

FISHER-ROSEMOUNT

RS3™

Service Quick Reference Guide

August 1999
U.S. Manual PN: 10P57000201

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Components of the RS3 distributed process control system may be protected by U.S. patent Nos. 4,243,931; 4,370,257; 4,581,734. Other Patents Pending.

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About This Manual

This manual is intended as an aid for service personnel supporting the RS3. It covers troubleshooting techniques, maintenance procedures, and data on virtually all of the hardware used with the system. This is a condensed quick reference manual. Full details are found in the *Site Preparation and Installation Manual (SP)* and in the *Service Manual (SV)*.

The best way to find data on a specific device is to use the index. You can look up the device part number, device name, or the legend printed on the printed circuit board. The legends are shown in all capital letters in the index.

Another way to find a specific device is to scan the Table of Contents. This lists the contents of each page. Similar devices are grouped on a page with the devices listed in decreasing part number order. The device with the highest part number is listed first.

| | |
|-----------|--|
| Section 1 | Troubleshooting procedures. |
| Section 2 | Maintenance procedures. |
| Section 3 | Hardware data (LED meanings, test point meanings, jumper settings, and fuse values) for the power distribution system. |
| Section 4 | Hardware data for the Twinax and Optical PeerWay. |
| Section 5 | Hardware data for consoles and peripheral devices. |
| Section 6 | Hardware data for ControlFiles. |
| Section 7 | Hardware data for the Analog Card Cage and Multipoint I/O devices. |
| Section 8 | Hardware data for PeerWay Interface devices such as the SCI, HIA, and RNI. |

Changes for This Release

- Numerous corrections and minor revisions have been made throughout the manual.
- Many changes to this manual reflect hardware installation and service requirements for a new system power supply, the new RS3 Millennium Package (RMP), and the new MPC5 controller with 4 Meg NV Memory.

Revision Level for This Manual

This manual is independent of Software Release level. New equipment is added with each release and older material is updated. You should always use the latest version.

| For This Software Version: | Refer to This Document: | | |
|----------------------------|-------------------------------|-------------|-------------|
| | Title | Date | Part Number |
| All | Service Quick Reference Guide | August 1999 | 10P57000201 |

References to Other Manuals

References to other RS3 user manuals list the manual, chapter, and sometimes the section as shown below.

Example Entries:

For ..., see CC: 3.

↑ ↑

Manual Title Chapter

For ..., see CC: 1-1.

↑ ↑

Manual Title Chapter-Section

Abbreviations of Manual Titles

- AL** = Alarm Messages
- BA** = ABC Batch
- CB** = ControlBlock Configuration
- CC** = Console Configuration
- DT** = Disk and Tape Functions
- IO** = I/O Block Configuration
- OP** = Operator's Guide
- OV** = System Overview and Glossary
- PW** = PeerWay Interfaces
- RB** = Rosemount Basic Language
- RI** = RNI Installation Guide
- RP** = RNI Programmer's Reference Manual
- RR** = RNI Release Notes
- SP** = Site Preparation and Installation
- SV** = Service

Reference Documents

Prerequisite Documents

You should be familiar with the information in the following documents before using this manual:

| | |
|---|----------------|
| <i>System Overview Manual and Glossary</i> | 1984-2640-21x0 |
| <i>Software Release Notes, Performance Series 1</i> | 10P56870106 |

Related Documents

You may find the following documents helpful when using this manual:

| | |
|--|----------------|
| <i>ABC Batch Software Manual</i> | 1984-2654-21x0 |
| <i>Alarm Messages Manual</i> | 1984-2657-19x1 |
| <i>ABC Batch Quick Reference Guide</i> | 1984-2818-1103 |
| <i>Configuration Quick Reference Guide</i> | 1984-2812-0808 |
| <i>Console Configuration Manual</i> | 1984-2643-21x0 |
| <i>ControlBlock Configuration Manual</i> | 1984-2646-21x0 |
| <i>I/O Block Configuration Manual</i> | 1984-2645-21x0 |
| <i>Operator's Guide</i> | 1984-2647-19x1 |
| <i>PeerWay Interfaces Manual</i> | 1984-2650-21x0 |
| <i>RNI Programmer's Reference Manual</i> | 1984-3356-03x1 |
| <i>RNI Release Notes and Installation Guide</i> | 1984-3357-02x3 |
| <i>Rosemount Basic Language Manual</i> | 1984-2653-21x0 |
| <i>Service Manual, Volume 1</i> | 10P569802x1 |
| <i>Service Manual, Volume 2</i> | 10P569802x2 |
| <i>Site Preparation and Installation Manual</i> | 10P569902x1 |
| <i>Software Discrepancies for Performance Series 1</i> | 10P56870304 |
| <i>User Manual Master Index</i> | 1984-2641-21x0 |

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Section 1: Troubleshooting

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Problem Reporting Terms

Please use the following set of terms when making a problem report. The terms have been defined in an attempt to reduce confusion in communication between users, System Support, and the development staff.

Definition of Terms

| Term | Definition |
|------------------|--|
| Action | Tape loaded upon insertion in the drive. "Tape Auto Load" field active on the [CCC] screen. |
| Boot | To start up a device by loading a program from a storage device to a processor board. |
| Called Up | Define HOW you called up the screen. By use of: <ul style="list-style-type: none"> Loop Callup Button Command Line Next Option Select Other Button |
| Crash | The processor stops processing: <ul style="list-style-type: none"> Red LED on processor board All functions halted in the node Console clock not updating (console crash) Crash Dump Screen appears (68020 crash) |
| Create Boot Tape | The operation which initialized a tape, crates a console program on the tape, and backs up the disk files onto the tape. |
| Disk Backup | The process of copying all disk files onto the tape. |
| Disk File Backup | The operation that copies a file from disk to tape or to another disk. |
| Disk File Copy | The operation that copies a file from one disk to another. |

(continued on next page)

Definition of Terms (continued)

| Term | Definition |
|----------------------|--|
| Disconnected PeerWay | Removed node from the PeerWay by: Physically disconnecting the Drop Cables Physically removing the PeerWay Buffer Card Use of the PeerWay Overview screen Use of the PeerWay Node screen |
| Folder Backup | The operation that copies a folder from disk to tape or to another disk. |
| Insert Tape | Physically placing the tape in the drive. |
| Loaded Tape | Tape Load: The software activity. |
| Manual Load | Tape was loaded by Disk Activity screen operation "Tape load". |

Troubleshooting the Power System

AC/DC Power Supply Troubleshooting

| Condition | Action |
|---|---|
| PS FAULT (red LED) on. PS NORM (green LED) off. Amber AC IN lamp not on and no A/C is present. | <ol style="list-style-type: none"> 1. Turn BATT ON/OFF switch OFF. Disconnect the DC power plug at supply. Voltage should measure between 28 and 34 volts DC. If not, replace the power supply. 2. Replace the battery charger board. |
| BATT TEST FAULT (red LED) on. NOTE: The power supply will continue to share the DC load without the battery or the battery charger board installed. | <ol style="list-style-type: none"> 1. Wait 60 minutes and press the BATT TEST pushbutton. 2. Open the battery compartment and determine if the battery connections are OK. NOTE: If the batteries show any sign of leaking, such as white corrosion on the battery posts, replace the batteries. 3. Check the fuse that is next to the battery compartment inside the power supply. 4. Replace the battery charger board. Wait for 60 minutes and press the BATT TEST pushbutton. 5. Replace the batteries. |

Troubleshooting a PeerWay

Three screens are useful in diagnosing PeerWay problems. See the Service manual, SV:10-1, for definitions of the screen fields.

Peerway Node Screen [PN] xx

This screen shows details for the named node (xx). Observe Qual A and Qual B, Noecho, Badecho, DupNode, AB Swap, and Coupler.

PeerWay Overview Screen [PO]

A dot indicates no errors, a number shows the number of errors, and ** indicates more than 99 errors. A vertical line of errors indicates a transmission problem, a horizontal line indicates a reception problem.

The A and B columns at the right side show each node's opinion of PeerWay A and B quality. Zero is perfect; 100 is a warning; and 500 shows very poor communication performance.

A node can be disconnected from PeerWay A by entering "A" at the prompt on the right. "B" disconnects the node from PeerWay B. "AB" disconnects both PeerWays.

The Actual margin should be between 495 and 505. A lower margin indicates a PeerWay B problem, a higher one indicates a PeerWay A problem.

Plant Status Screen [PS]

This screen shows the device at each node. Backlighting indicates ownership of the device by this console.

Diagnosing a Console or SCI PeerWay Problem

□ **To diagnose a Console or SCI PeerWay problem:**

1. Move the drop cable from one tap connection to another.

CAUTION

When moving drop cables and PeerWay buffers from a ControlFile for troubleshooting purposes, make certain you move only those associated with the suspect PeerWay. If anything on the good PeerWay is disconnected, the ControlFile or console could be taken off the PeerWay.

Look at the PeerWay Node screen for this device, and note the “Noecho” and “Badecho” Fields. If the problem is now cleared, replace the Tap Box at the earliest convenience. If all of the tap connections are used, swap two drop cables at the Tap Box. Determine if the problem moves to the node that was swapped. If the problem moved, replace the Tap Box.

2. Replace the Console PeerWay Interface Card.
3. Replace the Console Power Regulator Card.
4. Replace the drop cable.
5. Command Console and Basic Command Console only: Pull the console card cage out and connect the drop cable directly to the back of the motherboard, bypassing the short marshaling panel cable. Use extreme caution when removing and installing the console card cage to avoid damaging any cables.

Diagnosing a ControlFile PeerWay Problem

The procedure for checking PeerWay problems differs if there is one ControlFile or several ControlFiles on the PeerWay.

□ **To diagnose a ControlFile PeerWay problem with one ControlFile on the PeerWay:**

1. Move the drop cable from one tap connection to another.

WARNING

When moving drop cables and PeerWay buffers from a ControlFile for troubleshooting purposes, make certain you move only those associated with the suspect PeerWay. If anything on the good PeerWay is disconnected, the ControlFile or console could be taken off the PeerWay.

Look at the PeerWay Node screen for this device, and note the “Noecho” and “Badecho” Fields on this screen. If the problem is now cleared, replace the Tap Box. If all of the tap connections are used, swap two drop cables at the Tap Box. Determine if the problem moves to the node that was swapped. If the problem moved, replace the Tap Box.

2. Remove the PeerWay Buffer card from the ControlFile on the faulty PeerWay. Follow step a or b below depending on the part number of the card.
 - a. Part number 1984-1402-0003: The card must be replaced to determine if it is bad. If no spares are available, the card can be swapped with the other buffer in this cage. This will take the node off of the PeerWay.
 - b. Part number 1984-1502-0001: Remove the card and move the seven jumpers (HD 2, 3, 4, 5, 6, 7, and 8) on the card to the TEST position. Install the card and look at the PeerWay Node screen and determine if the Noecho and Badecho Fields are at 0. If they are now at 0, the PeerWay Buffer Card is bad and must be replaced.

WARNING

If the Coordinator Processor Card is disabled on a running process, all operator process changes, links running between controllers in that cage, and links to and from that ControlFile will freeze at the last value received. The controllers will continue to operate the process under these conditions. As soon as the Coordinator Processor Card is restarted all links will be updated.

3. Replace the Coordinator Processor Card.

If there are several ControlFiles on the PeerWay, use the following procedure.

- ☐ **To diagnose a ControlFile PeerWay problem with multiple ControlFiles on the PeerWay:**
 1. Move the drop cable from one tap connection to another.

WARNING

When moving drop cables and PeerWay Buffer Cards from a ControlFile for troubleshooting purposes, make certain you move only those cards and cables associated with the suspect PeerWay. If anything on the good PeerWay is disconnected, the ControlFile could be taken off the PeerWay.

2. Look at the PeerWay Node screen from the Tap Box, and note the “Noecho” and “Badecho” Fields on the screen. If the problem is now cleared, replace the Tap Box at your earliest convenience. If all of the tap connections are used, swap two drop cables at the Tap Box. Determine if the problem moves to the node that was swapped. If the problem moved, replace the Tap Box.
3. Swap the PeerWay Buffer Card from this node’s bad PeerWay with a PeerWay Buffer Card from the same PeerWay of another ControlFile. If the problem moves, replace the PeerWay Buffer Card.

WARNING

If the Coordinator Processor Card is disabled on a running process, all operator process changes, links running between controllers in that cage, and links to and from that ControlFile will freeze at the last value received. The controllers will continue to operate the process under these conditions. As soon as the Coordinator Processor Card is restarted all links will be updated.

4. If the problem does not move to the other ControlFile in step 3, replace the Coordinator Processor Card in the suspect card cage.

Troubleshooting Twinax PeerWay Cables

□ **To diagnose a twinax PeerWay cable problem:**

1. Check all twinax cable connections for proper seating on the Tap Boxes.
2. Check that both ends of the PeerWay are properly terminated.
3. Check for multiple grounds. Only one Tap Box on each PeerWay (A and B) can have the jumper in the "SHIELD" position.
4. Check to make sure that all twinax cable connectors are isolated from ground.
5. Remove the "T" connector from the Tap Box, keeping the two twinax cables connected to the "T" connector.

NOTE: The "Force Margin" field on the Peerway Overview screen should show "None".

Use an ohmmeter to measure the following resistances:

- a. Between 1 and 2: 50 ohms nominal (acceptable range: 45 to 70 ohms)
- b. Between 1 and shield: resistance greater than 1 megohm
- c. Between 2 and shield: resistance greater than 1 megohm.

If the resistance between 1 and 2 is 100 ohms or greater (or in extended length cable, 124 ohms or greater), there is a break in one of the twinax cable segments. Disconnect the two twinax cables from the "T" and measure between 1 and 2 of both cable ends. The reading should be between 100 and 140 ohms. Follow the faulty cable back until the open is located. Terminations at both ends should read 100 or 124 ohms.

If the resistance between 1 and shield or between 2 and shield measures less than 1 megohm, this indicates a short between one of the lines and the shield. Disconnect the two twinax cables from the "T" connector and measure each cable to find the faulty end. Continue following the cable segments until the fault is found.

General Console Troubleshooting Procedures

□ **To diagnose Console problems:**

1. Load from boot tape. If the console loads OK, replace the hard disk drive.

NOTE: Use a tape made from the “Create Boot Tape” function. To load from tape, insert the boot tape and power up the console. Hold [HDWR ALARM] throughout the Hardware Power Up Diagnostics screen until the console indicates loading from the streaming tape. After the console displays the Main Menu, enter [DISK DIRECTORY PEERWAY], cursor to the “TAPE” field, and press [ENTER]. Then perform the “Restore Tape Files to Disk” function. Cycle DC power and try to load using the Winchester disk. If the console still will not boot from the hard disk, replace the disk drive assembly. For the Enhanced or Standard Engineering Keyboard (1984-1654-000x): Hold the “H” key in place of [HDWR ALARM].

2. If the console will not load from tape, replace the SCSI interface card.

NOTE: Do not replace a SCSI Interface card with a Disk Interface card.

Console Power-Up Diagnostics

When power is applied to a console, the console is put through a series of comprehensive tests to verify console card operation.

If a failure occurs on any one of the console cards, the word "PASSED" is replaced with "FAILED" or "MISSING". The console will then finish the power-up tests, and an alarm at the bottom of the screen will indicate "CRITICAL FAULTY OR MISSING". If any card is indicated as missing, the card has failed to the point that it cannot be detected in the card cage and the console will not run. If a card indicates "FAILED", the test that failed will be backlit in red and the console may still be able to run, depending on the fault of the card. Pressing [ACK] on the Loop Control Panel or the red [ALARM ACK] button on the Operator Keyboard will attempt the system boot. Before pressing [ACK], note which card and the specific test that failed for future reference.

NOTE: For the Enhanced Engineering Keyboard (1984-1654-000x): The red ACK key is not recognized until the console has finished booting. Press the "A" key or "F10" to acknowledge the alarm.

Console Power-Up Tests

| Item | Test | Definition |
|---------|--------------------|---|
| Console | Bus/Interrupt Test | This is a test of the processor card ability to talk to the other cards on an interrupt level. A failure here could indicate that the processor card is bad or one of the other cards in the console could be affecting the test. The power should be turned off to the console and all cards but the power supply and processor removed. The front panel keyboard cable should also be removed. The console should again be turned on and, after 30 seconds, the green LED on the processor card should turn on, indicating the card passed all tests. The rest of the cards should then be added one by one until the fault again appears and that card should be replaced. |

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Console Power-Up Tests (continued)

| Item | Test | Definition |
|--------------------|------------------------|---|
| Console (cont.) | EDAC Test | This is a test of the Error Detection and Correction circuitry. An error is purposely written into a number of RAM addresses to verify that the EDAC will correct it. If the card has failed the EDAC test and passed the RAM test there should be no fault that would corrupt data. The card should operate for a period of time but could reset the console frequently. The processor card should be replaced as soon as possible. |
| | Four Meg RAM Test | An address and data test is run on all of the RAM on the processor card. If a failure is indicated here the console will probably not run reliably. NOTE: If a single bit error is detected during the RAM test, the Error Detection and Correction (EDAC) circuit will correct for a single RAM chip failure. The EDAC test on the processor card will be bypassed (indicated by the EDAC test also being backlit) and the console will not halt on this screen but will start up from disk in the normal way. A "Console Weak RAM Chip,bit XX" alarm will be generated and placed on the Active Alarm List. |
| | Instruction Set Test | This is a test of the microprocessor itself. An elaborate algorithm is run using many of the varied instructions to verify the integrity of the microprocessor. If a failure is indicated here, the processor may be bad and the card should be replaced. Power regulator voltage should also be checked. |
| | Processor Boot Version | This number indicates the software revision number of the ROM memory parts of the processor card. The ROM contains the information that the processor needs to run the power-up diagnostics and the routine needed to load the Boot Disk into the console in order to begin operating. |

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Console Power-Up Tests (continued)

| Item | Test | Definition |
|--------------------|-------------------------------|--|
| Console (cont.) | ROM Test | A test of the integrity of the boot ROMs on the processor card that instruct the processor on how to run the power up diagnostics. If a failure is indicated here and the acknowledge button will start up the console, the failure will not affect the operation of the console once it is running. The boot ROMs are only used during start up. The online test of the ROM (MCT Screen) may also indicate test failures. |
| | SR Test | SRAM test. If a fault is indicated here the card should be replaced. |
| | Watch Dog Timer | The watch dog circuit is allowed to time out and reset the microprocessor to verify its operation. The card will operate if the watch dog circuit is not functioning. However, the card should be replaced as soon as possible or, if a fault does appear, the card may not reset in the case of a bad instruction. |
| Keyboard | All Lamps on for Visual Check | All the LEDs on the Loop Callup Panel are turned on to verify that they are all working. |
| | Display Panel | The panel is asked for the firmware revision number. The response is checked for correct format and checksum. The firmware level is displayed on the screen. If there is no response, the panel is assumed not installed. |
| | Keyboard Interface | Same as Display panel. |
| | Option Panel | Same as Display panel. |
| | Trackball | Same as Display panel. |
| | TTY Keyboard | This indicates that the null character was not received from the keyboard microprocessor by the console processor. A fault here could indicate a bad TTY Keyboard, a disconnected keyboard cable or a bad cable connection on the console motherboard. NOTE: If the cable between the motherboard and the Loop Callup Panel is disconnected, the console will show a fault yet would also load the disk. The console screen then locks up showing the date, time, and an alarm at the bottom of the screen with no menu. |

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Console Power-Up Tests (continued)

| Item | Test | Definition |
|--------------|--------------------|--|
| PeerWay | Jabber Halt | A circuit on the card is intended to keep a faulty node from transmitting too long on the PeerWay. If this test indicates a fault, the card may operate, but should be replaced as soon as possible. |
| | Local Loop Back | This is a test of the console ability to hear its own echo through the PeerWay system. If a failure is indicated here, this indicates that the console is not working on one or both PeerWays. The Tap Box could be faulty, drop cables could be disconnected, or the PeerWay Interface card could be bad. |
| | RAM Test #1 | This is a data test of the RAM on the card. The card should be replaced if a fault is indicated. |
| | RAM Test #2 | This is an addressing test of the RAM. The card should be replaced if a fault is indicated. |
| | Register Check | This is a check of the several chips on the card. If this test indicates a fault, the card should be replaced. |
| Power Supply | +5 V and +12 V | A voltage sense circuit is read and if the +5 or +12 volt supply on the power supply card is not in tolerance, the voltage will be backlit. The power supply should be replaced. |
| | A: +30 and B: +30 | The voltage sense on the incoming DC bus is monitored and, if one of them is below approximately 18 volts, the indication will show a fault. However, many consoles use only one DC bus for power so the card fault will not indicate "FAILED". |
| Printer | NVRAM Test | A checksum is run on the data in NVRAM. If the checksum is incorrect, the test will indicate a fault. The system will run if this is showing a fault, but some of the console configuration could be corrupt. The online NVRAM checksum test should also be checked on the Menu Confidence Test screen. |
| | Periodic Interrupt | This is a test of the interrupt system generated off the clock. If this test indicates a fault, the card should be replaced. |

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Console Power-Up Tests (continued)

| Item | Test | Definition |
|---|-----------------|--|
| Printer (cont.) | Printer Ready | This indicates if the printer is present and on line. If the printer is not connected, it will not cause the diagnostic screen to lock up, but printer indication will be backlit, indicating no printer is connected. |
| | RTC | The operation of the Real Time Clock is tested. If a fault is indicated, the card should be replaced. |
| | RTC Battery | This indicates the state of the charge on the batteries used to back up the Real Time Clock. If a fault is indicated, the battery charge is low or the battery jumper switch is in the off position. The battery status is also monitored on the MCT screen. |
| SCSI Board (MTCC) Disk Drive (MC and BCC) | DMA Registers | The registers of several of the devices on the card are tested to verify operation of the board. If a fault is indicated here, the console may not boot up from disk. If it does, operation can be attempted, but the card should be replaced as soon as possible. |
| | RAM Test #1 | This is a data test of the RAM on the Disk Interface card. If a fault is indicated here, the card should be replaced. |
| | RAM Test #2 | This is an addressing test of the RAM on the Disk Interface card. If a fault is indicated here, the card should be replaced. |
| | SCSI Controller | This test checks the registers of the specialized SCSI interface bus devices for proper power up conditions. |
| | SCSI Master | This indicates which console is the SCSI master. |

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Console Power-Up Tests (continued)

| Item | Test | Definition |
|-----------------|------------|---|
| Video Generator | Color Test | Tests for shorts between the RGB lines. An error could be a board fault or a cable fault. |
| | DAC Test | Test of the Digital to analog Converter which measures voltages on the RGB output lines to the monitor. An error here can indicate that a video driver has failed so the card must be replaced. It could also indicate that the monitor is not properly terminated, the video cables are damaged, that the shields are shorted to ground, or the type of cable is wrong. |
| | PIT Test | Test of the Parallel Interface Timer which is used to control interrupts. If a fault is indicated the Video Generator card should be replaced. |
| | RAM Test | Addressing and data test is run on the RAM in the Video Generator. If a fault is indicated here the card should be replaced. |
| | Synch Test | Tests synch signal rates. If a fault is indicated the Video Generator card should be replaced. |
| | Tape Drive | <p>Test to check for the presence of the tape drive SCSI controller board and checks for tape ready signal. If no tape is installed the tape indication will be backlit blue. If a tape is present, it will rewind the tape.</p> <p>NOTE: If the cable between SCSI controller card located on the tape unit and the tape unit is disconnected, this test will not indicate a fault without a tape installed. This can be verified by installing a tape in the unit and the tape test should not be in the blue color.</p> |
| | Winchester | <p>Tests to check for disk ready signal, and verifies the integrity of several sections of the disk to make sure it works properly.</p> <p>NOTE: If the cable between the SCSI controller card located on the disk unit and the disk unit is not connected, both the disk and tape unit will indicate fault by being backlit in red.</p> |

Console Off-Line Diagnostics

Off-line diagnostics for the console are loaded from tape or floppy disk depending on the console in use. Tests are the same with the exception of the keyboard tests which are suited to the individual console.

□ **To run the off-line diagnostics:**

1. For a Command Console, insert the appropriate Off-Line Diagnostics tape in the console tape drive, turn the console power off for 30 seconds and then back on. Hold down the “Hardware Alarm” button during the power-up diagnostics until the console indicates it is “Booting From Streaming Tape”. This boots the console and brings up the Off-Line Diagnostic Menu.

For a MiniConsole or Basic Command Console, insert the appropriate Off-Line Diagnostics disk in either disk drive, turn off the console power for 30 seconds and then back on. This boots the console and brings up the Off-Line Diagnostic Menu.

2. Check the Power-Up Diagnostic screen for any faults.
3. Run desired tests.

Console Off Line Diagnostic Menu Definitions

| Item | Test | Definition |
|-------------------|---------------------------------|--|
| Revision No. | | This indicates the software revision of the Off-line Diagnostics test disk being used. |
| Processor Card | 1. Processor RAM Test | This is a thorough address and data test of all of the RAM on the card. The test takes approximately 4 minutes and runs indefinitely unless stopped by pressing the [CTL] and [C] buttons together (Control C function) or power to the MiniConsole is shut off. |
| | 2. Processor ROM Test | A checksum test is run on the boot ROMs on the Processor card. The test is run very rapidly and will run indefinitely unless halted by a Control C function. |
| | 3. Reset System - Power-up Test | This function will force the MiniConsole to go through the power-up test and reboot from disk. |
| | 4. Processor RAM Test | This is a thorough address and data test of all of the SRAM on the card. |
| Printer Interface | 5. NVRAM Test | This is a nondestructive test of the nonvolatile RAM on the Printer Interface card. The test must be allowed to run up to 8192 before the test is complete. Any write errors will be reported. |
| | 6. Clear NVRAM | This is a destructive test of the nonvolatile RAM on the Printer Interface card. It will write all zeros to the NVRAM. Any write errors will be reported. The NVRAM must be reloaded from the disk Console Configuration file. |

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Console Off Line Diagnostic Menu Definitions (continued)

| Item | Test | Definition |
|---------------------------|---------------------------------|---|
| Printer Interface (cont.) | 7. Printer Port Loopback Test | This initiates a test of the circuitry to drive the printer. Before starting the test the Printer Interface card must be removed and jumpers HD 7, HD 8, and HD 9 must be moved to the test position and jumpers HD 1 through 6 should be removed. NOTE: All tests except the Printer Barber Pole test can be run with the jumpers in this position. |
| | 8. Printer Barber Pole | This test outputs a barber pole printer pattern for testing the printer. The printer must be set up for 9600 baud. |
| Video Generator | 9. Color Palette RAM Test | This tests the color palette. |
| | 10. Video RAM Test | 16 pages can be written into the Video RAM. During the test, patterns are written to each page of the Video RAM. |
| | 11. Video Convergence Pattern | This generates a test pattern to enable checking the CRT for alignment and linearity. No test results are given. |
| | 12. Alarm Contacts Test | Tests the alarm contacts. |
| Keyboard Assemblies | 13. Command Entry Keyboard Test | This test allows for the testing the Main Operator Keyboard Keys. All keys are pictured on the screen and each key picture will light when the corresponding key is pushed. |
| | 14. TTY/ASCII Keyboard Test | This test allows for the testing part of the individual TTY keys. All keys are pictured on the screen and each key picture will light when the corresponding key is pushed. |

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Console Off Line Diagnostic Menu Definitions (continued)

| Item | Test | Definition |
|-----------------------------|--------------------------------------|---|
| Keyboard Assemblies (cont.) | 15. Old TTY Cursor/numeric Keys Test | This test is used to test the Cursor/Numeric keys of the old configuration keyboard. |
| | 16. New TTY Cursor/numeric Keys Test | This test is used to test the Cursor/Numeric keys of the new configuration keyboard. |
| | 17. MTO Cursor/Numeric Keys Test | This test is used to test the Cursor/Numeric keys of the enhanced keyboard. |
| | 18. Loop Callup Keyboard Test | This test allows for the testing the individual Loop Callup keys. All keys are pictured on the screen and each key picture will light when the corresponding key is pushed. |
| | 19. Trackball Keyboard Test | This tests the trackball. |
| | 20. Keyswitch Test | This test allows for the testing of the Key Switch. Each key can be inserted in the key switch and the key number seen by the system is reported on the screen. |
| | 21. Panel Light Test | This test lights all the panel LEDs in single sequence and then in rows. It is used to verify all LEDs are working and no shorts exist between lights. |
| Floppy Utilities | 22. Winchester Disk Exerciser | This test reads and writes to the hard disk to determine if there is a hardware problem or a media problem. This test will destroy all information on the disk. |
| | 23. Winchester Formatter | This test destroys all information on the disk and formats the disk. |

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Console Off Line Diagnostic Menu Definitions (continued)

| Item | Test | Definition |
|-----------------------------|---------------------------------|---|
| Floppy Utilities (cont.) | 24. Tape Tests | <p>This brings up a tape test menu which allows the user to choose between the following tests to be performed on the tape drive:</p> <ul style="list-style-type: none"> Retension Tape Erase Tape Tester/Exerciser Disk Copy Compare Tape Copy Unload Tape <p>These tests can be used to test the tape drive. CAUTION: "Erase Tape" and "Tester/Exerciser" will destroy all information on the tape.</p> |
| | 25. Floppy Disk Exerciser | <p>This test performs reads and writes to the floppy disk drive to determine if there are any drive problems. This test will destroy all information on the disk.</p> |
| | 26. Floppy Formatter | <p>This test destroys all information on the disk and formats the disk.</p> |
| PeerWay Interface Card | 27. PeerWay Interface Card test | <p>Runs these tests on the PeerWay Interface Card:</p> <ul style="list-style-type: none"> RAM Test #1 RAM Test #2 Jabber-Halt Local Loop Back |

Console Crash Dump Screen

This screen is intended to trap software errors and may appear because of faulty processor RAM or other hardware faults or software problems. If this screen appears, note which function was being performed when the screen appeared and make a screen print. If you are unable to get a printout of the screen, copy down all the items highlighted in the figure.

- Screen Title
- Time
- System Error Trap Number.....SR Number.....PC Number.....
- All of the lines of the System Stack
- All of the lines of the User Stack

It is also important to note which software revision levels are being run at the time of the crash.

If the console locks up repeatedly, perform the Off Line Diagnostics on the processor card ROM, disk or SCSI RAM, and Video Generator RAM.

Memory Dump

The memory dump helps service personnel diagnose software problems. A node's RAM memory can be captured and viewed or saved to a file. The contents of RAM memory can often be used to help solve difficult software problems. Disk event messages are generated as the result of memory dump activities.

- The memory dump can only be performed on consoles, CPs, and SRUs.
- The node must be active. If the PeerWay Node screen is functioning, the node is active.
- A memory dump can only be performed on 68020 consoles running Version 15 or higher.

To make a memory dump of a node:

1. Cursor to the command line. Type:

MD (*node #*) , (*filename*) [ENTER]

2. The memory of the specified node is put into the specified file in the Log Files folder. The file is of the type Memory Dump.

The memory dump is performed in the background and may take a few minutes to complete. You can perform other tasks while the dump is occurring.

To stop a memory dump before it is finished:

1. Cursor to the command line. Type:

KMD [ENTER]

Memory View Screen

The Memory View screen has been added to allow you to view the contents of a memory dump file or the current contents of memory. The screen is only available with 68020 pixel consoles.

- ☐ **To read current memory data from a node:**
 1. Call up the Memory View screen.
MV [ENTER]
 2. If you want to look at a node other than the one you are at, change the “Node” field entry.
- ☐ **To read memory data from a file:**
 1. Call up the Memory View screen.
MV [ENTER]
 2. Cursor to the “Memory” field and press [ENTER]. The field changes to “File”.
 3. Enter the “Volume”, “File Type”, and “Filename” of the file that contains the memory data.
 4. Cursor to the “Read” field and press [ENTER].
 5. To access other screens to see more memory data:
[PAGE AHEAD] and [PAGE BACK]

Memory View Screen Field Description

| Field | Description |
|-------------|---|
| Addr | Specifies the starting address of the memory data displayed on the screen. |
| Decimal/Hex | Specifies that addresses are shown in decimal or hexadecimal. To change this field, press [ENTER]. |
| File/Memory | Specifies that the memory data is being read from a file or directly from the node. You can change this field by pressing [ENTER]. |
| File Type | Specifies the type of folder that contains the file you want to view. For memory dumps, the type should be “Log File”. |

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Memory View Screen Field Description (continued)

| Field | Description |
|--------------|---|
| Filename | Specifies the name of the file that contains the memory data. |
| Hex/Decimal | See the "Decimal/Hex" field. |
| Memory/File | See the "File/Memory" field. |
| Node | Specifies the node number of the source of the memory data. |
| Read | Reads the current memory data onto the screen, or reads data from a file. Press [ENTER] to read new data. The Memory View screen takes a snapshot of memory. This field allows you to refresh the screen with the current contents of memory. |
| View | Specifies how the data is interpreted and displayed. Byte =2 hex character groups Char =2 hex character groups Float =Floating point numbers Link =Link addresses Long =8 hex character groups Short =4 hex character groups Time =System time |
| Volume | Specifies the name of the volume that contains the memory data file. |

Node Dump Screen

The Node Dump screen shows details after a crash of a console or ControlFile. Enter **ND** nn where nn is the node number.

Menu Confidence Screen

The Menu Confidence screen allows you to view the status of console power, the status and results of ongoing RAM and ROM tests, and the battery jumper position. Enter **MCT** to call up the screen. You may boot the console by cursoring to “Power Up Test” and pressing [SELECT]. You can also configure the console to play a tune on boot up by changing the “Startup Tune” parameter.

Keyboard Problems

A locked keyboard may be reset by holding down [CTRL], [ALT], and [INSERT] simultaneously.

The console will report bad keys (shorted or excessive length keystroke) by the message “Keyboard Error X:XX” where the first X represents the keyboard number and the XX represents the key.

The numbers for the keyboards keys depend on the type of console.

CRT Problems

If there are problems with the CRT, a quick way to test whether it is the monitor or the video source is to connect another monitor to the video cables. Another trick is to connect the video cables to another OI Card Cage.

Troubleshooting OI Card Cage Problems

NOTE: All procedures assume that you have found all red fault LEDs and that they have been corrected before proceeding to the troubleshooting process.

The procedure is to reduce the Operator Interface (OI) to a configuration which you know works. From that point you can selectively add removed components until the faulty component is isolated.

CAUTION

Remove power from the card cage each time a card is removed or inserted. Do not touch the gold edge connectors on any board.

If at any point the installation of a circuit card stops the progress of booting, that card should be replaced. If this process does not find faulty components, contact FRSI for further assistance.

To diagnose a OI Card Cage problem:

1. Remove all OI card cage circuit boards except the Power Regulator. Put them on a grounded static mat.

CAUTION

Use a grounded wrist strap with a built-in one megohm resistor for your safety and the protection of static sensitive circuits. The resistor allows static electricity to drain to ground and still isolates you from direct ground.

2. If the Power Regulator green LED comes on when power is applied, the Power Regulator is operational.
3. Install the the OI Processor. When power is applied the red LED will be on until the processor completes running the self-diagnostics. When the green LED comes on, the Processor has passed all the power up diagnostics and should be considered operational.
4. Install the Video Generator. Either the green or the red LED will be on until the processor starts to run the diagnostics on this board. While diagnostics are being run, the red LED will be on. When the diagnostics are completed successfully, the green LED is turned on by the processor. As soon as the Video Generator is installed, you should be able to see the progress of the diagnostic tests on the screen.

5. Monitor the Console Power-Up screen for error indications.
6. Install the PeerWay Interface. Either the green or the red LED will be on until the processor starts to run the diagnostics on this board. While diagnostics are being run, the red LED will be on. When the diagnostics are completed successfully, the green LED is turned on by the processor.
7. Install the Printer Interface. Either the green or the red LED will be on until the processor starts to run the diagnostics on this board. While diagnostics are being run, the red LED will be on. When the diagnostics are completed successfully, the green LED is turned on by the processor.
8. Install the SCSI Host Adapter. Either the green or the red LED will be on until the processor starts to run the diagnostics on this board. While diagnostics are being run, the red LED will be on. When the diagnostics are completed successfully, the green LED is turned on by the processor.

CAUTION

Before you put the console back into service, be sure to switch all of the OI card cages off. Switch them back on together to ensure that the proper cage becomes the SCSI Master.

Troubleshooting ControlFiles

All procedures assume that you have found all red fault LEDs and that they have been corrected before proceeding to the troubleshooting process.

The general procedure is to reduce the ControlFile to a configuration which you know works. From that point you can selectively add removed components until the faulty component is isolated.

CAUTION

Use a grounded wrist strap with a built-in one megohm resistor for your safety and the protection of static sensitive circuits. The resistor allows static electricity to drain to ground and still isolates you from direct ground.

Do not touch the gold edge connectors on any board.

Remove all ControlFile circuit boards except the Power Regulator, one Coordinator Processor, and the Nonvolatile Memory. If the green LED on the Power Regulator and the Coordinator Processor comes on when enabled, they should be considered operational. If the Coordinator Processor does not successfully boot, replace the Nonvolatile Memory, Coordinator Processor or the Power Regulator. The goal at this point is to have the ControlFile Coordinator Processor operating.

Next install the the PeerWay Buffers. At this point you should be able to see the ControlFile Status on the console.

Continue installing the other Power Regulator, Coordinator Processor, and the Controller Processors one at a time until the faulty component is found. If, at any point, the installation of a circuit card stops the progress of Booting, that card should be replaced.

CAUTION

When performing this procedure care must be taken to disable the Nonvolatile Memory and then the Coordinator Processors each time a card is removed or inserted (with the exception of the PeerWay Buffer cards).

Turn off the Nonvolatile Memory card before removing AC and DC power.

NOTE: Any slot which previously contained a PLC, RBLC, or MUX Controller must have either a WIPE BUBBLE or KILL CONTROLLER performed on it prior to loading an image or configuration. Failure to do so could cause some strange errors or problems with the controller.

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If a nonredundant Coordinator Processor card is disabled on a running process, all operator process changes, links between controllers in that cage, and links to and from that ControlFile will freeze at the last value received. The controller will continue to operate the process under these conditions. As soon as the Coordinator Processor is restarted, all links will be updated.

If a Controller Processor card is disabled on a running process, the analog output Field interface card and the discrete output module will either hold their last value or go to zero, depending on the position of the jumper on the Field interface card. If it is necessary to close (go to zero) the output of the field device that uses the "HOLD" mode after the controller is disabled, the Field Interface card must be removed.

If both PeerWay Buffer cards are removed from the ControlFile on a running process, all operator changes and links to and from this ControlFile will freeze at the last value received. The links within the ControlFile will continue to update. The Controller Processors will continue to operate under these conditions.

ControlFile Troubleshooting

| Condition | Action |
|--|---|
| <p>Controller Processor card will not pass Power Up Diagnostics. Green LED does not come on.</p> | <ol style="list-style-type: none"> 1. Replace the Controller Processor card. |
| <p>Controller Processor card will not start. The green LED comes on briefly with all yellow LEDs on.</p> | <ol style="list-style-type: none"> 1. The yellow LEDs on the Coordinator Processor and Nonvolatile Memory cards must be flickering, indicating that the cards are operating properly. NOTE: if no Controller Processor card is running inside this ControlFile, the Nonvolatile Memory card will have only a green LED on. If the Coordinator Processor and Nonvolatile Memory card LEDs are not as indicated, see section on "Coordinator Processor will not load from Nonvolatile Memory". 2. Perform a Wipe Bubble command on the suspect Controller Processor card. Re-enable the Controller Processor card after the Wipe Bubble procedure is performed. If the Controller Processor now starts, the plant Configuration must be reloaded from disk for that controller. Refer to the Wipe Bubble Procedure in this section. 3. Using a disk with the same software level as in the ControlFile, perform a Disk Load Program command on that ControlFile. It is normal to have an active hardware alarm "Program Image Bad" for this node during the Disk Load Program function. The alarm must clear after the Disk Load Program is complete. If the Disk Load Program is successful, try to restart the Controller Processor card. 4. If the Controller Processor card has been jumpered for additional images, check the jumper positions on the card. See Chapter 4 of this manual for jumper positions and locations. 5. Replace the Nonvolatile Memory card if the Disk Load Program is not successful. (Then attempt the Nonvolatile Memory Recovery Procedure.) 6. Replace the Controller Processor card. 7. Replace the Coordinator Processor card. |

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ControlFile Troubleshooting (continued)

| Condition | Action |
|---|--|
| <p>Controller Processor card will not start with the Coordinator Processor card in one of the two Coordinator Processor card slots.</p> <p>If the Coordinator Processor card is installed in the other slot, the controller will run.</p> | <ol style="list-style-type: none"> 1. Replace the Controller Processor card. 2. Replace the Coordinator Processor card. 3. Check the terminators on the back of the ControlFile motherboard 4. Replace the terminators. |
| <p>Controller Processor card will run alone, but will not run as a redundant pair.</p> <p>(Either controller alone will start and run.)</p> | <ol style="list-style-type: none"> 1. Check the Controller Processor cables on the back of the motherboard and verify that both the upper and lower cable connections for the two redundant Controller Processor slots are in place. 2. Ensure that both Controller Processors are seated properly inside the ControlFile. 3. Replace one Controller Processor at a time with a known good Controller Processor in redundant configuration. |
| <p>Coordinator Processor will not pass Power Up Diagnostics. The green LED does not come on and the top yellow LED is off.</p> | <ol style="list-style-type: none"> 1. Replace the Coordinator Processor card. |

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ControlFile Troubleshooting (continued)

| Condition | Action |
|---|--|
| <p>Coordinator Processor will not load from the Nonvolatile Memory card.</p> <p>The green LED comes on briefly, then the red FAULT LED comes on.</p> <p>The top yellow LED is on.</p> | <ol style="list-style-type: none"> 1. Insure that the Nonvolatile Memory card switch is in the ENABLE position. 2. Insure that the Nonvolatile Memory card is in the proper slot within the ControlFile. (See diagram on ControlFile door.) <p>NOTE: If the primary Coordinator Processor is running and the secondary is not, the primary should NOT be disabled at this time. An attempt should be made to load the Plant Program into the nonvolatile memory (Disk Load Program function). If the function fails the Nonvolatile Memory card must be replaced.</p> 3. Move the Coordinator Processor card to its redundant slot. If the Coordinator Processor works in the redundant slot, see the Troubleshooting section on "Coordinator Processor will not start in one of the two slots". 4. Replace the Nonvolatile Memory card. <p>NOTE: The Nonvolatile Memory Recovery Procedure may help recover the card if it is bad. The PeerWay Boot Procedure is also available.</p> 5. Replace the Coordinator Processor card. 6. Insure ControlFile upper and lower terminators are installed correctly. <p>NOTE: If no Controller Processors were running, the plant configuration must be reloaded from disk.</p> |

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ControlFile Troubleshooting (continued)

| Condition | Action |
|--|--|
| <p>Coordinator Processor starts but stops after a short period of time.</p> <p>ControlFile appears on the ControlFile Status screen and then disappears.</p> | <ol style="list-style-type: none"> 1. Pull out the two PeerWay Buffer cards in the ControlFile. 2. Reseat the Coordinator Processor and Nonvolatile Memory cards and try to restart the Coordinator Processor. 3. If the Coordinator Processor now starts and runs, check the Control Block Directory screens (a configuration key must be used when viewing the screens) of all other ControlFiles on the PeerWay for corrupted data. Look for scrambled loop tags and abnormal block status and dynamic memory sizes. 4. If a suspect controller is located, the Kill Controller function must be performed on all Controller Processors in that cage. After the Kill Controller has been performed, the plant configuration must be reloaded from the disk to the ControlFile. 5. With the PeerWay Buffers cards still removed, disable and remove all Controller Processor cards within the faulty cage. 6. Reseat the Coordinator Processor and Nonvolatile Memory cards and try to start just these two cards. If the Coordinator Processor will not stay running, replace it. 7. If the Coordinator Processor now starts and runs, begin installing the Controller Processor cards one at a time. As each card is installed, restart the Coordinator Processor and Controller Processor cards (this is done to determine if one of the Controller Processors is preventing the Coordinator Processor from running). 8. If a Controller Processor is found that prevents the Coordinator Processor from running, reseat and start the Coordinator Processor and Nonvolatile Memory cards with all Controller Processors set to DISABLE. After the Coordinator Processor is running, reinstall the PeerWay Buffer cards and perform the Wipe Bubble command for all Controller Processors in the ControlFile. 9. Turn all Controller Processors to ENABLE and allow them to restart. If one of the Controller Processors will not start, or if it will not allow the Coordinator Processor to start, replace that Controller Processor card. 10. After the ControlFile is running with all of its Controller Processors, load the Plant Configuration from disk for that ControlFile. |

(continued on next page)

ControlFile Troubleshooting (continued)

| Condition | Action |
|---|--|
| <p>Coordinator Processor card will not start in one of the two Coordinator Processor slots, but will start and run in the other slot.</p> | <ol style="list-style-type: none"> 1. Remove all cards in the ControlFile except for one Power Regulator card, one Nonvolatile Memory card, and one Coordinator Processor card in the faulty slot. Re-enable the Coordinator Processor and Nonvolatile Memory cards. If the Coordinator Processor now runs, proceed to step 5. 2. If the Coordinator Processor does not start, replace the Nonvolatile Memory card. 3. If the Coordinator Processor still does not start, replace the Power Regulator card. 4. If the Coordinator Processor still will not run in this slot, check the ControlFile terminators on the back of the ControlFile card cage. 5. Once the Coordinator Processor is running in this minimum configuration, install the remaining cards one at a time until the card is found that prevents the Coordinator Processor from running. Replace the faulty card. |
| <p>Coordinator Processors will run separately, but not as a redundant pair.</p> | <ol style="list-style-type: none"> 1. Replace the Nonvolatile Memory card. 2. Replace the Coordinator Processor cards one at a time. 3. Check the ControlFile terminators on the back of the ControlFile card cage. |

ControlFile Status Screen

The ControlFile Status screen is where you can find out what program type (such as \$\$CP, \$\$CPMax, or \$\$CPBat), and version level is loaded in the CP boards. The Coordinator Processor and Controller Processor must be booted to determine what \$\$CP program and version is loaded in the NV Memory .

You can find the Image type and the version level for each controller card on this screen by reading the “Card Type” Field, and the “Prgm Rev” fields for each Controller card. Also, you can tell what additional images are loaded in the NV Memory by the “Additional Images” fields, but you cannot tell what level of each Image is loaded in the NV Memory.

The Jumper Code field indicates MPC II or MPC5 functionality and image selection as determined by jumpers on the MPC II card. Displayed as X_Y_Z where:

X = MPC II HD2 setting: 0 for MPC I functionality
1 for MPC II functionality

Y = combination of HD6, HD7, and HD8 as an octal number

Z = combination of HD4, HD5, and HD9 as an octal number

See Section 4-2 for jumper details and CB: 3-4 for a complete description of this screen.

Wipe Bubble Procedure

The following procedure describes how to perform a Wipe Bubble procedure on the ControlFile Nonvolatile Memory. Wiping rewrites the header and purges the plant configuration information for the specified Controller Processor card. The command works on Bubble NV Memory and RAM NV Memory.

CAUTION

When a Wipe Bubble or a Kill Controller procedure is performed on an MPC1 controller, all *ENTRY and *VALUE items will be lost. Write down the values BEFORE wiping the configuration.

When a Wipe Bubble or a Kill Controller procedure is performed on a MUX configuration the calibration constant of the FEMs will be lost. The calibration constants should be written on the FEM.

To wipe the NV memory:

1. Toggle the desired Controller Processor card enable/disable switch to DISABLE.
2. Move the cursor to the command line and press:
WB = [Controller Processor address]
An alarm is generated:
BUBBLE WIPED FOR CONTROLLER=xx
The NV memory is now wiped.
3. Toggle the Controller Processor card enable/disable switch to ENABLE.

Troubleshooting I/O

This section covers I/O troubleshooting:

- General I/O problems
- Analog Card Cages
- FlexTerms
- Field Interface cards.
- RBL controller and cards.

These procedures assume that you have found all red fault LEDs and that they have been corrected before you proceed to the troubleshooting process.

CAUTION

Use a grounded wrist strap with a built-in one megohm resistor for your safety and the protection of static-sensitive circuits. All cards should be placed on a grounded static mat or be placed in a static protection envelope.

Potential problem areas include:

- Bad fuses (in and out – no indicators)
- Bad card
- Bad Controller card
- Bad cable
- Bad software
- Bad firmware
- Bad I/O Block or ControlBlock configuration
- Bad field device

CAUTION

Remove power from the Multiplexer FlexTerm before installing or removing any cards.

Restoring Redundant FICs

When a primary FIC with redundancy fails, the redundant FIC takes over. The failed FIC lights its red LED or flashes its green LED. Replace the failed FIC and determine that the new FIC has its green LED lighted and that the Field I/O Status screen (previously the FIC Status screen) shows no error for the FIC. The “Health” field of the primary FIC will still show “Bad”.

The original configuration must be restored to have redundancy effective again.

WARNING

Do not pull the redundant FIC to force a switch back to the primary FIC. This introduces a “double hardware failure” and may result in unexpected operation.

To restore FIC redundancy:

1. Call up the RIOB screen.
2. Put the RIOB in MANUAL.
3. Highlight the line:
Reset Backup of Line n (Press Enter)
and press [ENTER].

This restores the primary FIC and resets the backup FIC for backup action. The Health field of the primary FIC will now show “Good”.

4. Put the RIOB in AUTO.
Normal redundancy operation is restored.

Serial (MPC) I/O Troubleshooting

| Condition | Action |
|--|--|
| <p>Analog Input No Reading</p> <p>Inst. Low Alarm</p> <p>AIB Field Reading - 25%</p> | <ol style="list-style-type: none"> 1. Use a VOM to check that the input current is in the range 4-20 mA. If a transfer card is installed, measure between test points on the card. Otherwise, measure at the marshaling panel by breaking the loop. <p>If the current is OK:</p> <ul style="list-style-type: none"> Check the FlexTerm to ControlFile cables. Replace the FIC. Replace the Controller Processor Card. <p>If the current is not OK:</p> <ul style="list-style-type: none"> Check all fuses on the FIC. 2. Using the RMT 262 Field calibrator (or similar device), input an appropriate current signal into the marshaling panel. <p>If the value is wrong on the AIB screen, replace the FIC.</p> <p>If the value is correct on the AIB screen, check the field wiring and the transmitter. Be sure to check the system/self-powered jumper on the FIC.</p> |
| <p>Analog Input shows incorrect or unstable reading.</p> | <ol style="list-style-type: none"> 1. Using the RMT 262 Field Calibrator (or similar device), input an appropriate current signal into the marshaling panel. Check the Field Reading on the AIB screen. <p>If the reading is incorrect:</p> <ul style="list-style-type: none"> Calibrate the point. Replace the FIC. Replace the Controller Processor Card. <p>If the reading is correct:</p> <ul style="list-style-type: none"> Measure the transmitter current with the RMT 262 (or similar device). Check the field wiring for shorts and resistance to ground. |

(continued on next page)

Serial (MPC) I/O Troubleshooting (continued)

| Condition | Action |
|---|---|
| Analog output Feedback check alarm | <ol style="list-style-type: none">1. Remove the field wiring from the marshaling panel for this FIC. Connect a Rosemount 262 Field Calibrator (or similar device) to the terminals. Put the AOB in MANUAL and enter an output value of 50.00%. Check the Actual Value reading on the AOB (it should be 50%) and verify that the Rosemount 262 meter reading is also 50% (12 mA).2. If the Actual Value Reading and the meter reading are not 50%:<ul style="list-style-type: none">Check all fuses on the output FIC.Calibrate the point.Replace the FIC.Replace the controller.3. If the Actual Value and meter readings are 50% and the alarm clears off the Active Hardware Alarm List, the problem is an open circuit in the field wiring or the field device. |

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Serial (MPC) I/O Troubleshooting (continued)

| Condition | Action |
|--|--|
| <p>Discrete input module does not work. Input FIC point LED not on. FIC communications are OK.</p> | <ol style="list-style-type: none"> 1. Check the mode of the CIB; it must be in AUTO or MANUAL. If the Status Field is blank, this indicates an override condition, which is illegal for a CIB. <ul style="list-style-type: none"> Check if the discrete manual bypass is turned on for this point. Replace the FIC. Replace the FlexTerm motherboard. 2. Measure the voltage across the input terminations for the faulty point. <p>NOTE: If the CIB is configured for Normally Closed (N.C.) operation, the Field State on the CIB screen will show ON when the module has no voltage across it and OFF when the module has voltage across it.</p> 3. If no voltage is present across the point: <ul style="list-style-type: none"> Check the polarity for the DC module. Replace the module. Replace the FIC. 4. If all of the points on this FIC and the card next to it are not working, the FIC may not be seated properly in its connectors. <p>It is possible one of the two connector tabs are not seated correctly in the FlexTerm motherboard connectors.</p> <p>WARNING</p> <p>Before proceeding, remove all field voltage from the FIC to prevent shock or equipment damage.</p> <p>Loosen the two captive screws holding the FIC in place. Gently move the card away from the FlexTerm mounting plate and verify that both card connector tabs are properly plugged into the motherboard connectors.</p> |

Multiplex I/O Troubleshooting

| Condition | Action |
|---|---|
| Multiplex input point(s) bad. | <ol style="list-style-type: none">1. Put an appropriate substitute signal into the point. Verify the accuracy to determine if the problem is system or field related. CAUTION Always remove field DC power before working on a 4-20 mA input Front End Module (FEM). NOTE: FEMs should not be removed or inserted with power on. If the problem is in the system:<ol style="list-style-type: none">a. For thermocouples, check the configuration of the MIB. Verify that the "SIG CHAR" field is not configured for millivolts (example: J NBS is correct; do not use NBS mV).b. For 4-20 mA inputs with the 10 ohm dropping resistors mounted on the marshaling panel, remove the field wiring and measure the resistance of the resistor.c. Replace the FEM.2. Remove the input signal from the FEM. Configure the MIB for "Raw Counts". The MIB input reading should be about 20000. If it is much lower, replace the FEM. |
| MIB I/O Block configuration shows FEM type "None Type C". | The FEM may have been inserted with MUX power ON. Turn MUX power OFF and then ON to force the MUX CPU to reinitialize. |

RTD and Thermocouple I/O Troubleshooting

| Condition | Action |
|--|---|
| <p>RTD and thermocouple field problems.</p> | <p>For RTD and thermocouple field problems, the following items should be checked carefully:</p> <ul style="list-style-type: none"> Loose or corroded connections or FEM not securely mounted in MUX. This can cause all input points to read as negative numbers. For FEM mounting instructions see SV: 5-3. Reverse polarity Wires shorted to case at temperature sensor Wrong type of thermocouple wire Noise caused by close proximity to AC wires High common node voltage. Measure from all device leads to chassis with a digital voltmeter using both AC and DC meter scales. |
| <p>Universal Voltage FEM shows positive overload on open circuit.</p> | <p>This appears when Universal Voltage FEM is connected through a remote communication link and configured as a thermocouple input. The system cannot differentiate between a thermocouple with a high temperature reading and one with a broken or open loop.</p> <p>Check that the MUX CPU PROM is Doric (Beckman) part number 278-7000-03B.</p> |
| <p>Communication failure to MUX CPU and the Coordinator Processor.</p> | <p>Ensure that TransZorbs CR17 through CR20 are bipolar (PGKE47CA). The correct units have no polarity marking.</p> |
| <p>Low thermocouple reading (or reading at low value) for thermocouples attached to Universal FEM.</p> | <p>This appears when MIB is configured for TC or mv input.</p> <p>Replace the FEM.</p> |
| <p>Incorrect RTD readings with two or three-wire RTDs.</p> | <ol style="list-style-type: none"> 1. Check for correct wiring at FEM. See SV:5. 2. Check for correct wiring at RTD Marshaling Panel and at FEM. See SV: 5. |

(continued on next page)

RTD and Thermocouple I/O Troubleshooting (continued)

| Condition | Action |
|--|---|
| TC/RTD FIC shows poor accuracy. | If the sensor of an 1984-2731-000x TC/RTD FIC is disconnected and reconnected, the reading will be inaccurate for approximately ten minutes. The reading will be within 1% in one minute and will gradually gain accuracy. This is a characteristic of the circuit. |
| Discrete output module does not work. FIC communications are OK. | <ol style="list-style-type: none">1. Put the COB into MANUAL Status and command the output to ON. Verify that the output LED for the FIC is on. The proper load must be connected.2. If the LED is on:<ul style="list-style-type: none">Check the module fuseCheck the field voltageReplace the moduleIf the LED is not on:<ul style="list-style-type: none">Replace the moduleReplace the FIC<p>NOTE: Output Modules ODC5A5 and OAC5A5 are Normally Closed Modules.</p>3. If all of the points on this FIC and the FIC next to it are not working, the FIC may not be seated properly in its connectors. It is possible one of the two connector tabs are not seated correctly in the FlexTerm motherboard connectors. <p>WARNING</p> <p>Before proceeding, remove all field voltage from the FlexTerm Termination card to prevent shock or equipment damage.</p> <p>Loosen the two captive screws holding the FIC in place. Gently move the card away from the FlexTerm mounting plate and verify that both card connector tabs are plugged into the motherboard connectors properly.</p> |

Field I/O Status Screen (FIC Status Screen)

The Field I/O Status Screen (previously the FIC Status screen) displays information about the Field Interface Cards (FICs) and Field interface Modules (FIMs) that communicate with a Controller Processor. This screen is for display purposes only. No screen entries are allowed. To call up the Field I/O Status screen, type the command **FS** [=address] [ENTER] where "address" is the hardware address such as =87F.

NOTE: MultiLoop FlexTerms, some Contact FlexTerms, and Multiplexor FlexTerms cannot be displayed on this screen.

Field I/O Status Screen Fields

| Field | Description of Displayed Information |
|--------------------|--|
| Cont | Address of the Controller Processor in the ControlFile. |
| 1 2 3 4 5 6 7 8 | Communication line from the controller. |
| A, B, C, D | Card cage address letter. |
| Type | <p>Configured type of FIC. When the type is changed, this is displayed in the corresponding alarm color.</p> <p>AO Early analog output card</p> <p>AIO Analog I/O (2 in 1 out or 3 in FIC with all programs in ROM)</p> <p>AIO_R Redundant Analog I/O (2 in 1 out or 3 in FIC with redundancy and down-loadable code in battery backed RAM)</p> <p>AIO_RS Redundant Analog I/O with Smart daughterboard (2 in 1 out or 3 in FIC with redundancy, downloadable code in battery backed RAM, and a Smart daughterboard for HART communication)</p> <p>CIO Contact I/O (six points per card)</p> <p>DIO Discrete I/O (32 point discrete input/output FIM)</p> <p>MAI Multipoint Analog Input (16 point Input FIM)</p> <p>MAI32-x Multipoint Analog 32 Point Input (32 point input FIM). "x" shows cage address of the "other" 16 points.</p> <p>MAO Multipoint Analog Output (16 point output FIM)</p> <p>PIOB Pulse input/output FIC</p> <p>SI HART input card</p> <p>TIB Temperature input FIC</p> |

(continued on next page)

Field I/O Status Screen Fields (continued)

| Field | Description of Displayed Information |
|--------------|--|
| F-Rev | Revision level and firmware of the FIC. |
| S-Rev | Revision level of the FIC software. |
| Status | Displays the status of the FIC. Refer to the next table for a list and description of the status bits that may appear. |

FIC/FIM Status Bits

| Status for: | Status Bits | Bit | Description |
|------------------|-------------|-----|---|
| Any | NON-BOOT | | Indicates that the FIC/FIM program needs to be loaded. |
| Analog FIC Bits: | 1xxx xxxx | 7 | Lost calibration: Set to 1 if any A/D or D/A calibration constants become questionable. |
| | x1xx xxxx | 6 | A/D converter failure. Set to 1 if any A/D converter does not complete a conversion within 45 milliseconds. |
| | xx1x xxxx | 5 | Smart Transmitter message available. Set to 1 when a message is available. |
| | xxx1 xxxx | 4 | Redundancy Jumper. Set to 1 for 1:1 redundancy. Set to 0 for other redundancy (including none). |
| | xxxx 1xxx | 3 | Output Bypass Unit status. Set to 1 when the Output Bypass Unit is active. |
| | xxxx x1xx | 2 | Hold/Zero jumper setting. Set to 1 to hold output value if a problem occurs. |
| | xxxx xx1x | 1 | Normal/Inverse acting valve jumper setting. Set to 1 for inverse acting valves. |
| | xxxx xxx1 | 0 | Background diagnostics failure. Set to 1 if any background diagnostic test (except calibration constants) fails. |
| Analog FIM Bits: | 1xxx xxxx | 7 | Indicates the health of the other FIM. Set to 1 if the other FIM is "sick" or missing. |
| | x1xx xxxx | 6 | Set to 1 if this FIM is disconnected from the field. |
| | xx1x xxxx | 5 | Indicates the health of this FIM. Set to 1 if this FIM is "sick". |
| | xxx1 xxxx | 4 | Input Data Validity; Set to 0 if the data is good. Set to 1 if the data is invalid. Output Data Validity: This bit is not used for outputs. |

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FIC/FIM Status Bits (continued)

| Status for: | Status Bits | Bit | Description |
|---|-------------|-----|--|
| Analog FIM Bits: (continued) | xxxx 1xxx | 3 | Not currently used. Always set to 0. (Early versions reported DC power status with this bit.) |
| | xxxx x1xx | 2 | Loop Power Module status bits: 0 for Loop Power Module A. 1 for Loop Power Module B. |
| | xxxx xx1x | 1 | Set to 0 when the Loop Power Module is good. Set to 1 when there is a problem with the Loop Power Module. |
| | xxxx xxx1 | 0 | Set to 0 when the Loop Power Module is present. Set to 1 when the Loop Power Module is absent. |
| Contact Bits: | 1xxx xxxx | 7 | Setting of the Hold jumper: 1 = Hold, 0 = Off |
| | x1xx xxxx | 6 | Diagnostics: 1 = Fault, 0 = OK |
| | xx1x xxxx | 5 | Point 6 when the OBU is connected: 1 = Normal, 0 = Override |
| | xxx1 xxxx | 4 | Point 5 when the OBU is connected |
| | xxxx 1xxx | 3 | Point 4 when the OBU is connected |
| | xxxx x1xx | 2 | Point 3 when the OBU is connected |
| | xxxx xx1x | 1 | Point 2 when the OBU is connected |
| | xxxx xxx1 | 0 | Point 1 when the OBU is connected |
| Pulse Bits: | 1xxx xxxx | 7 | RAM test result: Set to 1 if the RAM background test fails. |
| | x1xx xxxx | 6 | ROM test result: Set to 1 if the ROM checksum fails. |
| | xx1x xxxx | 5 | CPU test result: Set to 1 if the CPU test fails. |

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FIC/FIM Status Bits (continued)

| Status for: | Status Bits | Bit | Description |
|------------------------------------|-------------|-----|---|
| Pulse Bits: (continued) | xxx1 xxxx | 4 | Redundancy status: Set to 1 for 1:1 redundancy; set to 0 for any other redundancy (including none). |
| | xxxx 1xxx | 3 | Not used. |
| | xxxx x1xx | 2 | D/A failure: Set to 1 when the D/A has failed three times in a row. |
| | xxxx xx1x | 1 | Open loop: Set to 1 if analog output is open circuit. |
| | xxxx xxx1 | 0 | General diagnostic status: Set to 1 if any diagnostic test fails. |
| Temp Bits: | 1xxx xxxx | 7 | Lost calibration: Set to 1 if any A/D calibration constant becomes questionable. |
| | x1xx xxxx | 6 | A/D Converter failure. |
| | xx1x xxxx | 5 | Not used. |
| | xxx1 xxxx | 4 | Redundancy Jumper setting. |
| | xxxx 1xxx | 3 | Not used. |
| | xxxx x1xx | 2 | Not used. |
| | xxxx xx1x | 1 | Not used. |
| | xxxx xxx1 | 0 | General diagnostic status: Set to 1 if any background diagnostic test fails. |

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FIC/FIM Status Bits (continued)

| Status for: | Status Bits | Bit | Description |
|-------------------------------|-------------|-----|---|
| Discrete I/O FIM Bits: | 1xxx xxxx | 7 | Health of the other FIM: Set to 1 when the other FIM is bad or is not present. |
| | x1xx xxxx | 6 | Disconnect bit: Set to 1 when the other FIM has been disconnected by this FIM. |
| | xx1x xxxx | 5 | Configuration bit: Set to 1 when there is a problem with the configuration of this FIM. |
| | xxx1 xxxx | 4 | A/D #4: Set to 1 when there is a problem with A/D group 4 (points 25-32). |
| | xxxx 1xxx | 3 | A/D #3: Set to 1 when there is a problem with A/D group 4 (points 17-24). |
| | xxxx x1xx | 2 | A/D #2: Set to 1 when there is a problem with A/D group 4 (points 9-16). |
| | xxxx xx1x | 1 | A/D #1: Set to 1 when there is a problem with A/D group 4 (points 1-8). |
| | xxxx xxx1 | 0 | Overall test: Set to 1 if any test fails. |

Field I/O Detail Screen

The Field I/O Detail screen (previously the FIC Detail screen) displays information about the blocks that are associated with an individual FIC or FIM. This screen is for display purposes only. To call up the Field I/O Detail screen, cursor to the desired FIC or FIM and press [SELECT] from the Field I/O Status screen (previously the FIC Status screen). To view the Field I/O Detail screen for a FIC or FIM, cursor to the desired card and press [SELECT]. If any I/O Block is in alarm the associated FIC or FIM will be in a corresponding color. There are five groups of status bits. The first is the same as for the Field I/O Status screen. The next four are for points 1-4, 5-8, 9-12, and 13-16.

Field I/O Detail Screen Fields

| Field | Description of Displayed Information |
|-------------|--|
| Controller | Address of the Controller Processor associated with the particular FICs. None is displayed if no Controller Processor has been assigned. |
| Type | Configured type of FIC: analog I/O (AIO), contact I/O (CIO), redundant analog I/O (AIO-R), redundant AIO with Smart daughter board (AIO-RS), discrete I/O (DIO). |
| FIC | Slot number of the FIC within the Controller Processor. |
| F-Rev | Revision level and firmware of the FIC. |
| S-Rev | Revision level of the FIC software. |
| Status | Displays the status of the FIC. |
| Tag/Address | Tag or address of the FICs residing in the Controller Processor. |
| Type | Type of block on the FIC. |
| Value | Output value of the block. |
| Mode | Mode of the FIC: AUTO, MANUAL, or SIMULATE. |

FIC/FIM Status Bits

| Status for: | Status Bits | Bit | Description |
|-------------|-------------|-----|--|
| Multipoint | 1xxx xxxx | 7 | Not used. |
| | x1xx xxxx | 6 | Not used. |
| Discrete | xx1x xxxx | 5 | Input Latch for points 25-32: Set to 1 if bad. |
| I/O | xxx1 xxxx | 4 | Input Latch for points 17-24: Set to 1 if bad. |
| FIM | xxxx 1xxx | 3 | Input Latch for points 9-16: Set to 1 if bad. |
| (MDIO) | xxxx x1xx | 2 | Input Latch for points 1-8: Set to 1 if bad. |
| | xxxx xx1x | 1 | Output Latch for points 9-16: Set to 1 if bad. |
| | xxxx xxx1 | 0 | Output Latch for points 1-8: Set to 1 if bad. |
| Multipoint | 1xxx xxxx | 7 | Overall health of point 4, 8, 12, or 16 |
| | x1xx xxxx | 6 | Calibration Constant condition of point 4, 8, 12, or 16 |
| Analog | xx1x xxxx | 5 | Overall health of point 3, 7, 11, or 15 |
| Input | xxx1 xxxx | 4 | Calibration Constant condition for point 3, 7, 11, or 15 |
| FIM | xxxx 1xxx | 3 | Overall health of point 2, 6, 10, or 14 |
| (MAI) | xxxx x1xx | 2 | Calibration Constant condition for point 2, 6, 10, or 14 |
| | xxxx xx1x | 1 | Overall health of point 1, 5, 9, or 13 |
| | xxxx xxx1 | 0 | Calibration Constant condition for point 1, 5, 9, or 13 |
| Multipoint | 1xxx xxxx | 7 | Feedback check for point 4, 8, 12, or 16 |
| | x1xx xxxx | 6 | Calibration Constant condition for point 4, 8, 12, or 16 |
| Analog | xx1x xxxx | 5 | Feedback check of the point for point 3, 7, 11, or 15 |
| Output | xxx1 xxxx | 4 | Calibration Constant condition for point 3, 7, 11, or 15 |

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FIC/FIM Status Bits (continued)

| Status for: | Status Bits | Bit | Description |
|--------------------|--------------------|------------|--|
| FIM (MAO) | xxxx 1xxx | 3 | Feedback check for point 2, 6, 10, or 14 |
| | xxxx x1xx | 2 | Calibration Constant condition for point 2, 6, 10, or 14 |
| | xxxx xx1x | 1 | Feedback check for point 1, 5, 9, or 13 |
| | xxxx xxx1 | 0 | Calibration Constant condition for point 1, 5, 9, or 13 |

Section 2: Maintenance

| | |
|-------------------------------------|-----|
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Scheduled Maintenance

Scheduled Maintenance

| Procedures | Item | Frequency |
|---|---|----------------------------------|
| Cleaning Tape Drives | Magnetic Tape Drives | Weekly |
| Cleaning Console Fan Filters | MiniConsole Cage Fan Filters MiniConsole Disk Drive Filters Basic Command Console Filters Command Console Cage Filters | Weekly |
| Cleaning Cabinet Filters | Cabinet Door Filters ControlFile Fan Filters Cabinet Fan Screens | Weekly |
| Checking LEDs | Disk Drives Consoles and ControlFiles Power Supplies | Weekly |
| Checking Active Hardware Alarms | Hardware Alarm List | Weekly |
| Maintaining the Printer | Change Ribbon | As required |
| Checking the AC/DC Power Supply Battery | Battery | 6 Months |
| Replacing the AC/DC Power Supply Battery | AC/DC Power Supplies | Approximately every four years |
| Replacing the Power Supply Module Cooling Fan | System Power Supply Unit | 3.5 Years |
| Maintaining the CRT | Glare Filter on MiniConsole CRT CC and BCC CRT, Clean and Degauss | 6 Months |
| Running Off-Line Console Diagnostic Programs | Off-Line Background Diagnostic Checks NOTE: This should be done only by authorized FRSI personnel. | 6 Months |
| Checking Calibration | Analog Input Blocks (AIB) Analog Output Blocks (AOB) Multiplexer Input Blocks (MIB) | 6 Months 6 Months 6 Months |

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Scheduled Maintenance (continued)

| Procedures | Item | Frequency |
|--|---|-------------------------|
| Checking Voltages | ControlFile Power Regulator | 6 Months |
| | Console Power Regulator | 6 Months |
| Checking Backup Cards in Redundant Pairs | Coordinator Processor | 6 Months |
| | Controllers | 6 Months |
| Cleaning Cards | Consoles, Printer, ControlFiles & FlexTerms | 12 Months / as required |

**WARNING**

The AC/DC Power Supply weighs 70 pounds (32 kg). At least two persons should remove the supply from the cabinet to prevent injury.

**WARNING**

Prevent the CRT from sliding off the table, hold the CRT pan so that it does not tilt while you are removing the CRT screws.

**WARNING**

The fan blades are exposed during the console fan filter cleaning procedure. To avoid injury, keep fingers away from the fan.

**WARNING**

To prevent injury or damage to components, all field power to the FlexTerm must be removed before attempting to remove a Contact FlexTerm.

**WARNING**

To prevent accidental injury, make certain you have turned off the correct circuit breaker for the AC/DC Power Supply. The amber light on the front of the power supply should be off.

**WARNING**

When removing the Command Console Hard Disk Drive, disconnect the AC plugs in the support column to prevent shock when disconnecting the AC power cables on the supply.



WARNING

The Serial I/O Analog Output Points calibration procedures require that the process measurement or output drive be completely disconnected from the control system. Any control scheme using a measurement to be calibrated must be in **MANUAL** mode. Any devices connected to an output to be calibrated must be isolated from the process.

Filter Replacements

Filter Replacements

| Application | Filter | Part Name |
|-----------------------------------|----------------|--|
| MiniConsole Card Cage | G12918-0001 | Fan Filter Replacement |
| MiniConsole Floppy Disk Drive | G12918-0002 | Fan Filter Replacement |
| Multitube EC Cabinet | 1984-0359-0006 | Fan Filter Replacement |
| Command Console | G12918-0002 | Fan Filter Replacement |
| Cabinet Door, Series I | 1984-0359-0003 | Filter Replacement, Door |
| Cabinet Door, Series 2 | 1984-0359-0008 | Cabinet Filter |
| ControlFile | 1984-0359-0001 | Fan Filter Replacement |
| OI Card Cage HIA SCI SRU | 1984-0359-0002 | Filter Replacement - HIA, SCI, SRU |
| Tower Electronics Cabinet | 1984-0359-0007 | Filter Replacement - Tower Door |
| 7U Hanging Cabinet | 10P55500011 | Filter Replacement - Bottom of Cabinet |



WARNING

The fan blades are exposed during the filter cleaning procedure. To avoid injury, keep fingers away from the fan.

Cleaning Tape Drives

Magnetic tape drives should be cleaned once a week or after every eight hours of tape operation. Clean the drive after 2 hours of operation with new tape cartridges.

Use a 1984-2154-0001 Tape Drive Head Cleaner Kit. Additional supplies are available in the 1984-2154-0002 Tape Drive Head Cleaner Refill Kit.

Follow the directions supplied with the kit.

Cleaning Floppy Disk Drives

Disk drives should be cleaned periodically or when excessive errors occur.

Use a 1984-2891-0001 Floppy Drive Cleaner Kit for the 3.5-inch drives and a 1984-2891-0002 Floppy Drive Cleaner Kit for the 5.25-inch drives.

Cleaning the Trackball

Most problems with a trackball can be cured by a thorough cleaning. Dirt accumulates around the ball itself and in the optical disk readouts inside the assembly. The trackball itself can be replaced without replacing the entire assembly.

□ **To clean a trackball:**

Required tools:

- #1 Phillips screwdriver
- 1/16-inch Allen wrench
- Source of dry air under pressure (20 psi max)
- Denatured alcohol

1. The Trackball Assembly can be part of the Operator Keyboard Assembly or be free standing.
 - a. Operator Keyboard Assembly: Unplug the keyboard cable from the keyboard interface card. Turn the keyboard assembly over and remove the four screws that hold the Trackball Assembly to the Operator Keyboard.
 - b. Free-standing trackball: Unplug the trackball cable. Remove the four screws that hold the base in place.
2. Remove the two brackets that hold the black box containing the trackball. Push the black box out. This may require some force since the black box is glued to the assembly.
3. Unplug the black box from the trackball electronics.
4. Remove the black box top cover (four Allen screws).
5. Remove and clean the ball and the area around the hole in the cover.
6. Use dry air to blow dust and dirt out of the optical sensor wheels and sensors.
7. Clean the bearing that holds the ball tightly against the sensor wheels.
8. Reassemble the black box.
9. Connect the trackball electronics cable and install the box in the trackball assembly, being careful to center the ball in the hole in the keyboard before you tighten the brackets.
10. Replace the base or reinstall in the keyboard assembly.
11. Plug in the cable and test. If the trackball does not work, replace the black box (1984-1653-000x).

Removing and Installing Cards

Proper procedures must always be followed when removing or inserting cards in the system. Observe the following precautions and instructions when working on the system.

- Use a grounded wrist strap with a built-in one megohm resistor for your safety and to prevent damage to static sensitive circuits. The resistor allows static electricity to drain to ground while isolating you from direct ground.
- Before removing AC and DC power from the system, move all Nonvolatile Memory card ENABLE/DISABLE switches to the DISABLE position.
- Before removing or inserting any card (except a PeerWay buffer card) in a ControlFile, first disable the Nonvolatile Memory card and then the Coordinator processor card by placing the ENABLE/DISABLE switches to the DISABLE position.
- Always power down consoles before removing or installing cards.

NOTE: The Disk Shutdown (DS) command should always be performed before powering down the console. This will purge the cache and prevent possible loss of data.

- Check the jumper positions when you replace a card.
- Ensure that cards are seated properly.
 - Place your right thumb on the upper plastic card extractor lever and place your left thumb on the lower extractor.
 - Push evenly and firmly with both thumbs at the same time. You should feel the card seat.
- All circuit cards must be in antistatic bags when outside their card cage. Use approved antistatic bags when shipping or storing cards.
- Never handle circuit cards by the edge connectors. Small amounts of oil from your skin can contaminate the edge connectors, causing problems with intermittent contacts.
- Use only approved nonstatic brushes to clean edge connectors. Never use erasers, abrasive materials, or nylon brushes. Abrasives can remove the gold flash, and other materials can cause static electricity damage to onboard components. Follow the instructions in “Cleaning Cards” in this section.

Cleaning Cards

Cards should be removed from the system and cleaned once a year (more often in installations where conductive dust is present). The cards must be removed and cleaned in an antistatic work area, using an antistatic mat on the work surface and an antistatic wrist strap. Clean cards with an air hose or vacuum cleaner that is static protected.

To remove dust from cards:

1. Use an air hose to blow the dust off the cards and assemblies. Use very dry air or an ionizing nozzle on the air hose to prevent static damage to the cards. Air pressure should be limited to 2.1 Kg/cm² (30 PSI).

or

2. Use a vacuum cleaner. We recommend use of a dust attachment with a wire wrapped around the brush bristles, connecting to ground through a 1 megohm resistor to eliminate static buildup on the brush.

To clean edge connectors:

CAUTION

Do not use a rubber eraser to clean edge connectors. A rubber eraser wears away the thin gold coating on the connector and will then allow the contacts to corrode.

1. Use a "RUSH BRUSH" or similarly designed edge connector brush to remove oxidation and contaminants from the gold coated edge connectors.
2. To remove contaminants, wipe connector contacts with a soft tissue wetted with denatured alcohol.

Storing Cards

Cards must be stored in a clean area, free of corrosives. Always store cards in an approved antistatic bag.

Section 3: Power

| | |
|--|------|
| DC Power Distribution System Color Codes | 3-2 |
| AC Entrance Panel | 3-3 |
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DC Power Distribution System Color Codes


Standard Color Codes for Wiring and Test Points

| Color | Voltage |
|--------|-------------------------------------|
| Orange | +30 VDC |
| Brown | Ground Return |
| Red | +12 VDC |
| Blue | -12 VDC |
| Yellow | +5 VDC |
| Purple | +9 VDC (Unregulated) ⁽¹⁾ |
| White | +5 V Relative Current Indication |
| Green | +12 V Relative Current Indication |
| Gray | Isolated Ground Return |

⁽¹⁾ Violet is used for test points on the -2494 Analog Transfer Card.

AC Entrance Panel 10P5662000x
..... 1984-0303-000x

AC Input Wiring

| Terminal | 115 VAC Wiring | 230 VAC Wiring |
|---|----------------|----------------|
| L1 | Hot | Line 1 |
| L2/N | Neutral | Line 2 |
|  | Ground | Ground |

Dual Feed AC Entrance Panel Fuses

| Fuse | FRSI Part No. | Bussman Part No. | Littelfuse Part No. | Characteristics |
|----------|---------------|------------------|---------------------|----------------------|
| F1 F2 | G09140-0017 | MDQ 1/2 | 313.500 | .5 A 250 V Slow Blow |

WARNING



For personal safety, it is wise to use a circuit breaker lockout device to ensure that an opened breaker is not accidentally closed while you are working on the line.

WARNING



Dangerous AC voltage may be present even if the “AC IN” indicator is not lit. If the input fuse is blown, AC may still be present at the input terminal block.

System Power Supply Unit

Module **12P0238X012**
Housing **12P0236X012**
Fan Replacement Kit **12P0239X012**

System Power Supply Module Parts Replacement

| Part No. | Replaces | Comment |
|-------------|----------|---|
| 12P0238X012 | - - | <p>The 12P0238X012 supply module is NRTL/C certified and CE-compliant.</p> <p>Each power supply unit consists of at least one power supply module and one power supply housing.</p> <p>They cannot be mixed with 10P5658-XXXX, 1984-2298-XXXX, 10P5664-XXXX, or 1984-0390-XXXX AC/DC power supplies on the same DC bus.</p> |

AC/DC Power Supply (With Battery Backup) 10P5658000x
 1984-2298-000x
 1984-0298-000x
OI Remote Power Supply 1984-1046-000x

AC/DC Power Supply (With Battery Backup) Parts Replacement

| Part No. | Replaces | Comment |
|--|----------------------------------|---|
| 10P5658000x | 1984-0298-000x 1984-2298-000x | The 10P5658000x supply is CE-compliant |
| 1984-2298-000x | 1984-0298-000x | Supplies are fully interchangeable |
| 1984-0298-000x | 1984-2298-000x | Supplies are fully interchangeable |
| 1984-2298-000x or 1984-0298-000x | 1984-0390-000x | Either supply may replace a -0390 AC/DC Power Supply (Without Battery Backup) but the BATT switch must be turned OFF. NOTE: The PS FAULT alarm jumper (HD1) must be set to 2-3 since the -0390 contacts are Normally Closed (N.C.). |

Power Supply (With Battery Backup) Indicators and Controls

| Item | Function |
|---------------------------|---|
| BATT ON/OFF Toggle Switch | Removes the battery backup circuit from the system when in OFF position. |
| BATT TEST Pushbutton | The Battery Test Pushbutton is used to manually enable the 16 amp, 5 second battery test. If battery voltage falls below 20 V during the test, the BATT FAULT LED lights and the battery alarm activates. NOTE: The battery cannot be tested until the system has been running for at least five minutes or until five minutes after the last battery test. |
| AC IN Indicator (Orange) | Indicates that AC input is present. |

(continued on next page)

Power Supply (With Battery Backup) Indicators and Controls (continued)

| Item | Function |
|--|---|
| OUTPUT CURRENT (Bar Graph LED) (Red) | This is a series of LEDs indicating the relative current being delivered to the DC distribution system by the AC/DC power supply. It indicates the load share provided by the power supply with a readout in 3 amp intervals. Power supplies should be within 1 to 2 LEDs of the others on the DC distribution system for proper load sharing. |
| PS FAULT LED (DS1) (Red) | The 30 Volt DC output has dropped below 26 Volts. The power supply alarm is actuated when this LED is on. |
| PS NORM LED (DS2) (Green) | The DC output voltage and battery status (if the battery is used with the header jumper enabled) is in normal working condition. |
| BATT FAULT LED (DS3) (Red) | The battery has failed the periodic load test. Approximately once every 24 hours the unit automatically tests the batteries under a 16 amp load for five seconds. If battery voltage drops below 20 Volts DC (24 Volts nominal), the BATT FAULT LED will light, the PS NORM LED will go out, and the battery fault alarm will activate. The battery fault alarm will also activate if the battery test fails. |

AC/DC Power Supply (With Battery Backup) Fuse

| Fuse | FRSI Part No. | Bussman Part No. | Littelfuse Part No. | Characteristics |
|------|---------------|------------------|---------------------|--------------------------|
| F1 | G50527-0004 | -- | SLC50 | 50 A 300 V Time Delay |
| F2 | 50P03980007 | SC-30 | -- | 30 A 300 V Time Delay |

Battery Charger Card 1984-1283-000x**Battery Charger Card Test Points**

| Test Point | Function | Comment |
|------------|------------------------------|----------------------------------|
| TP1 | Return reference | |
| TP2 | Reference voltage 2.35 Volts | Adjust with variable resistor R1 |
| TP3 | Battery voltage 27.6 Volts | Adjust with variable resistor R2 |

Battery Charger Card Jumper Positions

| Jumper | Purpose | Position |
|--------|--------------------------------------|---|
| HD1 | Alarm contact for power supply fault | 1-2 N.O. - Contact is normally open 2-3 N.C. - Contact is normally closed |
| HD2 | Alarm contact for battery fault | 1-2 N.O. - Contact is normally open 2-3 N.C. - Contact is normally closed |
| HD3 | Battery connection | 1-2 W BAT - Test Battery every 24 hours 2-3 W/O BATT - Do not test Battery |

Battery Charger Card Fuses

| Fuse | FRSI Part No. | Bussman Part No. | Littelfuse Part No. | Characteristics |
|------|---------------|------------------|---------------------|-------------------------|
| F1 | G09140-0016 | AGC 1/2 | 312.500 | .5 A V 250 Quick Acting |
| F2 | G09140-0030 | AGC 2 | 312002 | 2 A 250 V Quick Acting |

**AC/DC Power Supply
(Without Battery Backup) 10P5664000x
..... 1984-0390-000x**

AC/DC Power Supply (Without Battery Backup) Parts Replacement

| Part No. | Replaces | Comment |
|----------------|--|--|
| 10P5664000x | 10P5658000x | Power Supplies are interchangeable only in systems that do not use batteries. The BATT switch on the replaced unit must have been turned OFF. The PS FAULT contact (if used) must have been jumpered as Normally Closed (N.C.). |
| 1980-0390-000x | 1984-0298-000x or 1984-2298-000x | Power Supplies are interchangeable only in systems where the batteries are not being used. The BATT switch on the replaced unit must have been turned OFF. The PS FAULT contact (if used) must have been jumpered as Normally Closed (N.C.). |

AC/DC Power Supply (Without Battery Backup) Indicators

| Item | Function |
|-------------------|---|
| AC IN (Orange) | Indicates that AC input is present. |
| POWER (Green) | Indicates that the DC output voltage is in normal working range. The power supply alarm is actuated when this LED is off. |

AC/DC Power Supply (Without Battery Backup) Fuse

| Fuse | FRSI Part No. | Bussman Part No. | Littelfuse Part No. | Characteristics |
|------|---------------|------------------|---------------------|--------------------------|
| F1 | 50P03980007 | SC-30 | -- | 30 A 300 V Time Delay |

MTCC Remote Power Supply 10P5645000x
..... 1984-3023-000x

MTCC 1984-3023-000x Remote Power Supply Jumper

| Jumper | Position |
|---------------|------------------------------|
| Internal Wire | In place (-0001 110 V input) |
| | Removed (-0002 220 V input) |

MTCC Remote Power Supply Fuse

| Fuse | FRSI Part No. | Bussman Part No. | Littelfuse Part No. | Characteristics |
|------------------------------------|--------------------------|-----------------------------|--------------------------------|------------------------|
| F1 power supply: 1984-3023-000x | G09140-0064 | GMC-5 | -- | 5 A 250 V Miniature |
| F1 power supply: 10P5645000x | G09140-0041 | MTH5 | 312005 | 5 A 250 V 1-1/4 in. |

DC/DC Power Supply 1984-0393-000x

DC/DC Power Supply Specifications

| Parameter | Specification |
|----------------------|---|
| Power supply type | Switching regulator |
| Temperature range | 0° C to 50° C |
| Input voltage | 30 Volts DC |
| Input voltage range | 10 Volts DC to 60 Volts DC |
| Line regulation | ± .5% with input voltage >15 Volts |
| Output voltage | 1984-0393-0001: set @ 24 Volts DC 1984-0393-0002: set @ 24 Volts DC 1984-0393-0003: set @ 15 Volts DC |
| Output voltage range | 4.4 Volts DC to 30 Volts DC |
| Output current | 0 to 12 Amps |
| Output ripple | 50 milliVolts (0-25K Hz) 150 milliVolts (total) |

DC/DC Power Supply Fuses

| Fuse | FRSI Part No. | Bussman Part No. | Littelfuse Part No. | Characteristics |
|-------------|----------------------|-------------------------|----------------------------|------------------------|
| All | G09140-0036 | MDL 3 | 313003 | 3 A 250 V Slow Blow |

AC/DC Unregulated Power Supply 1984-1089-000x

AC/DC Power Supply Specifications

| Parameter | Specification |
|---------------------|--|
| Voltage | 1984-1089-0001: 115 Volts AC 1984-1089-0002: 220 Volts AC |
| Input Voltage Range | 1984-1089-0001: 104 to 127 Volts AC 1984-1089-0002: 198 to 242 Volts AC |
| Frequency Range | 47 to 63 Hz |
| Output Source | Nominal: 27.5 Volts, 7.5 Amps |

AC/DC Unregulated Power Supply Fuse

| Fuse | FRSI Part No. | Bussman Part No. | Littelfuse Part No. | Characteristics |
|------|---------------|------------------|---------------------|-------------------|
| F1 | G09140-0046 | AGC 10 | 311010 | 10 A 32 V Regular |

Remote I/O Power Supply 10P57010001
..... 1984-4302-000x

The Remote I/O Power Supply is used with an AC Distribution Block and a DC Distribution Block and their internal fuses.

Remote I/O Power Supply Specifications

| Power Supply | Voltage |
|---------------------|---|
| 10P57010001 | 110 Volts AC to 230 Volts AC Autosensing |
| 1984-4302-0001: | 110 Volts AC |
| 1984-4302-0002: | 220 Volts AC |

Remote Power OI Supply 10P57560001

Remote 10P5756 OI Power Supply Specifications

| Power Supply | Voltage |
|---------------------|---|
| 10P57560001 | 110 Volts AC to 230 Volts AC Autosensing |

Remote Power Supply
For Operator Interface (OI) Applications **10P5409000x**
For Input/Output (I/O) Applications **10P5503000x**

The supplies differ only in mounting bracket and cables. The 10P5503 unit is used in conjunction with the AC Distribution Block and DC Distribution Block.

Remote Power Supply Specifications

| Parameter | Specification |
|-----------|--|
| Voltage | -0001 & 3: 115 Volts AC -0002 & 4: 230 Volts AC |
| Output | 24 VDC, adjustable ± 1 Volt 6 Amp |

Remote Power Supply Fuses

| FRSI P/N | Wickman P/N | Schurter P/N | Characteristics |
|----------|-------------|----------------|-------------------------------------|
| -- | 19372K | Series MST 250 | 3.15 A, 250 V Slow Blow, Plug-In |

Connector Pin-Out

| Pin | Description |
|-----|---|
| 6 | DC + output |
| 14 | DC return |
| 16 | Jumper to pin 32 (connects DC return to AC safety ground) |
| 28 | L1 AC line 1 |
| 30 | L2/N AC line 2 (230 V) or neutral (115 V) |
| 32 | AC safety ground |

| | |
|------------------------------------|-----------------------|
| AC Distribution Block | 1984-4329-0001 |
| DC Distribution Block | 1984-4329-0002 |
| ..... | 1984-4329-0003 |

The AC Distribution Block and DC Distribution Block are used with the Remote Power Supply and the Remote I/O Power Supply. Each distribution block has internal fuses. Input power must be connected to the side of the block holding the jumper.

Distribution Block Fuses

| Block | FRSI P/N | Wickman P/N | Littelfuse P/N | Characteristics |
|--------------------------------|-----------------|--------------------|-----------------------|----------------------------------|
| AC Distribution | G53394-3000-1 | Series 19197 | Series 235 | 3.0 amp 250 V CSA approved |
| DC Distribution 10 Circuits | G53394-1000-1 | Series 19197 | Series 235 | 1.0 amp 250 V CSA approved |
| DC Distribution 1 Circuit | G53394-3000-1 | Series 19197 | Series 235 | 3.0 amp 250 V CSA approved |

DC Output Card 1984-1264-000x

DC Output Card Fuses

| Device | FRSI Part No. | Bussman Part No. | Littelfuse Part No. | Characteristics |
|--------------------------------------|----------------------|-------------------------|----------------------------|------------------------|
| Multitube Command Console: 1 Tube | G09140-0047 | AGC 15 | 311015 | 15 A 32 V Regular |
| Multitube Command Console: 2 Tubes | G09140-0061 | ABC 20 | 314020 | 20 A 250 V Regular |
| Multitube Command Console: 3 Tubes | G09140-0061 | ABC 20 | 314020 | 20 A250 V Regular |
| Command Console | G09140-0047 | AGC 15 | 311015 | 15 A 32 V Regular |
| MiniConsole | G09140-0047 | AGC 15 | 311015 | 15 A 32 V Regular |
| ControlFile | G09140-0061 | ABC 20 | 314020 | 20 A250 V Regular |
| ControlFile Fan | G09140-0046 | AGC 10 | 311010 | 10 A 32 V Regular |
| I/O Card Cage | G09140-0047 | AGC 15 | 311015 | 15 A 32 V Regular |
| FlexTerm | G09140-0046 | AGC 10 | 311010 | 10 A 32 V Regular |
| System Resource Unit (SRU) | G09140-0047 | AGC 15 | 311015 | 15 A 32 V Regular |
| Highway Interface Adapter (HIA) | G09140-0047 | AGC 15 | 311015 | 15 A 32 V Regular |
| Supervisory Computer Interface (SCI) | G09140-0047 | AGC 15 | 311015 | 15 A 32 V Regular |
| System Manager Station (SCI) | G09140-0047 | AGC 15 | 311015 | 15 A 32 V Regular |
| RS3 Network Interface (RNI) | G09140-0046 | AGC 10 | 311010 | 10 A 32 V Regular |

(continued on next page)

DC Output Card Fuses (continued)

| Device | FRSI Part No. | Bussman Part No. | Littelfuse Part No. | Characteristics |
|----------------------------|---------------|------------------|---------------------|-------------------|
| Multipoint I/O Term Panels | G09140-0046 | AGC 10 | 311010 | 10 A 32 V Regular |
| Fiber Optic I/O Converter | G09140-0046 | AGC 10 | 311010 | 10 A 32 V Regular |

Section 4: PeerWay

| | |
|-----------------------------------|-----|
| Twinax PeerWay Tap Block Set | |
| Tap Box A (CE Approved) | |
| Tap Box B (CE Approved) | 4-2 |
| Optical Tap Box A | |
| Optical Tap Box B | 4-4 |
| Electrical Tap Box A | |
| Electrical Tap Box B | 4-5 |
| PeerWay Extender (PX) | |
| PeerWay A | |
| PeerWay B | 4-6 |
| Optical Repeater/Attenuator | 4-8 |

| | |
|---|-----------------------|
| Twinax PeerWay Tap Block Set | 1984-0496-000x |
| Tap Box A (CE Approved) | 10P52760001 |
| ..... | 1984-0488-000x |
| Tap Box B (CE Approved) | 10P52790001 |
| ..... | 1984-0489-000x |

NOTE: One tap box must be grounded on each PeerWay. Ground both PeerWay A and B at the same tap box.

PeerWay Tap Box Parts Replacement

| Part | Part No. | Replaces | Comment |
|-------------|-----------------|-----------------|-----------------------------|
| Tap A | 10P52760001 | 1984-0488-000x | All installations. |
| | 1984-0488-000x | 10P52760001 | Non-EMC installations only. |
| Tap B | 10P52790001 | 1984-0489-000x | All installations. |
| | 1984-0489-000x | 10P52790001 | Non-EMC installations only. |

PeerWay Tap Box Test Points

| Test Point | Range | Comment |
|--------------------------|---------------|-----------------|
| TP1, 2 Yellow - Brown | 4.75-5.25 VDC | Power for tap 1 |
| TP3, 4 Yellow - Brown | 4.75-5.25 VDC | Power for tap 2 |
| TP5, 6 Yellow - Brown | 4.75-5.25 VDC | Power for tap 3 |
| TP7, 8 Yellow - Brown | 4.75-5.25 VDC | Power for tap 4 |

10P5276 and 10P5279 Tap Box Grounding

| Grounding Screw Position | Function |
|---------------------------------|----------------------------|
| GROUND | Grounds the PeerWay Shield |
| OPEN | Normal setting |

1984-0488 and -0489 Tap Box Grounding

| Jumper | Position | Comment |
|---------------|-----------------|----------------------------|
| HD3 | GND | Grounds the PeerWay Shield |
| | HOLD | Normal setting |

| | |
|-------------------------|----------------|
| Optical Tap Box A | 1984-3211-0001 |
| ..... | 1984-1191-0001 |
| Optical Tap Box B | 1984-3214-0001 |
| ..... | 1984-1192-0001 |

WARNING

Use care when handling optical cables. The ends are subject to damage from chipping, dust, and dirt. The cable may be damaged if it is bent at too small a radius.

Optical Tap Box Replacement Data

| Part No. | Replaces | Comment |
|----------------|----------------|---------------------------|
| 1984-3211-0001 | 1984-1191-0001 | PeerWay A Optical Tap Box |
| 1984-1191-0001 | 1984-3211-0001 | PeerWay A Optical Tap Box |
| 1984-3214-0001 | 1984-1192-0001 | PeerWay B Optical Tap Box |
| 1984-1192-0001 | 1984-3214-0001 | PeerWay B Optical Tap Box |

NOTE: One tap box, either optical or electrical, must be grounded in each set. Ground both PeerWay A and B at the same tap box.

Optical Tap Box Jumpers

| Jumper | Position | Comment |
|--------|----------|---------------------|
| HD3 | GND | Grounds the tap box |
| | HOLD | Normal setting |

| | |
|-----------------------------------|-----------------------|
| Electrical Tap Box A | 1984-3211-0002 |
| ..... | 1984-1193-0002 |
| Electrical Tap Box B | 1984-3214-0002 |
| ..... | 1984-1194-0002 |

NOTE: Electrical Tap Boxes are used only with Optical Tap boxes.

Electrical Tap Box Replacement Data

| Part No. | Replaces | Comment |
|----------------|----------------|------------------------------|
| 1984-3211-0002 | 1984-1193-0001 | PeerWay A Electrical Tap Box |
| 1984-1193-0002 | 1984-3211-0002 | PeerWay A Electrical Tap Box |
| 1984-3214-0002 | 1984-1194-0001 | PeerWay B Electrical Tap Box |
| 1984-1194-0002 | 1984-3214-0002 | PeerWay B Electrical Tap Box |

NOTE: One tap box, either optical or electrical, must be grounded in each group of optical and electrical tap boxes. Ground both PeerWay A and B at the same tap box.

Electrical Tap Box Jumpers

| Jumper | Position | Comment |
|--------|----------|---------------------|
| HD3 | GND | Grounds the tap box |
| | HOLD | Normal setting |

| | |
|------------------------------------|--------------------|
| PeerWay Extender (PX) | |
| PeerWay A | 10P50930001 |
| PeerWay B | 10P50960001 |

CAUTION

The PX must be supplied with a reliable source of DC power. If the PX loses power, the PeerWay is broken at that point.

PX Parts Replacement Data

| Part No. | Replaces | Name | Comment |
|--------------------------|-----------------|-------------------|--|
| Tap A 10P50930001 | 10P52760001 | Twinax Tap Box A | Provides only two PeerWay drops. |
| | 1984-0488-0001 | Twinax Tap Box A | Provides only two PeerWay drops. |
| | 1984-3211-0001 | Optical Tap Box A | Provides only two PeerWay drops. Cannot connect to Electrical Tap Boxes. |
| | 1984-1191-0001 | Optical Tap Box A | Provides only two PeerWay drops. Cannot connect to Electrical Tap Boxes. |
| Tap B 10P50960002 | 10P52760002 | Twinax Tap Box B | Provides only two PeerWay drops. |
| | 1984-0488-0002 | Twinax Tap Box B | Provides only two PeerWay drops. |
| | 1984-3211-0002 | Optical Tap Box B | Provides only two PeerWay drops. Cannot connect to Electrical Tap Boxes. |
| | 1984-1191-0002 | Optical Tap Box B | Provides only two PeerWay drops. Cannot connect to Electrical Tap Boxes. |

PX LEDs

| LED | Meaning |
|--------------------|--|
| STATUS (Yellow) | The PX is running and has adequate power applied. |
| XMT (Yellow) | Fiber Optic Transmit - ON when messages are being transmitted on the fiber optic channel. ON continuously indicates a stuck transmitter. |
| RECV (Yellow) | Fiber Optic Receive - ON when messages are being received on the fiber optic channel. ON continuously indicates a stuck transmitter at the other end of the fiber. |

Fiber Optic Power Switch

| S3 Position | Effect |
|--------------------|--|
| HIGH POWER | Full optical transmitter power is used |
| LOW POWER | Optical transmitter power is reduced 7 - 10 dB |

Normal/Test Switch

| S1 Position | S2 Position | Effect |
|--------------------|--------------------|---------------|
| Right | Right | Normal Mode |
| Right | Left | Disabled |
| Left | Right | Disabled |
| Left | Left | Test Mode |

PX Fuses

| Fuse | FRSI Part No. | Littelfuse Part No. | Schurter Part No. | Characteristics |
|-------------|----------------------|----------------------------|--------------------------|------------------------|
| F1, F2 | G50382-0009 | 273.125 | MSF 034.4210 | 1/8 A 125 V Plug-In |
| F3 | G50382-0019 | 273.001 | MSF 034.4221 | 1 A 125 V Plug-In |

Optical Repeater/Attenuator 1984-0514-000x

LEDs for Optical Repeater/Attenuator

| LED | Meaning |
|------------|-----------------|
| DS1 | Hardware Good |
| DS2 | Hardware Bad |
| DS3 | +30V Fuse Blown |
| DS4 | FO TX1 Failed |
| DS5 | FO TX2 Failed |
| DS6 | Data 1 |
| DS7 | Data 2 |

Optical Repeater/Attenuator Jumper Settings

| Jumper | Normal Position | Test Position |
|---------------|------------------------|----------------------|
| HD1 | 1-2 | 2-3 |
| HD2 | 1-2 | 2-3 |

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Keyboard Alarm

Hardware alarm 090 warns of bad keys:

Board: Key <p:kkk> is bad

Where “p” is the keyboard number and “kkk” is the key number.

Multitube Command Console Keyboard Numbers

| Keyboard Number | Keyboard |
|------------------------|--|
| 1 | Configuration Keyboard (Alphanumeric Keyboard) |
| 2 | Trackball Keyboard |
| 3 | Operator Keyboard |
| 4 | Callup Option Keyboard 1 (Left) |
| 5 | Callup Option Keyboard 2 (Middle) |
| 6 | Callup Option Keyboard 3 (Right) |

| | |
|---|-----------------------|
| Enhanced Engineering Keyboard | 1984-2386-000x |
| Main Keyboard/Trackball | 1984-1634-000x |
| Main Keyboard/Trackball/Option | 1984-2372-000x |

Main Keyboard Parts Replacement

| Part | Part No. | Replaces | Characteristics |
|---------------------------------------|-----------------|-----------------|---|
| Keyboard Electronics 68HC05 | 1984-2871-000x | 1984-1970-000x | EMC compliant. Can replace any other board |
| Keyboard Electronics | 1984-1970-000x | 1984-2871-000x | Fully interchangeable except Not EMC Compliant. |
| Main Keyboard Replacement Subassembly | 1984-1695-000x | Keyboard top | Without base or cable |

Keyboard Electronics Board Jumper Positions for Use in Main Keyboard

| Board use | HD1 (J1) | HD2 (J2) | HD3 (J3) | HD4 (J4) |
|------------------|-----------------|-----------------|-----------------|-----------------|
| Main Keyboard | 1-2 | 1-2 | 2-3 | 2-3 |

Trackball Assembly 1984-1631-000x**Trackball Keyboard Parts Replacement**

| Part No. | Name | Replaces | Characteristics |
|---|--|----------------------------------|--|
| 10P52850004 | Keyboard Electronics Board 68HCC05 | 1984-1975-000x 1984-2662-000x | EMC compliant. Can replace any other board |
| 1984-2662-000x | Keyboard Electronics Board 68HCC05 | 10P52850004 1984-1975-000x | Keyboard Electronics boards are interchangeable except for EMC compliance |
| 1984-1975-000x6 | Keyboard Electronics Board | 10P52850004 1984-2662-000x | Keyboard Electronics boards are Interchangeable except for EMC compliance |
| 10P53240001 0002, 0003, 0009 | Trackball Keyboard Replacement Subassembly | 1984-1693-000x | EMC compliant. Use in any console. Replaces the keyboard top only. Has no base or cable |
| 1984-1693-000x | Trackball Keyboard Replacement Subassembly | Keyboard top | Not EMC Compliant - Replaces keyboard top only. Has no base or cable |
| 1984-1653-0003 Normal Trackball 1984-1653-0004 Teflon Sealed | Trackball | Trackball | Replaces the "black box" containing the trackball NOTE: Use the sealed version only where needed. It is much stiffer. |

Option Keyboard 1984-1632-000x

Option Keyboard Electronics Board Parts Replacement

| Part No. | Replaces | Name on PWA | Characteristics |
|----------------|----------------|----------------------|---|
| 1984-2871-000x | 1984-1970-000x | KEYBOARD ELECTRONICS | EMC Compliant. Replaces any other board. |
| 1984-1970-000x | 1984-2871-000x | KEYBOARD ELECTRONICS | Fully interchangeable, except for EMC Compliance. |

Keyboard Electronics Board Jumper Positions

| Usage | HD1 (J1) | HD2 (J2) | HD3 (J3) | HD4 (J4) |
|-------------------|----------|----------|----------|----------|
| Option Keyboard 1 | 1-2 | 1-2 | 1-2 | 2-3 |
| Option Keyboard 2 | 1-2 | 1-2 | 2-3 | 1-2 |
| Option Keyboard 3 | 1-2 | 1-2 | 1-2 | 1-2 |

| | |
|-----------------------|-----------------------|
| Joystick | 1984-3038-000x |
| Touchpad | 1984-2844-000x |
| ..... | 1984-2321-000x |

Joystick Parts Replacement

| Item | Part No. | Replaces | Characteristics |
|------------------------------------|----------------|----------------------------------|---|
| Joystick | 1984-3038-000x | | |
| Joystick Upgrade Kit | 1984-3040-000x | | Replaces the Touchpad. |
| Keyboard Electronics Board 68HCC05 | 10P52850004 | 1984-1975-000x 1984-2662-000x | EMC compliant. Can replace any other board |
| Keyboard Electronics Board 68HCC05 | 1984-2662-000x | 10P52850004 1984-1975-000x | Keyboard Electronics boards are interchangeable except for EMC compliance |
| Keyboard Electronics Board | 1984-1975-000x | 10P52850004 1984-2662-000x | Keyboard Electronics boards are interchangeable except for EMC compliance |

Touchpad Replacement

| Item | Part No. | Characteristics |
|-------------------------------------|----------------------------------|--|
| Touchpad | 1984-2321-000x 1984-2844-000x | A Touchpad should be replaced with a Joystick upgrade kit. |
| Touchpad Keyboard Electronics Board | 1984-1981-000x | A Touchpad Keyboard Electronics Board should be replaced with a Joystick upgrade kit. |
| Keyboard, Cursor Control (Modified) | 1984-2335-000x | The membrane keyboard may be replaced with any dash number (-000x) keyboard assembly or with a Joystick upgrade kit. |

Keyboard Electronics Board 1984-2871-000x
..... 1984-1970-000x

Keyboard Electronics Board Parts Replacement

| Item | Part No. | Replaces | Characteristics |
|----------------------------|----------------|----------------|----------------------------|
| Keyboard Electronics board | 1984-2871-000x | 1984-1970-000x | Completely interchangeable |
| Keyboard Electronics board | 1984-1970-000x | 1984-2871-000x | Completely interchangeable |

Keyboard Electronics Board Jumper Positions

| Usage | HD1 (J1) | HD2 (J2) | HD3 (J3) | HD4 (J4) |
|-------------------|----------|----------|----------|----------|
| Main Keyboard | 1-2 | 1-2 | 2-3 | 2-3 |
| Option Keyboard 1 | 1-2 | 1-2 | 1-2 | 2-3 |
| Option Keyboard 2 | 1-2 | 1-2 | 2-3 | 1-2 |
| Option Keyboard 3 | 1-2 | 1-2 | 1-2 | 1-2 |

Trackball Electronics Board **10P52850004**
 **1984-2662-000x**
 **1984-1975-000x**

NOTE: Trackball Electronics Boards are completely interchangeable except that only 10P5285 can be used in a EMC compliant console.

Trackball Electronics Board Replacement

| Name on PWA | Part No. | Replaces | Characteristics |
|-----------------------|-----------------|----------------------------------|--|
| TRACKBALL 68HC05 | 10P5285000x | 1984-2662-000x 1984-1975-000x | EMC compliant. Useable in any console. |
| TRACKBALL 68HC05 | 1984-2662-000x | 1984-1975-000x 10P5285000x | Not for an EMC compliant console. |
| TRACKBALL KEYBOARD | 1984-1975-000x | 1984-2662-000x 10P52850004 | Not for an EMC compliant console. |

Trackball Keyboard Replacement Subassembly

..... **10P53240001**
 **1984-1693-000x**

Trackball Keyboard Replacement Subassembly

| Name | Part No. | Replaces | Characteristics |
|--|----------------|----------------|--|
| Trackball Keyboard Replacement Subassembly | 10P53240001 | 1984-1693-000x | EMC compliant. Useable in any console. |
| Trackball Keyboard Replacement Subassembly | 1984-1693-000x | 10P53240001 | Not for an EMC compliant console. |

Keyboard Interface **10P50842004**
 **1984-3222-x00x**
 **1984-2889-x00x**
 **1984-1978-000x**

Keyboard Interface Parts Replacement

| Part No. | Replaces | Name on PWA | Characteristics |
|-----------------|--|---------------------------------------|---|
| 10P50842004 | 1984-3222-2004 | KEYBD INTERFACE/ VIDEO ISOLATOR | EMC compliant Password Security Software |
| 1984-3222-2004 | None | KEYBD INTERFACE/ VIDEO ISOLATOR | Password Security Software |
| 10P50840004 | 1984-3222-0004 1984-2889-0004 1984-1978-000x | KEYBD INTERFACE/ VIDEO ISOLATOR | EMC compliant Standard Keyswitch only |
| 1984-3222-0004 | 1984-2889-0004 1984-1978-000x | KEYBD INTERFACE/ VIDEO ISOLATOR | Standard Keyswitch or Dual Keyswitch (Uses 1984-3223-xxx Dual Keyswitch Cable) |
| 1984-2889-0004 | 1984-1978-000x | KEYBD INTERFACE/ VIDEO ISOLATOR | Standard Keyswitch or Dual Keyswitch |
| 1984-1978-000x | None | CONSOLE/ KEYBOARD INTERFACE | Standard Keyswitch No video isolation |
| 1984-3222-1004 | 1984-2889-1004 | KEYBD INTERFACE/ VIDEO ISOLATOR | Remote Keyswitch (Uses 1984-3267-xxxx Remote Keyswitch Cable) |
| 1984-2889-1004 | None | KEYBD INTERFACE/ VIDEO ISOLATOR | Remote Keyswitch (with pigtail cable) |

Keyboard Interface LEDs

| LED | Color | Meaning |
|-----|--------|--|
| DS1 | Yellow | Flashes when receiving data from the printer interface |
| DS2 | Yellow | Flashes when sending data to the printer interface |
| DS3 | Red | Fuse F1 is blown |

Keyboard Interface Jumper Setting

| Jumper Position | Function |
|------------------------------|--|
| HD2 1-2 12.86↓ | Console software is at revision 12.86 or lower (Not present on 1984-1978-000x) |
| HD2 2-3 12.90↑ | Console software is at revision 12.90 or higher (Not present on 1984-1978-000x) |
| J414 Jumper wire | 1984-3222-1004 only. Standard keyswitch application |
| J414 Dual keyswitch cable | 1984-3222-0004 only. Dual keyswitch application |

Keyboard Interface Fuses

| Part No. | Name on PWA | Fuse | FRSI Part No. | Schurter Part No. | Littelfuse Part No. | Characteristics |
|----------------------------------|---------------------------------|----------|---------------|-------------------|---------------------|-------------------|
| 1984-3222-000x 1984-2889-000x | Keybd Interface/ Video Isolator | F1 | C50382-0021 | MSF 034.4224 | 273002 | 2 A 125 V Plug-In |
| 1984-1978-000x | Console/ Keyboard Interface | F1 F2 | C50382-0021 | MSF 034.4224 | 273002 | 2 A 125 V Plug-In |

Multitube Command Console CRT

Conrac 7241 Components

| Component | FRSI part number | Conrac part number |
|-----------------------------|------------------|--------------------|
| Scan Board (Selectable) | 1984-1651-0018 | 162885-77 |
| BNC (Selectable) | 1984-1651-0033 | 162938-74A |
| Video Processor Board | 1984-1651-0004 | 162838-72 |
| High Voltage Module | 1166-0524-0010 | 106513-6 |
| Low Voltage Regulator Board | 1984-1651-0007 | 162931-71 |
| CRT Socket Board | 1984-1651-0019 | 162921-72 |
| Control Board | 1984-1651-0020 | 162951-71 |

Adaptor Cables for Sony CRTs

| Part No | Model No | Adaptor Cable |
|----------------|----------------------|----------------|
| 1984-3286-000x | CPD-1430 | 1984-3287-9500 |
| 1984-3246-000x | CPD-1304S C-1404S | 1984-3245-0001 |
| 1984-2633-000x | CPD-1304 | 1984-3005-9030 |

Sony Monitor Adjustments

| Control | Function |
|-------------------------------|---|
| AUTO SIZE | Must be set to "ADJ" to enable use of the other controls. |
| H Size (horizontal size) | Used to adjust the horizontal size of the display. |
| H Shift (horizontal shift) | Used to adjust the center of the display horizontally. |
| V Size (vertical size) | Used to adjust the vertical size of the display. |
| V Cent (vertical center) | Used to adjust the center of the display vertically. |

Pedestal Command Console
Keyboard Interface **1984-1782-000x**
..... **1984-1921-000x**

Command Console Key Map

| Key Number | Keyboard | Part Number |
|--------------------|--------------------------------|----------------|
| 1 - 26 32 - 63 | Command Console Entry Keyboard | 1984-1731-000x |
| 64 - 68 | Trackball and Cursor Control | 1984-1779-000x |
| 72 - 87 | Block Configuration | 1984-1776-000x |
| 27 - 31 69 - 71 | Not Used | -- |

Keyboard Interface Parts Replacement

| Part No. | Part Name on PWA | Replaces |
|----------------|-----------------------|----------------|
| 1984-1921-000x | OS KEYBOARD INTERFACE | 1984-1782-000x |
| 1984-1782-000x | OI KEYBOARD INTERFACE | Itself |

Pedestal Command Console CRT
Conrac 7211 1984-1872-000x

Conrac 7211 CRT Components

| Component | Rosemount Part Number | Comment |
|--------------------------------------|------------------------------|-------------------------------|
| Scan Board (15.75 kHz) | 1166-0524-0016 | |
| BNC (Differential) | 1166-0524-0044 | |
| Video Processor Board (Differential) | 1166-0524-0045 | |
| BNC (Single Ended) | 1166-0524-0011 | Replaced by 1984-0524-0044 |
| Video Processor Board (Single Ended) | 1166-0524-0012 | Replaced by 1984-0524-0045 |
| High Voltage Module | 1166-0524-0010 | |
| Low Voltage Regulator Board | 1166-0524-0015 | |
| CRT Socket Board | 1166-0524-0013 | |
| Rectifier and Filter Board | 1166-0524-0014 | |
| Control Board | 1166-0524-0017 | |

Monochrome Video Generator 1981-1002-000x

LEDs for Monochrome Video Generator

| LED | Meaning |
|-----|---|
| DS1 | Card good. No faults detected on the video generator card. Controller processor lights DS1 when power up diagnostics are completed. |
| DS2 | Card fault. DS2 lights if the video generator card fails power up diagnostics. |
| DS3 | Indicates that fuse F1, directing 12 volts to the CRT MONITOR, is bad. |

Monochrome Video Generator Fuse

| Fuse | Rosemount Part No. | Bussman Part No. | Littelfuse Part No. | Characteristics |
|------|--------------------|------------------|---------------------|---------------------|
| F1 | G09140-0032 | MDL 2 | 313002 | 2 A 250 V Slow Blow |

**MiniConsole
Floppy Interface (SCSI) 1984-1053-000x**

LEDs for MiniConsole Floppy Interface (SCSI)

| LED | Meaning |
|------|---|
| DS1 | Card Good. No faults are detected on the card. |
| DS2 | Card Fault. A fault has been detected on the Interface card. |
| DS4 | (Not used) |
| DS5 | (Not used) |
| DS6 | Write Data. The Interface card is writing to one of the Disk Drives. |
| DS7 | Head Load. The read/write head on a disk drive is in the loaded position. |
| DS8 | Read Data. Data is being transmitted from the disk drive to the Interface card. |
| DS9 | Ready. The disk drive is sending a signal that it is ready for use. |
| DS10 | Drive Sel 1. Disk drive number 1 is doing an active command. |
| DS11 | Drive Sel 2. Disk drive number 2 is doing an active command. |
| DS12 | CMD Request. A request for data to or from the drives is awaiting execution. |
| DS13 | CMD Active. The system is currently sending a command for data transfer. |
| DS14 | Retry. System is doing rereads or rewrites because of incomplete data on the first try. |

Floppy Disk Power Supply 1984-1050-000x

Floppy Disk Power Supply Fuses

| Fuse | Rosemount Part No. | Bussman Part No. | Littelfuse Part No. | Characteristics |
|-------------|---------------------------|-------------------------|----------------------------|------------------------|
| F1 | G09140-0011 | MD1 1/4 | - - | 1/4 A 250 V Slow Blow |
| F2 | G09140-0045 | AGC 8 | - - | 8 A 250 V Regular |

Hard Disk Drive

| | |
|-------------------------------|-----------------------|
| IBM Deskstar 540 | 10P5665000x |
| LPS 270S | 10P52800002 |
| LPS 170S | 1984-3500-0002 |
| LPS 105S | 1984-3100-0002 |
| 80S | 1984-2780-0001 |
| Q280 | 1984-2307-0001 |
| Q540 | 1984-1928-0001 |

Warning

The metal frame of the disk drive must not make electrical contact with the mounting frame in the console. Use either the black coated mounting can or use mylar insulating pads between the drive and the yellow can.

Hard Disk Drive Parts Replacement

| Part No. | Replaces | Characteristics |
|-----------------|--|--|
| 10P5665000x | Itself only | 3.5-inch disk IBM Deskstar 540 540 Meg Formatted |
| 10P52800002 | 1984-3500-0002 1984-3100-0002 | 3.5-inch disk Quantum ProDrive LPS 270S 270 Meg Unformatted, Built-in SCSI |
| 1984-3500-0002 | 1984-3100-0002 | 3.5-inch disk Quantum ProDrive LPS 170S 170 Meg Unformatted, Built-in SCSI |
| 1984-3100-0002 | 1984-2780-000x 1984-2307-000x 1984-1928-000x | 3.5-inch disk Quantum ProDrive LPS 105S 102 Meg Formatted |
| 1984-2780-0001 | 1984-2307-000x 1984-1928-000x | 3.5-inch disk Quantum ProDrive 80S 100 Meg Unformatted, 84 Meg Formatted |
| 1984-2307-0001 | 1984-1928-000x | 5.25-inch disk Quantum Q280 100 Meg Unformatted, 80 Meg Formatted |
| 1984-1928-0001 | Itself only | 5.25-inch disk Quantum Q540 40 Meg |

Cable 10P56840001 Inline Fuses Fuses

| Fuse | FRSI Part No. | Bussman Part No. | Littelfuse Part No. | Characteristics |
|---------|---------------|------------------|---------------------|----------------------|
| F1 & F2 | G01940-0046 | AGC 10 | 311010 | 10 A 32 V Regular |

IBM Deskstar 540 Jumpers

| Jumper | Factory Setting |
|--------|-----------------|
| 1 | ON (Jumper) |
| 2 | OFF (No Jumper) |
| 3 | ON (Jumper) |
| 4 | OFF (No Jumper) |
| 5 | ON (Jumper) |
| 6 | ON (Jumper) |
| 7 | ON (Jumper) |
| 8 | OFF (No Jumper) |
| 9 | OFF (No Jumper) |
| 10 | OFF (No Jumper) |
| 11 | OFF (No Jumper) |
| 12 | OFF (No Jumper) |

LPS and 80S Drive Address Jumpers

| Jumper | Factory Setting |
|---------------|------------------------|
| A0 | ON (Jumper) |
| A1 | OFF (No Jumper) |
| A2 | ON (Jumper) |

LPS 105S and 80S Drive Option Jumpers

| Jumper | Purpose | Factory Setting |
|---------------|-----------------------|------------------------|
| WS | Wait Spin Option | OFF (No Jumper) |
| EP | Enable Parity Option | ON (Jumper) |
| SS | Self Seek Test Option | OFF |

Q280 Version 1 Drive Option Jumpers

| Jumper | Purpose | Factory Setting |
|---------------|-----------------------|------------------------|
| WS | Wait Spin Option | OFF (No Jumper) |
| EP | Enable Parity Option | ON (Jumper) |
| SS | Self Seek Test Option | OFF |
| R0 | | OFF |
| R1 | No function | ON |

Q280 Version 2 Drive Option Jumpers

| Jumper | Purpose | Factory Setting |
|---------------|-----------------------|------------------------|
| WS | Wait Spin Option | OFF (No Jumper) |
| EP | Enable Parity Option | ON (Jumper) |
| SS | Self Seek Test Option | OFF |
| P1 | No function | ON |
| P2 | No function | ON |

Q280 Drive Address Jumpers

| Drive Address | Jumper A0 | Jumper A1 | Jumper A2 |
|---------------|-----------|-----------|-----------|
| 0 | OFF | OFF | OFF |
| 1 | ON | OFF | OFF |
| 2 | OFF | ON | OFF |
| 3 | ON | ON | OFF |
| 4 | OFF | OFF | ON |
| 5 | ON | OFF | ON |
| 6 | OFF | ON | ON |
| 7 | ON | ON | ON |

Q540 Drive Jumpers

| Jumper | Setting |
|--------|-----------|
| A-B | ON |
| C-D | No Jumper |
| E-F | No Jumper |
| G-H | No Jumper |
| J-K | ON |
| DG | No Jumper |
| PAR | ON |
| A4 | ON |
| A2 | No Jumper |
| A1 | ON |

Floppy Disk Drive:
3.5-inch 1984-2837-000x

8-Bit Switch Setting

| Switch | Position |
|--------|----------|
| 1 | OFF |
| 2 | OFF |
| 3 | OFF |
| 4 | OFF |
| 5 | ON |
| 6 | ON |
| 7 | ON |
| 8 | ON |

4-Bit Switch Setting

| Switch | Position |
|--------|----------|
| 1 | ON |
| 2 | ON |
| 3 | ON |
| 4 | OFF |

Floppy Disk Drive:

5.25-inch 1984-1803-000x

5.25-Inch Floppy Disk Drive Parts Replacement

| Part No. | Characteristics |
|----------------|--|
| 1984-1803-000x | Kit includes drive and mounting hardware |

| Model | Jumper |
|----------------------|---|
| Panasonic JU475-4AEG | DA, RDY, MS, GX, AX, BX, PH, TM NOTE: TM is removed for drive 2 |
| Panasonic JU475-3AEG | NAX, MDA, BX, 1, OP, TM NOTE: TM is removed for drive 2 |
| Panasonic JU475-2AEG | MS, DA, IX, BX, RD, AX, MX-DS (RIGHT), 1 NOTE: Resistor pack is removed for drive 2 |

Magnetic Tape Drive

| | |
|-----------------------------|-----------------------|
| Tandberg 5623 | 10P5685000x |
| Viper 2150S | 1984-3389-000x |
| Viper 2060S | 1984-3289-000x |
| Scorpion 5945S | 1984-1989-000x |
| Scorpion 5945C | 1984-1927-000x |

Magnetic Tape Drive Parts Replacement

| Part No. | Replaces | Characteristics |
|----------------|--|--|
| 10P5685000x | 1984-3389-000x | Tandberg tape drive with embedded SCSI controller. NOTE: The Tandberg can read tapes written by any of the drives below. Of the drives listed below, only the Viper 2150S can read tapes written by the Tandberg. |
| 1984-3389-000x | 1984-3289-000x 1984-1989-000x 1984-1927-000x | Viper 2150S tape drive with embedded SCSI controller. NOTE: The Viper 2150S can read tapes written by any of the drives below. The drives below CANNOT read tapes written by the Viper 2150S. |
| 1984-3289-000x | 1984-1989-000x 1984-1927-000x | Viper 2060S tape drive with embedded SCSI controller |
| 1984-1989-000x | 1984-1927-000x | Scorpion 5945S tape drive with embedded SCSI controller |
| 1984-1927-000x | None | Scorpion 5945C tape drive with SCSI controller board |

| Drive | Jumper or Switches |
|----------------------------|--|
| Tandberg 5623 | PARITY, 2, and TERMPWR ON |
| Viper 2150S Viper 2060S | BUFFER DISCONNECT SIZE (16K) CF2, CF0, ID2 ON |
| Scorpion 5945S | Switches 3, 5, 8 ON, all others OFF |
| Scorpion 5945C | Switches 1, 3, 5, 8 ON, all others OFF |

Printer:
Fujitsu DPL24C **1984-0510-000x**

Fujitsu DPL24C Printer Switch Settings

| Dip Switch | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|------------|-----|-----|-----|-----|-----|-----|--------------|--------------|
| A | ON | OFF | ON | OFF | OFF | OFF | OFF | ON |
| B | ON | ON | OFF | OFF | OFF | OFF | OFF | OFF |
| C | OFF | OFF | OFF | OFF | OFF | OFF | (Don't care) | (Don't care) |
| D | ON | ON | ON | ON | OFF | ON | OFF | OFF |

Fujitsu DL2600 Printer Paper Thickness

| Paper | Notch |
|-----------------------|--------|
| Single part, 10 pound | 1 or 2 |
| Two part | 2 |
| Three part | 3 |
| Four part | 4 |
| Ribbon removal | D |

☐ **To set up the Fujitsu DL2600 printer:**

1. Hold down ALT and then press SETUP. The display shows "SET-UP MODE" and then "FUNCTION: STYLE".
2. Press ITEM to enter the "style" level.
3. Press SELECT to display each of the items listed below. When the correct item is displayed, press ITEM to enter it in memory.

Fujitsu DL2600 Printer Setup

| Item | Value | | Item | Value |
|----------|----------|--|----------|-----------|
| PPR OUT: | DETECT * | | COLOR: | AUTOSEL * |
| LF-CODE: | LF ONLY | | LINE SP: | 6 LPI * |
| BUZZER: | ON * | | PRF SKP: | NO * |
| QUALITY: | DRAFT | | OFFSET: | 0 * |
| ATTRIB: | NONE * | | CR-CODE: | CR ONLY * |
| CHAR SP: | 10 CPI * | | PRT-DIR: | BI-DIR * |

* indicates a factory setting

4. Press FUNCTION until "FUNCTION: INTERFACE" is displayed. Press ITEM to enter the "function" level.
5. Press SELECT to display each of the items listed below. When the correct item is displayed, press ITEM to enter it in memory.

Fujitsu DL2600 Printer Setup

| Item | Value | | Item | Value |
|----------|---------|--|----------|---------|
| TYPE: | SERIAL | | PROTOCL: | XON/XOF |
| WORD LG: | 8 BIT | | DUPLEX: | FULL |
| FORMAT: | 8NONE 1 | | CONTROL: | 3 WIRE |
| BAUD RT: | 4800 | | | |

6. Press FUNCTION until "FUNCTION SAVE" is displayed. Press ITEM to have the printer save the selected options in nonvolatile memory.
7. Press ONLINE to resume normal operation.

Printer:**Fujitsu DL3800 1984-3318-000x**

 To set up the Fujitsu DL 3800 printer:

1. Have continuous form paper loaded. The setup procedure will require several sheets.
2. Put the printer in setup mode:
Put the printer off-line (press ONLINE until the ONLINE light goes out). Press both the FONT and MENU buttons until the printer beeps.

-or-
Turn the printer off. Press both the FONT and MENU buttons. Turn the printer on. The printer will beep.
3. The printer will print a header describing the setup procedure, a Help menu, and the <<FUNCTION>> menu. The red cursor on the print guide is positioned at the SAVE&END function.
4. Press LOCK to move the cursor to the MENU1 function. Press FONT to select it. The printer will print the first item in the menu and the options for the item.
5. The cursor will stop at the option currently stored in memory. This option will have a short underline on the paper. Use LOCK to move the cursor to the desired option.
6. Use FONT to select the option. When an option is selected it is completely underlined. The next item in the menu is then printed.
7. Set MENU1 to the options shown below.
8. Press ONLINE to return to the <<FUNCTION>> menu. Press LOCK to position the cursor at MENU2. Press FONT to select MENU2. Set the options in MENU2 as shown below.

Fujitsu DL3800 Printer MENU1 and MENU 2 Options

| Item | Option | | Item | Option |
|---------|---------|--|----------|----------|
| EMULATE | DPL24+ | | TOP-MRG | 1 LINE |
| FONT | COUR10 | | LANGUAGE | PAGE 437 |
| QUALITY | DRAFT | | CHR-SET | SET 2 |
| PITCH | 10 CPI | | PRF-SKP | NO SKIP |
| LINE SP | 6 LPI | | WIDTH | 13.6 IN |
| CHAR-W | NORMAL | | ZEROFNT | NO-SLSH |
| CHAR-H | NORMAL | | DC3-CDE | ENABLE |
| ATTRIB | NONE | | CR-CODE | CR ONLY |
| PAGE LG | 11.0 IN | | LF-CODE | LF ONLY |
| COLOR | AUTOSEL | | RGHTEND | WRAP |
| LFT-END | 1 COLM | | | |

- Continued -

- 9. Press ONLINE to return to the <<FUNCTION>> menu. Press LOCK to position the cursor at HARDWARE and press FONT to select it. Set options in the HARDWARE menu as shown below.

Fujitsu DL3800 Printer HARDWARE Menu Options

| Item | Option | Item | Option |
|---------|--|---------|----------|
| PPR-OUT | CNTOONLY | INTRFCE | SERIAL |
| PRT-DIR | BI-DIR | FORMAT | 8NONE1 |
| BUZZER | ON | BAUE-RT | 4800 |
| WORD-LG | 8-BIT | PROTOCL | XON/XOFF |
| BUFFER | 8KB NOTE: Do not use a buffer size larger than 8 kB. | DSR | IGNORE |
| FEEDER | REAR | DUPLEX | FULL |

- 10. Press ONLINE to return to the <<FUNCTION>> menu. Press LOCK to position the cursor at SAVE&END and press LOCK to select it. The configuration will be saved in memory. The printer will be in ONLINE mode, ready for use.
- 11. The printout is a record of the configuration. Selected options have full underlines. Options that were changed have a partial underline at the original value.

Printer:
Fujitsu DL4600 1984-0543-000x

To set up the Fujitsu DL4600 printer:

1. Press "NEXT DISPLAY" until "enter setup" appears in the display window. Press F1, "Menu 1" appears in the display window. Scroll through the options and verify the settings shown below. Scroll with F2. Change options with F3.
2. Press F1, "Menu 2" appears in the display window. Scroll through the options and verify the settings. Menu 2 must be identical to Menu 1.

Fujitsu DL4600 Printer Setup

| Menu Item | Value | Menu Item | Value |
|-----------|---------|-----------|----------|
| EMULATE | DPL24C | TOP-MRG | 1 LINE |
| FONT | COUR10 | LANGUAGE | USA |
| QUALITY | DRAFT | CHR-SET | SET 2 |
| PITCH | 10 CPI | PRT-SKIP | NO-SKIP |
| LINE SP | 6 LPI | WIDTH | 13.6 IN |
| CHAR-W | NORMAL | ZEROFNT | NO-SLASH |
| CHAR-H | NORMAL | DC3-CDE | ENABLE |
| ATTRIB | NONE | CR-CODE | CR ONLY |
| PAGE LG | 11.0 IN | LF-CODE | LF ONLY |
| COLOR | AUTOSEL | RGHTEND | WRAP |
| LFT-END | 1 COLM | =END= | |

3. Press F1 until “Hardware Features” appears in the display window. Scroll through the options and verify the settings shown below. Scroll with F2. Change options with F3.

Fujitsu DL4600 Printer Setup

| Menu Item | Value | | Menu Item | Value |
|-----------|---|--|-----------|----------|
| SensePE | REAR | | FORMAT | 8 NONE 1 |
| PRT-DIR | BI-DIR | | BAUD-RT | 4800 |
| BUZZER | ON | | PROTOCOL | XON/XOF |
| WORD-LG | 8 BIT | | DSR | IGNORE |
| BUFFER | 8 KB NOTE: Do not use a buffer size larger than 8 KB. | | DUPLEX | FULL |
| FEEDER | REAR | | =END= | |
| INTRFCE | SERIAL | | | |

4. Press F1 until “Save” appears in the display window. Press F3 to save the configuration.
5. Press F1 until “Func LIST” appears. Press F3 to print the option lists. Verify the printed lists.
6. Press F1 until “Self Test” appears in the display window. Press F3 to start the test, press F2 to stop it after about 30 seconds. Press F1 to exit the self test.
7. Press the “ON LINE” button to resume normal operation.

Printer:
Texas Instruments 810 1984-0317-000x

TI 810 Processor Board Jumpers

| Jumpers | Setting |
|----------------|----------------|
| E1-E2-E3 | E2-E3 |
| E4-E5-E6 | E5-E6 |
| E7-E8-E9 | E8-E9 |
| E10-E11-E12 | E11-E12 |
| E13-E14-E15 | E13-E14 |
| E16-E17-E18 | E17-E18 |
| E19-E20-E21 | OPEN |
| E22-E23-E24 | OPEN |

TI 810 Printer Motherboard Jumpers

| Jumpers | Setting |
|----------------|----------------|
| E1-E2 | JUMPERED |
| E3-E4 | JUMPERED |
| E11-E12-E13 | E11-E12 |

TI 810 Printer Baud Rate (Pencil) Switches

| Switch | Setting | Switch | Setting |
|--------|---------|--------|---------|
| 1 | ON | 5 | OFF |
| 2 | OFF | 6 | ON |
| 3 | ON | 7 | ON |
| 4 | OFF | | |

TI 810 Printer Voltage Checks

| Test Point | Voltage | Tolerance |
|------------|---------|-----------|
| E4 | +12 VDC | ± .6 VDC |
| E5 | -12 VDC | ± .6 VDC |
| E6 | +8 VDC | ± 1 VDC |
| E7 | -75 VDC | ± 15 VDC |
| E8 | -5 VDC | ± .25 VDC |
| E9 | +30 VDC | ± 10 VDC |
| E10 | +5 VDC | ± .05 VDC |

Alarm Output Board 1984-0744-000x

Alarm Output Board Fuses

| Fuse | Rosemount Part No. | Bussman Part No. | Characteristics |
|-------------|-------------------------------|-----------------------------|------------------------|
| F1 F2 | G09140-0029 | MDQ-1-1/2 | 1.5 A 250 V Slow Blow |

PeerWay Interface 1984-1045-000x

LEDs for PeerWay Interface

| LED | Meaning |
|------|--|
| DS1 | Card Good: No faults are detected on the card. |
| DS2 | Card fault: A fault has been detected in the communication link. |
| DS4 | PW Tap ST A: The Timer in tap A has timed out. |
| DS5 | PW Tap ST B: The Timer in tap B has timed out. |
| DS6 | RTS: Ready to send generated from the PeerWay Interface. |
| DS7 | Bus Active: The PeerWay Interface is receiving data. |
| DS8 | A Active: The Interface is using the A PeerWay. |
| DS9 | B Active: The Interface is using the B PeerWay. |
| DS10 | CMD Active: Command active. The software is actively executing a command on the Interface Board. |

PeerWay Interface Test Points

| Test Point | Function |
|------------|----------------------------|
| TP1 | +5 V Isolated DC for Tap A |
| TP2 | A return |
| TP3 | +5 V Isolated DC for Tap B |
| TP4 | B return |

To set the jumpers for an address on PeerWay 1, set the jumpers so:

$$\text{node address} = (\text{Sum of jumpers}) + 2$$

To set the jumpers for use on PeerWay "P":

$$\text{Jumper setting} = (\text{Node Number}) - 32(P-1)$$

PeerWay Interface Jumper Values

| Jumper | Value at 1-2 | Value at 2-3 |
|---------------|---------------------|---------------------|
| HD1 | 2 | 0 |
| HD2 | 4 | 0 |
| HD3 | 8 | 0 |
| HD4 | 16 | 0 |

OI Power Supply 1984-1137-000x

OI Power Supply Parts Replacement

| Part No. | Replaces | Characteristics | Comment |
|----------------|----------------|---|---------------------------------|
| 1984-1137-000x | 1984-1017-000x | 24 V or 30 VDC Input. 12 V Output 3 Amps 5 V Output 20 Amps | Replaces any 1984-1017-000x. |
| 1984-1017-000x | | 30 VDC Input. 12 V Output 2 Amps 5 V Output 11 Amps | |

OI Power Supply LEDs

| LED | Meaning |
|-----|---|
| DS1 | Card Good: Comparators are within tolerance. |
| DS2 | Card fault: +5V or +12V comparator has sensed voltage out of tolerance. |
| DS3 | Fuse F1 is bad: Regulator. |
| DS4 | Fuse F2 is bad: Fan. |
| DS6 | +5V Good: The +5V comparator is within tolerance. |
| DS7 | +12V Good: The +12V comparator is within tolerance. |
| DS8 | +30V Bus A Good: The 30VDC A power bus is within tolerance. |
| DS9 | +30V Bus B Good: The 30VDC B power bus is within tolerance. |

OI Power Supply Test Points

| Test Point | Function |
|--------------------------|---------------------------|
| TP1-TP2 (Violet - Gray) | Isolated +9V A and Return |
| TP3-TP4 (Violet - Gray) | Isolated +9V B and Return |
| TP5-TP6 (Yellow - Brown) | +5 V and Return |
| TP7-TP8 (Red - Brown) | +12 V and Return |

OI Power Supply Jumper Settings

| Jumper HD1 Position | Input Voltage |
|---------------------|---------------|
| 1-2 | 30 VDC |
| 2-3 | 24 VDC |

OI Power Supply Fuses

| Card | Fuse | FRSI Part No. | Bussman Part No. | Littelfuse Part No. | Characteristics |
|----------------|------|---------------|------------------|---------------------|---------------------|
| 1984-1137-000x | F1 | G09140-0047 | AGC 15 | 311015 | 15 A 32 V Regular |
| | F2 | G09140-0023 | MDQ 1 | 313001 | 1 A 250 V Slow Blow |
| 1984-1017-000x | F1 | G09140-0044 | AGC 7-1/2 | 31107.5 | 7.5 A 32 V Regular |
| | F2 | G09140-0023 | MDQ 1 | 313001 | 1 A 250 V Slow Blow |

OI Processor

| | |
|-----------------------|-----------------------|
| OI 68040 | 10P5527001x |
| ..... | 1984-3202-0010 |
| OI 68020 | 1984-1540-0009 |
| ..... | 1984-1161-0009 |
| OI 68000 | 10P57140008 |
| ..... | 1984-2759-0008 |
| ..... | 1984-2137-0008 |
| ..... | 1984-2122-0007 |
| ..... | 1984-2120-0008 |
| ..... | 1984-2107-0005 |
| ..... | 1984-1061-0005 |

OI Processor Replacement Data

| Part No. | Replaces | RAM | Used In | PWA Marked |
|----------------------------------|------------------------------------|--------|--------------------------------|---|
| 10P55270011 | -- | 16 Meg | SMS | OI PROCESSOR V |
| 10P55270010 | 1984-3202-0010 | 16 Meg | MTCC | OI PROCESSOR V |
| 1984-3202-0010 | 1984-1540-0009* 1984-1161-0009* | 16 Meg | MTCC | OI PROCESSOR V |
| 1984-1540-0009 1984-1161-0009 | All below* | 4 Meg | MTCC HIA SCI | OI PROCESSOR 68020 W/ASIC OI PROCESSOR 68020 |
| 10P57140008 | 1984-2759-0008 | 2 Meg | MC CC MTCC HIA SCI | OI PROCESSOR III |
| 1984-2759-0008 | All below | 2 Meg | MC CC MTCC HIA SCI | OI PROCESSOR III |

* Use of this processor requires pixel graphics and may require changing software.

(continued on next page)

OI Processor Replacement Data (continued)

| Part No. | Replaces | RAM | Used In | PWA Marked |
|----------------|----------------------------------|------------|---------------------------------------|-----------------------|
| 1984-2137-0008 | All below | 1 Meg | MC BCC CC MTCC HIA SCI | OI PROCESSOR 1 MEG |
| 1984-2122-0007 | All below | 1 Meg | BCC CC | OI PROCESSOR 1 MEG |
| 1984-2120-0008 | 1984-2107-00051 984-1061-0005 | 1/2 Meg | MC BCC | OI PROCESSOR |
| 1984-2107-0005 | 1984-1061-0005 | 1/2 Meg | MC BCC | OI PROCESSOR |
| 1984-1061-0005 | | 1/2 Meg | MC BCC | OI PROCESSOR |

* Use of this processor requires pixel graphics and may require changing software.

OI Processor:
68040 **10P5527001x**
 **1984-3202-0010**

OI Processor 68040 LEDs

| LED | Meaning |
|------------|--|
| DS1 | Card Good: No faults are detected on the card. |
| DS2 | Card Fault: A fault has been detected on the Processor Card. |
| DS6 | Display Active: Processor is updating Video Generator RAM. |
| DS7 | Keyboard Active: Processor is operating on an instruction from a keyboard. |
| DS8 | Controller I/O: Processor is working on a data update from a Controller. |

OI Processor 68040 Jumper Positions

| Jumper | Position 1-2 | Position 2-3 |
|---------------|---------------------|---------------------|
| HD1 | Not used | Hard wired |
| HD2 | Not used | Hard wired |
| HD3 | PeerWay Boot | Disk Boot (Normal) |
| HD4 | Not used | Hard wired |
| HD5 | Not used | Hard wired |
| HD6 | Not used | Hard wired |

OI Processor:

68020 **1984-1540-0009**
 **1984-1161-0009**

OI Processor 68020 LEDs

| LED | Meaning |
|------------|--|
| DS1 | Card Good: No faults are detected on the card. |
| DS2 | Card Fault: A fault has been detected on the Processor Card. |
| DS6 | Display Active: Processor is updating Video Generator RAM. |
| DS7 | Keyboard Active: Processor is operating on an instruction from a keyboard. |
| DS8 | Controller I/O: Processor is working on a data update from a Controller. |

OI Processor 68020 Jumper Positions

| Jumper | Position 1-2 | Position 2-3 |
|---------------|---------------------|---------------------|
| HD3 | PeerWay Boot | Disk Boot (Normal) |
| HD4 | Not used | Factory set |
| HD5 | Not used | Factory set |

OI Processor:

| | |
|-----------------------|-----------------------|
| OI 68000 | 10P57140008 |
| ..... | 1984-2759-0008 |
| ..... | 1984-2137-0008 |
| ..... | 1984-2122-0007 |
| ..... | 1984-2120-0008 |
| ..... | 1984-2107-0005 |
| ..... | 1984-1061-0005 |

OI Processor 68000 LEDs

| LED | Meaning |
|-----|--|
| DS1 | Card Good: No faults are detected on the card. |
| DS2 | Card Fault: A fault has been detected on the Processor Card. |
| DS3 | Ext Loop Sel 30V Fuse: Fuse F1 is bad. |
| DS4 | Fuse Blown: 5V Keyboard fuse blown. |
| DS6 | Display Active: Processor is updating Video Generator RAM. |
| DS7 | Keyboard Active: Processor is operating on a keyboard instruction. |
| DS8 | Controller I/O: Processor is working on a data update from a Controller. |

OI Processor 68000 Jumper Positions

| Card | Jumper HD2 Position 2-3 | Jumper HD2 Position 1-2 |
|--|----------------------------------|-------------------------|
| 10P57140008 1984-2759-0008 | No movable Jumpers | No movable Jumpers |
| 1984-2137-0008 1984-2122-0007 1984-2120-0008 1984-2107-0005 1984-1061-0005 | 256K EPROM installed (Normal) | 128K EPROM installed |

OI Processor 68000 Fuses

| Fuse | FRSI Part No. | Bussman Part No. | Littelfuse Part No. | Characteristics |
|------|---------------|------------------|---------------------|--------------------|
| F1 | G09140-0036 | MDL-3 | 313003 | 3A 250 V Slow Blow |
| F2 | G09140-0041 | MDL-5 | 312005 | 5 A 250 V Regular |

Pixel Graphics Video Generator 10P58900001
 1984-2503-0001

Pixel Graphics Video Generator LEDs

| LED | Meaning |
|------------------|---|
| DS1 (Green) | No faults are detected on the card. DS1 lights when the OI Processor completes power up diagnostics. |
| DS2 (Red) | The Pixel Graphics Video Generator has a fault. |
| DS8 (Yellow) | The Graphics Processor on the Pixel Graphics Video Generator is executing commands. DS8 lights when the CRT screen is periodically updated. |
| DS9 (Yellow) | The specific area of memory where commands are stored is being used. When the Graphics Processor is finished executing commands, DS9 goes out and the command area can be accessed. |
| DS10 (Yellow) | The memory bus is in use. DS10 lights when the OI Processor is reading into or writing from the Pixel Graphics Video Generator memory. |
| DS11 (Yellow) | Text fields on the CRT screen are being updated. DS11 goes out after the fields are updated. |
| DS12 (Yellow) | Horizontal sync. Under normal operation, DS12 blinks at a regular rate. |

Character Graphics Video Generator 1984-1064-0001

Character Graphics Video Generator LEDs

| LED | Meaning |
|------------------|--|
| DS1 (Green) | No faults are detected on the card. DS1 lights when the OI Processor completes power up diagnostics. |
| DS2 (Red) | Card fault. DS2 lights if the Video Generator Card does not pass power up diagnostics. |
| DS3 (Red) | Not used. |
| DS6 (Yellow) | Page 0 is active. Page 0 and page 1 store information for the CRT display. Depending on the amount of screen information, either DS6 or DS7 lights, or both DS6 and DS7 light. |
| DS7 (Yellow) | Page 1 is active. Page 0 and page 1 store information for the CRT display. Depending on the amount of screen information, either DS6 or DS7 lights, or both DS6 and DS7 light. |
| DS8 (Yellow) | Hardware alarm contact. The signal sent to light DS8 has also been sent to open or close the hardware alarm contact. |
| DS9 (Yellow) | Process alarm contact. The signal sent to light DS9 has also been sent to open or close the process alarm contact. |
| DS10 (Yellow) | Diagnostic routine is in progress during a power up procedure. |
| DS11 (Yellow) | Screen blank is active. On a normally functioning Character Graphics Video Generator Card, DS11 shows a slight but constant flicker. |

Character Graphics Video Generator Fuse

| Fuse | Rosemount Part No. | Bussman Part No. | Littelfuse Part No. | Characteristics |
|------|--------------------|------------------|---------------------|--------------------|
| F1 | G09140-0032 | MDL-2 | 312002 | 2A 250 V slow blow |

Printer Interface 1984-1011-000x

Printer Interface Parts Replacement

| Part No. | Replaces | Characteristics |
|----------------------------------|----------------------------------|---|
| 1984-1011-0001 1984-1011-0002 | | No RS-422 Interface |
| 1984-1011-0003 1984-1011-0004 | 1984-1011-0001 1984-1011-0002 | RS-422 Interface for Multitube Consoles |

Printer Interface Card -0001, -0002 (without RS-422 interface) LEDs

| LED | Meaning |
|------------|--|
| DS1 | Card good. No faults are detected on the card. |
| DS2 | Card fault. A fault has been detected in the communication link. |
| DS8 | TXD. Indicates data being transmitted to the printer. |
| DS9 | CTS. Clear To Send. Printer is connected and ready to accept data. |
| DS10 | NV Write. The nonvolatile RAM is being written. |
| DS11 | Clock. A one-second pulse that the RTC is running. |
| DS12 | Software Clock. The internal software clock of the console is running. |

Printer Interface Card -0003, -0004 (with RS-422 interface) LEDs

| LED | Meaning |
|------------|--|
| DS1 | Card good. No faults are detected on the card. |
| DS2 | Card fault. A fault has been detected in the communication link. |
| DS6 | TXD A. Indicates data being transmitted to the keyboard. |
| DS7 | CTS A. Clear To Send. Keyboard is connected and ready to accept data. |
| DS8 | TXD B. Indicates data being transmitted to the printer. |
| DS9 | CTS B. Clear To Send. Printer is connected and ready to accept data. |
| DS10 | NV Write. The nonvolatile RAM is being written. |
| DS11 | Clock. A one-second pulse that the RTC is running. |
| DS12 | Software Clock. The internal software clock of the console is running. |

Printer Interface Jumpers

| Jumper | Position | Function |
|---------------|-----------------|--|
| HD10 | 1-2 | Clock battery connected (Operating position) |
| | 2-3 | Clock battery disconnected (Storage position) |
| HD1-HD6 | M | Configured as Modem (Normal position) |
| HD7-HD9 | N | Test disabled (Normal position) |

SCSI (Small Computer System Interface) 1984-3301-0001
..... 1984-1140-0001

SCSI Card Parts Replacement

| Part No | Replaces | Characteristics |
|----------------|--|--|
| 1984-3301-0001 | 1984-1140-000x NOTE: You cannot mix -3301 and -1140 boards in a MultiTube console. | Requires OI 68020 or 68040 Processor with boot ROM at least 9.xx (68020) or 10.xx (68040). |
| 1984-1140-000x | Itself only | Cannot be used with a -1140 board in a MultiTube console. |

NOTE: With a disk-only console, SCSI termination is required. Use 1984-3301-0001 with the proper termination jumper settings, or use 1984-1140-0003, which has termination resistors.

SCSI Card LEDs

| LED | Meaning |
|------------------|--|
| DS1 (Green) | No faults are detected on the card. DS1 lights when the card has passed power up diagnostics. |
| DS2 (Red) | A fault has been detected on the card. DS2 lights when the card has failed power up diagnostics. |
| DS6 (Yellow) | SCSI bus is busy. DS6 is a hardware driven LED and will flicker under normal operation. |
| DS7 (Yellow) | Message or status information is being transferred on the SCSI bus. DS7 is driven by the target device and will flicker under normal operation. A steady ON indicates the bus is locked. |
| DS8 (Yellow) | Indicates data is being transferred to the tape or drive. DS8 is driven by a target device and will flicker under normal operation. A steady ON indicates the bus is locked. |
| DS9 (Yellow) | Indicates messages or commands are being transferred on the SCSI bus. DS9 is driven by a target device and will flicker under normal operation. A steady ON indicates the bus is locked. |
| DS10 (Yellow) | Direct memory access request. Indicates a data transfer between the disk or tape and SCSI Interface card. |

(continued on next page)

SCSI Card LEDs (continued)

| LED | Meaning |
|------------------|---|
| DS12 (Yellow) | Hard disk access. A command is being issued to the hard disk. |
| DS13 (Yellow) | Indicates a command is being issued to the tape drive. DS13 will blink every second as the tape drive is monitored for tape insertion or removal. |
| DS14 (Yellow) | Indicates cache memory on the SCSI board is being accessed. The most recently used disk sectors are stored in cache memory. |

SCSI Board 2 (1984-3301-0001) ID Jumper Setting

| SCSI Device ID | Put Jumper On | Used For |
|-----------------------|----------------------|-----------------|
| 0 | HD0 | Card Cage A |
| 1 | HD1 | Card Cage B |
| 2 | HD2 | Card Cage C |

SCSI Board 2 (1984-3301-0001) Bus Terminal Jumper Setting

| HD3 | Action |
|------------|-----------------------------|
| 1-2 | Enabled (disk-only console) |
| 2-3 | Disabled (Normal setting) |

OI SCSI Host Adapter (1984-1140-0001) Device ID Jumper

| SCSI Device ID | Put Jumper On | Used For |
|----------------|---------------|---|
| 0 | HD1 | Card Cage A |
| 1 | HD2 | Card Cage B or Command Console |
| 2 | HD3 | Card Cage C |
| 3-7 | HD4-HD8 | These device IDs are not used in Console Card Cages |

OI SCSI Host Adapter (1984-1140-0001) Address Jumpers

| SCSI Bus Address | HD9 | HD10 | HD11 | Used For |
|------------------|-----|------|------|--------------------------------|
| 0 | 2-3 | 2-3 | 2-3 | Card Cage A |
| 1 | 2-3 | 2-3 | 1-2 | Card Cage B or Command Console |
| 2 | 2-3 | 1-2 | 2-3 | Card Cage C |
| 3 | 2-3 | 1-2 | 1-2 | Not used |
| 4 | 1-2 | 2-3 | 2-3 | Not used |
| 5 | 1-2 | 2-3 | 1-2 | Not used |
| 6 | 1-2 | 1-2 | 2-3 | Not used |
| 7 | 1-2 | 1-2 | 1-2 | Not used |

OI Nonvolatile Memory

- OI NV RAM** **1984-1547-000x**
- OI Bubble** **1984-1147-000x**
- OI Bubble SC** **1984-1167-000x**

OI NV Memory Replacement Data

| Part No. | Replaces | Characteristics |
|-------------------------|----------------------------------|---|
| 1984-1547-0001 -0002 | 1984-1147-000x 1984-1167-000x | 256K RAM Memory -0001 has X.25 -0002 has X.25 disabled |
| 1984-1547-0003 -0004 | 1984-1147-000x 1984-1167-000x | 512K RAM Memory -0003 has X.25 -0004 has X.25 disabled |
| 1984-1167-0001 -0002 | 1984-1147-000x | 256K Bubble Memory -0001 has X.25 -0002 has X.25 disabled |
| 1984-1147-000x | - | Original 256K Bubble Memory Does not have X.25 capability |

OI Bubble Memory **1984-1147-000x**
 **1984-1167-000x**

OI Bubble Memory LEDs

| LED | Meaning |
|------------------|--|
| DS1 (Green) | No faults are detected on the card. DS1 lights when the card has passed power up diagnostics. |
| DS2 (Red) | A fault has been detected on the card. DS2 lights when the card has failed power up diagnostics. |
| DS6 (Yellow) | TXD for RS-422 channel. |
| DS7 (Yellow) | RXD for RS-422 channel. |
| DS8 (Yellow) | CTS for RS-422 channel. |
| DS9 (Yellow) | RXD for RS-232 channel. |
| DS10 (Yellow) | CTS for RS-232 channel. |
| DS11 (Yellow) | TXD for RS-232 channel. |
| DS12 (Yellow) | Status LED 1: Operation: Program Access Power-up Test: Low order bit of test number. |
| DS13 (Yellow) | Status LED 2: Operation: Writing to the Bubble. Power-up Test: Middle bit of test number. |
| DS14 (Yellow) | Status LED 3: Operation: Reading from the Bubble. Power-up Test: High order bit of test number. |

OI Bubble LED Sequences

| Status LEDs (DS12, 13, 14) | Failed Test |
|-------------------------------|-------------------------------------|
| -- OFF OFF | Unable to initialize. |
| -- OFF ON | Write failure. |
| -- ON OFF | Read failure. |
| -- ON ON | Read or write failure. |
| ON ON ON | Both 30 VDC power supplies are bad. |

OI Bubble Jumpers

| Jumper | Value | Purpose |
|-----------------|-------|--------------------------------------|
| HD1 (BATT) | ON | Real Time Clock battery connected |
| | OFF | Real Time Clock battery disconnected |
| HD2 (BOOT SWAP) | T | No longer used by software |
| | N | No longer used by software |
| HD3 (SYNC) | 1-2 | Bubble test (Factory use only) |
| | 2-3 | Normal operation |
| HD4 (CS1) | 1-2 | Bubble test (Factory use only) |

(continued on next page)

OI Bubble Jumpers (continued)

| Jumper | Value | Purpose |
|--------------------|----------|---|
| | 2-3 | Normal operation |
| HD5 (SYNC) | 1-2 | Bubble test (Factory use only) |
| | 2-3 | Normal operation |
| HD6 (CS2) | 1-2 | Bubble test (Factory use only) |
| | 2-3 | Normal operation |
| HD7, HD10 | N | Normal Communications (RS-232) |
| | T | Communications Loopback Test(RS-232) |
| HD8, 9, 11, 12, 13 | M | Function as a Modem (RS-232) |
| | T | Function as a Terminal (RS-232) |
| HD14 | - | Not Used |
| HD15, 16, 17, 18 | T | Communications Loopback Test (RS-422) |
| | N | Normal Communications (RS-422) |
| HD19 | DOWNLOAD | Address this board as Secondary (See text) |
| | NORMAL | Address this board as Primary (See text) |
| HD20 | M | Function as a Modem (RS-422) |
| | T | Function as a Terminal (RS-422) |
| HD21 | T | Function as a Terminal (RS-422) |
| | M | Function as a Modem (RS-422) |

OI NV RAM 1984-1547-000x**OI NV RAM LEDs**

| LED | Meaning |
|------------------|--|
| DS1 (Green) | No faults are detected on the card. DS1 lights when the card has passed power up diagnostics. |
| DS2 (Red) | A fault has been detected on the card. DS2 lights when the card has failed power up diagnostics. |
| DS4 (Yellow) | Battery 1 is low. Replace both batteries (battery 1 first). |
| DS5 (Yellow) | Battery 2 is low. Replace both batteries (battery 2 first). |
| DS6 (Yellow) | TXD for RS-422 channel. |
| DS7 (Yellow) | RXD for RS-422 channel. |
| DS8 (Yellow) | CTS for RS-422 channel. |
| DS9 (Yellow) | RXD for RS-232 channel. |
| DS10 (Yellow) | CTS for RS-232 channel. |
| DS11 (Yellow) | TXD for RS-232 channel. |
| DS12 (Yellow) | Status LED 1: Operation: Program Access Power-up Test: Low order bit of test number. |
| DS13 (Yellow) | Status LED 2: Operation: Writing to the Bubble. Power-up Test: Middle bit of test number. |
| DS14 (Yellow) | Status LED 3: Operation: Reading from the Bubble. Power-up Test: High order bit of test number. |

OI NV VAM LED Sequences

| Status LEDs (DS12, 13, 14) | Meaning |
|-------------------------------|---|
| OFF ON ON | Failure in read/write tests of RAM. |
| ON ON ON | Bad program length, failed SCI image checksum, or both 30 VDC power supplies are bad. |

OI NV RAM Memory Test Points

| Test Point | Color | Purpose |
|------------|--------|-----------------------------|
| TP1 +5V1 | Yellow | RS-422 isolated +5 V supply |
| TP2 IG1 | Gray | RS-422 isolated ground |
| TP3 +5V2 | Yellow | RS-232 isolated +5 V supply |
| TP4 IG2 | Gray | RS-232 isolated ground |
| TP5 +9V | Purple | Comparator supply |
| TP6 B1C | White | Battery 1 current |
| TP7 B2C | Green | Battery 2 current |
| TP8 B1V | White | Battery 1 voltage |
| TP9 B2V | Green | Battery 2 voltage |
| TP10 GND | Brown | Logic ground |

OI NV RAM Jumpers

| Jumper | Value | Purpose |
|--------------|-------|------------------------|
| HD1 (BATT 1) | ON | Battery 1 Connected |
| | OFF | Battery 1 Disconnected |
| HD2 (BATT 2) | ON | Battery 2 Connected |
| | OFF | Battery 2 Disconnected |

(continued on next page)

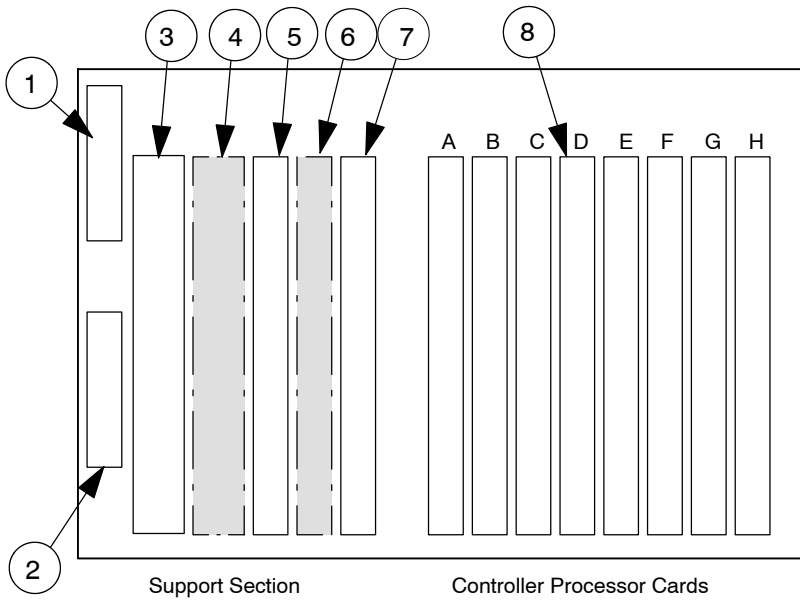
OI NV RAM Jumpers (continued)

| Jumper | Value | Purpose |
|--------------------------|-----------|---|
| HD3 (RTCPWR) | BAT&PS | Hardwired |
| | PS ONLY | |
| HD4 (NVM SIZE) | 512 KB | Hardwired for number of RAM chips used |
| | 256KB | Hardwired for number of RAM chips used |
| HD5 (PEERWAY BOOT) | PWAY | Force PeerWay boot |
| | NORM | Normal operation |
| HD7, HD10 | R | Run Normal Communications (RS-232) |
| | L | Communications Loopback Test (RS-232) |
| HD8, 9, 11, 12, 13 | M | Function as a Modem (RS-232) (Remove for Loopback Test) |
| | T | Function as a Terminal (RS-232) (Remove for Loopback Test) |
| HD15, 16, 17, 18 | L | Communications Loopback Test (RS-422) |
| | R | Run Normal Communications (RS-422) |
| HD19 (BD ADDR DECODE) | SECONDARY | Address this board as Secondary (See text) |
| | PRIMARY | Address this board as Primary (See text) |
| HD20 | M | Function as a Modem (RS-422) |
| | T | Function as a Terminal (RS-422) (Hardwired for non-X.25 operation) |
| HD21 | M | Function as a Modem (RS-422) (Hardwired for non-X.25 operation) |
| | T | Function as a Terminal (RS-422) |

Section 6: ControlFiles

| | |
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| Controller Processor: | |
| MLC | |
| SSC | |
| MUX and PLC | 6-32 |

ControlFile Card Cage **10P52960001**
 **1984-3048-000x**
 **1984-0023-000x**



ControlFile Cards

| Item | Card | Item | Card |
|------|-----------------------------------|------|--|
| 1 | PeerWay Buffer A | 5 | Coordinator Processor (CP) |
| 2 | PeerWay Buffer B | 6 | Redundant Coordinator Processor (optional) |
| 3 | Power Regulator | 7 | Nonvolatile Memory |
| 4 | Second Power Regulator (optional) | 8 | Controller Processor A-H NOTE: Redundant processors must be installed in adjacent slots (AB, CD, EF, GH) |

NOTE: 10P52960001 is EMC (CE) compliant and has built-in data bus terminators.

ControlFile Address Jumper Values

| Jumper | Value at H | Value at L |
|---------------|-------------------|-------------------|
| 5 | 16 | 0 |
| 4 | 8 | 0 |
| 3 | 4 | 0 |
| 2 | 2 | 0 |
| 1 | 1 | 0 |

NOTE: The Node Address is the sum of the jumpers plus 1.

PeerWay Buffer **1984-1502-000x**
 **1984-1402-000x**

Parts Replacement for PeerWay Buffer

| Part No. | Replaces | Characteristics |
|----------------|----------------|------------------------------------|
| 1984-1502-000x | 1984-1402-000x | Marked "PEERWAY BUFFER" on the PWA |
| 1984-1402-000x | | No name marked on the PWA |

PeerWay Buffer LEDs

| LED | Meaning and Response |
|--------------------|---|
| RTS (DS7) | Request-To-Send signal active; enables transmission on PeerWay. |
| TXD (DS6) | Transmitting to the PeerWay. |
| BUS ACTIVE (DS5) | Card active; Data is being transmitted or received through the Coordinator Processor. |
| +5 V FAULT (DS4) | PeerWay buffer voltage comparators sense that the main regulator is out of operating tolerance (high or low). |
| FUSE BLOWN (DS3) | Replace Fuse F1 (Supplies power to the PeerWay Buffer Power Regulator). |
| STATUS FAULT (DS2) | The status timer has timed out, indicating the RTS Signal has been enabled too long and the jabber-halt relay has opened. The RTS signal is forced OFF to keep the node from interfering with the PeerWay. The fault could be the status timer in the PeerWay Tap, the RTS signal on the Coordinator Processor, the Tap Board connection, or loss of the onboard clock, which is a PeerWay Buffer or Coordinator Processor problem. |
| STATUS GOOD (DS1) | The timer on the PeerWay Tap is in its normal operating mode. |

PeerWay Buffer 1984-1502-000x Jumper Positions

| Jumper | Signal | Normal | Loop Back Test |
|---------------|----------------------|---------------|-----------------------|
| HD1 | Not used | Not used | Not used |
| HD2 | Receive Clock | 2-3 | 1-2 |
| HD3 | Transmit Clock | 2-3 | 1-2 |
| HD4 | Receive Data | 2-3 | 1-2 |
| HD5 | Transmit Data | 2-3 | 1-2 |
| HD6 | Ready to Send | 2-3 | 1-2 |
| HD7 | BSL (Coupler Status) | 2-3 | 1-2 |
| HD8 | Clear to Send | 2-3 | 1-2 |

PeerWay Buffer Fuse

| Fuse | FRSI Part No. | Bussman Part No. | Littelfuse Part No. | Characteristics |
|-------------|----------------------|-------------------------|----------------------------|------------------------|
| F1 | G09149-0022 | AGC 1 | 312001 | 1 A 250 V Quick Acting |

ControlFile Power Regulator 5 VDC Only 1984-3505-000x

ControlFile Power Regulator 5 VDC Only Parts Replacement

| Part No. | Replaces | Characteristics |
|----------------|----------------------------------|--|
| 1984-3505-000x | 1984-1505-000x 1984-1432-000x | Replaces these cards ONLY in ControlFiles that use NVRAM and MPC Processors. |

ControlFile Power Regulator 5 VDC Only LEDs and Test Points

| LED | Meaning and Response |
|--------------------------|---|
| +5 V POWER CHARGE (DS10) | Input capacitors are charging as you insert the card with card cage power on. Slowly insert the card into the ControlFile Motherboard connector (the LED will blink on briefly). |
| INPUT B STATUS (DS9) | Bus B (24 VDC or 30 VDC) from the DC distribution system is within operating tolerance. Normally OFF if only one DC bus used. |
| INPUT A STATUS (DS8) | Bus A (24 VDC or 30 VDC) from the DC distribution system is within operating tolerance. |
| +5 V STATUS (DS5) | The +5 VDC regulator is within operating tolerance. |
| CARD FAULT (DS4) | The +5 VDC regulator section is out of operating tolerance. <i>Replace the card.</i> |
| 5 V FUSE BLOWN (DS2) | Replace Fuse F2 (Power to the +5 VDC Power Regulator). |
| CARD GOOD (DS1) | +5 VDC Supply is within operating tolerance. Does not include status of the DC buses. |

| Test Point | Function |
|------------|----------------------------------|
| BROWN | Ground return |
| YELLOW | +5 VDC Regulator |
| WHITE | +5 V Relative current indication |

ControlFile Power Regulator 5 VDC Only Jumper Positions

| Jumper HD1 | Position 1-2 | Position 2-3 |
|-------------------|---------------------|---------------------|
| 30 V Input | | ON |
| 24 V Input | ON | |

ControlFile Power Regulator 5 VDC Only Fuse

| Fuse | FRSI Part No. | Bussman Part No. | Littelfuse Part No. | Characteristics |
|-------------|----------------------|-------------------------|----------------------------|------------------------|
| F2 | G09140-0061 | ABC 20 | 314020 | 20 A 250 V Regular |

ControlFile Power Regulator 5 and 12 VDC 1984-1505-000x
..... 1984-1432-000x

ControlFile Power Regulator 5 and 12 VDC Parts Replacement

| Part No. | Replaces | Characteristics |
|----------------|----------------|---|
| 1984-1505-000x | 1984-1432-000x | 30 or 24 VDC input jumper-selected. 3 or 6 amp 12 VDC jumper-selected output |
| | 1984-3505-0001 | ONLY in a ControlFile with NVRAM |

ControlFile Power Regulator 1984-1505-000x Jumper Positions

| Jumper | 30 V Input | 24 V Input | 3 Amp Output | 6 Amp Output |
|--------|------------|------------|--------------|--------------|
| HD1 | 2-3 | 1-2 | | |
| HD2 | | | Open | Bar |
| HD3 | | | Bar | Open |
| HD4 | | | 1-2 | 2-3 |
| HD5 | | | 1-2 | 2-3 |

ControlFile 5 VDC Only Power Regulator Fuse

| Fuse | FRSI Part No. | Bussman Part No. | Littelfuse Part No. | Characteristics |
|----------------|---------------|------------------|---------------------|--------------------|
| F1 (12 VDC) | G09140-0044 | AGC 7-1/2 | 31107.5 | 7.5 A 32 V Regular |
| F2 (5VDC) | G09140-0061 | ABC 20 | 314020 | 20 A 250 V Regular |

ControlFile Power Regulator 5 and 12 VDC LEDs and Test Points

| LED | Meaning and Response |
|---------------------------|---|
| +12 V POWER CHARGE (DS11) | Input capacitors are charging as you insert the card with card cage power on. Slowly insert the card into the ControlFile Motherboard connector (+12 AND +5 V Power Charge LEDs will blink on briefly). |
| +5 V POWER CHARGE (DS10) | Same as +12 V Power Charge above. |
| INPUT B STATUS (DS9) | Bus B (24 VDC or 30 VDC) from the DC distribution system is within operating tolerance. Normally OFF If only one DC bus used. |
| INPUT A STATUS (DS8) | Bus A (24 VDC or 30 VDC) from the DC distribution system is within operating tolerance. |
| -12 V STATUS (DS7) | The -12 VDC regulator is within operating tolerance. If HD2 is jumpered, DS7 is forced ON and -12 VDC is disabled. |
| +12 V STATUS (DS6) | The +12 VDC regulator is within operating tolerance. |
| +5 V STATUS (DS5) | The +5 VDC regulator is within operating tolerance. |
| CARD FAULT (DS4) | One of the regulator sections (+5, +12, -12 VDC) is out of operating tolerance. Replace the card. |
| 12 V FUSE BLOWN (DS3) | Replace Fuse F1 (+ 12 VDC supply sections of the Power Regulator). |
| 5 V FUSE BLOWN (DS2) | Replace Fuse F2 (Power to the +5 VDC Power Regulator). |
| CARD GOOD (DS1) | +5, +12, and -12 VDC Supplies are within operating tolerance. Does not include status of the DC buses. |

| Test Point | Function |
|------------|-----------------------------------|
| BROWN | Ground return |
| BLUE | -12 VDC Regulator |
| YELLOW | +5 VDC Regulator |
| RED | +12 VDC Regulator |
| WHITE | +5 V Relative current indication |
| GREEN | +12 V Relative current indication |

CP (Coordinator Processor):

| | |
|--------------|----------------|
| CP5 | 10P57360007 |
| CP-IV+ | 10P50870004 |
| ..... | 1984-4164-000x |
| CP-IV | 1984-4064-000x |
| CP-II | 1984-1594-000x |
| CP-I | 1984-1448-000x |
| ..... | 1984-1240-000x |

Coordinator Processor Parts Replacement

| Name | Part No. | Replaces | Characteristics |
|--------|----------------|--|--|
| CP5 | 10P57360007 | NOTE: For use with MPC II, MPC5, or a combination of MPC II and MPC5. | EMC compliant 68040 microprocessor |
| CP-IV+ | 10P50870004 | 1984-4164-000x 1984-4064-000x NOTE: For use with MPC I, MPC II, MPC5, or a combination of MPC I and MPC II. | EMC compliant 64 MHz oscillator; 4 Meg RAM; 68020 microprocessor |
| CP-IV+ | 1984-4164-000x | 1984-4064-000x NOTE: For use with MPC I, MPC II, MPC5, or a combination of MPC I and MPC II. | 64 MHz oscillator; 4 Meg RAM; 68020 microprocessor |
| CP-IV | 1984-4064-000x | 1984-4164-000x NOTE: for use with MPC II only | 64 MHz oscillator; 4 Meg RAM; 68020 microprocessor |
| CP-II | 1984-1594-000x | 1984-1448-000x 1984-1240-000x | 48 MHz oscillator; 512K RAM |
| CP-I | 1984-1448-000x | 1984-1240-000x | 40 MHz Oscillator; 128K RAM |
| CP-I | 1984-1240-000x | | 40 MHz Oscillator; 128K RAM |

Coordinator Processor LEDs and Test Points

| LED | Meaning and Response |
|-------------------------|--|
| TIC (DS10) | Beginning of a new time interval counter period (one tic is 1/4 second). The system operates on a 1/4 second data transfer rate for all PeerWay nodes (electrical drops). |
| CONT (DS9) | The Coordinator Processor is communicating with a Controller via the Motherboard. With redundant Coordinator Processors, this LED indicates which one is active. |
| BUS A (DS8) | The Coordinator Processor is using PeerWay A to transmit or receive data. |
| BUS B (DS7) | The Coordinator Processor is using PeerWay B to transmit or receive data. |
| RTS PEERWAY (DS6) | The Ready-To-Send signal is active and data is transmitting on one of the two PeerWays. |
| 5 V FUSE BLOWN (DS3) | Replace Fuse F1 (Supplies 5 VDC to the Coordinator Processor). |
| CARD FAULT (DS2) | A fault has been detected on the Coordinator Processor, or the Enable/Disable Switch is in the DISABLE position. If the switch is ENABLED and this LED is on, replace the Coordinator Processor. |
| CARD ENABLE (DS1) | The Enable/Disable Switch is ENABLED and no hardware faults are detected on the Coordinator Processor. |

| Test Point | Function |
|------------|---------------|
| Yellow | 5 V (± 0.1 V) |
| Brown | Ground Return |

CP Fault Indications

| Yellow LED Conditions | Fault Condition: Green LED OFF, Red LED ON, |
|---|--|
| OFF OFF OFF ON OFF | 1. CPU Test fault |
| OFF OFF ON OFF OFF | 2. Boot ROM Checksum fault |
| OFF OFF ON ON OFF | 3. Vector Test fault |
| OFF ON OFF OFF OFF | 4. Watchdog Timer fault |
| OFF ON OFF ON OFF | 5. Nondestructive RAM |
| OFF ON ON OFF OFF | 6. Destructive RAM Test or EDAC fault |
| OFF ON ON ON OFF | 7. Synch Bus Test Level 1 & 2 and checks on interrupts |

CP Fault Indications

| Yellow LED Conditions | Fault Condition: Green LED ON Then OFF, Red LED ON |
|---|--|
| ON OFF OFF OFF OFF | 1. Nonvolatile Memory write test failed before the PeerWay boot procedure was performed. The Nonvolatile Memory card should be replaced. |
| ON OFF OFF ON OFF | 2. No Nonvolatile Memory card is present or the Nonvolatile Memory card switch is in the DISABLE position. |
| ON OFF ON OFF OFF | 3. Checksum invalid after load. If the problem persists, a nonvolatile memory reload from disk may be necessary. |
| ON OFF ON ON OFF | 4. Uncorrectable error detected in CP card communications. Replace the CP card. |
| ON ON OFF OFF OFF | 5. Nonvolatile memory initialize failed. Nonvolatile Memory card problem. See Chapter 10, Troubleshooting. |
| ON ON OFF ON OFF | 6. Nonvolatile memory table checksum bad. Nonvolatile Memory card problem. See Chapter 10, Troubleshooting. |
| ON ON ON OFF OFF | 7. No program image stored in the nonvolatile memory. See Chapter 10, Troubleshooting. |

CP Fault Indications (continued)

| Yellow LED Conditions | Fault Condition: Green LED ON Then OFF, Red LED ON |
|--|---|
| ON ON ON ON OFF | 8. Nonvolatile Memory card hardware error on read. If the Nonvolatile Memory card was enabled, the card should be replaced. |
| ON OFF OFF OFF ON OFF | 9. No Nonvolatile Memory card is present or the Nonvolatile Memory card switch is set at DISABLE. |

CP-IV+ Jumper Positions

| Jumper | Position | Function |
|---------------|----------------------|--|
| HD3 to HD6 | 1-2 | Factory set - do not move |
| HD7 | MPC II or MPC5 (1-2) | Working with MPC II or MPC5 Controller Processors only (Factory Setting) |
| | OTHER (2-3) | Working with MPC I Controller Processors or a mix of MPC I and MPC II |

CP-IV Jumper Position

| Jumper | Position | Function |
|---------------|-----------------|---------------------------|
| HD3 to HD6 | 1-2 | Factory set - do not move |

CP-II Software Jumper Positions

| Software | Jumper HD8 | Jumper HD16 |
|---|-------------------|--------------------|
| \$\$CPBATxx | 2-3 | 2-3 |
| \$\$CPxx V9 | 1-2 | 1-2 |
| \$\$CPMAXXxx V9 and above \$\$CPxx V11 and above | 2-3 | 1-2 |

CP-II Factory Set Jumpers

| Jumper | Position |
|-------------------|----------|
| HD2 | 2-3 |
| HD5 | 1-2 |
| HD7 | 1-2 |
| HD10 through HD15 | Open |

CP-I Factory Set Jumpers

| Jumper | Position |
|--------|----------|
| HD2 | 2-3 |
| HD5 | 2-3 |
| HD7 | 1-2 |

CP Fuses

| Card | Fuse | FRSI Part No. | Bussman Part No. | Littelfuse Part No. | Characteristics |
|---|------|---------------|------------------|---------------------|----------------------|
| CP5 10P57360007 | F1 | G09140.0037 | AGC 4 | 311004 | 4 A 32 V Regular |
| CP-IV+ 10P50870004 1984-4164-000x | F1 | G09140-0041 | MTH 5 | 312005 | 5 A 250 V Regular |
| CP-IV 1984-4064-000x | F1 | G09140-0041 | MTH 5 | 312005 | 5 A 250 V Regular |
| CP-II 1984-1594-000x | F1 | G09140-0039 | AGC 5 | 311005 | 5 A 32 V Regular |
| CP-I 1984-1448-000x | F1 | G09140-0037 | AGC 4 | 311004 | 4 A 32 V Regular |
| CP-I 1984-1240-000x | F1 | G09140-0037 | AGC 4 | 311004 | 4 A 32 V Regular |

NV (Nonvolatile) Memory:

RAM 1984-2347-000x

CAUTION

Disable the NV Memory and then the Coordinator Processor cards before removing any card (other than a PeerWay Buffer card) from the ControlFile. Failure to do so may result in a corrupted data transfer.

RAM NV Memory Parts Replacement

| Part No. | Replaces | Memory | Board Marked |
|----------------|----------------|----------------|--------------|
| 1984-2347-0041 | | 4 Megabyte RAM | NV MEMORY |
| 1984-2347-0021 | Any card below | 2 Megabyte RAM | NV MEMORY |
| 1984-2347-0011 | Any card below | 1 Megabyte RAM | NV MEMORY |

RAM NV Memory LEDs and Test Points

| LED | Meaning and Response |
|----------------------|---|
| BATTERY 2 LOW (DS10) | Battery 2 voltage is low. Replace both batteries. (One at a time) |
| BATTERY 1 LOW (DS9) | Battery 1 voltage is low. Replace both batteries. (One at a time) |
| PROGRAM ACCESS (DS8) | The Coordinator Processor is accessing the main operating programs of a Controller Processor or itself. The CP is reading from Nonvolatile memory to download data to a card, or is writing to Nonvolatile memory from the ControlFile. |
| WRITE (DS7) | The Coordinator Processor is writing to the Nonvolatile memory. |
| READ (DS6) | The Coordinator Processor is reading the Nonvolatile memory. |

(continued on next page)

RAM NV Memory LEDs and Test Points (continued)

| LED | Meaning and Response |
|------------------|--|
| +5 VDC BAD (DS3) | Replace Fuse F1. |
| CARD BAD (DS2) | Enable/Disable switch is set at DISABLE or the card failed power-up diagnostics. |
| CARD GOOD (DS1) | Card passed power-up diagnostics. |

| Test Point | Function |
|-------------------|-----------------------|
| Brown | Ground Return |
| Yellow | +5 VDC |
| Green | Voltage of Battery #2 |
| White | Voltage of Battery #1 |

NV RAM LED Sequence

| Yellow LED Pattern | Fault Condition: Red "Card Bad" LED ON Green LED OFF |
|---------------------------|--|
| OFF OFF OFF | 0 MC68000 Microprocessor test |
| OFF OFF ON | 1 EPROM checksum test |
| OFF ON OFF | 2 Program & Dual Port ROM test |
| OFF ON ON | 3 Watchdog Timeout test |

(continued on next page)

NV RAM LED Sequence (continued)

| Yellow LED Pattern | Fault Condition: | |
|-------------------------------------|---------------------------|---------------|
| | Red "Card Bad" LED ON | Green LED OFF |
| ON OFF OFF | 4 Not used | |
| ON OFF ON | 5 Interrupt test | |
| ON ON OFF | 6 Parallel Interface test | |
| ON ON ON | 7 Not used | |

RAM NV Memory Battery Jumper Positions

| Jumper | Position | Action |
|--------|----------|--------------------|
| HD6 | 1-2 | Battery 2 enabled |
| | 2-3 | Battery 2 disabled |
| HD7 | 1-2 | Battery 1 enabled |
| | 2-3 | Battery 1 disabled |

RAM NV Memory Jumper Positions

| Card | HD3 | HD4 | HD5 | Characteristics |
|----------------|------------|-------------------|-------------------|------------------------|
| 1984-2347-0011 | 1-2 | 1-2 | 1-2 Hard wired | 1 Meg RAM |
| 1984-2347-0021 | 1-2 | 2-3 | 1-2 Hard wired | 2 Meg RAM |
| 1984-2347-0041 | -- | 2-3 Hard wired | 2-3 Hard wired | 4 Meg RAM |

RAM NV Memory Fuse Data

| Fuse | FRSI Part No. | Bussman Part No. | Littelfuse Part No. | Characteristics |
|-------------|--------------------------|-----------------------------|--------------------------------|------------------------|
| F1 | G09140-0037 | AGC 4 | 311004 | 4 A 32 V Regular |

NV (Nonvolatile) Memory:

| | |
|---------------------|-----------------------|
| Bubble | 1984-1598-000x |
| ..... | 1984-1483-000x |
| ..... | 1984-1224-000x |

CAUTION

Disable the NV Memory and then the Coordinator Processor cards before removing any card (other than a PeerWay Buffer card) from the ControlFile. Failure to do so may result in a corrupted data transfer.

Bubble NV Memory Parts Replacement

| Part No. | Replaces | Memory | Board Marked |
|----------------|----------------|---------------------|---|
| 1984-1598-0001 | Any card below | 1 Megabyte Bubble | 4 MEG NV BUBBLE MEMORY (NOTE: This is 4 Megabits, which gives 1 Megabyte of useable memory) |
| 1984-1483-0001 | 1984-1224-000x | 1/2 Megabyte Bubble | NV BUBBLE MEMORY |
| 1984-1224-000x | -- | 1/2 Megabyte Bubble | NV BUBBLE MEMORY |

Bubble NV Memory LEDs and Test Points

| LED | Meaning and Response |
|-----------------------|---|
| PROGRAM ACCESS (DS8) | The Coordinator Processor is accessing the main operating programs of a Controller Processor or itself. The card is reading from Nonvolatile Memory to download data to a card, or is writing to the memory card from the disk drive. |
| WRITE (DS7) | The Coordinator Processor is writing to the Nonvolatile Memory Card. |
| READ (DS6) | The Coordinator Processor is reading the Nonvolatile Memory Card. |
| 12 V FUSE BLOWN (DS4) | Replace Fuse F2 (Supplies 12 VDC to the card). |

Bubble NV Memory LEDs and Test Points

| LED | Meaning and Response |
|----------------------|--|
| 5 V FUSE BLOWN (DS3) | Replace Fuse F1 (Supplies 5 VDC to the card). |
| CARD FAULT (DS2) | A fault is detected on the nonvolatile memory or the Enable/Disable Switch is DISABLED. If the switch is ENABLED and this LED is ON, replace the card. |
| CARD ENABLED (DS1) | The Enable/Disable switch is ENABLED and no hardware faults are detected on the Nonvolatile Memory card. |

| Test Point | Function |
|------------|----------------------|
| Yellow | +5 V (± 0.1 V) |
| Red | +12 V (± 0.1 V) |
| Brown | Ground Return |

Bubble NV Memory Fuses

| Card | Fuse | FRSI Part No. | Bussman Part No. | Littelfuse Part No. | Characteristics |
|----------------|------|---------------|------------------|---------------------|------------------------|
| 1984-1598-000x | F1 | G09140-0060 | MTH 4 | 312004 | 4 A 250 V Regular |
| | F2 | G09140-0041 | MTH 5 | 312005 | 5 A 250V Regular |
| 1984-1483-000x | F1 | G09140-0060 | MTH 4 | 312004 | 4 A 250 V Regular |
| | F2 | G09140-0030 | AGC 2 | 312002 | 2 A 250 V Quick Acting |
| 1984-1224-000x | F1 | G09140-0038 | MDL 4 | 313004 | 4 A 250V Slow Blow |
| | F2 | G09140-0030 | AGC 2 | 312002 | 2 A 250 V Quick Acting |

Controller Processor:

| | |
|--------------------------|-----------------------|
| MPC5 | 10P57520007 |
| MPC II | 10P50400006 |
| ..... | 1984-4068-000x |
| MPC | 1984-2500-000x |
| MLC | 1984-1439-000x |
| ..... | 1984-1249-000x |
| SSC | 1984-1442-000x |
| ..... | 1984-1371-000x |
| CC | 1984-1445-000x |
| ..... | 1984-1374-000x |
| MUX and PLC | 1984-1494-000x |

Controller Processor Parts Replacement

| Name | Part No. | Replaces | Characteristics |
|-------------|-------------------------------|----------------------------------|------------------------|
| MPC5 | 10P57520007 | -- | MPC Multipurpose |
| MPC II | 10P50400006 1984-4068-000x | 1984-2500-000x | MPC Multipurpose |
| | | 1984-1445-000x 1984-1374-000x | CC Contact |
| MPC | 1984-2500-000x | 1984-1494-000x | MUX and PLC |
| | | 1984-1445-000x 1984-1374-000x | CC Contact |
| | | 1984-1494-000x | MUX and PLC |
| MLC | 1984-1439-000x | 1984-1249-000x | MLC MultiLoop |
| SSC | 1984-1442-000x | 1984-1371-000x | SSC Single-Strategy |
| CC | 1984-1445-000x | 1984-1374-000x | CC Contact |
| MUX PLC | 1984-1449-000x | Itself only | MUX and PLC |

Controller Processor LEDs and Test Points

| LED | Meaning and Response |
|------------------------|---|
| Block Evaluation (DS8) | The microprocessor is evaluating an input or output block. With redundant Contact Processors, this LED indicates the active card. |
| CP Access (DS7) | The Coordinator Processor is accessing the Contact Processor's RAM memory and transferring configuration and dynamic data to the NV Memory. If the Contact Processor loses memory, current data is quickly reloaded from NV Memory. |
| Interrupt (DS6) | The Contact Processor is resetting its watchdog timer to prevent timing out or to acknowledge the synchronizing clock pulse. |
| 5 V Fuse Blown (DS3) | Replace Fuse F4 (Supplies 5 VDC to the Contact Processor). |
| Card Fault (DS2) | A fault has been detected on the Contact Processor, or the ENABLE/DISABLE Switch is in the DISABLE position. If the switch is enabled and this LED is on, replace the Contact Processor. |
| Card Enable (DS1) | The ENABLE/DISABLE Switch is enabled and no hardware faults are detected on the Contact Processor. |

| Test Point | Function |
|-------------------|---------------------|
| Yellow | +5 V (\pm 0.1 V) |
| Brown | Ground Return |

Controller Processor Fault Indications

| Yellow LED Conditions | Fault Condition |
|-----------------------|---|
| OFF OFF ON | CPU Test Fault |
| OFF ON OFF | Boot ROM Checksum Fault |
| OFF ON ON | Vector Test Fault |
| ON OFF OFF | Watchdog Timer |
| ON OFF ON | Nondestructive RAM |
| ON ON OFF | Destructive RAM Test or EDAC Fault |
| ON ON ON | Sync Bus Test Levels 1 & 2 and Checks on Interrupts |

Controller Processor:
MPC5 **10P57520007**

MPC5 Controller Processor Parts Replacement

| Name | Part No. | Replaces | Characteristics |
|-------------|-----------------|-----------------|--|
| MPC5 | 10P57520007 | - - | Replaces itself (Requires jumper setting) |

Jumpers for MPC5 Processor Functionality

| Image Select | HD6 | HD7 | HD8 |
|---------------------|------------|------------|------------|
| Additional Image #1 | 1-2 | 1-2 | 1-2 |
| Additional Image #2 | 1-2 | 2-3 | 2-3 |
| Additional Image #3 | 1-2 | 2-3 | 1-2 |
| Additional Image #4 | 1-2 | 1-2 | 2-3 |

MPC5 Image Functionality Jumpers

| Image Functionality | HD4 | HD5 | HD9 |
|----------------------------|------------|------------|------------|
| MPC+ | 1-2 | 1-2 | 1-2 |
| PLC+ | 1-2 | 1-2 | 2-3 |
| MUX+ | 1-2 | 2-3 | 1-2 |

With the MPC5, the I/O communication baud rate is set by software instead of by a hardware jumper (as done by the MPC II and MPC). The baud rate is set automatically when either the PLC+ or MUX+ image is selected.

ControlFile Status Screen Jumper Code

| Jumper Code | Image Selection | MPC5 Image Functionality |
|--------------------|------------------------|---------------------------------|
| 145 | Additional Image #2 | MUX5 |
| 146 | Additional Image #2 | PLC5 |
| 147 | Additional Image #2 | MPC5 |
| 155 | Additional Image #3 | MUX5 |
| 156 | Additional Image #3 | PLC5 |
| 157 | Additional Image #3 | MPC5 |
| 165 | Additional Image #4 | MUX5 |
| 166 | Additional Image #4 | PLC5 |
| 167 | Additional Image #4 | MPC5 |
| 175 | Additional Image #1 | MUX5 |
| 176 | Additional Image #1 | PLC5 |
| 177 | Additional Image #1 | MPC5 |

MPC5 Fuse

| Fuse | FRSI Part No. | Bussman Part No. | Littelfuse Part No. | Characteristics |
|-------------|----------------------|-------------------------|----------------------------|------------------------|
| F1 | G09140-0034 | ACG 3 | 312003 | 3 A 250 V Regular |

Controller Processor:
MPC II **10P50400006**
 **1984-4068-000x**

MPCII Controller Processor Parts Replacement

| Name | Part No. | Replaces | Characteristics |
|--------|-------------------------------|--|--|
| MPC II | 10P50400006 1984-4068-000x | 1984-2500-000x 1984-1439-000x 1984-1249-000x 1984-1442-000x 1984-1371-000x 1984-1445-000x 1984-1374-000x 1984-1494-000x | Replaces MPC as well as CC, PLC, and MUX Controller Processors (Requires jumper setting) |

MPC II Communication Rate Jumper

| Communication Rate | HD21 | HD22 | HD23 | HD24 |
|-----------------------|------|------|------|------|
| Rosemount 10.4 K Baud | 2-3 | 2-3 | 2-3 | 2-3 |
| Industry Standard | 1-2 | 1-2 | 1-2 | 1-2 |

MPC II Processor Functionality Jumper

| Processor Functionality | HD2 |
|-------------------------|-----|
| MPC II | 1-2 |
| MPC | 2-3 |

Jumpers for MPC Processor Functionality

| Image Select | HD6 | HD7 | HD8 |
|---------------------|------------|------------|------------|
| Contact (CC) | 2-3 | 2-3 | 1-2 |
| Multiplexor (MUX) | 2-3 | 1-2 | 1-2 |
| Additional Image #1 | 1-2 | 1-2 | 1-2 |
| Additional Image #2 | 1-2 | 2-3 | 2-3 |
| Additional Image #3 | 1-2 | 2-3 | 1-2 |
| Additional Image #4 | 1-2 | 1-2 | 2-3 |

Jumpers for MPC II Processor Functionality

| Image Select | HD6 | HD7 | HD8 |
|---------------------|------------|------------|------------|
| Additional Image #1 | 1-2 | 1-2 | 1-2 |
| Additional Image #2 | 1-2 | 2-3 | 2-3 |
| Additional Image #3 | 1-2 | 2-3 | 1-2 |
| Additional Image #4 | 1-2 | 1-2 | 2-3 |

Jumpers for MPC2+ Image Functionality

| MPC II+ Image Functionality | HD4 | HD5 | HD9 |
|------------------------------------|------------|------------|------------|
| MPC+ | 1-2 | 1-2 | 1-2 |
| PLC+ | 1-2 | 1-2 | 2-3 |
| MUX+ | 1-2 | 2-3 | 1-2 |

ControlFile Status Screen Jumper Code (Visible with MPC II Image only)

| Jumper Code | Processor Functionality | Image Selection | MPC II+ Image Functionality |
|--------------------|--------------------------------|--|------------------------------------|
| 0xx (Red) | MPC I | Jumper HD2 is set for MPC I functionality with an MPC II image | |
| 145 | MPC II | Additional Image #2 | MUX+ |
| 146 | MPC II | Additional Image #2 | PLC+ |
| 147 | MPC II | Additional Image #2 | MPC+ |
| 155 | MPC II | Additional Image #3 | MUX+ |
| 156 | MPC II | Additional Image #3 | PLC+ |
| 157 | MPC II | Additional Image #3 | MPC+ |
| 165 | MPC II | Additional Image #4 | MUX+ |
| 166 | MPC II | Additional Image #4 | PLC+ |
| 167 | MPC II | Additional Image #4 | MPC+ |
| 175 | MPC II | Additional Image #1 | MUX+ |
| 176 | MPC II | Additional Image #1 | PLC+ |
| 177 | MPC II | Additional Image #1 | MPC+ |

MPC II Fuse

| Fuse | FRSI Part No. | Bussman Part No. | Littelfuse Part No. | Characteristics |
|-------------|----------------------|-------------------------|----------------------------|------------------------|
| F1 | G09140-0041 | MTH 5 | 312005 | 5 A 250 V Regular |

Controller Processor

MPC 1984-2500-000x

MPC Parts Replacement

| Name | Part No. | Replaces | Characteristics |
|-------------|-----------------|----------------------------------|------------------------|
| MPC | 1984-2500-000x | 1984-1439-000x 1984-1249-000x | MLC MultiLoop |
| | | 1984-1442-000x 1984-1371-000x | SSC Single-Strategy |
| | | 1984-1445-000x 1984-1374-000x | CC Contact |
| | | 1984-1494-000x | MUX and PLC |

MPC Image Jumper Positions

| Image | Jumper HD6 | Jumper HD7 | Jumper HD8 |
|---------------------|-------------------|-------------------|-------------------|
| Contact | 2-3 | 2-3 | 1-2 |
| Multiplexer | 2-3 | 1-2 | 1-2 |
| Additional Image #1 | 1-2 | 1-2 | 1-2 |
| Additional Image #2 | 1-2 | 2-3 | 2-3 |
| Additional Image #3 | 1-2 | 2-3 | 1-2 |
| Additional Image #4 | 1-2 | 1-2 | 2-3 |

MPC Communications Jumper Positions

| Communication Rate | Jumper HD21 | Jumper HD22 | Jumper HD23 | Jumper HD24 |
|-------------------------------|--------------------|--------------------|--------------------|--------------------|
| Rosemount 10.4K Baud | 2-3 | 2-3 | 2-3 | 2-3 |
| Industry Standard (9600 Baud) | 1-2 | 1-2 | 1-2 | 1-2 |

MPC Fuse

| Fuse | FRSI Part No. | Bussman Part No. | Littelfuse Part No. | Characteristics |
|-------------|----------------------|-------------------------|----------------------------|------------------------|
| F1 | G09140-0041 | MTH 5 | 312005 | 5 A 250 V Regular |

Controller Processor:

| | |
|--------------------------|-----------------------|
| MLC | 1984-1439-000x |
| ..... | 1984-1249-000x |
| SSC | 1984-1442-000x |
| ..... | 1984-1371-000x |
| MUX and PLC | 1984-1494-000x |

LEDs and Test Points

| LED | Meaning and Response |
|------------------------|--|
| 12 V Fuse Blown (DS10) | Replace Fuse F1 (Supplies -12 VDC to the card). |
| +12 V Fuse Blown (DS9) | Replace Fuse F2 (Supplies +12 VDC to the card). |
| Block Evaluation (DS8) | The microprocessor is evaluating an input or output block. With redundant MultiLoop processors, this LED indicates which one is active. |
| CP Access (DS7) | The Coordinator Processor is accessing the MultiLoop Processor RAM Memory and transferring configuration and dynamic data to the NV Memory. If the MultiLoop Processor loses memory, current data is quickly reloaded from nonvolatile memory. |
| Interrupt (DS6) | The MultiLoop Processor is resetting its watchdog timer to prevent timing out or to acknowledge a synchronizing clock pulse. |
| 5 V Fuse Blown (DS3) | Replace Fuse F4 (Supplies 5 VDC to the MultiLoop Processor). |
| Card Fault (DS2) | A fault has been detected on the MultiLoop Processor or the ENABLE/DISABLE Switch is in the disable position. If the switch is enabled and this LED is on, replace the MultiLoop Processor. |
| Card Enable (DS1) | The ENABLE/DISABLE Switch is enabled and no hardware faults are detected on the MultiLoop Processor. |

| Test Point | Function |
|-------------------|-----------------|
| Yellow | +5 V (± 0.1 V) |
| Red | +12 V (± 0.1 V) |
| Brown | Ground Return |

Image Jumper Positions

| Image | Jumper HD6 | Jumper HD7 | Jumper HD8 |
|---------------------|-------------------|-------------------|-------------------|
| Contact | 2-3 | 2-3 | 1-2 |
| Multiplexer | 2-3 | 1-2 | 1-2 |
| Additional Image #1 | 1-2 | 1-2 | 1-2 |
| Additional Image #2 | 1-2 | 2-3 | 2-3 |
| Additional Image #3 | 1-2 | 2-3 | 1-2 |
| Additional Image #4 | 1-2 | 1-2 | 2-3 |

Image Jumper Positions for MLC and SS

| Image | Jumper HD6 | Jumper HD7 | Jumper HD8 |
|-------------------------------|-------------------|-------------------|-------------------|
| MLC (MultiLoop Controller) | 2-3 | 2-3 | 2-3 |
| SS (Single Strategy) | 2-3 | 2-3 | 2-3 |

Communications Jumper Positions

| Communication Rate | Jumper HD21 | Jumper HD22 | Jumper HD23 | Jumper HD24 |
|----------------------------------|--------------------|--------------------|--------------------|--------------------|
| Rosemount 10.4K Baud | 2-3 | 2-3 | 2-3 | 2-3 |
| Industry Standard (9600 Baud) | 1-2 | 1-2 | 1-2 | 1-2 |

Fuses

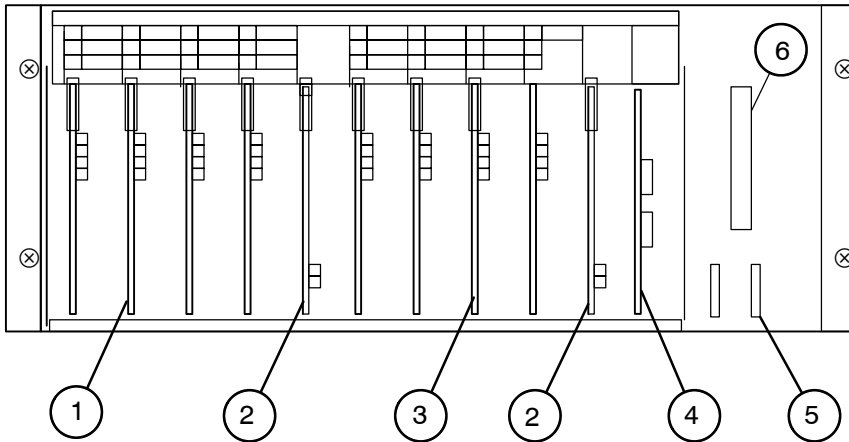
| Fuse | FRSI Part No. | Bussman Part No. | Littelfuse Part No. | Characteristics |
|-------------|--------------------------|-----------------------------|--------------------------------|--------------------------|
| F1 F2 | G09140-0016 | AGC 1/2 | 312.500 | 1/2 A 250 V Quick Acting |
| F1 F4 | G09140-0041 | MTH 5 | 312005 | 5 A 250 V Regular |

Section 7: Input/Output

| | |
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| | |
|--|------|
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| (Field wires land on panel) | |
| (Field wires on panel or on marshaling panel) | 7-54 |
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| (Field wires land on panel) | |
| (Field wires on panel or on marshaling panel) | 7-56 |
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Analog Card Cage 1984-2526-0002



Analog Card Cage

| Item | Name |
|------|--|
| 1 | FIC (Field Interface Card) 1-4 |
| 2 | Analog Transfer Card or Output Bypass Card |
| 3 | FIC (Field Interface Card) 5-8 |
| 4 | Communication Connect Card (Connects to ControlFile and provides 8 Communication Lines) |
| 5 | Power Connectors |
| 6 | Marshaling Panel Connector |

NOTE: Redundancy:
 7-1 Redundant FIC in Slot 8 (for FIC 1-7)
 3-1 Redundant FIC in Slot 4 (for FIC 1-3) or 8 (for FIC 5-7)
 1-1 Redundant FIC in adjacent slot 1-2, 3-4, 5-6, or 7-8

Communications Connect Card V (EMC Compliant) 10P54560001
Communications Connect Card IV 10P54530001
Communications Connect Card III 1984-2543-000x

Warning

The transient suppression networks are sufficient for cables within a building. For runs between buildings, put lightning arrestors where the cable enters the building. FRSI recommends metal conduit or a copper ground wire. (Or use a Fiber Optic I/O Converter.)

Cage Address Jumper Positions

| Card Cage Address | Jumper HD1 | Jumper HD2 |
|-------------------|-------------|-------------|
| A | 1-2 ZERO | 1-2 ZERO |
| B | 2-3 ONE | 1-2 ZERO |
| C | 1-2 ZERO | 2-3 ONE |
| D | 2-3 ONE | 2-3 ONE |

Controller Redundancy Jumper Positions

| Jumper | Controller Not Redundant | Controller Redundant |
|----------------|--------------------------|----------------------|
| HD4 A HD4 B | 1-2 NORMAL | 2-3 REDUNDANT |

| Jumper | Card Cage in ControlFile Area | Card Cage in Remote Location |
|--------|-------------------------------|------------------------------|
| HD5 | 2-3 CONTROL FILE AREA | 1-2 REMOTE I/O |

Communications Connect Card II 1984-2491-000x

Cage Address Jumper Positions

| Card Cage Address | Jumper HD1 | Jumper HD2 | Applies to: |
|-------------------|-------------|-------------|-------------------|
| A | 1-2 ZERO | 1-2 ZERO | Analog Card Cages |
| B | 2-3 ONE | 1-2 ZERO | Analog Card Cages |
| C | 1-2 ZERO | 2-3 ONE | Analog Card Cages |
| D | 2-3 ONE | 2-3 ONE | Analog Card Cages |

Comm Line Select Jumper Positions

| Jumpers A-J | No of Comm Lines Connected |
|-------------|----------------------------|
| 2-3 | 1-8 |

Controller Redundancy Jumper Positions

| Jumper | Controller Not Redundant | Controller Redundant |
|----------------|--------------------------|----------------------|
| HD4 A HD4 B | 1-2 NORMAL | 2-3 REDUNDANT |

Location Jumper Positions

| Jumper | Card Cage in ControlFile Area | Card Cage in Remote Location |
|--------|-------------------------------|------------------------------|
| HD5 | 2-3 CONTROL FILE AREA | 1-2 REMOTE I/O |

Analog Transfer Card 1984-2494-0001

Analog Transfer Card LEDs

| LED | Meaning |
|-------------|--|
| DS2 (Red) | 30V Fuse Blown |
| DS1 (Green) | +5V Status: The card has power and the regulator is operational. |

During a transfer card test, completely disconnect the leads at each point. Failing to disengage leads before going to the next point may damage the Transfer Card.

Test Points for Analog Transfer Card

| Test Point | Function |
|------------|----------------------|
| 101 501 | Slot 1 or 5, Point 1 |
| 102 502 | Slot 1 or 5, Point 2 |
| 103 503 | Slot 1 or 5, Point 3 |
| 201 601 | Slot 2 or 6, Point 1 |
| 202 602 | Slot 2 or 6, Point 2 |
| 203 603 | Slot 2 or 6, Point 3 |
| 301 701 | Slot 3 or 7, Point 1 |
| 302 702 | Slot 3 or 7, Point 2 |
| 303 703 | Slot 3 or 7, Point 3 |
| 401 801 | Slot 4 or 8, Point 1 |
| 402 802 | Slot 4 or 8, Point 2 |
| 403 803 | Slot 4 or 8, Point 3 |

Analog Transfer Card Fuse Data

| Fuse | FRSI Part No. | Littelfuse Part No. | Schurter Part No. | Characteristics |
|------|---------------|---------------------|-------------------|---------------------|
| F1 | G50382-0014 | 273.500 | MSF 034.4216 | 1/2 A 125 V Plug-In |

Output Bypass Card (OBC) 1984-2551-0001

Output Bypass Card Fuses

| Fuse | FRSI Part No. | Bussman Part No. | Littel-fuse Part No. | Schurter Part No. | Characteristics |
|------|---------------|------------------|----------------------|-------------------|---------------------------|
| F1 | G09140-0030 | AGC 2 | 312002 | -- | 2 A 250 V Quick Acting |
| F2 | G50382-0009 | -- | 273.125 | MSF 034.4210 | 1/8 A 125 V Plug-In |

Analog Card Cage Field Interface Cards:

Analog FIC (EMC Compliant) 10P54440002

Analog FIC 1984-2518-0002

Analog FIC Specifications

| Item | Specification |
|------------------------------|---|
| Temperature | 0-50° C |
| Humidity | 10-90% |
| Power Supply voltage | Nominal 24 VDC to 30 VDC, Minimum 22 VDC, Maximum 34 VDC, Minimum Battery Backup 18 VDC |
| Current (typical) | At 30 VDC 214 mA; At 24 VDC 260 mA; At 18 VDC 347 mA |
| Accuracy | .1% of span |
| Resolution over 4-20 mA span | Input (A/D) 13 bits (0.012%) Output (D/A) 12.4 bits (0.019%) |
| Drift/Temperature | .1 % of span from 25° C to any temperature in 0-50° range |

Analog FIC LEDs

| LEDs | Meaning |
|------|--|
| DS1 | Card Good: No card faults are detected and the controller processor card is controlling the output current. Blinking LED indicates the FIC is not connected to the field (I/O redundancy) or the output is being controlled by the Output Bypass card. |
| DS2 | Card Fault: A card fault is detected or communications with the Controller Processor card have ceased. |
| DS3 | TX Enable: Indicates communications activity. The signal that enables the transmit signal from the Field Interface card to the Controller Processor card is active. |
| DS4 | 30V Fuse Blown: Power fuse F1 has blown. This LED does not indicate the status of the fuses in the I/O loops. All fuses are installed in sockets and are removable without soldering. |

Analog FIC Jumper Positions

| Jumper | Value | Action |
|----------------------------------|--------------|--|
| FAIL HD1 | HOLD 1-2 | Hold output on failure |
| | ZERO 2-3 | Zero output on failure |
| OUT HD2 | NORM 1-2 | Normal output action (Jumper not used by software. Leave in the 1-2 position.) |
| | REV 2-3 | Reversed output action (Jumper not used by software.) |
| REDUNDANCY HD4 HD5 (Rev A) | 1-2 | 1-7 redundancy or no redundancy |
| | 2-3 | 1-1 redundancy |
| PWR HD11, HD21, HD31 | SYS 1-2 | System power for external devices |
| | SELF 2-3 | External devices are self powered |

Analog FIC Fuses

| Fuse | FRSI Part No. | Littelfuse Part No. | Schurter Part No. | Characteristics |
|--|--------------------------|--------------------------------|------------------------------|------------------------|
| F1 | G50382-0021 | 273002 | MSF 034.4224 | 2 A 125 V Plug-In |
| F11 F12 F21 F22 F31 F32 | G50382-0011 | 273.250 | MSF 034.4213 | 1/4 A 125 V Plug-In |

Analog Card Cage Field Interface Cards:

Smart Transmitter Daughterboard Kit (EMC Compliant) 10P54500005
Analog FIC W/Smart Transmitter Daughterboard 1984-2519-000x
Analog FIC W/Smart Transmitter Daughterboard (EMC) 10P57240002
Smart Transmitter Daughterboard Kit 1984-2483-0005

Smart Transmitter Daughterboard LEDs

| LEDs | Meaning |
|------------------------|---|
| RTS Request to Send | The Smart daughterboard generated a request to send. The card is transmitting to a Smart device. |
| XMIT/RECV | Shows data transmission in either direction. Flickering indicates data flow. |
| Input Select 3 | Daughterboard is communicating with the third FIC I/O point. |
| Input Select 2 | Daughterboard is communicating with the second FIC I/O point. |
| Input Select 1 | Daughterboard is communicating with the first FIC I/O point. |

Analog Card Cage Field Interface Cards:

Pulse I/O FIC (EMC Compliant) 10P54470002

Pulse I/O FIC 1984-2456-000x

Pulse I/O FIC Input Specifications

| Term | Voltage Input Specification | Contact Input Specification |
|---------------------------|---|------------------------------------|
| Input Frequency | Sine Wave 1 Hz - 50K Hz Square Wave .002 Hz - 50K Hz | .002 Hz - 50K Hz |
| Input Accuracy | 0.05% of reading | 0.05% of reading |
| Resolution | 0.01% of reading | 0.01% of reading |
| Count Match Response Time | 5 ms maximum | 5 ms maximum |
| Minimum Pulse Width | 10 μ s | 10 μ s |
| Voltage Range | 50 mV to 30 V peak-to-peak | - |
| ON State Current | - | 9 mA minimum |
| OFF State Current | - | 5 mA maximum |
| Short Circuit Current | - | 20 mA nominal |
| Open Circuit Voltage | - | 21 V minimum, 24 V maximum |
| Impedance | 100 K ohms minimum 300 pF maximum | - |
| Temperature Effect | 0.01% within 0° to 50° C | 0.01% within 0° to 50° C |
| Common Mode Rejection | 80DB 47-52, 57-63 Hz, at 3 V peak-to-peak | - |
| Normal Mode Protection | Fuse and transient suppressors | - |
| Isolation | point-to-point | point-to-point |

Pulse I/O FIC Output Specifications

| Term | Pulse Output Specification | Analog Output Specification |
|---------------------------|--------------------------------------|--|
| Output Range | 0 to 1K Hz | 0-60 mA |
| Output Accuracy | - | 0.5% of 4-20 mA span below 20 mA, 0.4% of reading above 20 mA |
| OFF State Leakage Current | 20 μ A maximum | 20 μ A maximum |
| Output Current Limit | 20 +/-0.5 mA | 60 mA min 65 mA max |
| Source Resistance | 100 ohms maximum | 25 ohms maximum (supply mode) |
| Open Loop Voltage | 21-24 V | 21.5 V to 24.5 V |
| Output Resolution | - | 11 bits 4-20 mA range on 7.5 μ A |
| Output Fail Options | None | Off only |
| Timing Accuracy | +/- [20 μ s + 0.01% of interval] | - |
| Timing Resolution | 1 μ sec | - |
| Minimum Pulse Width | 0.5 msec | - |
| Maximum Frequency | 1K Hz with one output point | - |
| Temperature Effect | 0.01%, within 0° to 50° C on timing | 0.1% of 4-20 mA span, within 0° to 50° C on output current |
| Isolation | point-to-point | point-to-point |

Pulse I/O FIC LEDs

| LEDs | Meaning |
|-------------|--|
| DS1 | Card Good: No card faults are detected and the Controller Processor card is controlling the output current. Blinking LED indicates the FIC is not connected to the field (I/O). |
| DS2 | Card Fault: A card fault is detected or communications with the Controller Processor card have ceased. |
| DS3 | TX Enable: Indicates communications activity. The signal that enables the transmit signal from the Field Interface card to the Controller Processor card is active. |
| DS4 | 30V Fuse Blown: Power fuse F1 has blown. This LED does not indicate the status of the fuses in the I/O loops. |
| DS5 | Status 1: Represents the state of INPUT 1. (Note: the state is shown after the prescaler.) |
| DS6 | Status 2: Represents the state of INPUT 2. (Note: The state is shown after the prescaler.) |
| | Not Used: For future use. |

Pulse I/O FIC Card Jumper Positions

| Jumper | 1:7, 1:3, or No Redundancy | 1:1 Redundancy |
|----------------------|-----------------------------------|-----------------------|
| HD4A HD4B HD4C | 1-2 | 2-3 |

Pulse I/O Field Interface Card Fuses

| Fuse | FRSI Part No. | Littelfuse Part No. | Schurter Part No. | Characteristics |
|--|---------------|---------------------|-------------------|---------------------|
| F1 | G50382-0021 | 273002 | MSF 034.4224 | 2.0 A 125 V Plug-In |
| F11 F12 F21 F22 F31 F32 | G50382-0011 | 273.250 | MSF 034.4213 | 1/4 A 125 V Plug-In |

Analog Card Cage Field Interface Cards:
Temperature Input FIC 1984-2731-000x

Temperature Input FIC Specifications

| Term | Specification |
|---|--|
| Temperature Drift | ±.125% Full Scale/25 °C change from calibration temperature |
| Cold Junction Compensation | RTD 57.72 ohms nickel sensor value broadcast through Controller Processor |
| Cold Junction Temperature Range | -30 C to +70 °C |
| Accuracy Cold Junction Compensation Circuit | ±.55 °C |
| Input Isolation | point-to-point |
| Maximum Sensor Wiring Resistance | 500 ohms per line |
| RFI Immunity | .2% to .6% Full Scale |
| External Resistance | 3.21 to 390 ohms |
| Ambient Cabinet Temperature | 0-50 °C |
| Input Power | 16-36 VDC |
| Power Requirements | 35 V 100 mA, nominal 30 V 112 mA, nominal 24 V 140 mA, nominal 20 V 164 mA, nominal |
| Turn On Voltage | 20 V, nominal |
| Turn Off Voltage | 15 V, nominal |
| RTD Excitation Current | 229 µA, nominal |
| RTD Resistance Range | Range 1: 0-100 ohms Range 2: 0-400 ohms |
| Millivolt Input Range | Gain 1: -4 to 22 mV Gain 2: -16 to 88 mV |

(continued on next page)

Temperature Input FIC Specifications (continued)

| Term | Specification |
|--|--|
| Accuracy (at calibration temperature) | TC/mv, Range 1: $\pm 0.075\%$ (19.5 μV) TC/mv, Range 2: $\pm 0.048\%$ (50 μV) RTD/ Ω , Range 1: ± 150 Milliohms RTD/ Ω , Range 2: ± 200 Milliohms |
| Input Impedance for Thermocouples | >100 Megohm |

Temperature Input FIC LEDs

| LEDs | Meaning |
|------|--|
| DS1 | Card Good: No card faults are detected. |
| DS2 | Card Fault: A card fault is detected or communications with the Controller Processor card have ceased. |
| DS3 | TX Enable: Indicates communications activity. The signal that enables the transmit signal from the Field Interface Card to the Controller Processor is active. |
| DS4 | 30V Fuse Blown: Power Fuse F1 has blown. |

Temperature Input FIC Card Jumper Positions

| Jumper | 1:7, 1:3, or No Redundancy | 1:1 Redundancy |
|-------------------|----------------------------|----------------|
| HD2 HD3 HD4 | 1-2 | 2-3 |

Temperature Input Field Interface Card Fuses

| Fuse | FRSI Part No. | Littelfuse Part No. | Schurter Part No. | Characteristics |
|-------------|----------------------|----------------------------|--------------------------|------------------------|
| F1 | G50382-0021 | 273002 | MSF 034.4224 | 2.0 A 125 V Plug-In |
| F6 to F11 | G50382-0009 | 273.125 | MSF 034.4210 | 1/8 A 125 V Plug-In |

Contact Card Cage **1984-2576-0001**
Contact FlexTerm **1984-1175-000x**
 **1984-1336-000x**

Parts Replacement

| Part No. | Replaces | Characteristics |
|----------------|----------------|---|
| 1984-2576-0001 | None | Used only with MPCx images |
| 1984-1336-000x | 1984-1175-000x | Used only with CC image. |
| 1984-1175-000x | None | Used only with CC image. Has marshaling panel connectors |

Contact Card Cage and Contact FlexTerm Jumper Positions

| Jumper | Purpose | Position |
|-------------------|--|---|
| HD1, HD2 | Indicates whether redundant Controller Processor Cards are connected to the Contact Card Cage and the ControlFile. | NORMAL: No redundant Controller Processors REDUNDANT: Redundant Controller Processors (HD1 and HD2 must be jumpered in the same position.) |
| HD3A through HD3H | Indicates whether the Contact Card Cage is Card Cage A or Card Cage B. The eight sets of jumpers correspond to the eight contact FICs. | -Card Cage A- Indicates card cage A -Card Cage B- Indicates card cage B NOTE: HD3A through HD3H must be jumpered in the same position. |

Contact Card Cage and Contact FlexTerm Fuses

| FRSI Part No. | Bussman Part No. | Littelfuse Part No. | Characteristics |
|---------------|------------------|---------------------|---------------------|
| G09140-0032 | MDL 2 | 313002 | 2 A 250 V Slow Blow |

Contact Termination Board 1984-1288-0001

Analog Transfer Card Fuse Data

| Fuse | FRSI Part No. | Bussman Part No. | Characteristics |
|--------------|--------------------------|-----------------------------|---|
| F1 to F24 | G09140-0029 | MDQ 1-1/2 | 1.5 A 250 V Slow Blow NOTE: Other fuses may be used to match the applied load. |

Contact Marshaling Panel 1984-2486-000x

Contact Marshaling Panel Specifications

| Term | Specification |
|-------------------------------------|--|
| Current Ratings/Temperature | DC Output: 2.3 amps at 25° C 1.8 amps at 40° C 1.0 amps at 60° C AC Output: 3.0 amps at 25° C 2.3 amps at 40° C 1.2 amps at 60° C |
| Voltage | Maximum: 300 V rms |
| Fusing | 4 amp slow blow per Optical Isolator Module |
| Cabling | 50 conductor round cable |
| Maximum distance | Card Cage or FlexTerm to Marshaling Panel: 750 feet |
| Connection to Card Cage or FlexTerm | 50 conductor cable terminated to connector on motherboard. |
| Wire gauge | 14-22 AWG solid or stranded |

Contact Marshaling Panel Fuses

| Fuse | FRSI Part No. | Bussman Part No. | Littelfuse Part No. | Characteristics |
|-------------|----------------------|-------------------------|----------------------------|--|
| F1 to F24 | G09140-0038 | MDL 4 | 313004 | 4 A 250 V Slow Blow NOTE: Smaller fuses should be used if smaller loads are applied. |

Optical Isolator Modules G12243-00xx

Optical Isolator Modules

| Part Number C12243- | Model | Function | Output Contact* | Voltage | Color |
|--------------------------------|----------------|-----------------|----------------------------|-------------------|--------------|
| 0005 | IAC5A | Input | None | 180-280 VAC/DC | Yellow |
| 0006 | IDC5 | Input | None | 10-32 VDC | White |
| 0007 | IDC5B IDC5F | Input | None | 4-16 VDC | White |
| 0008 | IAC5 | Input | None | 90-140 VAC/DC | Yellow |
| 0009 | ODC5 | Output | N.O. | 5-60 VDC | Red |
| 0010 | ODC5A | Output | N.O. | 5-200 VDC | Red |
| 0011 | OAC5A5 | Output | N.C. | 24-280 VAC | Black |
| 0012 | OAC5 | Output | N.O. | 12-140 VAC | Black |
| 0013 | OAC5A | Output | N.O. | 24-280 VAC | Black |

* All output modules, except OAC5A5, have normally open (N.O.) outputs. The output contact is open when the block output is false.

Maximum Current Ratings for Modules Mounted on Marshaling Panels

| Ambient Temperature | DC Output Modules | AC Output Modules |
|--------------------------------|------------------------------|------------------------------|
| 25 °C | 2.3 Amps | 3.0 Amps |
| 40 °C | 1.8 Amps | 2.3 Amps |
| 60 °C | 1.0 Amp | 1.2 Amps |

Contact FIC **1984-1460-000x**
 **1984-1304-000x**

Contact FIC Specifications

| Item | Specification |
|------------------------------|-------------------------------------|
| Power: Voltage Current | 22-34 VDC 90 mA at 30 V typical. |
| Switching current | 10 mA typical, 8 mA minimum |

Contact FIC LEDs

| LEDs | Meaning |
|----------|---|
| DS5-DS10 | I/O 1-6: Indicates the logic state of the module's input or output. With a normally open input or output, the module is on if the LED is on. With a special order normally-closed output module, contact is made with no power applied. The LED is on with an open contact on the module. |
| DS3 | 30V Fuse Blown: Replace power fuse F1 on the Contact Field Interface Card. |
| DS4 | TX Enable: The signal which enables the transmit signal from the Field Interface Card to the Contact Processor is active. |
| DS2 | Card Fault: A Fault is detected on the contact Field Interface card, or communications with the contact processor have ceased. Discrete outputs will go to the condition called for by the position of jumper HD1 (hold or off). |
| DS1 | Card Good: No faults are detected on the Contact Field Interface card and communication with the Contact Processor is active. |

Contact FIC Jumper Positions

| Jumper | Position | Effect |
|--------|----------|--|
| HD1 | HOLD | Hold output value on communications failure |
| | OFF | Drive output to zero on communications failure |

Contact FIC Fuses**Card 1984-1460-000x**

| Fuse | FRSI Part No. | Bussman Part No. | Littelfuse Part No. | Schurter Part No. | Characteristics |
|------|---------------|------------------|---------------------|-------------------|---------------------|
| F1 | G50382-0014 | -- | 273.500 | MSF 034.4216 | 1/2 A 125 V Plug-In |

Card 1984-1304-000x

| | | | | | |
|----|------------|---------|---------|----|--------------------------|
| F1 | G9140-0016 | AGC 1/2 | 312.500 | -- | 1/2 A 250 V Quick Acting |
|----|------------|---------|---------|----|--------------------------|

MUX Marshaling Panels

| | |
|----------------------|-----------------------|
| Voltage | 1984-2457-0002 |
| Current | 1984-2458-0001 |
| RTD | 1984-2456-0002 |

Voltage MUX Marshaling Panel Specifications

| Item | Specification |
|------------------------|---|
| Voltage | CSA: 150 V rms With a locally coated connector: 250V rms |
| Wire gauge | 12-20 AWG solid, stranded, lugged |
| Temperature | Maximum: 105° C |
| Connection to FlexTerm | 50 conductor cable terminated to connector on FlexTerm motherboard. |

4-20 mA MUX Marshaling Panel Specifications

| Item | Specification |
|-------------------------------|--|
| DC power isolation and fusing | 1984-1321 fuse module with isolating diodes |
| Per point fusing | 1/4 A |
| Temperature range | 0-70° C |
| Maximum voltage | Transmitter powered: 250 V rms System and remote powered: 150 V rms |
| Wire gauges | 12-20 AWG solid, stranded, lugged |
| Connection to FEM | 50 conductor cable terminated directly to FEM terminals. |

RTD MUX Marshaling Panel Specifications

| Item | Specification |
|------------------------|---|
| Voltage | CSA 150 V rms With a locally coated connector: 250V rms |
| Wire gauge | 12-20 AWG solid, stranded, lugged |
| Temperature | Maximum: 105° C |
| Connection to FlexTerm | 50 conductor cable terminated to connector on FlexTerm motherboard. |

PLC FlexTerm 10P53200001
 1984-2409-0001

NOTE: Use only 10P53200001 for EMC (CE) compliant installations.

PLC FlexTerm Jumpers

| Jumper | No Redundancy | Redundancy |
|--------------|---------------|------------|
| HD1A HD1B | 1-2 | 2-3 |
| HD2A HD2B | 1-2 | 2-3 |

NOTE: If only communication lines are used, the FlexTerm redundancy jumpers are inactive.

Parts Replacement

| Part No. | Replaces | Characteristics |
|----------------|----------------|--|
| 10P53200001 | 1984-2409-0001 | Replaces in all cases. |
| 1984-2409-0001 | 10P53200001 | Except in EMC compliant installations or ones using the communication lines. |

Port I/O Card:
RS-422/RS-232 **10P54880001**
 **1984-2402-0001**

NOTE: Use only 10P54880001 for EMC (CE) compliant installations

Parts Replacement for the RS-422/RS-232 Port I/O Card

| Part No | Replaces | Comments |
|----------------|----------------|--|
| 10P54880001 | 1984-2402-000x | Always permitted. |
| 1984-2402-0001 | 10P54880001 | Only for non-EMC approved installations. |

RS-232C Pin Assignments

| PLC Plug (15 Pin) (For Allen Bradley KE Module only) | Signal | Port I/O Card (25 Pin) | Signal |
|--|--------|---------------------------|--------|
| 1 | SHLD | 1 | SHLD |
| 2 | TXD | 2 | TXD |
| 3 | RXD | 3 | RXD |
| 4 | RTS | 4 | RTS |
| 5 | CTS | 5 | CTS |
| 6 | DSR | 6 | SR |
| 7 | GND | 7 | GND |
| 8 | DCD | 8 | DCD |
| 11 | DTR | 11 | GND |
| 13 | GND | 20 | DTR |

Port I/O Card RS-422/RS-232 LEDs

| LEDs | Meaning |
|------|--|
| DS4 | Receive Data: Indicates that data is being received from the PLC device. |
| DS3 | TX Data: Indicates that data is being sent to the PLC device. |
| DS2 | 30V Fuse Blown: Power fuse F1 is blown. |
| DS1 | Card Good: Voltages are within tolerances. |

RS-422/RS-232 Port I/O Card Jumper Positions

| Jumper | Position | Effect |
|--------|-------------|---|
| HD1A-D | A B | Use Communications Port A Use Communications Port B |
| HD2A-B | MOD TERM | Port I/O Card is a Modem Port I/O Card is a Terminal |
| HD3 | S M | Single Point: One PLC MultiDrop: Several PLCs |

RS-422/RS-232 Port I/O Card Fuse

| Fuse | FRSI Part No. | Littelfuse Part No. | Schurter Part No. | Characteristics |
|------|---------------|---------------------|-------------------|---------------------|
| F1 | G50382-0014 | 273.500 | MSF 034.4216 | 1/2 A 125 V Plug-In |

Port I/O Card: RS-422/RS-422 10P54850001
..... 1984-2441-0001

NOTE: Use only 10P54850001 for EMC (CE) compliant installations.

Parts Replacement for the RS-422/RS-232 Port I/O Card

| Part No | Replaces | Comments |
|----------------|----------------|--|
| 10P54850001 | 1984-2441-000x | Always permitted. |
| 1984-2441-000x | 10P54850001 | Only for non-EMC approved installations. |

Port I/O Card RS-422/RS-422 LEDs

| LEDs | Meaning |
|------|--|
| DS4 | Receive Data: Indicates that data is being received from the PLC device. |
| DS3 | TX Data: Indicates that data is being sent to the PLC device. |
| DS2 | 30V Fuse Blown: Power fuse F1 is blown. |
| DS1 | Card Good: All voltages are within tolerances. |

RS-422 Pin Assignments

| Pin | Signal |
|-----|-----------------|
| 1 | To Cable Shield |
| 3 | Transmit Data - |
| 9 | Transmit Data + |
| 4 | Receive Data - |
| 6 | Receive Data + |
| 5 | Isolated Return |

RS-422/RS-422 Port I/O Card Jumpers

| Jumper | Port A | Port B |
|---------------|---------------|---------------|
| HD1A-D | A | B |

RS-422/RS-422 Port I/O Card Fuse

| Fuse | FRSI Part No. | Littelfuse Part No. | Schurter Part No. | Characteristics |
|-------------|----------------------|----------------------------|--------------------------|------------------------|
| F1 | G50382-0021 | 273002 | MSF 034.4224 | 2 A 125 V Plug-In |

Analog Input FIC: Non-Isolated 1984-1463-0001
..... 1984-1394-000x

Non-Isolated Analog Input FIC LEDs

| LEDs | Meaning |
|------|---|
| - | 30V Fuse Blown: The 30 VDC power fuse to the card is blown. Note that this LED does not indicate whether field transmitter power and input current fuses are operational. |
| DS1 | +12V Status: Power is present and the regulator is operational. |

Non-Isolated Analog Input FIC Test Points

| Test Points | Meaning |
|-------------|---------------------------------------|
| Brown | Ground return. |
| Yellow | 1 to 5 V analog signal to controller. |

Non-Isolated Analog Input FIC Jumper Positions

| Jumper | Position | Purpose |
|--------|---|-----------------------------|
| HD1 | 1-2: System supplies power to transmitter output device. 2-3: Transmitter or output device supplies its own power. | Specifies FICs power setup. |

Non-Isolated Analog Input FIC Fuses

| Fuse | FRSI Part No. | Bussman Part No. | Littelfuse Part No. | Characteristics |
|----------------|---------------|------------------|---------------------|---------------------------|
| F1 F2 F3 | G09140-0010 | AGC 1/4 | 312.250 | 1//4 A 250 V Quick Acting |

Analog Input FIC: Smart Transmitter 1984-2412-0001

Smart Transmitter FIC LEDs+

| LEDs | Meaning |
|------|---|
| DS4 | Communications Activity: Indicates communications activity. The signal that enables the transmit signal from the Field Interface Card to the Controller Processor card is active. |
| DS3 | Fuse F3 Blown: Power fuse F3 has blown. This LED does not indicate the status of the fuses in the I/O loops. |
| DS2 | Card Bad: A card fault is detected or communications with the Controller Processor have ceased. |
| DS1 | Card Good: Card has passed power-up diagnostics. |

Smart Transmitter FIC Test Points

| Test Point | Meaning |
|-------------------|---|
| TP1 Controller | Controller loop current measured across 250 ohm resistor. |
| TP2 GND | Ground. |

Smart Transmitter FIC Jumper Values

| Jumper | Smart Transmitter Powered by System | Smart Transmitter Self Powered |
|--------|--|-----------------------------------|
| HD1 | 1-2 | 2-3 |

Smart Transmitter FIC Fuses

| Fuse | FRSI P/N | Littelfuse P/N | Schurter P/N | Characteristics |
|----------|-----------|----------------|--------------|-----------------|
| F1 F2 | G50382-11 | 273.250 | MSF 034.4213 | 1/4 A Plug-In |
| F3 | G50382-14 | 273.500 | MSF 034.4216 | 1/2 A Plug-In |

Analog Input FIC: Isolated 1984-1325-0001

Isolated Analog Input FIC LEDs

| LEDs | Meaning |
|------|---|
| DS4 | Input Signal: Indicates that the field input is present. The LED glows brighter as the field input increases. With no input, the LED is off. |
| DS3 | 30V Fuse Blown: The 30 VDC power fuse to the card is blown. Note that this LED does not indicate whether field transmitter power and input current fuses are operational. |
| DS2 | +12V Non-Isolated Status: The non-isolated +12 V regulator is operational. |
| DS1 | +12V ISO Status: The isolated +12 V regulator is operational. |

Isolated Analog Input FIC Test Points

| Test Point | Meaning |
|------------|---------------------------------------|
| Yellow | 1 to 5 V analog signal to controller. |
| Brown | Ground return. |

Isolated Analog Output FIC Jumper Positions

| Jumper | Position | Purpose |
|--------|----------|--|
| HD1 | 1-2 | System supplies power to transmitter or output device. |
| | 2-3 | Transmitter or output device supplies it own power. |

Isolated Analog Output FIC Fuses

| Fuse | FRSI P/N | Bussman P/N | Littelfuse P/N | Characteristics |
|----------|-------------|-------------|----------------|--------------------------|
| F1 F2 | G09140-0010 | AGC 1/4 | 312.250 | 1/4 A 250 V Quick Acting |
| F3 | G09140-0016 | AGC 1/2 | 312.500 | 1/2 A 250 V Quick Acting |

Analog Output FIC: Non-Isolated **1984-1490-0001**
 **1984-1273-0001**

Non-Isolated Analog Output FIC LEDs

| LEDs | Meaning |
|------|---|
| DS4 | TX Enable: The signal that enables the transmit signal from the Field Interface Card to the MultiLoop Processor is active. |
| DS3 | 30V Fuse Blown: One of three fuses has blown: F3 = digital section power regulator; F4 = analog panel station power; F5 = analog section power. This LED does not indicate the status of the two fuses on the output. |
| DS2 | Card Fault: A card fault is detected, or communications with the MultiLoop Processor have stopped. If a communication problem occurs, the output current is held at its last value or goes to zero. |
| DS1 | Card Good: No card faults are detected and the MultiLoop Processor or an analog panel station is controlling the output current. |

Non-Isolated Analog Output FIC Test Points

| Test Points | Meaning |
|-------------|--------------------|
| Brown | Ground return. |
| Yellow | Main 5V regulator. |

Non-Isolated Analog Output FIC Jumper Positions

| Jumper | Purpose | Position |
|-------------------------------|--|---|
| HD1 | Indicates whether the FIC holds the last output value or sets the output current to zero if there is loss of communication with the Controller Processor card. | <p>HOLD: The last output value is held if there is a failure within the ControlFile, with the comm lines, or at the FIC. If the power supply should fail, the output current goes to zero.</p> <p>OFF: The output value is held for about 1/2 second before going to zero if there is a failure in the FIC processors. For other types of failures, the output value is held for up to four seconds before the output current goes to zero.</p> |
| HD2 1984-1490-000x only | Select normal or reversed output | 1-2 Normal Output 2-3 Reversed Output |

Non-Isolated Analog Output FIC Fuses

| Fuse | FRSI P/N | Littelfuse P/N | Schurter P/N | Characteristics |
|----------|-------------|----------------|--------------|---------------------|
| F1 F2 | G50382-0011 | 273.250 | MSF 034.4213 | 1/4 A 125 V Plug-In |
| F3 F5 | G50382-0014 | 273.500 | MSF 034.4216 | 1/2 A 125 V Plug-In |
| F4 | G50382-0021 | 273.002 | MSF 034.4224 | 2 A 125 V Plug-In |

Analog Output FIC: Isolated **1984-1525-000x**
 **1984-1469-0003**
 **1984-1334-000x**

Isolated Analog Output FIC LEDs

| LEDs | Meaning |
|------|---|
| DS4 | TX Enable: The signal that enables the transmit signal from the Field Interface Card to the MultiLoop Processor is active. |
| DS3 | 30V Fuse Blown: One of three fuses has blown: F3 = digital section power regulator; F4 = analog panel station power; F5 = analog section power. This LED does not indicate the status of the two fuses on the output. |
| DS2 | Card Fault: A card fault is detected, or communications with the MultiLoop processor have ceased. If a communication problem occurs, the output current is held at its last value or goes to zero. |
| DS1 | Card Good: No card faults are detected and the MultiLoop Processor or an analog panel station is controlling the output current. |

Isolated Analog Output FIC Test Points

| Test Points | Meaning |
|-------------|--------------------|
| Brown | Ground return. |
| Yellow | Main 5V regulator. |

Isolated Analog Output FIC Jumper Positions

| Card | Jumper | Purpose | Position |
|----------------------------------|---------------------|--|--|
| 1984-1525-000x 1984-1469-000x | HD1A and HD1B | Indicates whether the FIC holds the last output value or sets the output current to zero if there is loss of communication with the Controller Processor card. | <p>HOLD: The last output value is held if there is a failure within the ControlFile, with the comm lines, or at the FIC. If the power supply should fail, the output current goes to zero.</p> <p>OFF: The output value is held for about 1/2 second before going to zero if there is a failure in the FIC processors.</p> <p>For other types of failures, the output value is held for up to four seconds before the output current goes to zero.</p> |
| | HD2 | Select normal or reversed output | <p>1-2 Normal Output</p> <p>2-3 Reversed Output</p> |
| 1984-1334-000x | HD1 HD2 | Indicates whether the FIC holds the last output value or sets the output current to zero if there is loss of communication with the Controller Processor card. | <p>HOLD: The last output value is held if there is a failure within the ControlFile, with the comm lines, or at the FIC. If the power supply should fail, the output current goes to zero.</p> <p>OFF: The output value is held for about 1/2 second before going to zero if there is a failure in the FIC processors.</p> <p>For other types of failures, the output value is held for up to four seconds before the output current goes to zero.</p> |

Isolated Analog Output FIC Fuses

| Fuse | FRSI P/N | Littelfuse P/N | Schurter P/N | Characteristics |
|----------------------|-------------|----------------|--------------|---------------------|
| F1 F2 F3 F4 | G50382-0014 | 273.500 | MSF 034.4216 | 1/2 A 125 V Plug-In |

I/O Scanning Rates

NOTE: Addressing any panel or card cage as “B”, “C”, or “D” drops the scanning rate to the slowest rate shown even if there are no other addressed panels or cages. The controller scan time (1.0, .50, .25, .125 second), selected from the ControlFile Status screen, must always be greater than the I/O point scan time. The controller scan time applies to all card cages served by the controller, so the scan time of the slowest cage must be used.

| Highest Card Cage Address | Cage Scan Pattern | Cage Scan Rate (Scans Per Second) | Minimum Controller Scan Time (Seconds) | |
|---------------------------|-------------------|--------------------------------------|--|------|
| | | | MDIO | MAIO |
| A | AAAA | 32 | .125 | .25 |
| B | ABAB | 16 | .125 | .50 |
| C | ABAC | A: 16 B, C: 8 | .25 | 1.0 |
| D | ABCD | 8 | .25 | 1.0 |

Remote Communications Termination Panel II 1984-4205-0001
Remote Communications Termination Panel I 1984-2552-0001

Remote Communications Termination Panel Parts Replacement

| Part No | Replaces | Characteristics |
|-------------------------|----------------|---|
| 1984-4409-0001 (Kit) | 1984-2552-000x | The Kit replaces a Remote Communications Termination Panel I. The kit contains two Remote Communications Termination Panel II units and a DIN rail for mounting them. |

Remote Communications Termination Panel II Jumpers

| Jumper | Position | Effect |
|--------------|---------------------|--|
| HD1 | REMOTE I/O (1-2) | Used when the panel is at the remote end of the communication line; at the card cage or FlexTerm. |
| | CONT FILE (2-3) | Used when the panel is at the ControlFile (source) end of the communication line. |
| HD4A HD4B | NORMAL (1-2) | Normal operation. One cable is used from the ControlFile to the panel. The panel is connected to one Controller Processor. |
| | REDUNDANT (2-3) | Redundant operation. Two cables are used between the ControlFile and the panel. The panel is connected to two Controller Processors. |

Remote Communications Termination Panel I Jumpers

| Jumper | Position | Effect |
|-------------------------------|-----------------------|---|
| HD1A HD1B (Top panel) | NORMAL (1-2) | Normal operation. One cable is used from the ControlFile to the panel. |
| | REDUNDANT (2-3) | Redundant operation. Two cables are used between the ControlFile and the panel. |
| HD3 (Top panel) | REMOTE I/O (1-2) | Used when the panel is at the remote end of the communication line: at the card cage or FlexTerm. |
| | CONTROL FILE (2-3) | Used when the panel is at the ControlFile (source) end of the communication line. |
| HD2A HD2B (Lower panel) | NORMAL (1-2) | Normal operation. One cable is used from the ControlFile to the panel. |
| | REDUNDANT (2-3) | Redundant operation. Two cables are used between the ControlFile and the panel. |
| HD4 (Lower panel) | REMOTE I/O (1-2) | Used when the panel is at the remote end of the communication line: at the card cage or FlexTerm. |
| | CONTROL FILE (2-3) | Used when the panel is at the ControlFile (source) end of the communication line. |

Fiber Optic I/O Converter 1984-3278-0001

NOTE: Use Minimum Revision C/D or higher for EMC (CE) compliant installations.

Fiber Optic I/O Converter LEDs

| LED | Color | Function |
|---------------|--------------|---|
| 5V POWER | GREEN | ON when power is ON. |
| RECEIVE DATA | YELLOW | Flashes when the unit is receiving data. |
| TRANSMIT DATA | YELLOW | Flashes when the unit is transmitting data. |

Standard Remote Termination Panel 1984-4344-0001

Standard Remote Termination Panel, Marshaling Panel Cable

| Application | Use Cable |
|---|------------------|
| Multi-FIM Termination Panel | 1984-4299-xxxx |
| Multi-FIM Termination Panel, Redundant FIMs | 1984-4319-xxxx |
| High Density Isolated Discrete Termination Panel | 1984-4298-xxxx |
| High Density Isolated Discrete Termination Panel, NEC/CSA | 1984-4345-xxxx |

Direct Discrete Termination Panel 1984-4127-0001

NOTE: For most applications, FRSI recommends that VTH be 1/2Vsource. For an input point with VTH = 1/2Vsource, the resistance to Vsource of the field device in the ON state must be 1400 ohms or less to ensure positive turn-ON. The resistance to Vsource of the field device in the OFF state must be 3200 ohms or greater to ensure positive turn-OFF.

Parts Replacement for the Direct Discrete Termination Panel

| Part No. | Replaces | Name on PWA | Characteristics |
|----------------|----------------|--------------------------------------|---|
| 10P52700001 | 1984-4127-0001 | DIRECT DISCRETE TERMINATION PANEL II | Use only the MDIOL Low-Side Switch FIM to ensure compatibility. |
| 1984-4127-0001 | 10P52700001 | DIRECT DISCRETE TERMINATION PNL | Valid replacement only in non-EMC installations that use the MDIOL Low-Side Switch FIM. |

Direct Discrete Termination Panel Jumpers

| Jumper | Value | Effect |
|--------|--|--|
| HD1 | A | FIM address A (factory setting) |
| | B | FIM address B |
| | C | FIM address C |
| | D | FIM address D |
| | E | Not used |
| | F | Factory setting, do not move |
| HD2 | Both Jumpers ON or both jumpers at NORM or both wires intact | Normal single FIM operation with online replacement capability |
| | Both Jumpers OFF or both jumpers at FIM REDUND or both wires cut | Redundant FIM operation |

Direct Discrete Termination Panel Fuses

| Fuse | FRSI Part No. | Littelfuse Part No. | Wickman Part No. | Characteristics |
|-----------|------------------|---------------------|------------------|--|
| F1 to F32 | G53394-1000-0005 | 216 001 | 19 194 1 A | 1 A 250 V (IEC) Quick action 5x20 mm Ceramic |

Direct Discrete Termination Panel II 10P52700001

NOTE: For most applications, FRSI recommends that V_{TH} be $\frac{1}{2}V_{source}$. For an input point with $V_{TH} = \frac{1}{2}V_{source}$, the resistance to V_{source} of the field device in the ON state must be 1400 ohms or less to ensure positive turn-ON. The resistance to V_{source} of the field device in the OFF state must be 3200 ohms or greater to ensure positive turn-OFF.

Parts Replacement for the Direct Discrete Termination Panel

| Part No. | Replaces | Name on PWA | Characteristics |
|----------------|----------------|--------------------------------------|--|
| 10P52700001 | 1984-4127-0001 | DIRECT DISCRETE TERMINATION PANEL II | Use only the MDIOL Low-Side Switch FIM to ensure compatibility. |
| 1984-4127-0001 | 10P52700001 | DIRECT DISCRETE TERMINATION PNL | Valid replacement only for non-EMC installations that use the MDIOL Low-Side Switch FIM. |

Direct Discrete Termination Panel II Jumper Settings

| Jumper | Setting | Function |
|------------------------------------|---------|--|
| HD1-HD16 (One jumper per point) | Left | MDIOL: Input or Output Point MDIOH: Input Point |
| | Right | MDIOH: Output Point |
| HD17 (One jumper) | A | Use Card Cage Address A |
| | B | Use Card Cage Address B |
| | C | Use Card Cage Address C |
| | D | Use Card Cage Address D |
| | E | Not used |
| | F | Not used |

(continued on next page)

Direct Discrete Termination Panel II Jumper Settings

| Jumper | Setting | Function |
|---------------|----------------|-----------------------------------|
| HD18 | NORM | Normal single-FIM operation |
| (Two jumpers) | REDUN | Redundant operation with two FIMs |

Direct Discrete Termination Panel II Fuses

| Fuse | FRSI Part No. | Littelfuse Part No. | Wickman Part No. | Characteristics |
|-------------|----------------------|----------------------------|-------------------------|--|
| F1 to F32 | G53394-1 000-0005 | 216 001 | 19 194 1 A | 1 A 250 V (IEC) Quick action 5x20 mm Ceramic |

Multi-FIM Discrete Termination Panel 1984-4282-0001

Multi-FIM Discrete Termination Panel Jumpers

| Jumper | Value | Effect |
|---------------|---|---|
| HD1, 2, 3 | A ON | FIM address A (factory setting) NOTE: Only one jumper is allowed in positions A-D |
| | B ON | FIM address B |
| | C ON | FIM address C |
| | D ON | FIM address D |
| | E OFF | Not used |
| | F ON | Factory setting, do not move |
| HD4-8 | 1-2 | Normal individual FIM operation |
| | 2-3 | Redundant operation of FIMs A and B |
| HD9, 10, 11 | 1-8 OFF 2-7 ON 3-6 ON 4-5 ON | Normal loop operation |
| | 1-8 ON 2-7 OFF 3-6 OFF 4-5 OFF | Used with Intrinsically Safe barriers CAUTION Remove power from the panel before moving jumpers on HD9, 10, or 11. The FIM may be damaged if 1-8 is ON when any of the other positions are ON. |
| HD12 | OFF (No jumpers) | Communication Ports A and B are independent (normal operation of FIMs A and B) |
| | 1-12 ON 3-10 ON 5-6 ON | Communication Ports A and B are connected (for online replacement operation of FIMs A and B) |

Isolated Discrete Termination Panel

A **1984-4121-0001**
B **1984-4124-0001**

NOTE: You must configure an I/O Block at FIM I/O address 1 to set the switch voltage for the entire FIM. Set to 1.7 volts for reliable operation.



WARNING

The solid state relays may be hot enough to cause burns.

Solid State Relays

| Part Number C12243- | Model | Function | Output Contact* | Voltage | Color |
|------------------------|------------------|-------------------------|--------------------|--|--------|
| 0005 | IAC5A | AC Input | None | 180-280 VAC/DC** | Yellow |
| 0006 | IDC5 | DC Input | None | 10-32 VDC | White |
| 0007 | IDC5-B IDC5-F | DC Input | None | 4-16 VDC | White |
| 0008 | IAC5 | AC Input | None | 90-140 VAC/DC** | Yellow |
| 0009 | ODC5 | DC Output | N.O. | 5-60 VDC | Red |
| 0010 | ODC5A | DC Output | N.O. | 5-200 VDC** | Red |
| 0011 | OAC5A5 | AC Output | N.C. | 24-280 VAC** | Black |
| 0012 | OAC5 | AC Output | N.O. | 12-140 VAC** | Black |
| 0013 | OAC5-A OAC5-1 | AC Output | N.O. | 24-280 VAC** | Black |
| 0014 | IDC5G IDC5N | DC Input | None | 35-60 VAC/DC | White |
| 0015 | ODC5RM ORR5-1 | Dry Contact Relay | N.O. | 100 VDC 130 VAC (Max switching current .5 A, 10 VA contact rating)** | |

* All output modules, except OAC5A5, have normally open (N.O.) outputs. The output contact is open when the block output is FALSE.

**** CAUTION**



**Hazardous voltages may be present on field wiring.
 Lock out and tag hazardous voltage circuits prior to servicing.**

Isolated Discrete Termination Panel A Jumpers

| Jumper | Value | Effect |
|---------------------------|---|---|
| HD1 (Panels "A" & "B") | A | Card cage A (factory setting) |
| | B | Card cage B |
| | C | Card cage C |
| | D | Card cage D |
| | E | Not used |
| | F | Factory setting, do not move |
| HD2 (Panel "A" only) | Both Jumpers ON or both jumpers at NORM or both wires intact | Normal single FIM operation with online replacement capability |
| | Both Jumpers OFF or both jumpers at FIM REDUND or both wires cut | Redundant FIM operation |

Isolated Discrete Termination Panel Fuses

| Fuse | FRSI Part No. | Littelfuse Part No. | Wickman Series | Characteristics |
|-------------|----------------------|----------------------------|-----------------------|---|
| F1 to F32 | G53394-3150-0005 | 216 3.15 | 19 194 3.15 A | 3.15 A 250 V (IEC) Quick action 5x20 mm Ceramic |



CAUTION

Hazardous voltages may be present. Lock out and tag hazardous voltage circuits prior to servicing.

High Density Isolated Discrete Termination Panel . . . 1984-4167-0001

NOTE: You must configure an I/O Block at FIM I/O address 1 to set the switch voltage for the entire FIM. Set to 1.7 volts for reliable operation.



WARNING

The solid state relays may be hot enough to cause serious burns.

High Density Isolated Discrete Termination Panel Address Jumpers

| Position | Effect |
|----------|--|
| A | Termination panel address is A (factory setting) (2-3 is ON) |
| B | Termination panel address is B |
| C | Termination panel address is C |
| D | Termination panel address is D |
| E | Not used |
| F | Factory setting, do not move |

High Density Isolated Discrete Termination Panel Solid State Relays

| Part Number C60350- | Model | Function | Output Contact | Voltage |
|------------------------|------------|-----------|-------------------|--------------|
| 0001 | 70M-IAC5-A | AC Input | None | 180-280 VAC* |
| 0002 | 70M-IDC5 | DC Input | None | 10-32 VDC |
| 0003 | 70M-IAC5 | AC Input | None | 90-140 VAC* |
| 0004 | 70M-ODC5 | DC output | NO | 5-60 VDC |
| 0007 | 70M-OAC5-A | AC output | NO | 24-280 VAC* |

***CAUTION**



Hazardous voltages may be present. Lock out and tag hazardous voltage circuits prior to servicing.

Discrete Field Interface Module (FIM)

Multipoint Discrete I/O FIM

MDIOH (High-side switch, EMC approved) 10P53550006

MDIOL (Low-side switch, EMC approved) 10P53520006

MDIO (Low-side switch) 1984-4080-0001

Parts Replacement for the Discrete Field Interface Module

| Part No. | Replaces | Name on Label | Characteristics |
|----------------|----------------|---|---|
| 10P53550006 | None | DISCRETE FIELD INTERFACE MODULE: HIGH SIDE SWITCH | High-side switching FIM (CE approved) |
| 10P53520006 | 1984-4080-000x | DISCRETE FIELD INTERFACE MODULE: LOW SIDE SWITCH | Low-side switching FIM (CE approved). Use in any installation. |
| 1984-4080-000x | 10P53520006 | DISCRETE FIELD INTERFACE MODULE | Low-side switching FIM Use only in non-CE approved installations. |

Discrete FIM LEDs

| LED | Meaning |
|---|--|
| On: FIM Good Flashing: FIM Inactive (Green) | ON steady when the FIM is in normal operation. Flashing when the FIM is disconnected from the field. |
| FIM Failure (Red) | ON when FIM considers itself failed or when the FIM is not communicating with the Controller. |
| Comm Active (Yellow) | Flashes when the FIM is communicating with the Controller Processor. |
| Input/Output Points 1-16 (Yellow) | Input: ON for voltage above threshold or for a closed contact OFF otherwise Output: ON when point is commanded ON OFF otherwise |
| Input-Only Points 17-32 (Yellow) | ON for voltage above threshold or for a closed contact OFF otherwise |

MAIO16 Termination Panel

(Field wires land on panel) 10P54770001
(Field wires on panel or on marshaling panel) 10P54770002

MAIO16 is EMC compliant.

NOTE: All input points must be constrained to operate within the common mode range of +29 to -2 VDC. This is automatic when all inputs are system powered. The ground levels must remain within ± 2 Volts of each other or erroneous results will be reported. The ground reference is available on TB17.

Parts Replacement for the MAIO16 Termination Panel

| Part No. | Replaces | Characteristics |
|-------------|---|---------------------------------------|
| 10P54770001 | 1984-4383-0001 | Replaces all cases. |
| | 10P54770002 1984-4383-0002 | Only if marshaling cable is not used. |
| 10P54770002 | 10P54770001 1984-4383-0001 1984-4383-0002 | Replaces all cases. |

MAIO16 Termination Panel Jumpers

| Jumper | Value | Effect |
|----------|------------|---|
| HD1-HD16 | Full left | Self-Powered Input Point with external ground reference or Output Point |
| | Centered | System-Powered Input Point |
| | Full right | Self-Powered Input Point with ground reference at the Termination Panel |
| HD17 | A at 1-2 | Cage address A (Factory setting) |
| | B at 1-2 | Cage address B |
| | C at 1-2 | Cage address C |
| | D at 1-2 | Cage address D |

MAIO16 Termination Panel Jumpers

| Jumper | Value | Effect |
|------------------------------|--|---|
| HD18 HD19 | Both at "N" (1-2) | Normal single FIM operation |
| | Both at "R" (2-3) | Redundant FIM operation (Requires two FIMs and two communication lines) |
| TB17 TB18 | V-, SH and CH jumpered (4-tab jumper installed) | Loop power negative and field wiring shields connected to chassis ground. Use with LPMs. (New factory setting.) |
| | SH to CH jumpered (4-tab jumper straddling TB18 or 2 tab jumper installed) | Field wire shields connected to chassis ground. Use with locally grounded source of loop power. (Old factory setting with 2 tab jumper.) |
| TB17 TB18 | SH to CH open (Jumper removed) | Allows connecting shield to a different ground reference than chassis. |
| TB19 TB20 TB21 TB22 | Jumpers fully installed, absent, or in "holder for loop position". | Fully installed: Power at TBA used for loop power. Holder position: Loop power connected at TB17. Absent: LPMs used for loop power. |

MAIO Termination Panel

(Field wires land on panel) 1984-4383-0001
(Field wires on panel or on marshaling panel) 1984-4383-0002

NOTE: All input points must be constrained to operate within the common mode range of +29 to -2 VDC. This is automatic when all inputs are system powered. The ground levels must remain within ± 2 Volts of each other or erroneous results will be reported. The ground reference is available on TB17.

Parts Replacement for the MAIO Termination Panel

| Part No. | Replaces | Characteristics |
|----------------|----------------|---------------------------------------|
| 1984-4383-0001 | 1984-4383-0002 | Only if marshaling cable is not used. |
| 1984-4383-0002 | 1984-4383-0001 | Replaces all cases. |

MAIO Termination Panel Jumpers

| Jumper | Value | Effect |
|--------------|-------------------|--|
| HD1-HD16 | Full left | Self-Powered Input Point with external ground reference or Output Point |
| | Centered | System-Powered Input Point |
| | Full right | Self-Powered Input Point with ground reference at Termination Panel |
| HD17 | A at 1-2 | Cage address A (Factory setting) |
| | B at 1-2 | Cage address B |
| | C at 1-2 | Cage address C |
| | D at 1-2 | Cage address D |
| HD18 HD19 | Both at "N" (1-2) | Normal single FIM operation |
| | Both at "R" (2-3) | Redundant FIM operation Requires two FIMs and two communication lines |

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MAIO Termination Panel Jumpers

| Jumper | Value | Effect |
|------------------------------|--|--|
| TB18 | V-, SH & CH jumpered (4 tab jumper installed) | Loop power negative and field wiring shields connected to chassis ground. Use with LPMs. (New factory setting.) |
| | SH to CH jumpered (4 tab jumper straddling TB18 or 2 tab jumper installed) | Field wire shields connected to chassis ground. Use with locally grounded source of loop power. (Old factory setting with 2 tab jumper.) |
| | SH to CH open (Jumper removed) | Allows connecting shield to a different ground reference than chassis. |
| TB19 TB20 TB21 TB22 | Jumpers fully installed, absent, or in "holder for loop position". | Fully installed: Power at TBA used for loop power Holder position: Loop power connected at TB17 Absent: LPMs used for loop power |

MAI32 Termination Panel

(Field wires land on panel) 10P53490001
(Field wires on panel or on marshaling panel) 10P53490002

The panel supports 32 analog input points using two termination panel addresses and two input blocks. The first address supports the Left Group of points (L1-L16), the second address supports the Right Group of points (R1-R16). An Analog Input Block (AIB) or a Smart Transmitter Input Block (SIB) must be configured for each address. HART variables can be addressed by configuring a VIB.

The Field I/O Status screen (previously the FIC Status screen) shows the type of device connected to each controller. The MAI32 FIM will have two entries, one for each cage address used. The type code is "MAI32-x" where the "x" shows the card cage of the OTHER set of 16 points. Thus if the panel is addressed as A and C, the first entry will show "MAI32-C" and the second will show "MAI32-A".

Multipoint Analog I/O Termination Panel Parts Replacement

| Part No | Replaces | Comments |
|-------------|-------------|---------------------------------------|
| 10P53490001 | 10P53490002 | Only if marshaling cable is not used. |
| 10P53490002 | 10P53490001 | Valid for all cases. |

MAI32 Termination Panel Jumpers

| Jumper | Position | Effect |
|--|--------------------------|--|
| HDL01-HDL16 HDR01-HDR16 Point Type | Full left | System-powered input point |
| | Full right | Self-powered input point |
| HD33 ADDRESS | One jumper A-C at 1-2 | Cage address for Left Group of points L01-L16 (A is recommended) |
| | One jumper B-D at 1-2 | Cage address for Right Group of points R01-R16 (B is recommended) |
| | P at 1-2 | Required for correct parity |

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MAI32 Termination Panel Jumpers (continued)

| Jumper | Position | Effect |
|------------------------------|---------------------------------|---|
| HD34 LOOP PWR DETECT | ENABLE | Enables detection of loop power loss |
| | DISABLE | Disables detection of loop power loss |
| TB21 Shield Grounding | SH and CH connected | All field wiring shields are connected to panel chassis ground |
| | SH and CH open | All field wiring shields are connected together and are floating with respect to panel chassis ground |
| | SH connected to external ground | All field wiring shields are connected together and are connected to the external ground point |

MAI32 Termination Panel Fuses

| Fuse | FRSI Part No. | Littelfuse Part No. | Wickman Part No. | Characteristics |
|-------------|----------------------|----------------------------|-------------------------|------------------------------------|
| F1 to F32 | G53394-0080-0005 | Series 216 | Series 19194 | 0.08 A 250 V (IEC) Quick acting |

Loop Power Module (LPM) 1984-4398-0001
10P57070001

NOTE: The LPM produces up to 380 mA DC at 25.0 to 25.5 Volts.

Loop Power Module LEDs

| LED | Meaning |
|-----------------|--|
| GOOD (Green) | LPM functioning normally. |
| BAD (Red) | LPM out of specification or failed. |
| None Lit | LPM out of specification, failed, or no input power. |

MAIO Input FIM
MAI16 (EMC Approved) 10P54040004 or
10P57700005
MAIO 1984-4414-1001

MAIO FIM Parts Replacement

| Part No | Replaces | Comments |
|----------------|----------------------------------|------------|
| 10P54040004 | 1984-4414-0001 1984-4414-100x | All cases. |
| 1984-4414-100x | 1984-4414-0001 | All cases. |

MAIO FIM LEDs

| LED | Meaning |
|---|---|
| On: FIM Good Flashing: FIM Inactive (Green) | ON steady when the FIM is in normal operation. Flashing when the FIM is disconnected from the field. |
| FIM Failure (Red) | ON when FIM considers itself failed. Flashing when the FIM is not communicating with the Controller. |
| Port A Active (Yellow) | Flashes when communication Port A is active. |
| Port B Active (Yellow) | For factory use only. |
| Status 1 (Yellow) | Flashes steadily while the FIM operates. |
| Status 2 (Yellow) | Flashes a diagnostic code if the FIM is disabled and the red LED is ON. |

MAIO Input "Status 2" LED Diagnostic Codes

| LED Code | Meaning |
|----------|--|
| 1 | RAM failure. |
| 2 | Voltage failure, one or more internal voltages are out of tolerance. |
| 3 | Not assigned. |
| 4 | ADC failure. |
| 5 | Address jumpers on the Termination Panel are not set to A, B, C, or D. |
| 6 | Write or erase failure in FLASH. |
| 7 | Verification failure in BOOT or APP code. |
| 8 | Not assigned. |
| 9 | Not assigned. |
| 10 | Point diagnostic failure. |
| 11 | Not assigned. |

MAIO Output FIM
MAO16 (EMC Approved) 10P54080004 or
10P58080005
MAO 1984-4418-0001

MAIO FIM Parts Replacement

| Part No | Replaces | Comments |
|-------------|-------------------------------|------------|
| 10P58080005 | 10P54080004 1984-4418-000x | All cases. |

MAIO Output FIM LEDs

| LED | Meaning |
|---|---|
| On: FIM Good Flashing: FIM Inactive (Green) | ON steady when the FIM is in normal operation. Flashing when the FIM is disconnected from the field. |
| FIM Failure (Red) | ON when FIM considers itself failed. Flashing when the FIM is not communicating with the Controller. |
| Port A Active (Yellow) | Flashes when communication Port A is active. |
| Port B Active (Yellow) | For factory use only. |
| Status 1 (Yellow) | Flashes steadily while the FIM operates. |
| Status 2 (Yellow) | Flashes a diagnostic code when the red LED is disabled and the red LED is ON. |

MAIO Output FIM "Status 2" LED Codes

| LED Code | Meaning |
|----------|--|
| 1 | RAM failure. |
| 2 | Voltage failure, one or more internal voltages are out of tolerance. |
| 3 | Not assigned. |
| 4 | ADC failure. |
| 5 | Address jumpers on the Termination Panel are not set to A, B, C, or D. |
| 6 | Write or erase failure in FLASH. |
| 7 | Verification failure in BOOT or APP code. |
| 8 | Not assigned. |
| 9 | Not assigned. |
| 10 | Point diagnostic failure. |
| 11 | Not assigned. |

MAI32 Input FIM (EMC Approved) 10P53190004 or 10P58300005

The FIM supports 32 analog input points using two termination panel addresses and two input blocks. The first address supports the Left Group of points (L1-L16), the second address supports the Right Group of points (R1-R16). An Analog Input Block (AIB) or a Smart Transmitter Input Block (SIB) must be configured for each address. HART variables can be addressed by configuring a VIB.

The Field I/O Status screen (previously the FIC Status screen) shows the type of device connected to each controller. The MAI32 FIM will have two entries, one for each cage address used. The type code is "MAI32-x" where the "x" shows the card cage of the OTHER set of 16 points. Thus if the panel is addressed as A and C, the first entry will show "MAI32-C" and the second will show "MAI32-A".

MAI32 Input FIM LEDs

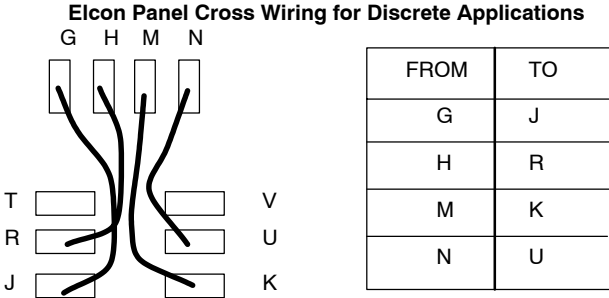
| LED | Meaning |
|---|---|
| On: FIM Good Flashing: FIM Inactive (Green) | ON steady when the FIM is in normal operation. Flashing when the FIM is disconnected from the field. |
| FIM Failure (Red) | ON when FIM considers itself failed. Flashing when FIM is not communicating with the Controller. |
| Port A Active (Yellow) | Flashes when communication Port A is active. |
| Port B Active (Yellow) | For factory use only. |
| Status 1 (Yellow) | Flashes steadily while the FIM operates. |
| Status 2 (Yellow) | Flashes a diagnostic code when the FIM is disabled and the red LED is ON. |

MAI32 FIM "Status 2" LED Patterns

| LED Code Number | Meaning |
|-----------------|--|
| 1 | RAM failure. |
| 2 | Voltage failure, one or more internal voltages are out of tolerance. |
| 3 | Point failure. |
| 4 | ADC failure. |
| 5 | Address jumpers on the Termination Panel are not set to A, B, C, or D. |
| 6 | Write or erase failure in FLASH. |
| 7 | Verification failure in BOOT or APP code. |
| 8 | Not assigned. |
| 9 | Not assigned. |
| 10 | Point diagnostic failure. |
| 11 | Temperature failure. |

Elcon Series 1000 Intrinsically Safe Termination Panel
 1216/CW-ROS4

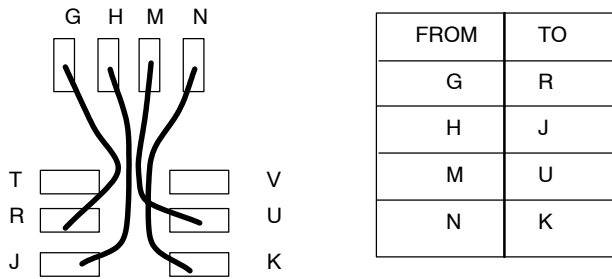
NOTE: Elcon barriers require a DC source between 21.5 and 28 Volts. The standard RS3 power bus can exceed these limits, so the panel should not be powered directly from the standard DC bus. A Remote I/O Power Supply (1984-4302-0000x) can be used.



Elcon Discrete IS Barriers

| Model | Elcon P/N | Description | Configura-tion | Comment |
|-------|-----------------|--|----------------|---------|
| 1822 | 1822 C0 0030 CC | Contact/Proximitior Input, Relay Output | 2 | Input |
| 1842 | 1842 C0 0030 CC | Contact/Proximitior Input, Optocoupler Output | 2 | Input |
| 1862 | 1862 L0 0060 CC | Contact Actuator | 12 | Output |
| 1872 | 1872 L0 0060 WW | Solenoid Valve Driver (35 mA per channel) | 6 | Output |
| 1882 | 1882 L0 0060 UU | Solenoid Valve Driver (70 mA per channel) Solenoid Valve Normally Energized | 2 | Output |
| 1882 | 1882 L0 0060 WW | Solenoid Valve Driver (70 mA per channel) Solenoid Valve Normally Deenergized | 2 | Output |

Elcon Panel Cross Wiring for Analog Applications



Elcon Analog IS Barriers

| Model | Elcon P/N | Description | Configuration | Comment |
|-------|-----------------|---|---------------|---------|
| 1012 | 1012 V0 0444 AA | Volt/mA Converter | 7 | Input |
| 1022 | 1022 A0 0242 AA | Smart Transmitter Barrier (Low Frequency Protocols) | 6 | Input |
| 1026 | 1026 A0 0242 AA | Smart (High Frequency Protocols) or Non-Smart Transmitter Barrier | 6 | Input |
| 1032 | 1032 H0 0242 AA | Bus Powered Analog Output Barrier | 6 | Output |
| 1034 | 1034 H0 0242 AA | Loop Powered Analog Output Barrier | 6 | Output |
| 1072 | 1072 D3 0510 AA | RTD/tx Potential Converter | 7 | Output |
| 1072 | 1072 F3 0510 AA | RTD/tx Potential Converter | 7 | Output |

Elcon IS Panel Fuses

| Panel | Wickman P/N | Characteristics |
|--------------|--------------------|---------------------------------------|
| Input | 19 194 1.60 A | 1.6 Amp 5x20 mm Ceramic 250 V IEC |
| Output | 19 194 3.15 A | 3.15 Amp 5x20 mm Ceramic 250 V IEC |

MTL IS Termination Panel A 10P50370001

NOTE: The MTL discrete isolators can be operated from the standard RS3 DC bus but you must be aware that the isolators will stop operating at low voltage before the system stops.

Mapping of I/O Points to MTL Discrete Panel A Isolators

| Input Point | Output Point | Isolator Position | Comment |
|-------------|--------------|-------------------|--|
| 1-2 | 1 | 1 | |
| 3-4 | 3 | 2 | |
| 5-6 | 5 | 3 | |
| 7-8 | 7 | 4 | |
| 9-10 | 9 | 5 | |
| 11-12 | 11 | 6 | |
| 13-14 | 13 | 7 | |
| 15-16 | 15 | 8 | |
| 17-18 | | 9 | |
| 19-20 | | 10 | |
| 21-22 | | 11 | |
| 23-24 | | 12 | |
| 25-26 | | 13 | |
| 27-28 | | 14 | |
| 29-30 | | 15 | |
| 31-32 | | 16 | The common LFD signal is on input point 32. Do not put an isolator in position 16 if common LFD is used. |

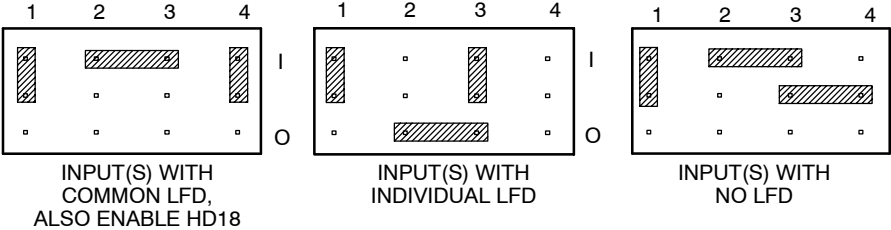
MTL Discrete IS Isolators

| MTL P/N | Name | Comment |
|----------------|--|---|
| MTL4016 | Two-Channel Switch/Proximity Detector Interface, With Line Fault Detection | Single-channel input - Serves an odd-numbered point on Panel A with the LFD signal on the even-numbered point. |
| MTL4021 | Solenoid/Alarm Driver | Single-channel output - Serves an odd-number point on Panel A or an even-number point on Panel B. |
| MTL4023 | Solenoid/Alarm Driver, With Line Fault Detection | Single-channel output - Serves an odd-numbered point on Panel A or an even-numbered point on Panel B (Common LFD is available). |
| MTL4025 | Solenoid/Alarm Driver, Low Current Output | Single-channel output - Serves an odd-number point on Panel A or an even-number point on Panel B. |

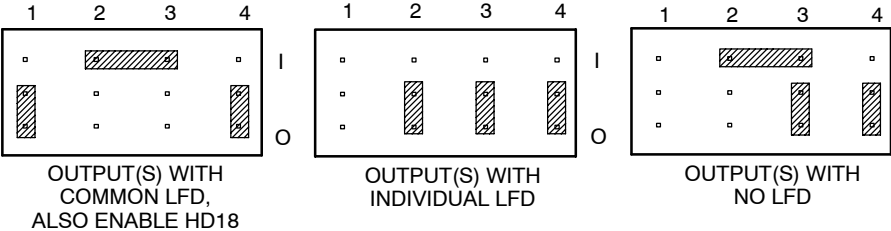
MTL Discrete Panel A Jumpers

| Jumper | Value | Action |
|---------------|--|--|
| HD1-HD16 | See diagrams below | Selects use of input/output, no LFD, common LFD, or individual LFD for the associated isolator 1-16. |
| HD17 | A, B, C, OR D at 1-2 F MUST be at 1-2 | Sets panel FIM address to A, B, C, or D. Jumper F sets standard transmission speed. |
| HD18 | ENABLE | Enables common LFD for panels A and B. |
| | DISABLE | Disables common LFD for panels A and B. |
| HD20-HD21 | Both at "N" | Normal single FIM operation. |
| | Both at "R" | Redundant FIM operation. |

HD1 TO HD16 JUMPER SETTINGS



HD1 TO HD8 JUMPER SETTINGS FOR OUTPUT(S)



MTL Discrete Panel A Fuse

| FRSI P/N | Wickman P/N | Littelfuse P/N | Characteristics |
|------------------|------------------|----------------|--|
| G53394-3150-0005 | 19 194 3.15 A | 216 3.15 | 3.15 Amp 5x20 mm Ceramic 250 V IEC |

MTL IS Termination Panel B 10P5049000x

NOTE: The MTL discrete isolators can be operated from the standard RS3 DC bus but you must be aware that the isolators will stop operating at low voltage before the system stops.

Mapping of I/O Points to MTL Discrete Panel B Isolators

| Input Point | Output Point | Isolator Position | Comment |
|-------------|--------------|-------------------|----------|
| | 2 | 17 | |
| | 4 | 18 | |
| | 6 | 19 | |
| | 8 | 20 | |
| | 10 | 21 | |
| | 12 | 22 | |
| | 14 | 23 | |
| | 16 | 24 | |
| | | 25 | Not Used |
| | | 26 | Not Used |
| | | 27 | Not Used |
| | | 28 | Not Used |
| | | 29 | Not Used |
| | | 30 | Not Used |
| | | 31 | Not Used |
| | | 32 | Not Used |

MTL Discrete Panel B Jumpers

| Jumper | Value | Action |
|---------------|---|---|
| HD1 | A, B, C, or D at 1-2 F MUST be at 1-2 | Sets panel FIM address to A, B, C, or D. Jumper F sets standard transmission speed. Must be identical to the Panel A setting. |
| HD17-HD32 | DISABLE | Default setting. Disables common LFD for the associated isolator 17-32. |
| | ENABLE | Enables common LFD for the associated isolator 17-32. Jumper HD18 on Panel A must be set to "ENABLE:." |

MTL Discrete Panel B Fuse

| FRSI P/N | Wickman P/N | Littelfuse P/N | Characteristics |
|------------------|--------------------|-----------------------|--|
| G53394-3150-0005 | 19 194 3.15 A | 216 3.15 | 3.15 Amp 5x20 mm Ceramic 250 V IEC |

MTL IS Analog Termination 10P50340001

The MTL analog IS isolators that work with RS3 are listed below. See the MTL catalog for details.

MTL Analog Input and Output Isolators

| MTL P/N | Description | Comment |
|----------|---|--|
| MTL4041B | Repeater Power supply, 4/20 mA, for 2- or 3-wire Transmitters (Smart Devices) | Single-channel input - Works with 2- or 3-wire 4/20 mA transmitters (Smart Devices) |
| MTL4041P | High-power Repeater Power supply, 4/20 mA, for 2- or 3-wire Transmitters | Single-channel input - Works with 2- or 3-wire 4/20 mA transmitters and smart transmitters |
| MTL4045B | Isolating Driver, 4/20 mA, for I/P Converters | Single-channel output - Works with 4/20 mA current/pressure (I/P) converters |
| MTL4046P | High-power Isolating Driver, for HART Valve Positioners | Single-channel output - Works with 4/20 mA devices and HART valve positioners. |

MTL Analog Termination Panel Jumpers

| Jumper | Value | Action |
|---------|-----------------------------|--|
| HD3 | A, B, C, OR D at 1-2 | Sets panel FIM address to A, B, C, or D. |
| HD1-HD2 | Both at "N" | Normal single FIM operation. |
| | Both at "R" | Redundant FIM operation. |

MTL Analog Fuse

| FRSI P/N | Wickman P/N | Littelfuse P/N | Characteristics |
|------------------|------------------|----------------|-------------------------------------|
| G53394-3150-0005 | 19 194 3.15 A | 216 3.15 | 3.15 Amp 5x20 mm Glass 250 V IEC |

Section 8:

PeerWay Interface

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Supervisory Computer Interface (SCI)

NOTE: The SCI can be connected to a host computer by:
 RS-232
 RS-422
 RS-422 X.25

RS-232C Signals and Connector Pin Assignments

| Pin | Signal | Pin | Signal |
|-----|---------------------------|-----|---------------------------|
| 1 | -- | 14 | -- |
| 2 | TXD (Data transmit) | 15 | -- |
| 3 | RXD (Data receive) | 16 | -- |
| 4 | RTS (Ready to send) | 17 | -- |
| 5 | CTS (Clear to send) | 18 | -- |
| 6 | DSR (Data set ready) | 19 | -- |
| 7 | Signal ground | 20 | DTR (Data terminal ready) |
| 8 | DCD (Data carrier detect) | 21 | -- |
| 9 | -- | 22 | -- |
| 10 | -- | 23 | -- |
| 11 | -- | 24 | -- |
| 12 | -- | 25 | -- |
| 13 | -- | | -- |

RS-422 Pins and Signals

| Pin | Signal | Pin | Signal |
|-----|----------------------|-----|----------------------|
| 1 | -- | 9 | -- |
| 2 | -- | 10 | TXC+ (X.25 only) |
| 3 | CTS+ (Clear to send) | 11 | TXC- (X.25 only) |
| 4 | CTS- (Clear to send) | 12 | RXC+ (X.25 only) |
| 5 | RXD+ (Data receive) | 13 | RXC- (X.25 only) |
| 6 | RXD- (Data receive) | 14 | RTS+ (Ready to send) |
| 7 | TXD+ (Data transmit) | 15 | RTS- (Ready to send) |
| 8 | TXD- (Data transmit) | | |

X.25 Clocking Parameters

| SCI Electrical Configuration | Nonvolatile Memory Jumper Configuration | Source of Clock Signals | Direction of Clock Lines (TXC and RXC) |
|------------------------------|---|-------------------------|--|
| Modem | Internal Clock | SCI | Output |
| Terminal | External Clock | Modem | Input |

EIA Options

| EIA Option | Description |
|------------|--|
| CTS | SCI configured as a modem: When DTR (pin 20) is asserted by the host, the SCI can transmit. SCI configured as a terminal: When DCD (pin 8) is asserted by the host, the SCI can transmit. |
| MODEM | SCI configured as a terminal: The SCI monitors the modem Carrier Detect (CD) signal to determine when the host has called in. When DTR (pin 20) is asserted by the SCI, the modem answers the phone and establishes the carrier. When DTR is dropped by the SCI, the modem hangs up the line. Unless dropped to hang up the line, this pin remains asserted once software initialization is complete. DCD (pin 8) is asserted by the modem to inform the SCI that the data carrier is detected. |
| NONE | No EIA option is selected. |

Highway Interface Adapter (HIA)

NOTE: Settings on the Configure HIA screen must match jumper settings on the HIA cards. When modems are used, a Black Box® Data Converter is required on each end of the line.

HIA/Black Box Cable Assembly Pin Assignments

| Twisted Pair | Signal | Wire Color | RS-422 Connector (HIA) | RS-449 Connector (Black Box) |
|--------------|---|-------------|------------------------|------------------------------|
| 1 | RXD - | Black | 6 | 6 |
| | RXD + | Red | 5 | 24 |
| 2 | RTS - | Black | 15 | 7 |
| | RTS + | White | 14 | 25 |
| 3 | TXC - | Black | 11 | 5 |
| | TXC + | Green | 10 | 23 |
| 4 | RXC - | Black | 13 | 8 |
| | RXC + | Blue | 12 | 26 |
| 5 | TXD - | Black | 8 | 4 |
| | TXD + | Yellow | 7 | 22 |
| 6 | CTS - | Black | 4 | 9 |
| | CTS + | Brown | 3 | 27 |
| 1-6 | Ground | Drain Wires | 2 | 19, 20, 37 |
| | Jumper Wire (0.25 mm ² 24 AWG) | White | | 7 TO 12 |
| | Jumper Wire (0.25 mm ² 24 AWG) | White | | 25 TO 30 |

HIA Status Screen Field Definitions

| Item | Definition |
|---------|---|
| NRoute | Point-to-point messages routed across this HIA. |
| RCount | Messages received directly from the partner HIA. |
| XCount | Messages transmitted. |
| ICount | Level 3 direct communication interrupts. |
| RTic | TIC messages received directly from the partner HIA. |
| RDist | Distance information messages received. |
| RNode | Node/type information messages received. |
| RPoint | Point-to-point messages received. |
| RAck | ACK direct messages received (piggybacked on HIA partner message) |
| RStat | Partner HIA direct communication status messages received. |
| MaxHop | Messages discarded for taking more than the maximum number of hops. |
| DupRout | Duplicate route messages (a message ID with the same, or higher, content has been seen) |
| NoPath | Messages where this HIA does not know the current path to the destination node. |
| ReQueue | Messages requeued for transmission on another path. |
| CRC | Messages with bad Cyclical Redundancy Check received from partner HIA. |
| Abort | Direct messages aborted. |
| Size | Number of messages received with size errors. |
| BCount | Number of messages received with byte count errors. |
| Overrun | Number of messages received with overrun errors. (scaled x1) Number of messages received with gross transmit communications timeouts. (scaled x200) 403 means 2 transmit timeouts and 3 overrun errors. |
| XToss | Transmit messages toss for debugging. |

(continued on next page)

HIA Status Screen Field Definitions (continued)

| Item | Definition |
|-------------|---|
| RToss | Received messages toss for debugging. |
| TimeOut | Transmit queue timeouts. |
| TicLost | TIC messages lost (unacknowledged). |
| LnkLost | LINK messages lost (unacknowledged). |
| RNack | Not acknowledged responses received from the partner HIA. |
| RBusy | Buffer busy responses received. |
| REnq | Status enquiries received from partner HIA. |
| BadSeq | Bad message sequence number ID for messages between HIAs. |
| XBusy | Busy responses sent to partner HIA (HIA direct buffers busy). |
| XEnq | Status enquiries sent to partner HIA. |

MicroVAX-PeerWay Marshaling Panel

(MicroVAX II) **1984-2533-0001**
(MicroVAX 3000) **1984-2622-0001**

MicroVAX/PeerWay Interface Marshaling Panel LEDs

| LED | Description |
|-----------------|--|
| B1 (RED) | Indicates the condition of the CPU card. (Board 1) |
| B2 (RED) | Indicates the condition of the PeerWay Interface card. (Board 2) |
| TXA (YELLOW) | Indicates transmission of data to PeerWay A. Blinks when data is sent. |
| TXB (YELLOW) | Indicates transmission of data to PeerWay B. Blinks when data is sent. |
| RXA (YELLOW) | Indicates data received from PeerWay A. Blinks when data is received. |
| RXB (YELLOW) | Indicates data received from PeerWay B. Blinks when data is received. |

VAX QBUS Interface Circuit Cards:

| | |
|---------------------------|-----------------------|
| QBUS Board 1 | 1984-3261-0002 |
| ..... | 1984-2507-000x |
| QBUS Board 2 | 1984-2510-0001 |

MicroVAX/PeerWay Interface Circuit Card Requirements

| Item | Board 1 (CPU Card) 1984-3261-0002 1984-2507-000x | Board 2 (PeerWay Interface Card) 1984-2510-0001 |
|----------------|---|--|
| 5 VDC current | 4 A | 1.5 A |
| 12 VDC current | --- | 700 mA |
| Total Watts | 20 W | 15.9 W |
| AC bus loads | 1 AC load | 0 AC load |
| DC bus loads | 1 DC load | 0 DC load |

Board 1 Jumper Settings

| Jumper | Setting | Function |
|---------------|------------------------------------|---|
| HD1 | 2-3 (1984-2507-000x board only) | Factory setting, do not move. |
| HD2 | 2-3 | Factory setting, do not move. |
| HD4-HD8 | See text for data | I/O Space Code, determines the base address used. |
| HD13-HD18 | See text for data | Memory Identification, first or second memory window. |
| HD29-HD30 | | Not used. |

SQ: 8-10

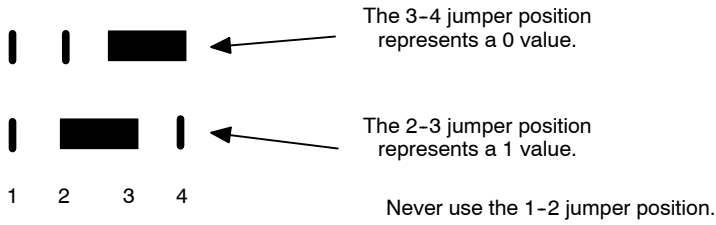
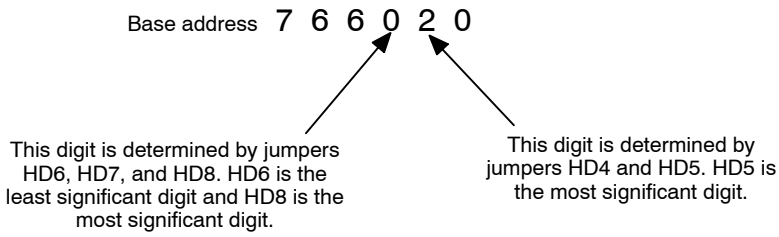


Jumper position to use the first memory window.



Jumper position to use the second memory window.

Board 1 Memory Identification Jumper Positions



This is the jumper position of the shipped board and represents 766020 octal.

This jumper position represents 766520 octal.
 HD5 is set to 1, HD4 is set to 0, giving 100 binary or 4 octal.
 HD8 is set to 1, HD7 to 0, and HD8 to 1, giving 101 binary or 5 octal.

Board 1 I/O Space Code Jumper Positions

Board 2 LEDs

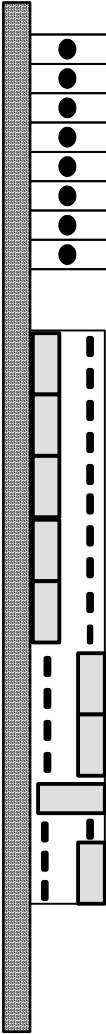
| Mode | LED Indications |
|--|--|
| Power on, but not yet booted; board reset | The bottom two LEDs alternate on and off and the bottom yellow LED is steady on. |
| Diagnostics | The bottom red LED is steady on. The yellow LEDs blink as diagnostics are run. |
| Running | The green LED is steady on. The yellow LEDs blink as indicated above. |

NOTE: The PeerWay address is the sum of the jumper values plus 1.

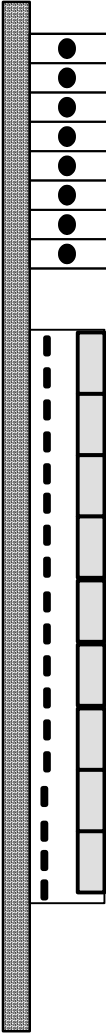
Board 2 PeerWay Address Jumpers

| Jumper | Value at 1-2 | Value at 2-3 |
|--------|--------------|--------------|
| J1 | 1 | 0 |
| J2 | 2 | 0 |
| J3 | 4 | 0 |
| J4 | 8 | 0 |
| J5 | 16 | 0 |

Diogenes Interface
TI Communications Card 1984-0408-0001



RS-232 connection



Current loop connection

Diogenes TI Comm Card Jumpering

RNI 10P53330001

NOTE: The RNI Fan assembly (10P53910001) plugs into jack J4 on the RNI power supply board. The fan is the only field-replaceable component of the RNI.

RNI LEDs

| LED | Color | Meaning |
|---------|--------|---|
| HW GOOD | Green | The hardware has passed all diagnostic tests and is running normally. |
| HW BAD | Red | The hardware has failed one or more diagnostic tests. The RNI is not operating. |
| COMM | Yellow | Blinks when internal communications occur in normal operation. |
| PW A/B | Yellow | ON when PeerWay A is active. OFF when PeerWay B is active. |
| ERROR | Yellow | Indicates failure of a diagnostic test if the red LED is ON and this LED flashes. The number of flashes indicates the failed test. 1 CPU 2 ROM CRC 3 Memory Controller 4 Main Memory 5 68302 Static Memory 6 Main Memory Size 7 TRAP Exceptions 8 TEA Exceptions 9 Read/Write Latch 10 Real Time Clock 11 Watchdog Interrupt 12 Ethernet Loopback |
| TMSTR | Yellow | ON if the RNI is the PeerWay Tick-Master. |

RNI Switches

| Switch | Meaning |
|--------|----------------------------|
| RESET | Resets and reboots the RNI |

RNI Connectors

| Connector | Meaning |
|---------------------------|--------------------------------|
| CONSOLE/ SERIAL PORT 1 | Connection for ASCII terminal. |

RNI Jumper

| Jumper | Setting | Function |
|----------|---------|--|
| HD1 | 10BASE2 | The 10Base2 Ethernet connector is enabled. |
| ETHERNET | 10BASET | The 10BaseT Ethernet connector is enabled. |

RNI Fuse

| Fuse | FRSI Part No. | Littelfuse Part No. | Bussman Part No. | Characteristics |
|------|---------------|---------------------|------------------|---|
| F1 | G50382-0021 | 273003 | MSF 034.4224 | 2 Amp Plug-in (On the Power Supply card) |

FISHER-ROSEMOUNT**RS3™
Service Quick Reference Guide**

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