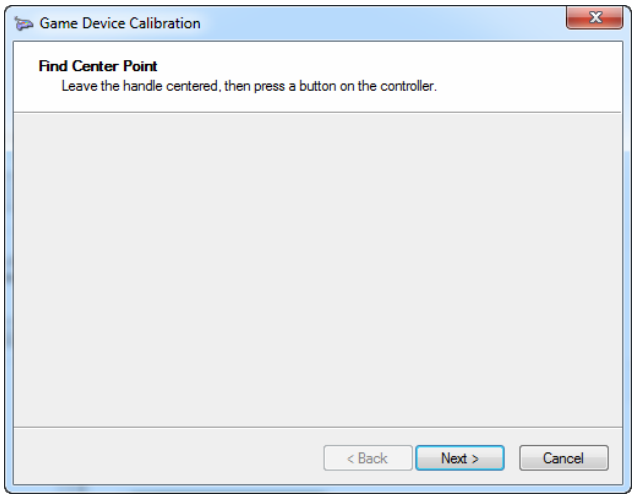
4) You may use the Test tab to exercise the joystick or throttle (whichever you chose previously).

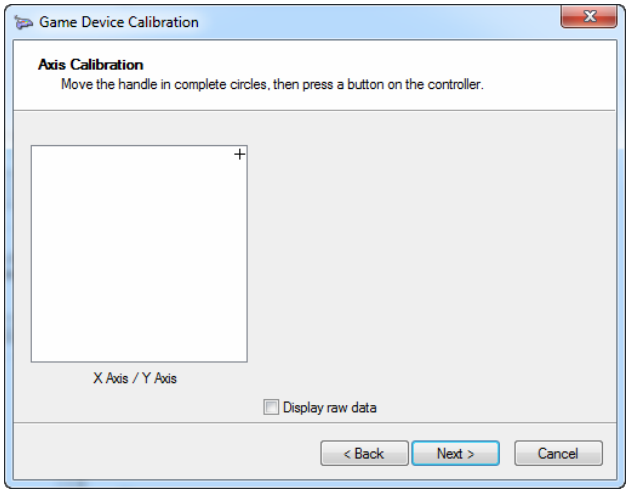
5) If calibration is desired, choose the Settings tab:

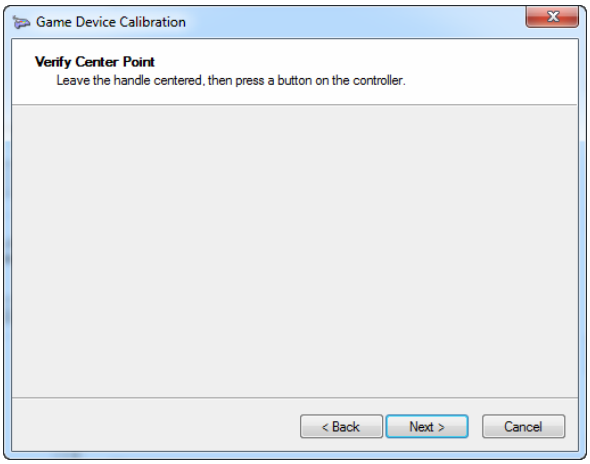


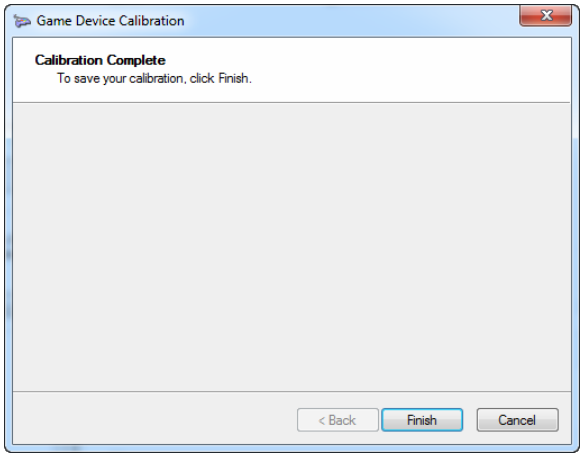
6) Choose the Calibrate button and follow the directions as instructed:


Game Device Calibration
Welcome to the Device Calibration Wizard
Use this wizard to calibrate the axes of your game controller.
< Back
Next >
Cancel


Game Device Calibration
Find Center Point
Leave the handle centered, then press a button on the controller.
< Back
Next >
Cancel


Game Device Calibration
Axis Calibration
Move the handle in complete circles, then press a button on the controller.
X Axis / Y Axis
Display raw data
< Back
Next >
Cancel





7) If desired, go back to step 3 and calibrate the other controller (joystick or throttle).

5.10. COLD START PROCEDURES

For cold start procedures, refer to the following manuals:

- JPATS-FTD-SPS, Software Product Specification for the Flight Training Device Component of the Joint Primary Aircraft Training System Ground Based Training System
- JPATS-FTD-SUM, Software User Manual for the Flight Training Device Component of the Joint Primary Aircraft Training System Ground Based Training System