Multi-Channel Option
Installation Instructions

Document Number 108-7047-040

Contributors

Written by Carolyn Curtis
Illustrated by Dan Young and Carolyn Curtis
Production by Laura Cooper
Engineering contributions by Kirk Law, Jeff Milo, Gregory Eitzmann, John Hallesy, Andrew Khau, Ed Miszkiewicz, Bharat Patel, David North, Scott Pritchett, Philip Montalban, Dennis Franklin, Bob Menker, Peter Luu, Carl Strasen, Mohsen Hosseini, Donna McMaster, Susan Tellep, and Todd Longbottom

Multi-Channel Option Installation Instructions
Document Number 108-7047-040

Silicon Graphics, Inc.
Mountain View, California

Contents

Figures

Tables

Introduction

The Multi-Channel Option is designed for users who need multiple viewports from within an application, such as visual simulation, virtual reality, or entertainment applications. The Multi-Channel Option runs on these compute platforms:

- Crimson™ equipped with RealityEngine™ graphics subsystem
- POWER Series™ equipped with RealityEngine graphics
- Skywriter™ equipped with RealityEngine graphics
- Onyx™ deskside or rackmount systems equipped with the VTX™ or RealityEngine^2™ graphics subsystem

The option consists of a board that fits into a VME slot in the chassis, plus paddleboards, cables, I/O panels, and software.

Note: This document is intended for use only by Silicon Graphics® System Support Engineers.

The Multi-Channel Option requires:

- IRIX™ version
  - 4.0.5H, 5.1, or later for Crimson, POWER Series, or SkyWriter
  - 5.0.1, 5.1, or later for Onyx systems
- on any compute platform, at least one Raster Memory (RM) board, revision level (as shown by the *gfxinfo* program) 00101 or greater (p/n 030-0235-004), 00102 or greater (p/n 030-0337-001, 030-0338-001, 030-0359-001, or 030-0360-001) for field-sequential formats, in which red, green, and blue signals are multiplexed on a single cable

Structure of This Document

The *Multi-Channel Option Installation Instructions* includes the following chapters:

Chapter 1 "Kit Contents" depicts and gives part numbers for all Multi-Channel Option components.

Chapter 2 "Installing the Option: Older Version (No Breakout Box)" describes how to install the version of Multi-Channel Option with I/O door panels.

Chapter 3	“Installing the Option: Version With Breakout Box” describes how to install the version of Multi-Channel Option with the breakout box.
Chapter 4	“Setting VME Addresses” explains how to write the DG2 EEPROM with an MCO VME address and reconfigure the kernel to recognize it.
Chapter 5	“Testing the Installation” details how to ensure that the Multi-Channel Option is installed properly.
Chapter 6	“Using Multi-Channel Option Diagnostics“ explains how to use IDE and other tests for the Multi-Channel Option.
Appendix A	“Multi-Channel Option Error Messages” lists error messages and their explanations and solutions.

An index completes this guide.

Multi-Channel Option Features

Tightly coupled to the Silicon Graphics graphics subsystem—interfacing to the digital graphics output board (DG2)—the Multi-Channel Option converts digital information stored in the graphics frame buffer into a variety of multiple analog video signals (or channels), ranging from multiple high-resolution outputs (1280 x 1024) to lower-resolution outputs, such as VGA. The output can then be displayed on additional monitors, projection devices, or both. Output can be genlocked to an external reference signal.

The Multi-Channel Option can drive up to six independent channels per graphics pipe, eliminating the need to purchase multiple systems and genlock the outputs together. A system with more than one RealityEngine graphics subsystem can support multiple Multi-Channel Option boards. The Multi-Channel Option can display the same format on all outputs or, depending on the system configuration and the format chosen, display two different formats simultaneously.

Table I-1 summarizes Multi-Channel Option configurations.

Platform	Number of Channels	
	No Breakout Box	Breakout Box
Crimson or POWER Series	Up to 4	Up to 6
POWER Series rack system	Up to 6	Up to 12
SkyWriter rack system with 2 Multi-Channel Option boards	Up to 6	Up to 12
Onyx deskside system	Up to 4	Up to 6
Onyx rack system with 3 Multi-Channel Option boards	Up to 14	Up to 18

Table I-1 Multi-Channel Option configurations

Conventions

In command syntax descriptions and examples, square brackets ([ ]) surrounding an argument indicate an optional argument. Variable parameters are in italics. Replace these variables with the appropriate string or value.

In text descriptions, IRIX filenames are in italics. The names of IRIS® keyboard keys are printed in boldface typewriter font and enclosed in angle brackets, such as **<Enter>** or **<Esc>**.

Messages and prompts that appear onscreen are shown in typewriter font. Entries that are to be typed exactly as shown are in boldface typewriter font.

Chapter 1

Kit Contents

This chapter summarizes the contents of the Multi-Channel Option kit (D4-MCO-4D, D4-MCO-ONYX, or D4-MCO-BOB). For convenience, Figure 1-1 shows all components for the older version with no breakout box (D4-MCO-4D or D4-MCO-ONYX). Figure 1-2 shows all Multi-Channel Option components for the version with the breakout box (D4-MCO-BOB).

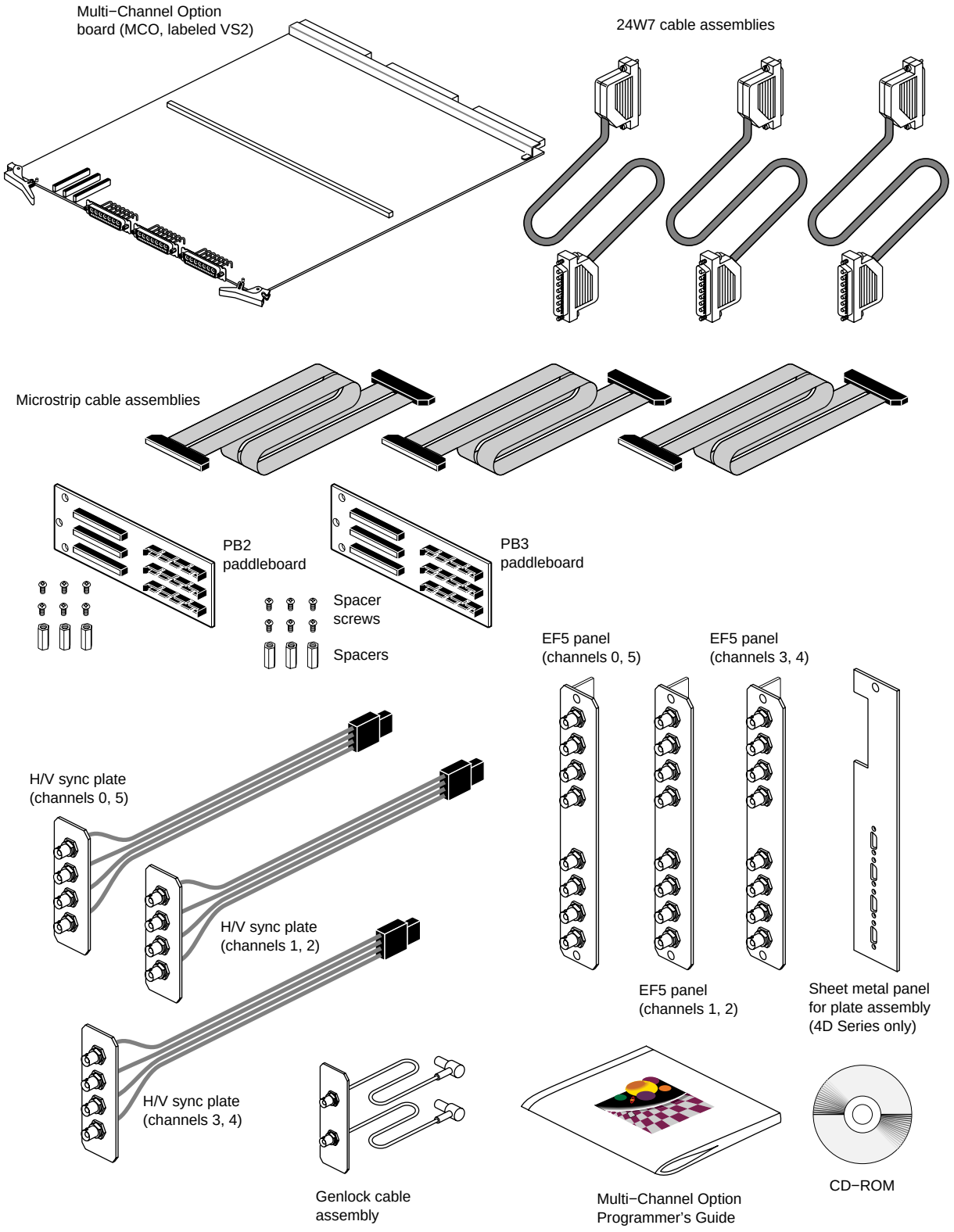


Figure 1-1 Kit contents for Older Version with No Breakout Box

For convenience, part numbers for the components for a Crimson or POWER Series chassis are listed in Table 1-1.

Component	Part Number	Quantity
Multi-Channel Option board (MCO board, labeled VS2 board)	030-0284-004	1
Cable kit	026-0782-002	1
PB2 paddleboard for DG2	030-0328-002	1
PB3 paddleboard for MCO board	030-0352-001	1
Microstrip cable assembly	9290050	3
Nylon spacers for paddleboards	7430100	6
Nylon screws for paddleboards	93-00407	12
24W7 cable assembly	018-0317-002	3
Genlock cable assembly	018-0318-001	1
EF5 panel for channels 0, 5	013-0557-001	1
EF5 panel for channels 1, 2	013-0621-001	1
EF5 panel for channels 3, 4	013-0622-001	1
H / V sync plate for channels 0, 5	013-0659-001	1
Panel	040-0543-001	1
Cable	041-0056-001	1
H / V sync plate for channels 1, 2	013-0658-001	1
Panel	040-0541-001	1
Cable	041-0056-001	1
H / V sync plate for channels 3, 4	013-0660-001	1
Panel	040-0542-001	1
Cable	041-0056-001	1
Sheet metal panel for plate assembly for deskside system with dual processor boards	040-0765-001	1
User documentation and software		
Multi-Channel Option Programmer's Guide	007-1812-030	1
Multi-Channel Option software (not required for IRIX 5.1 or later)	SC4-W4D-4.0.5H or SC4-W4D-5.0.1	1

Table 1-1 Multi-Channel Option Kit Contents for Crimson or POWER Series (D4-MCO-4D)

The IDE diagnostics CD for IRIX 4.0.5H (p / n 806-0007-009), 5.0.1 (p / n 812-0121-002), or 5.1 (5.1.1; 5.2: p / n 812-0121-003) is required for running diagnostics on the Multi-Channel Option on a Crimson or POWER Series system. The customer does not have this CD; bring your copy.

The operating system software is not structured to the product; it must be ordered separately. MCO support is an integral part of the operating system software starting with release 5.1 (p / n 812-0119-003).

For convenience, part numbers for the components for an Onyx deskside or rackmount chassis are listed in Table 1-2.

Component	Part Number	Quantity
Multi-Channel Option board (MCO board, labeled VS2 board)	030-0284-004	1
Cable kit	026-0782-002	1
PB2 paddleboard for DG2	030-0328-002	1
PB3 paddleboard for MCO board	030-0352-001	1
Microstrip cable assembly	9290050	3
Nylon spacers for paddleboards	7430100	6
Nylon screws for paddleboards	93-00407	12
24W7 cable assembly	018-0317-002	3
Genlock cable assembly	018-0413-001	1
EF5 panel for channels 0, 5	013-0835-001	1
EF5 panel for channels 1, 2	013-0833-001	1
EF5 panel for channels 3, 4	013-0834-001	1
H / V sync plate for channels 0, 5	013-0838-001	1
Panel	040-0732-001	1
Cable	041-0056-001	1
H / V sync plate for channels 1, 2	013-0836-001	1
Panel	040-0730-001	1
Cable	041-0056-001	1
H / V sync plate for channels 3, 4	013-0837-001	1
Panel	040-0731-001	1
Cable	041-0056-001	1
User documentation and software		
Multi-Channel Option Programmer's Guide	007-1812-030	1
Multi-Channel Option software (not required for release IRIX 5.1 or later)	SC4-W4D-5.0.1	1

Table 1-2 Multi-Channel Option Kit Contents for Onyx (D4-MCO-ONYX)

The IDE diagnostics CD for IRIX 5.0.1 (p / n 812-0121-002) or 5.1 (5.1.1, 5.2: p / n 812-0121-003) is required for running diagnostics on the Multi-Channel Option on an Onyx system. The customer does not have this CD; bring your copy.

The operating system software is not structured to the product; it must be ordered separately. MCO support is an integral part of the operating system software starting with release 5.1.

Note: Because the chassis backplane or midplane must be jumpered if VME slots are skipped, make sure you have jumpers or interrupt boards: at least 20 regular jumpers (p / n 9090003) for Onyx deskside or Onyx rackmount cardcage 2, or up to four interrupt boards (p / n 030-0516-00x) for Onyx rackmount cardcage 3.

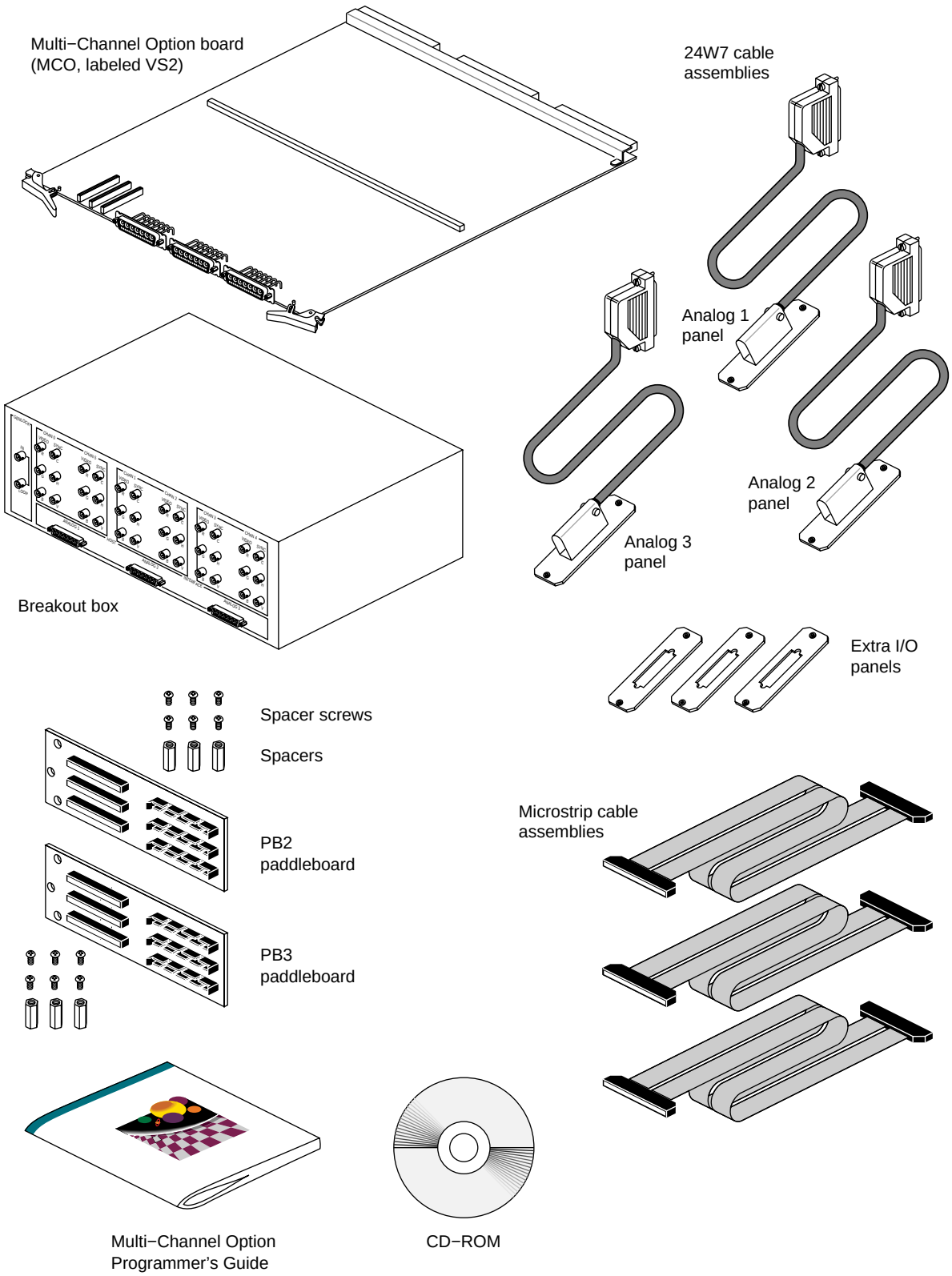


Figure 1-2 Kit contents for Version with Breakout Box

Part numbers for the components for a MCO with a breakout box are listed in Table 1-3.

Component	Part Number	Quantity
Multi-Channel Option board (MCO board, labeled VS2 board)	030-0284-004	1
Cable kit	026-0782-002	1
PB2 paddleboard for DG2	030-0328-002	1
PB3 paddleboard for MCO board	030-0352-001	1
Microstrip cable assembly	9290050	3
Nylon spacers for paddleboards	7430100	6
Nylon screws for paddleboards	93-00407	12
24W7 cable assembly		
ANALOG 1	018-0450-001	1
ANALOG 2	018-0451-001	1
ANALOG 3	018-0452-001	1
Connector plates for Crimson / POWER Series		1
ANALOG 1	040-0897-001	
ANALOG 2	040-0898-001	
ANALOG 3	040-0899-001	
Breakout box		1
Chassis assembly	013-0959-001	
Mounting assembly hardware kit	026-0941-001	
External cable for breakout box	018-0453-001	3
Label sheet	024-0853-001	
User documentation and software		
Multi-Channel Option Programmer's Guide	007-1812-030	1
Multi-Channel Option software (not required for IRIX 5.1 or later)	SC4-W4D-4.0.5H or SC4-W4D-5.0.1	1

Table 1-3 Multi-Channel Option Kit Contents for Version With Breakout Box (D4-MCO-BOB)

The IDE diagnostics CD for IRIX 4.0.5H (p / n 806-0007-009, 5.0.1 (p / n 812-0121-002), or 5.1 (5.1.1, 5.2: p / n 812-0121-003) is required for running diagnostics on the Multi-Channel Option on a Crimson or POWER Series system. The customer does not have this CD; bring your copy.

The operating system software is not structured to the product; it must be ordered separately. MCO support is an integral part of the operating system software starting with release 5.1.

Chapter 2

Installing the Option: Older Version (No Breakout Box)

This chapter describes how to install the Multi-Channel Option (MCO) in a VME slot in the following IRIS chassis:

- deskside: POWER Series, Crimson (Diehard II), and Onyx (Eveready)
- rack: POWER Series (Predator), SkyWriter, and Onyx (Terminator)

The installation procedure is divided into the following steps:

1. preparing the chassis
2. installing the EF5s and attaching 24W7 cables
3. installing and cabling the sync and genlock panels
4. jumpering the Onyx backplane or midplane
5. changing the physical VME address on the board
6. attaching the paddleboards and installing the MCO board
7. attaching microstrip cables to the paddleboards
8. attaching the 24W7 cables and closing the chassis
9. cabling the VIDI/O BOX™ from Truevision® for use with MCO
10. restarting the system and installing the Multi-Channel Option software

For MCO in an Onyx, IRIX release 5.0.1 or later is required. If the Onyx is running 5.0, upgrade to 5.0.1 or later before proceeding.

For POWER Series or Crimson, 4.0.5H or later is required. If the system is running an earlier version, upgrade it before proceeding.

The system should have been upgraded to latest versions of hardware; for example, the F chips on the IO4 board must be version 2 for the Multi-Channel Option to function in the system.

Other Silicon Graphics manuals contain instructions for exchanging circuit boards. Make sure you have the appropriate one(s):

- *Single Tower Maintenance Manual* (108-7002-xxx): Crimson and POWER Series systems
- *CHALLENGE™/Onyx™ L Deskside Installation Instructions* (108-7039-xxx)
- *CHALLENGE™/Onyx™ XL Rackmount Installation Instructions* (108-7042-xxx)

- *CHALLENGE and Onyx Retrofit Instructions* (domestic version: 802-0107-002; international version: 802-0106-002)
- *Challenge/Onyx Rackmount Third Cardcage (CC3) Upgrade Instructions* (release note, 802-0105-xxx): setting up cardcage 3 for Onyx rackmount
- *SkyWriter Installation Instructions* (108-7011-xxx)

Make sure you have other pertinent release notes and Field Information Bulletins as well.

You need a flat-blade screwdriver and a Phillips screwdriver to install the Multi-Channel Option. To run diagnostics, use the IDE diagnostics CD for IRIX 5.2 (812-0119-005), 5.1 (812-0121-003), IRIX 5.0.1 (812-0121-002), or IRIX 4.0.5H (806-0007-009) as explained in Chapter 6, "Using Multi-Channel Option Diagnostics," in this document.

You will need jumpers for the backplane or midplane of the machine if you are installing the MCO in an Onyx:

- Onyx deskside chassis and cardcage 2 (CC2) of an Onyx rackmount chassis: up to 20 jumpers (p / n 9090003)
- cardcage 3 (CC3) of an Onyx rackmount chassis: up to four interrupt boards (p / n 030-0516-xxx)

Note: To perform with the Multi-Channel Option, the system must have at least one Raster Memory board at revision level 00101 or greater (p / n 030-0235-004). Revision level 00102 or greater (p / n 030-0337-001, 030-0338-001, 030-0359-001, or 030-0360-001) is required for field-sequential formats, in which red, green, and blue signals are multiplexed on a single cable.

2.1 Preparing the Chassis

To prepare the chassis for installing the option, follow these steps:

Caution: Board components are extremely sensitive to electrostatic discharge. Use proper antistatic procedures while handling the board.

1. Make sure all users are off the target system. To check the revision level of the RM board(s) before you shut down the system, type as root

   ```
   /usr/gfx/gfxinfo -v
   ```

   In the result, look for a line such as

   ```
   2 RM boards (rev. 00102/00102)
   ```

   To work properly with MCO, the last digit of each RM board reported must be a number other than zero. If the system is running a field-sequential format, the digit must be greater than one.

2. Shut down the system; open the chassis, removing the rear outer panel if necessary.
3. Open the rear metal panel to expose the slots.
4. Check the revision level of the VCAM in the system. Not many of these exist. Determine the revision level by inspecting O0B0 and M9C0:

- no rework at O0B0 and no rework at M9C0: 030-0500-003
- rework at O0B0 and no rework at M9C0: 030-0500-004
- rework at O0B0 and rework at M9C0: 030-0500-005

If the VCAM is revision level 030-0500-004, swap it for another revision level.

5. Check the revision level of the RM boards in the system. Each board must have a number other than zero (or one) as its last digit, or have one of these part numbers:
   - 030-0235-004 (00101)
   - 030-0337-001 or 030-0338-001 (00102) for field-sequential formats
   - 030-0359-001 or 030-0360-001 (00112) for field-sequential formats
6. In Crimson or POWER Series deskside systems with dual processor boards (four processors), the existing plate assembly for the second processor board is situated on the blank plate or sheet metal panel (p/n 040-0159-001) so that there is no room to attach the PB3 paddleboard to the MCO board. The replacement panel (p/n 040-0765-001) included in the MCO shipment situates the plate assembly on its lower half, allowing room for the PB3. Figure 2-1 depicts these panels.

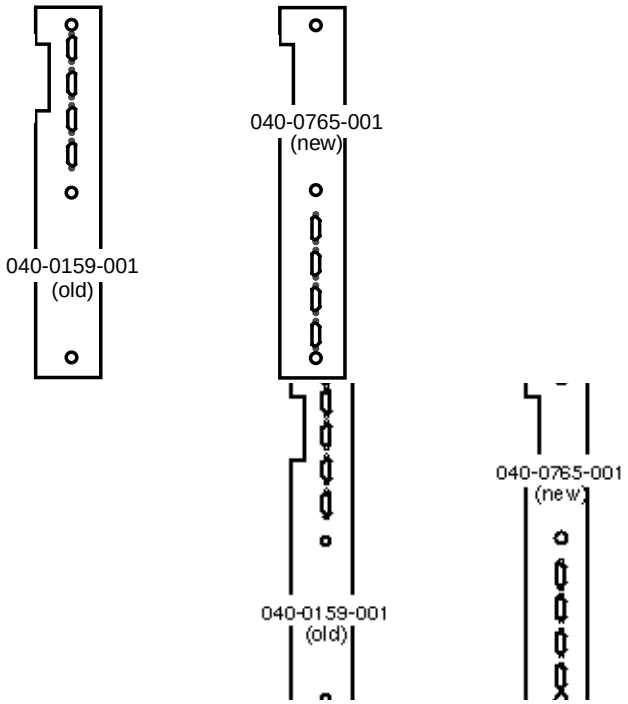


Figure 2-1 Sheet Metal Panels for Plate Assembly

If you are installing the Multi-Channel Option in a Crimson or POWER Series deskside system with dual processors and the old sheet metal panel (p/n 040-0159-001), you must replace the panel. Follow these steps:

- Unscrew the plate assembly (p/n 013-0861-001) from the sheet metal panel. Detach the flat ribbon cable (018-0136-001) if necessary.
- Unscrew the old metal panel (p/n 040-0159-001) from the I/O door.

- Install the new panel (p/n 040-0765-001) shipped with MCO into the I/O door over the same I/O slots as the one you removed.
- Screw the plate assembly onto the new sheet metal panel. Reattach the flat ribbon cable if necessary.

7. Plan where to install the MCO board, the EF5 panels, and the cables:

   - *VME slot required*: To allow room for internal cables, the option should go into VMME slot 3 in the Crimson or POWER Series, the VME slot closest to the DG2 board in the Onyx deskside, and any available VME slot in the SkyWriter and Onyx rackmount.

     If the appropriate slot is occupied by an existing option, move it to free the slot. If slot 1, slot 2, or both are unoccupied, you must jumper the backplane, as explained in this chapter.

   - *Space for paddleboards*: The paddleboards that you will attach to the MCO and DG2 boards extend into the space between the board slots and the I/O door. To avoid interference from the paddleboards and their cables, you may need to move existing options.

     Note: For a Crimson chassis, clearance between the edges of the paddleboards and the I/O door, when closed, is only 1/10 inch.

   - *Space for cables*: Care must be taken to avoid crimping any cables, particularly the sensitive microstrip cables that join the two paddleboards.

   - *EF5 panel placement*: Each EF5 occupies two adjacent (lengthwise) slots on the I/O door. The EF5s for channels 0 and 5 and for channels 1 and 2 must occupy parallel but alternate slots, with the genlock panel in a slot between them.

     Note: In an Onyx deskside system, the EF5 panels must occupy the leftmost slots on the I/O door to allow room for the PB3. In cardcage 3 of an Onyx rackmount, the two EF5 panels for channels 1 and 2 must be installed upside down. Figure 2-2 diagrams this placement.

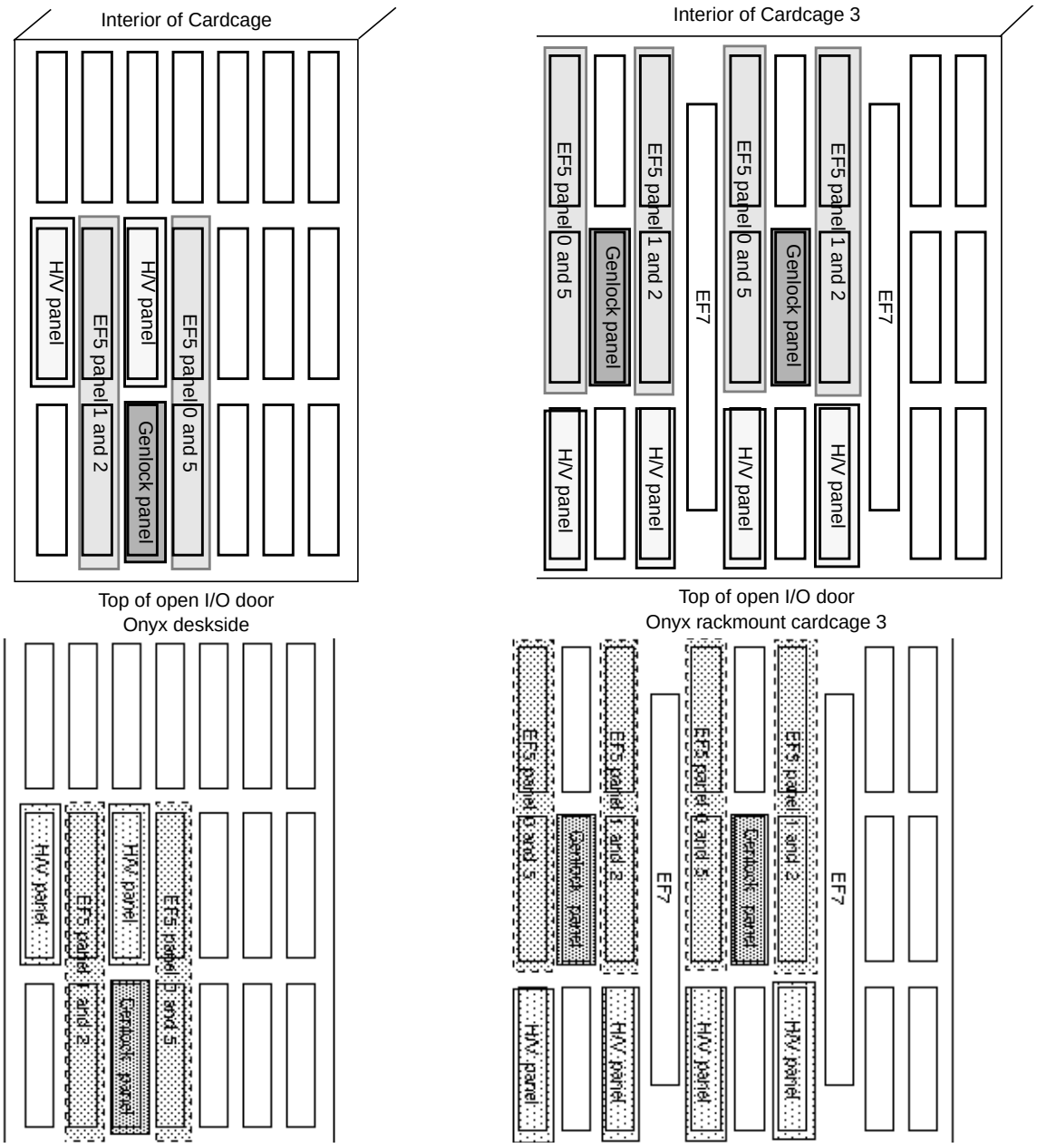


Figure 2-2 Multi-Channel Option Panel Placement in Onyx

Typically, the Multi-Channel Option panels are installed in the upper slots because of the length of the associated cables.

Note: In an Onyx rackmount (Terminator) chassis, one MCO board and up to three EF5 panels go into cardcage 2 and one or two MCO boards and up to four EF5 panels go into cardcage 3, for a maximum total of 14 channels. Eighteen-channel MCO is available with the MCO breakout box.

- *H/V sync panels*: If the customer is using composite sync- or sync-on-green type monitors, the H / V sync panels might not be required. Because the Multi-Channel Option requires several slots, ask the customer if H / V panels should be installed.

8. Remove the appropriate number of slot covers. For example:
   - For a deskside system and for a rackmount system using four channels, remove five to seven slot covers, depending on whether the customer is using H/V sync.
   - For a rackmount system using six channels, remove seven to ten slot covers, depending on whether the customer is using the H/V sync panels.

   Note: Reserve the screws for use with the Multi-Channel Option.

Illustrations of complete option installations appear later in this chapter:

- Crimson chassis: Figure 2-20
- POWER Series rackmount chassis: Figure 2-21
- SkyWriter chassis: Figure 2-22
- Onyx deskside chassis: Figure 2-23
- Onyx rackmount chassis: Figure 2-24 and Figure 2-25

2.2 Installing the EF5 Panels and Attaching 24W7 Cables

The three EF5 panels are not interchangeable. Each of the three EF5 panels outputs to two different channels and has a different silkscreen:

- EF5 for channels 0 and 5 (p/n 013-0557-001 for Crimson and POWER Series, 013-0835-001 for Onyx)
- EF5 for channels 1 and 2 (p/n 013-0621-001 for Crimson and POWER Series, 013-0833-001 for Onyx)
- if the customer is using the six-channel option: EF5 for channels 3 and 4 (p/n 013-0622-001 for Crimson and POWER Series, 013-0834-001 for Onyx)

To install the EF5 panels, follow these steps:

1. Select the two slots (adjacent lengthwise) for the EF5 0 and 5 panel. These slots are the two leftmost slots from which you have removed slot panels. Refer to Figure 2-2.
2. Orient the EF5 panel over the slots, with the top of the panel aligned with the top of the I/O door, as shown in Figure 2-3.

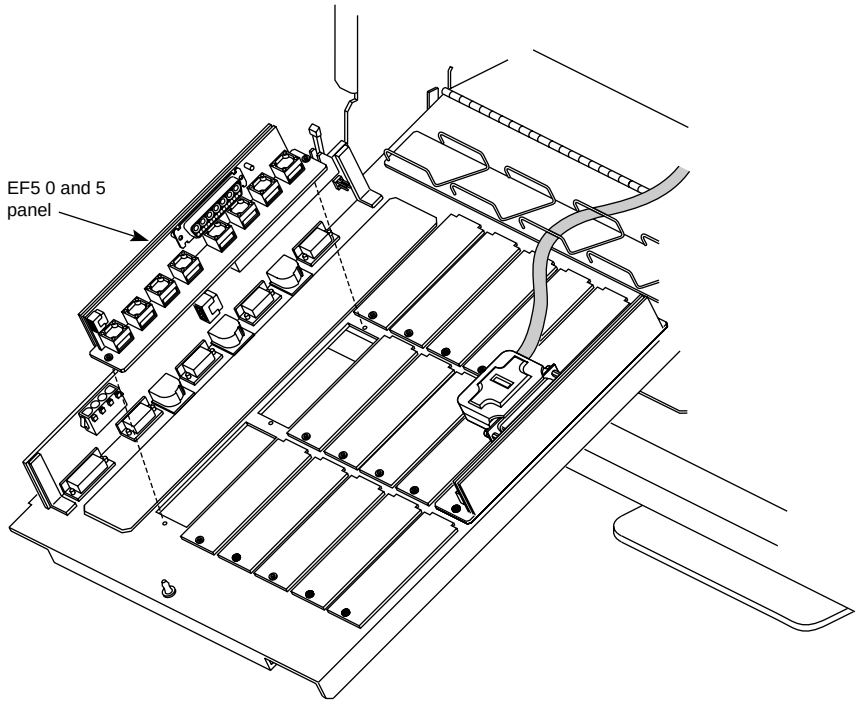


Figure 2-3 Placing the EF5 0 and 5 Board

3. Screw EF5 panel for channels 0 and 5 into place.

4. Attach one end of a 24W7 cable to the connector on the EF5 panel for channels 0 and 5. The cable should exit toward the bottom of the board, as shown in Figure 2-4. Screw it in.

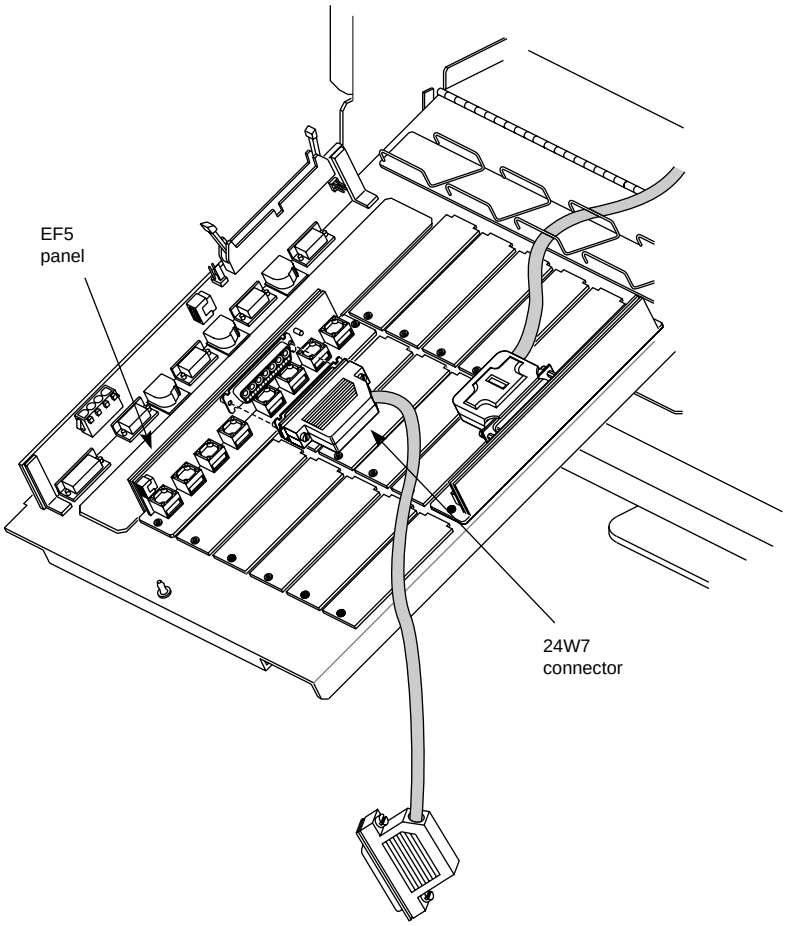


Figure 2-4 Attaching the 24W7 Cable to the EF5 0 and 5 Panel

5. Skipping a pair of slots, orient the EF5 1 and 2 panel over the next pair of slots (adjacent lengthwise). Align the top of the board with the top of the I/O door.

   Note: If you are installing the MCO in cardcage 3 of an Onyx rackmount chassis, you must orient the EF5 panel for channels 1 and 2 upside down. See Figure 2-2.

6. Screw the EF5 panel for channels 1 and 2 into place.

7. Attach one end of a second 24W7 cable to the connector on the EF5 panel for channels 1 and 2. The cable should exit toward the bottom of the I/O door. Screw it in.

   Note: In the case of the upside-down EF5 panel(s) for channels 1 and 2 in Onyx rackmount CC3, the cable exits toward the top of the I/O door.

8. If the customer is using channels 3 and 4, install that EF5; attach one end of the third 24W7 cable to it as explained earlier. Even if the customer is not using H/V sync panels, you must skip a pair of slots between the EF5 for channels 1 and 2 and the EF5 for channels 3 and 4 to allow room for the video connectors.

Figure 2-5 shows two EF5 panels installed, with 24W7 cables attached.

9. In a multipipe system, repeat the process for each set of EF5 panels.

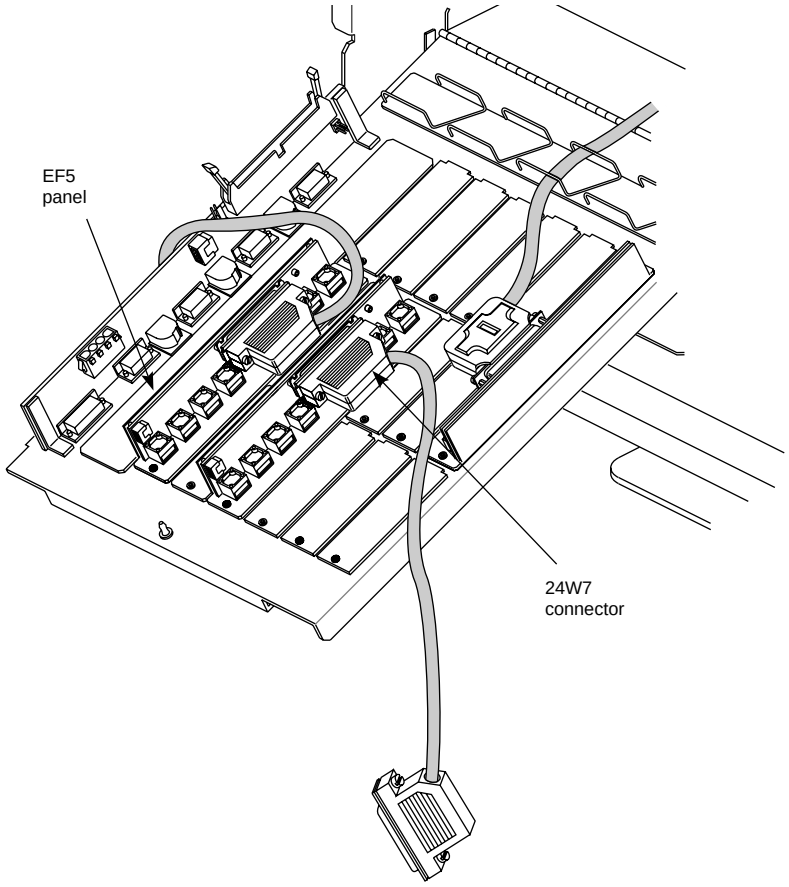


Figure 2-5 Two EF5 Panels and 24W7 Cables Installed

2.3 Installing and Cabling the Genlock and H/V Sync Panels

After you have installed the EF5 panels, install the genlock and H / V sync panels over the slots between. You'll install

- one genlock panel (p / n 018-0318-001 for Crimson and POWER Series, 013-0838-001 for Onyx)

and, if the customer is using them

- H / V sync panel for channels 0 and 5 (p / n 013-0659-001 for Crimson and POWER Series, 013-0838-001 for Onyx)
- H / V sync panel for channels 1 and 2 (p / n 013-0658-001 for Crimson and POWER Series, 013-0836-001 for Onyx)
- H / V sync panel for channels 3 and 4 (p / n 013-0660-001 for Crimson and POWER Series, 013-0837-001 for Onyx)

To install and cable the genlock and sync panels, follow these steps:

1. Position the genlock panel over the middle slot between the EF5 0 and 5 panel and the EF5 1 and 2 panel. Figure 2-6 diagrams this placement on the inside and outside of the I/O door. For an Onyx rackmount chassis, consult Figure 2-2.

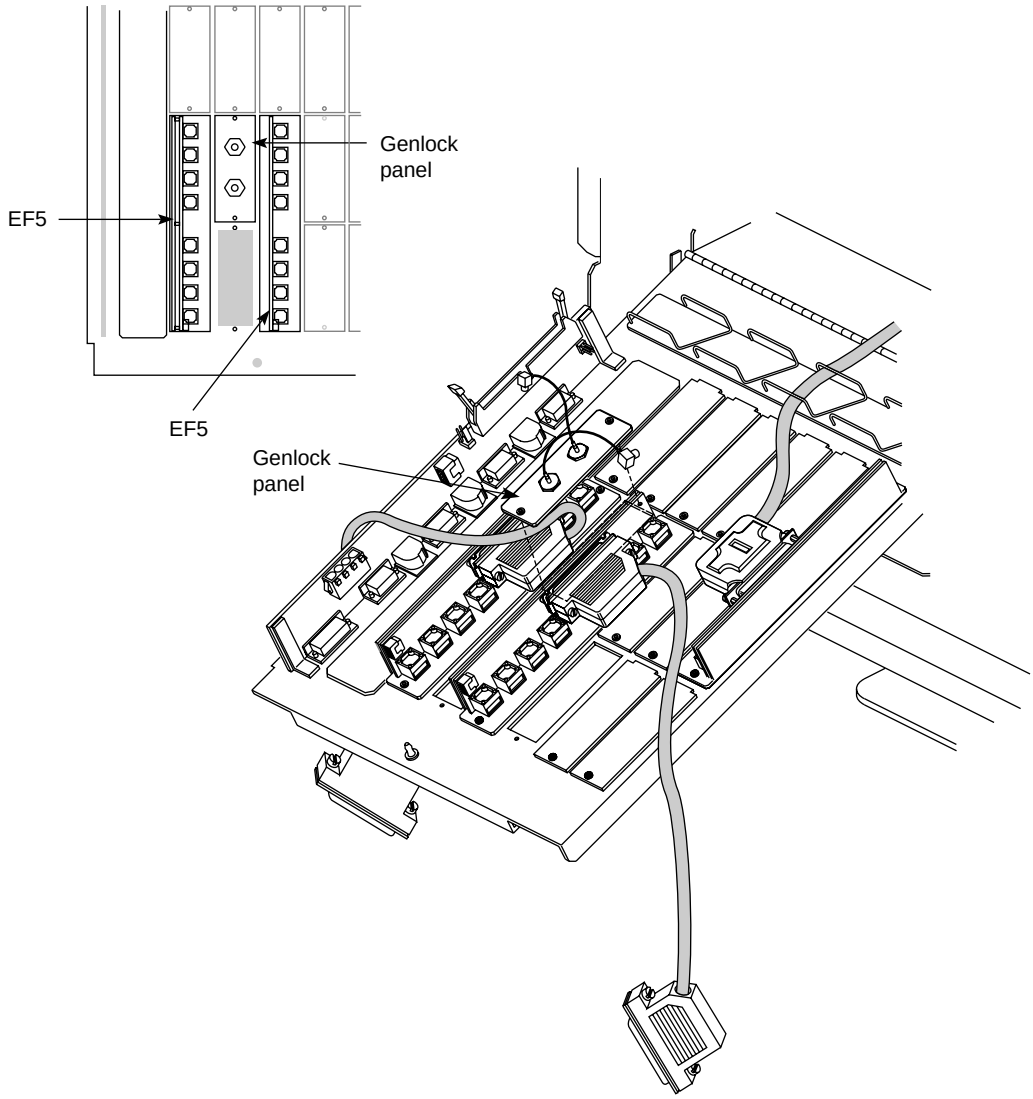


Figure 2-6 Positioning the Genlock Panel

2. Screw in the genlock panel.
3. Cable the genlock panel for loopthrough:

- push the coax cable attached to **GEN IN** on the genlock panel onto the **J10** connector on the EF5 0 and 5 panel
- push the coax cable attached to **GEN OUT** on the genlock panel onto the **J10** connector on the EF5 1 and 2 panel

Figure 2-7 shows this cabling.

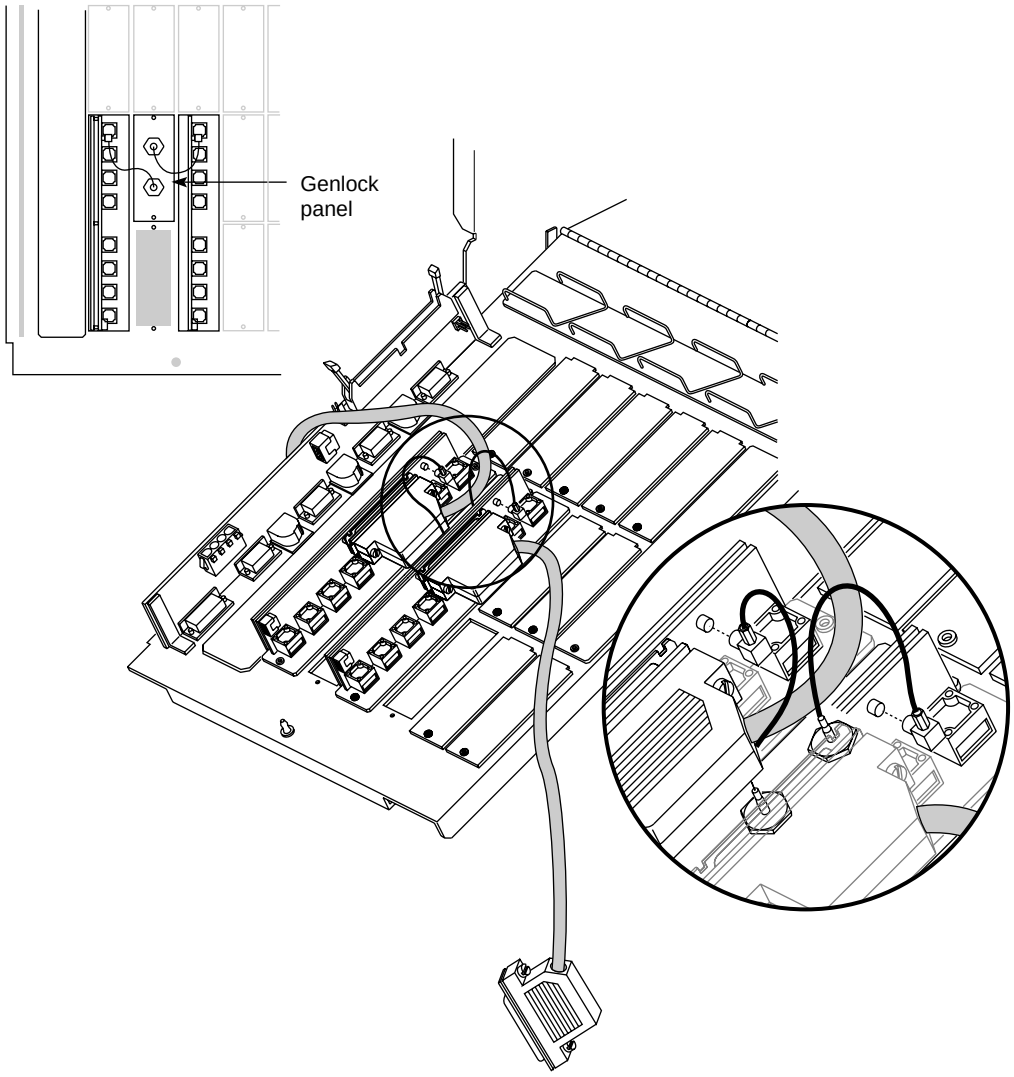


Figure 2-7 Cabling the Genlock Panel

Note: If the customer uses the genlock input, a 75-ohm terminator (user-provided) must be attached to the end of the transmission line. Therefore, if the signal source for genlock is not being looped through the MCO to another device, this 75-ohm terminator should be attached to the **GEN OUT** BNC of the MCO genlock panel.

4. In a multipipe system, repeat this step for each set of I/O panels.

5. If the customer is using H / V sync, position the H / V sync panel for channels 0 and 5 next to the EF5 panel for channels 0 and 5, over the slot adjacent (lengthwise) to the one you used for the genlock panel. Align the top of the H / V sync panel with the top of the I / O door and screw it in. See Figure 2-8.

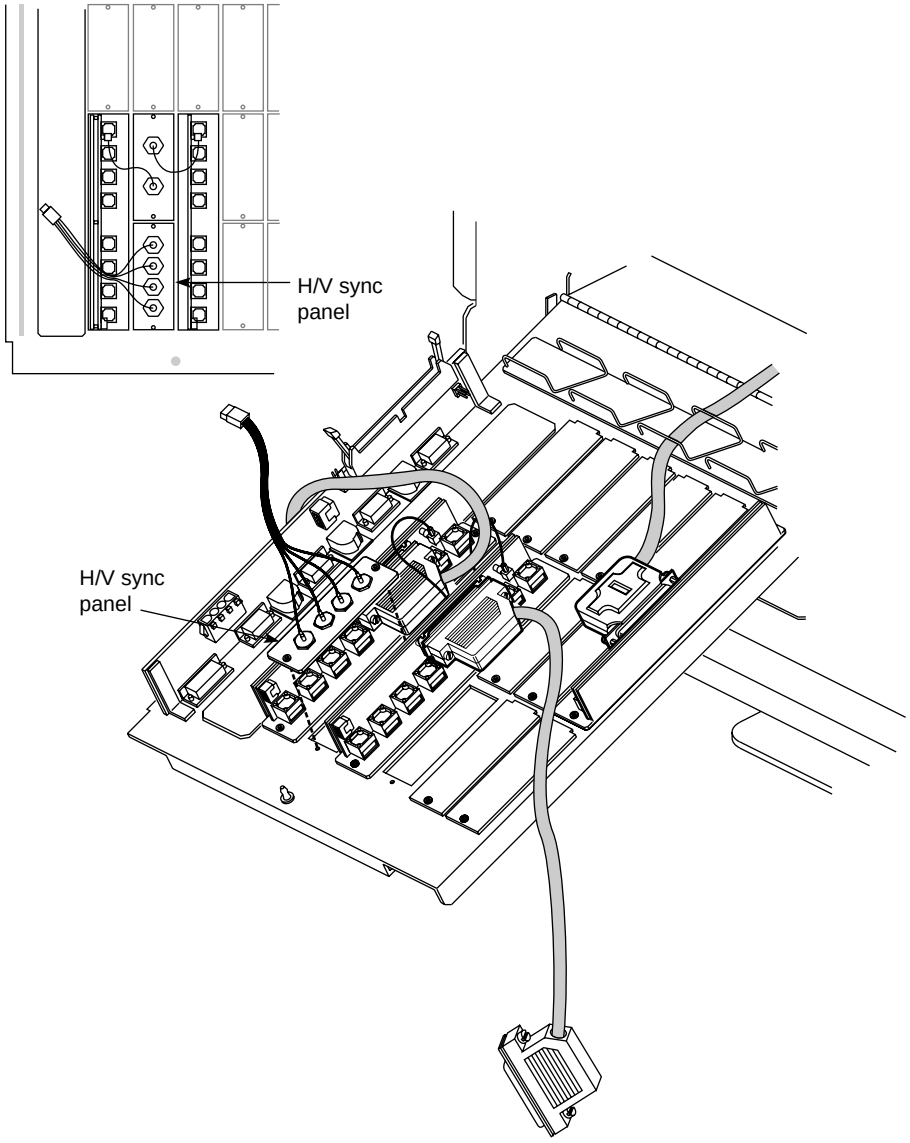


Figure 2-8 Installing the First H / V Sync Panel

6. Position the H / V sync panel for channels 1 and 2 next to the EF5 for channels 1 and 2. Install the panel.
7. If the customer is using six channels, position the H / V sync panel for channels 3 and 4 next to the EF5 for channels 3 and 4. Install the panel.
8. Cable the H / V sync panel for channels 0 and 5 to the EF5 0 and 5 panel: attach the black plastic 4 x 2 connector to the EF5's **J11** connector, as shown in Figure 2-9. The connectors are keyed.

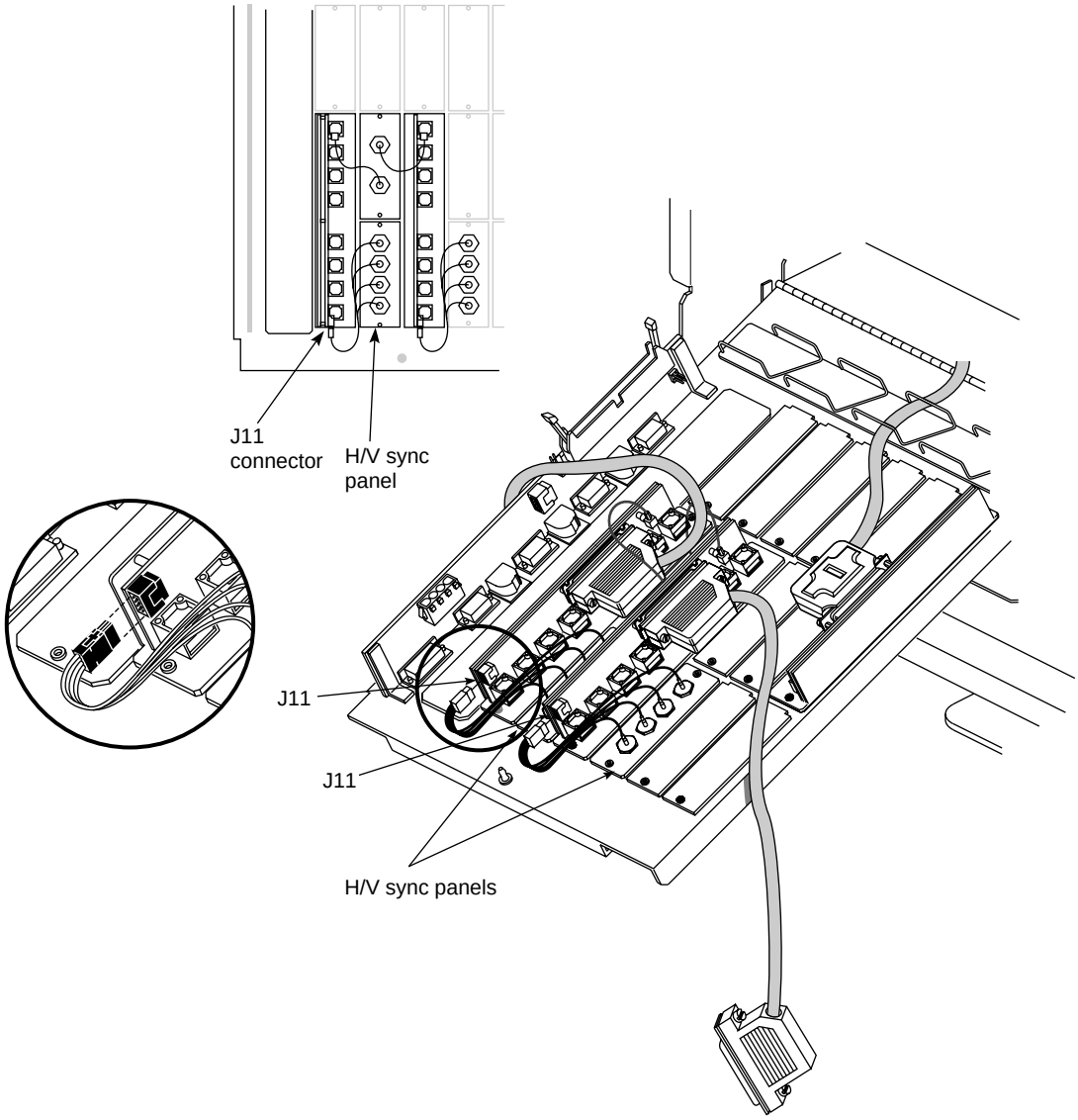


Figure 2-9 Cabling the H / V Sync Panels

9. If necessary, coil the cables and tuck them out of the way against the raised sides of the EF5s.
10. Repeat the process for the remaining H / V sync panel(s), cabling each H / V sync panel to the appropriate EF5.

Figure 2-10 shows all panels installed in a Crimson chassis.

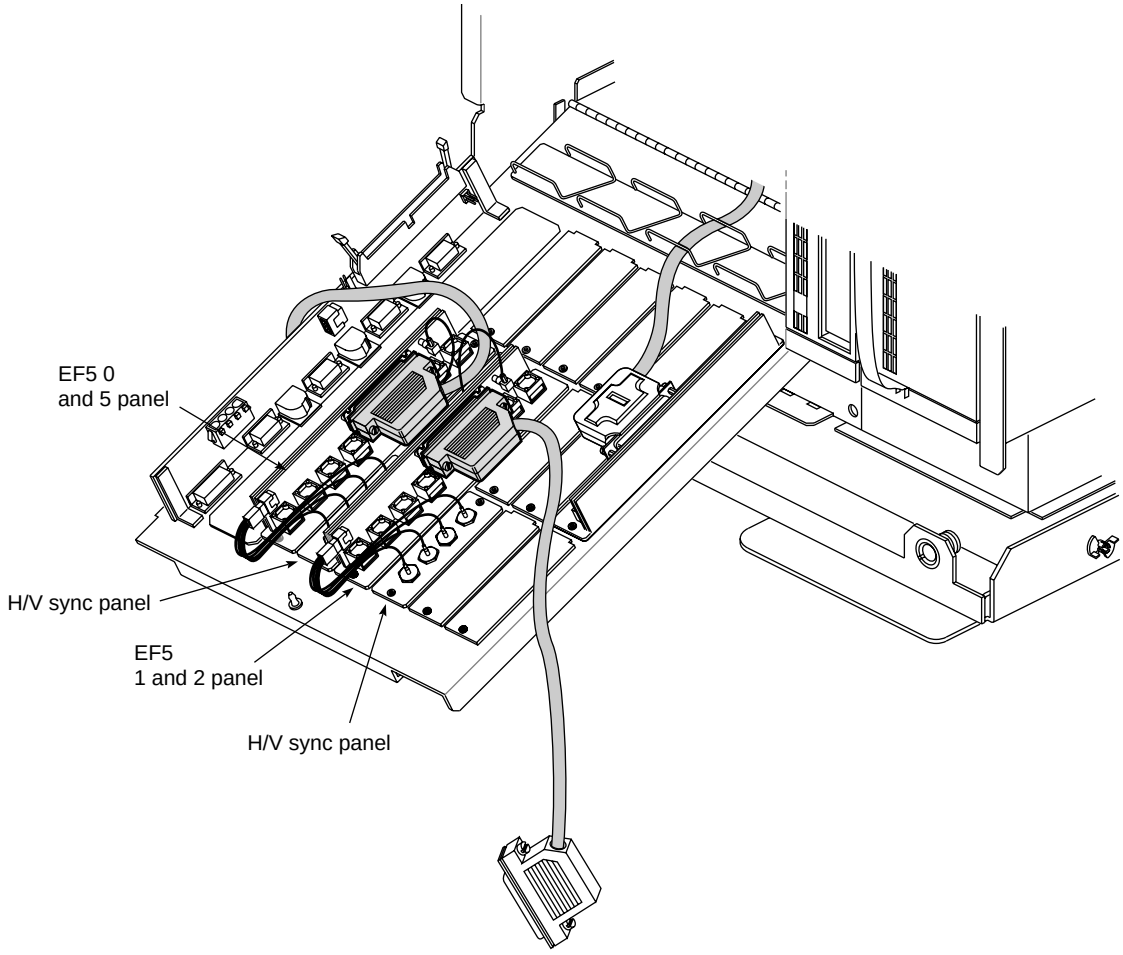


Figure 2-10 Crimson Chassis with All Panels Installed

Figure 2-11 shows all panels installed in an Onyx rackmount chassis.

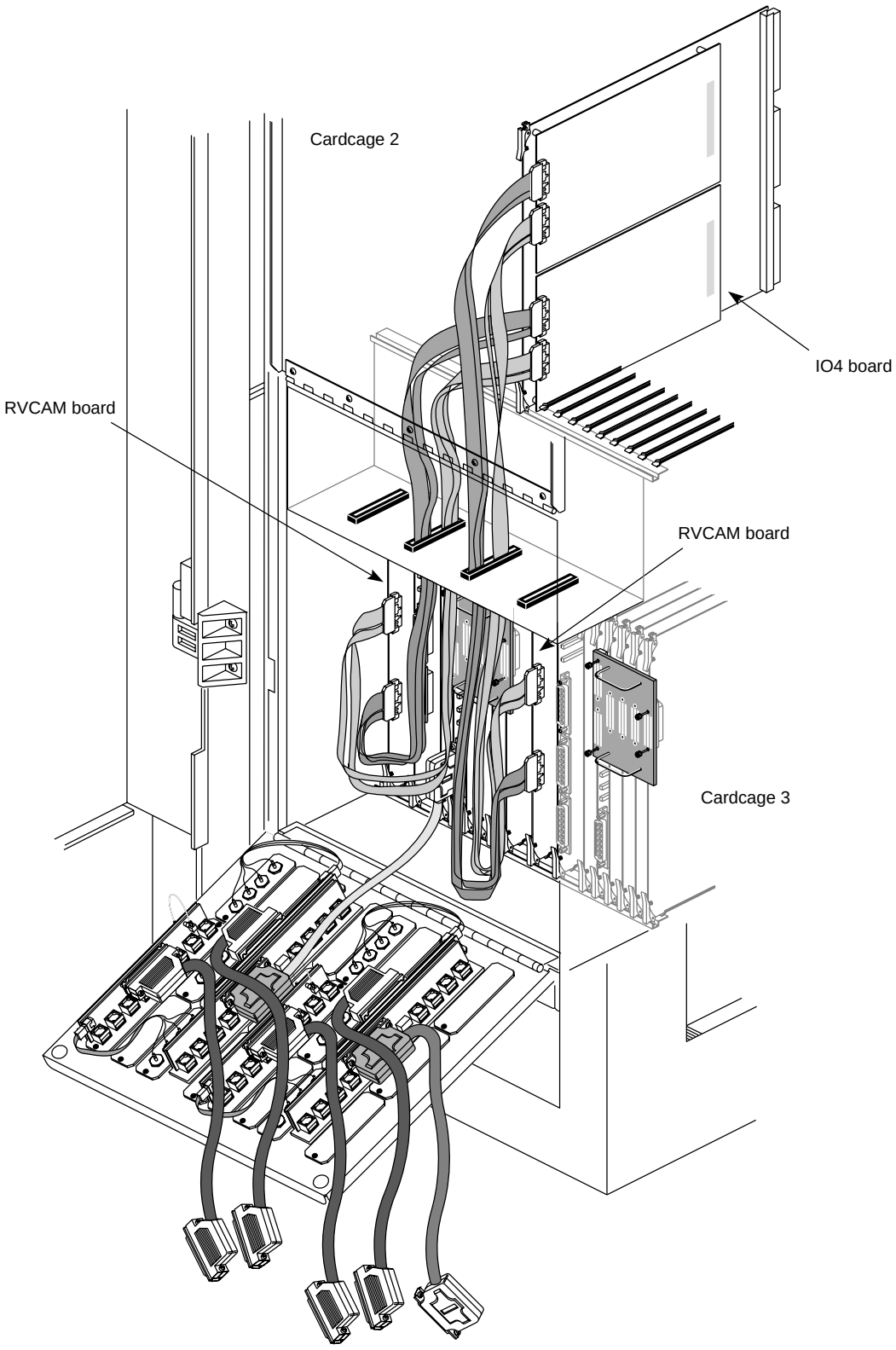


Figure 2-11 Onyx Rackmount Chassis With All Panels Installed

2.4 Changing the Physical VME Address on the Board

Changing the default VME address for the Multi-Channel Option is required when

- the board's address space conflicts with another A24 VME peripheral installed in the same system
- you are installing a second MCO into the same VME bus to split the graphics output from pipe 1 of a dual-head MP bus-based SkyWriter system (RealityEngine graphics)

Note: If you are installing an MCO in a Crimson or POWER Series workstation (not SkyWriter) under 4.0.5H, it must be on graphics pipe 0.

Changing the MCO board's address requires resetting DIP switches, as explained in this section, and, for IRIX versions before 5.2, making software changes, as explained in Chapter 4, "Setting VME Addresses."

The VME address is factory set to `0x00800000`, corresponding to graphics pipe 0. The DIP switch on the far right is set; all others are unset. Default physical VME addresses are listed in Table 2-1.

Pipe	Name in */usr/sysgen/master.d/mem*	Physical Starting Address and Range
0 (all pipes in Onyx rackmount)	`VIDEO_VS2_A24_NP_BASE_PIPE0`	`0x00800000 - 0x0080ffff`
1 (second pipe in SkyWriter only)	`VIDEO_VS2_A24_NP_BASE_PIPE1`	`0x00810000 - 0x0081ffff`

Table 2-1 Default VME Addresses

DIP switch settings for the physical VME addresses are diagrammed in Figure 2-12.

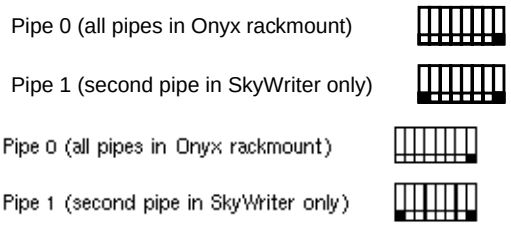


Figure 2-12 Default Physical DIP Switch Settings

To change the VME address on the second MCO board in an MP bus-based system, set the DIP switches for pipe 1 as follows:

- set leftmost switch
- leave rightmost switch set
- all others are unset

Note: For multipipe in an Onyx rackmount chassis, leave all (one, two, or three) VS2 boards set to the default DIP switch settings. Use an adapter number when configuring the DG2 EEPROM with the address for each board, as explained in Chapter 4, "Setting VME Addresses." You must use the separate VME buses that accompany each graphics pipe in the Onyx rackmount system; otherwise, the MCO microstrip cabling will not be able to reach the DG2 board.

If the customer wants to use addresses other than the defaults, follow these guidelines:

- The MCO board requires an address space of 0x10000 (65536) bytes.
- For release 5.2 and later, you must choose an address from the following:
  - POWER Series, pipe 0: 0x00800000, 0x00900000, 0x0a00000, 0x0b00000, 0x0c00000, 0x0d00000, 0x0e00000, 0x0f00000
  - POWER Series, pipe 1: 0x0810000, 0x0910000,0x0a10000, 0x0b10000, 0x0c10000, 0x0d10000, 0x0e10000, 0x0f10000
  - Onyx, any pipe: any address listed at the two subbullets above
- For release 5.1 and earlier, the valid range of physical starting addresses for the MCO board is the upper 8 MB of VME A24:

  `0x00800000 - 0x00ff0000`
- Addresses should be on 64-KB boundaries (0x10000, 65536) for proper alignment.

Note: You must also reconfigure the DG2 EEPROM and (for MP bus-based systems) the *mem* file. Instructions are in Chapter 4, "Setting VME Addresses."

2.5 Jumpering the Onyx Backplane or Midplane

If you are installing any VME board in an Onyx deskside or rackmount chassis and are skipping slots, you must jumper the backplane or midplane. Because the MCO board must be installed as close as possible to the DG2 board in an Onyx, skipping slots might result. If the backplane or midplane is not jumpered, the MCO will not show up in the *hinv* output.

The procedure varies, depending on whether you are installing MCO in

- an Onyx deskside system
- cardcage 2 of an Onyx rackmount system
- cardcage 3 of an Onyx rackmount system

2.5.1 Jumpering an Onyx Deskside System

Insert jumpers (p / n 9090003) into the jumper banks that correspond to the VME slot numbers you are skipping. For example, if you are skipping the first VME slot, insert jumpers into jumper bank 1. To jumper a bank, connect all five pairs of posts with jumpers.

Follow these guidelines:

- If you are skipping the first VME slot (that is, slot 5 in an Onyx or slot 7 in a CHALLENGE™ system) to use the next VME slot, place five jumpers in the jumper bank designated as slot 1 (see Figure 2-13).
- If you are skipping the first two VME slots to use the third VME slot, place jumpers in banks 1 and 2.
- If boards occupy VME slots 1 and 3, and slot 2 is vacant, place jumpers in bank 2.

Figure 2-13 shows placement of the jumpers.

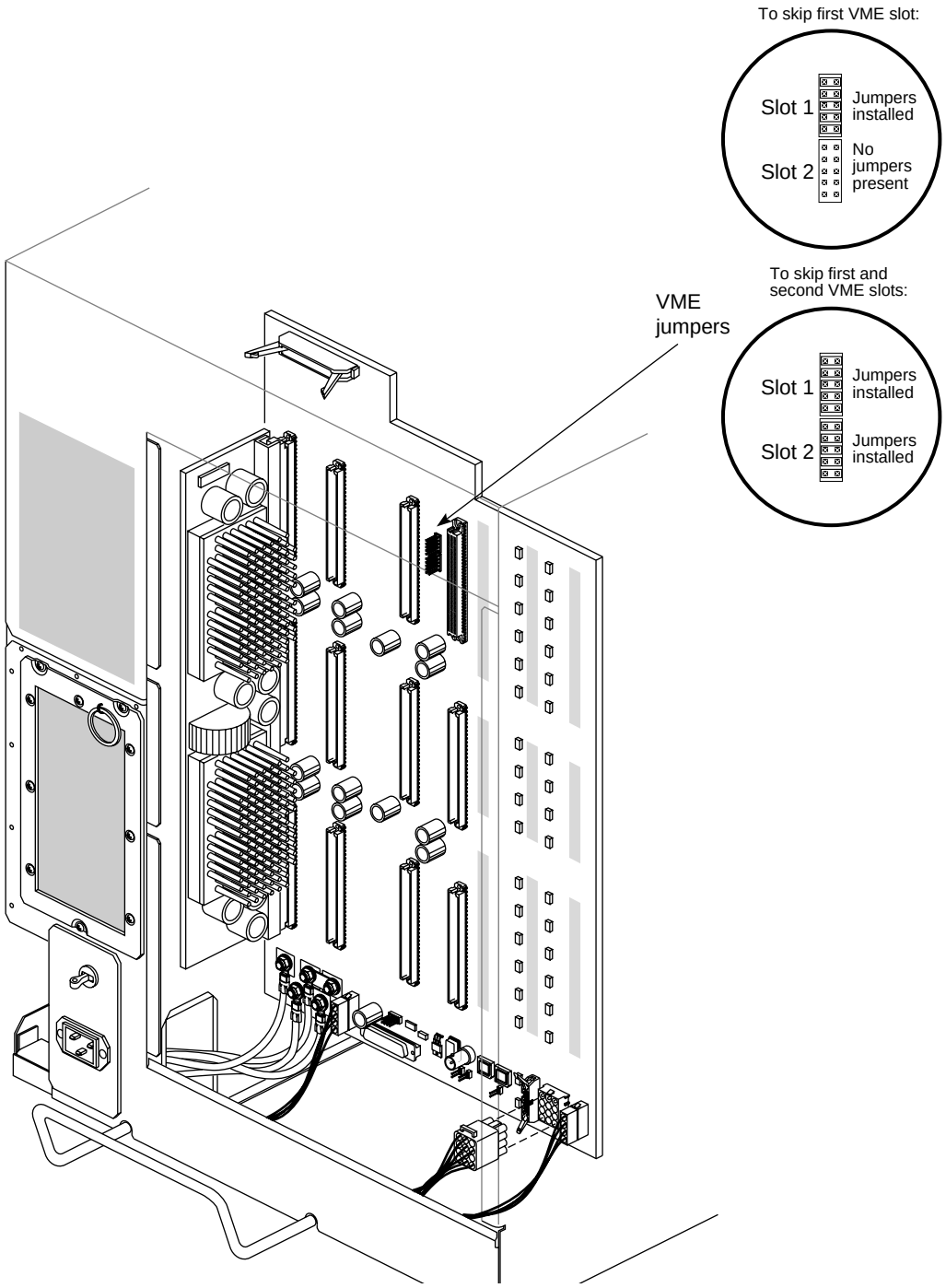


Figure 2-13 Jumpering the Onyx Deskside Backplane

2.5.2 Jumpering Cardcage 2 of an Onyx Rackmount System

Insert jumpers (p/n 9090003) into the jumper banks that correspond to the VME slot numbers you are skipping. Jumper the VME slots only if you are leaving gaps between the VCAM in slot 16 and the MCO board or any other VME boards, or if you are skipping slots between VME boards.

Corresponding to each slot is a bank of five jumpers, as shown in Table 2-2.

Jumper Bank	Cardcage 2 VME Slot
1	17
2	18

Table 2-2 Onyx Cardcage 2 Jumper Banks and Slots

The jumper banks are located on the cardcage 1 side of the midplane, between the power bus slots, as shown in Figure 2-14.

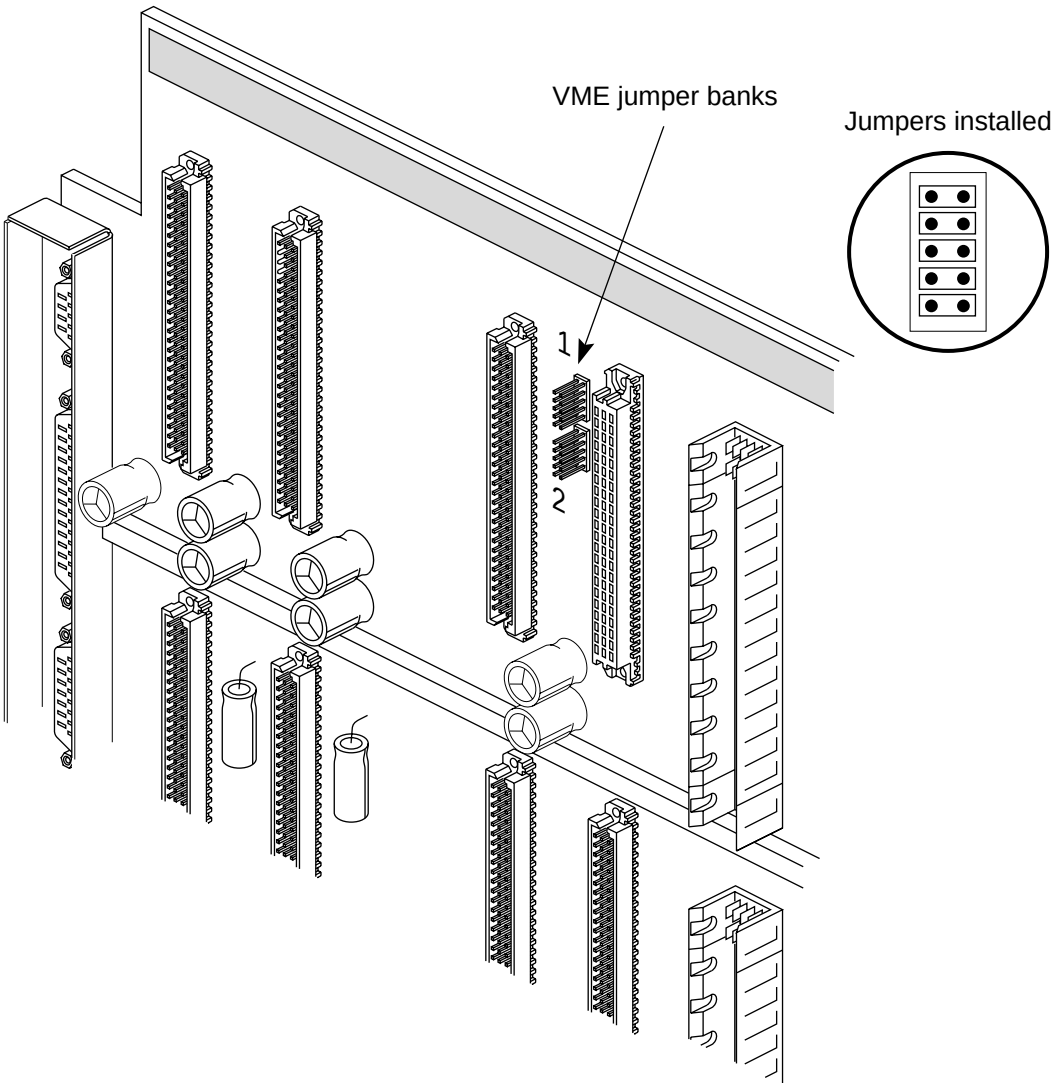


Figure 2-14 Jumpering the Onyx Rackmount Midplane (Cardcage 2)

2.5.3 Jumpering Cardcage 3 of an Onyx Rackmount System

Typically, between each remote VCAM and each graphics head in cardcage 3 are three VME slots. The MCO should be put in the rightmost or middle slot of the three in each case.

If no other VME cards occupy the slot(s) to the left of the MCO board, you must attach an interrupt terminator (interrupt board) (p / n 030-0516-00x) to the top connector (P1 VME bus connector) for each slot on the backplane, as shown in Figure 2-15. Interrupt boards are required because there are no jumper banks for slots on the cardcage 3 backplane.

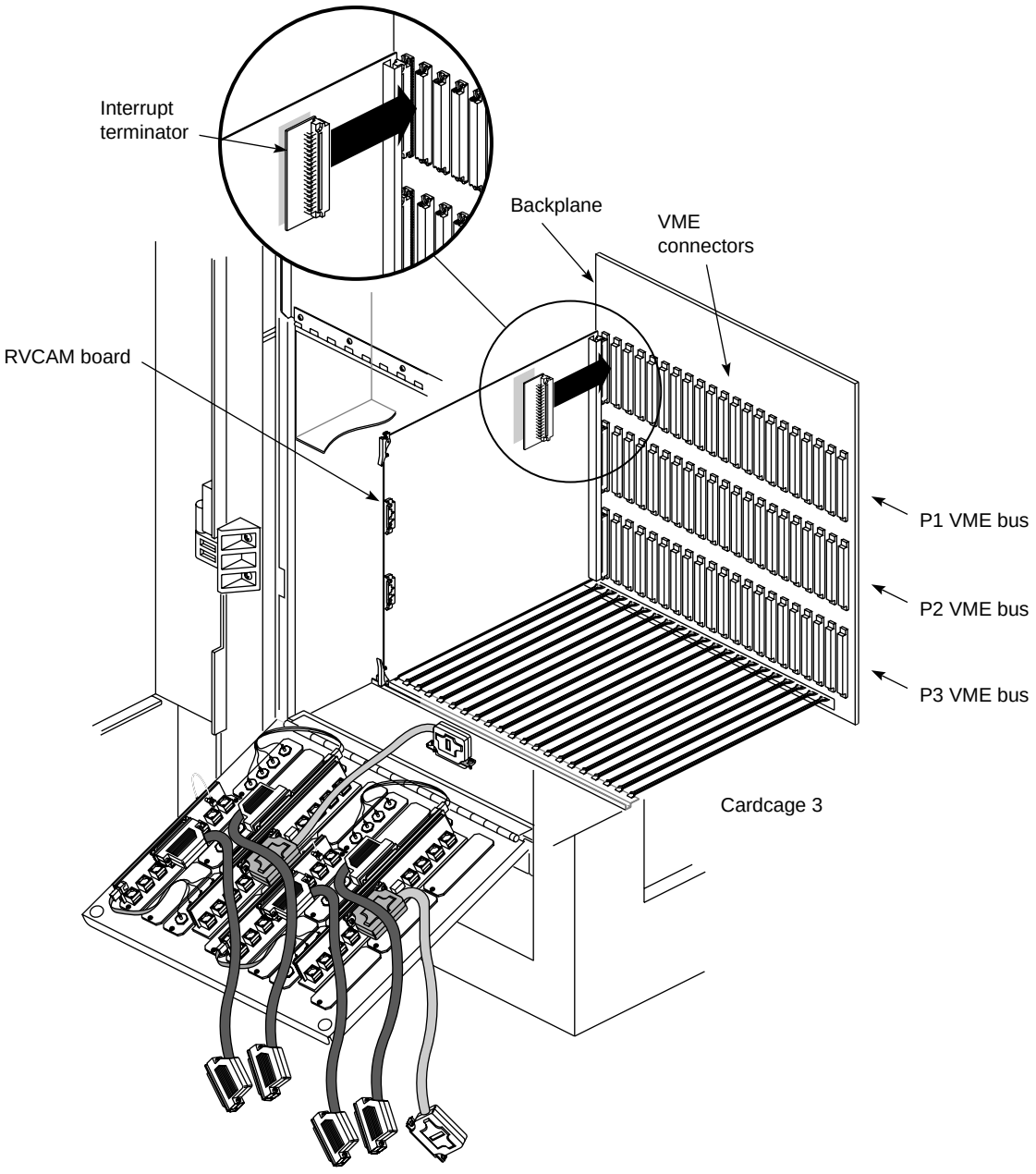


Figure 2-15 Jumpering the Onyx Rackmount Backplane (Cardcage 3)

2.6 Attaching the Paddleboards and Installing the MCO Board

In this step you attach the paddleboards to the MCO board (labeled VS2) and DG2 board, attach nylon spacers (standoffs) to each of the two paddleboards, and insert the MCO board into the chassis.

The paddleboards must be attached as follows:

- PB2 (p / n 030-0328-002) to the DG2 board
- PB3 (p / n 030-0352-001) to the MCO board

The names of the paddleboards are silkscreened onto the component side.

To attach the PB2 paddleboard to the DG2, follow these steps:

1. Detach the front plane so that the DG2 board is accessible. Detach the 24W7 cable connector from the EF7; leave the small cable (stereo sync) attached to the DG2 board.
2. Remove the DG2 board from the chassis and lay it on a nonstatic surface.
3. Install three nylon spacers (p / n 7430100) into the connector side of the PB2. Make sure you have the PB2 paddleboard (p / n 030-0328-001), not the PB3 paddleboard.
4. Making sure the two cables for stereo and swap ready remain connected to the two-pin connectors on the DG2, mate the three connectors (**J1**, **J2**, and **J3**) on the PB2 paddleboard (p / n 030-0328-002) to the **P6**, **P7**, and **P8** connectors on the DG2 board.

   Supporting the DG2 board from the other side, carefully push the PB2 paddleboard onto the connectors. Be careful not to bend the DG2 board.

   Caution: Be extremely careful not to bend or smash the pins in the paddleboard connectors; they are very fragile. If a pin gets bent, vertical stripes appear on all MCO channels. These pins cannot be reliably repaired. If they are damaged, replace the entire paddleboard.
5. From the other side of the DG2 board, screw three nylon screws (p / n 93-00407) into the spacers.

   Figure 2-16 shows installation of the paddleboard onto the DG2 board.

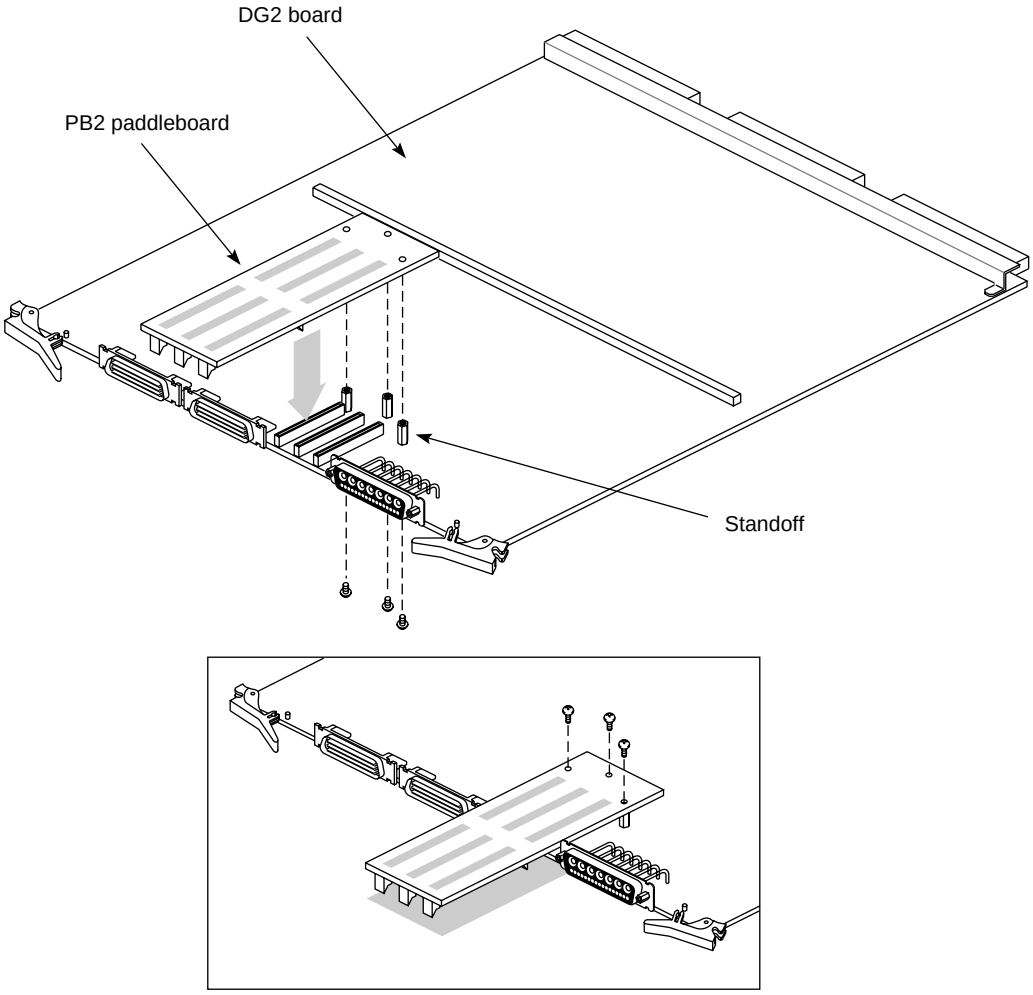


Figure 2-16 DG2 Board With PB2 Paddleboard

6. Reinsert the DG2 board into its slot. Reattach the front plane and 24W7 cable.

   Note: If you need to replace the DG2 board for any reason, you must reset the default address for the MCO board, which is stored in the DG2's EEPROM. Instructions are in Chapter 4, "Setting VME Addresses."

To attach the PB3 paddleboard to the MCO board and install the board, follow these steps:

1. Lay the MCO board on a nonstatic surface.
2. Install three nylon spacers (p/n 7430100) into the connector side of the PB3 paddleboard (p/n 030-0352-001) as you did for the PB2.
3. Mate the three connectors (**J1**, **J2**, and **J3**) on the PB3 paddleboard to the three connectors (**J1**, **J2**, and **J3**) on the MCO board.

   Supporting the MCO board from the other side, ease the PB3 paddleboard onto the connector. Be careful not to bend the MCO board.

Caution: Be extremely careful not to bend or smash the pins in the paddleboard connectors, as they are very fragile. If a pin gets bent, vertical stripes appear on all MCO channels. These pins cannot be reliably repaired. If they are damaged, replace the entire paddleboard.

4. From the other side of the MCO board, screw three nylon screws (p/n 93-00407) into the spacers.
5. Grasp the Multi-Channel Option board so that your hands are on the ejector tabs and the component side of the board faces right.

   The MCO board goes in:

   - VME slot 3 (Crimson or POWER Series chassis)
   - VME slot closest to the DG2 board (Onyx deskside)
   - any available VME slot (SkyWriter and Onyx rackmount).

   Caution: Check for ribbon cables to the immediate left of the slot you have selected. Hold any cables flat against their respective boards while inserting the Multi-Channel Option board to prevent them from being chafed by the Multi-Channel Option board components.
6. Insert the MCO board all the way into the cardcage slot. Angle the board's plastic ejectors outward so that the U-shaped grooves of the ejectors fit into the upper and lower metal frames of the system.
7. Push the upper and lower ejector tabs toward the center of the board's lower edge until both are vertical. You should hear and feel the board seat into the connectors on the backplane.

   Figure 2-17 shows both boards in place, with paddleboards attached.

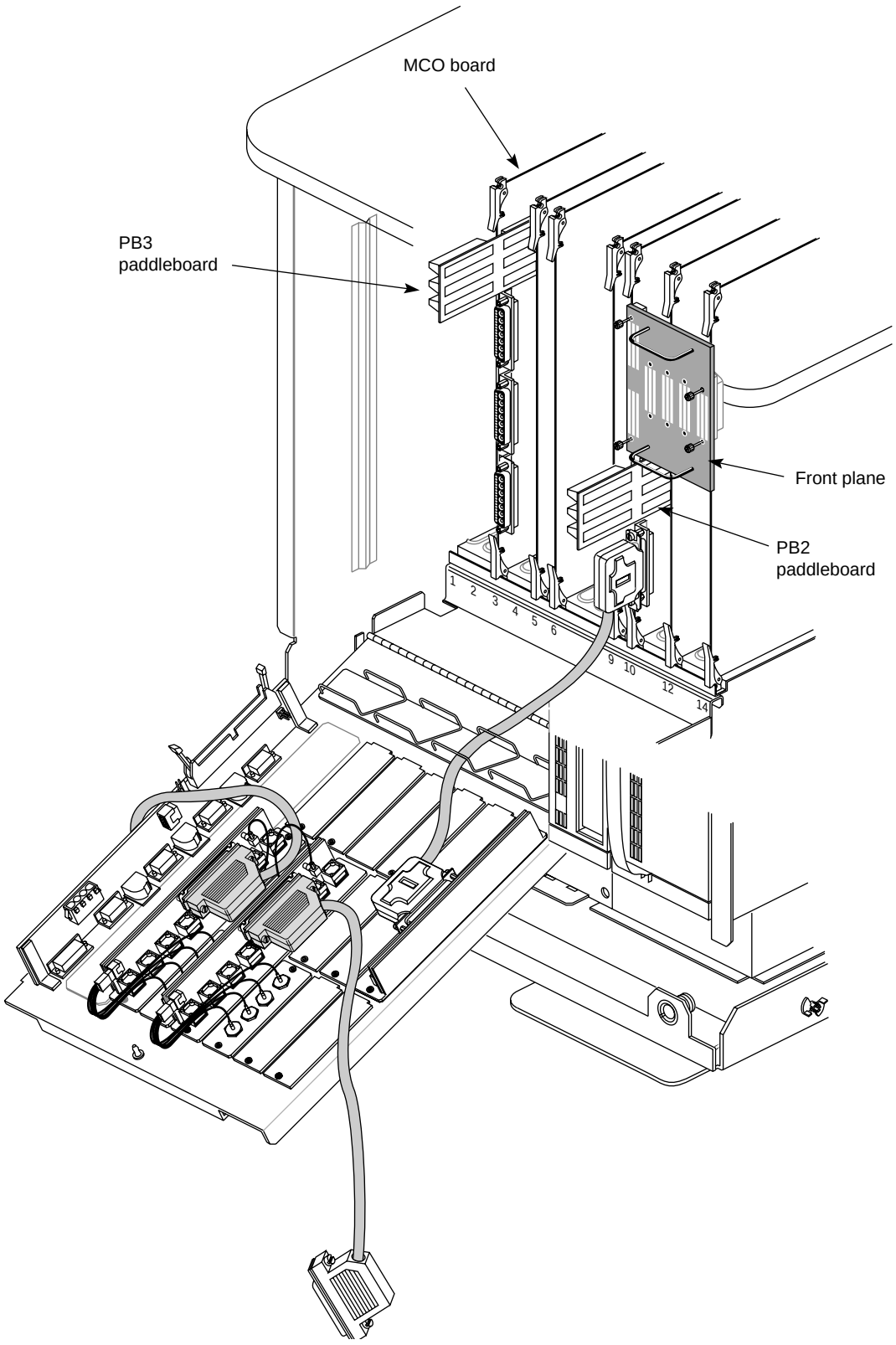


Figure 2-17 MCO and DG2 Boards in Chassis With Paddleboards Attached

2.7 Attaching Microstrip Cables to the Paddleboards

The three sets of microstrip cables that connect the two paddleboards are shipped in rolls protected by plastic.

Note: The cables, which are taped in the middle to minimize tangling, are very fragile. Exercise care in handling them.

The cables are attached as follows, so that they nest and lie flat:

- from **J4** (top socket) on the PB3 to **J4** (bottom socket) on the PB2
- from **J5** (middle socket) on the PB3 to **J5** (middle socket) on the PB2
- from **J6** (bottom socket) on the PB3 to **J6** (top socket) on the PB2

Follow these steps:

1. Holding down the metal strip connector latches on each side of a connector of a microstrip cable, insert the connector onto the top socket (**J4**) on the PB3 paddleboard. The connector is keyed. Release the connector latches to secure the cable in place.

   Holding down the connector latches, insert the connector on the other end of the microstrip cable onto the bottom socket (**J4**) on the PB2 paddleboard; release the connector latches to secure the cable in place.

2. Attach the middle microstrip cable: plug a connector into the middle socket (**J5**) on the PB3 board and insert the other connector onto the middle socket (**J5**) on the PB2 board.

3. Attach the last microstrip cable: plug a connector into the bottom socket (**J6**) on the PB3 board and insert the other connector onto the top socket (**J6**) on the PB2 board.

   Note: For the best cable routing, feed each microstrip cable underneath all of the other cables in the cable trough so that the microstrip cables actually lie on the sheet metal. The cables can lie on the floor of the cardcage.

   Figure 2-18 shows the cables attached.

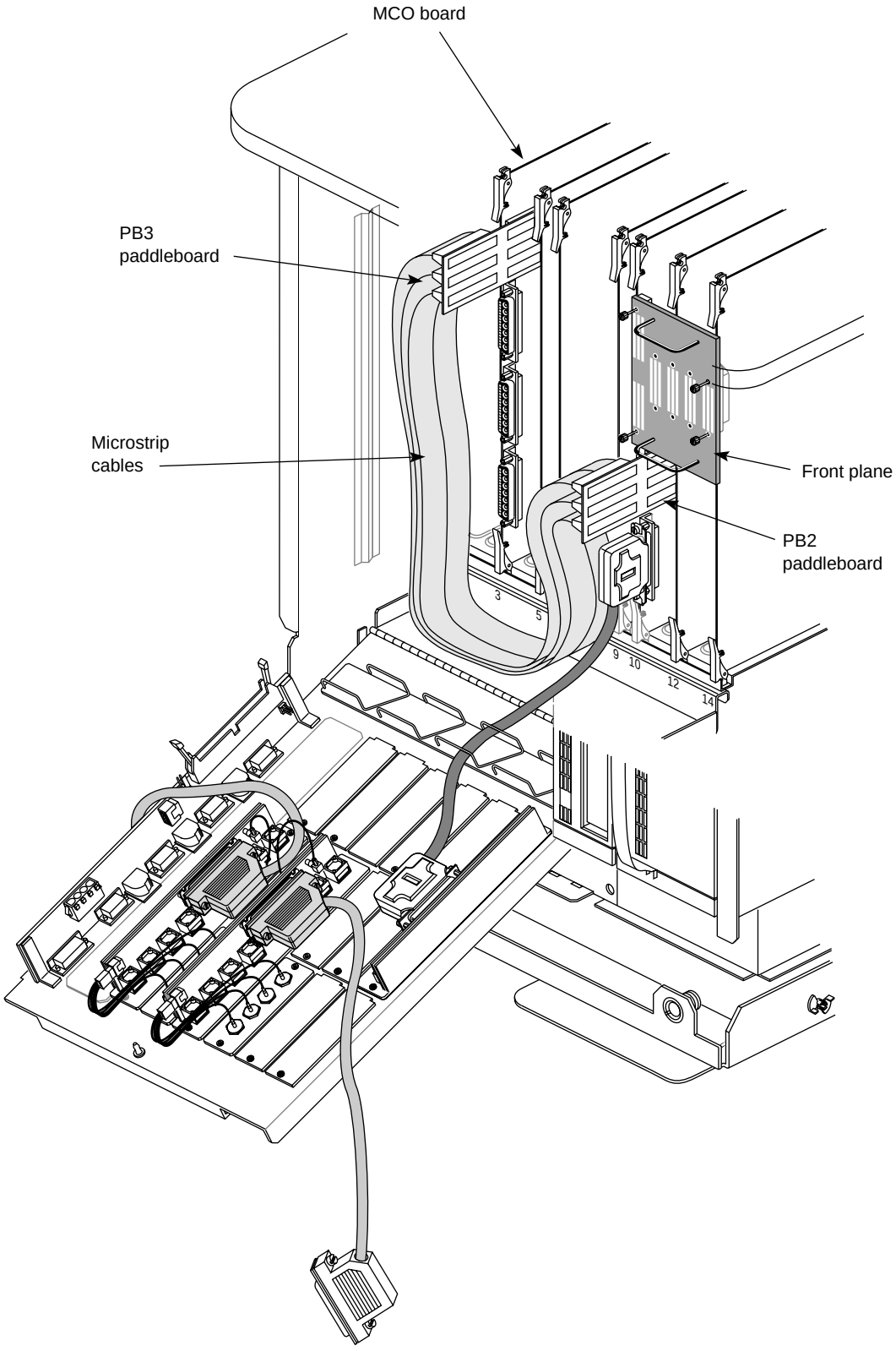


Figure 2-18 Microstrip Cables

2.8 Attaching the 24W7 Cables and Closing the Chassis

You have already installed one end of each 24W7 cable onto each EF5 panel in the system. To install the other ends of the 24W7 cables onto the MCO board, follow these steps:

1. Attach the connector of the 24W7 cable from the EF5 panel for channels 0 and 5 to the **J4** connector (the top 24W7 connector) on the MCO board and screw it in. The cable must exit from the bottom of the connector.
2. Attach the connector of the 24W7 cable from the EF5 panel for channels 1 and 2 to the **J5** connector (the middle 24W7 connector) on the MCO board and screw it in. The cable must exit from the bottom of the connector.
3. If the customer is using six channels, attach the connector of the 24W7 cable from the EF5 panel for channels 3 and 4 to the **J6** connector (the bottom 24W7 connector) on the MCO board. The cable must exit from the bottom of the connector.

   Note: The 24W7 cables must be connected to the **J4** and **J5** connectors on the MCO board to complete the genlock loopthrough path. If one or both cables are not so connected, genlock performance is not guaranteed.
4. Carefully and gradually close the I/O door.

   Caution: Exercise extreme care in closing the I/O door so that the paddleboards and cables are not damaged. This process may require repositioning cables and, in the worst cases, reinstalling panels and boards in different locations.

Figure 2-19 through Figure 2-25 show the 24W7 cables completely installed.

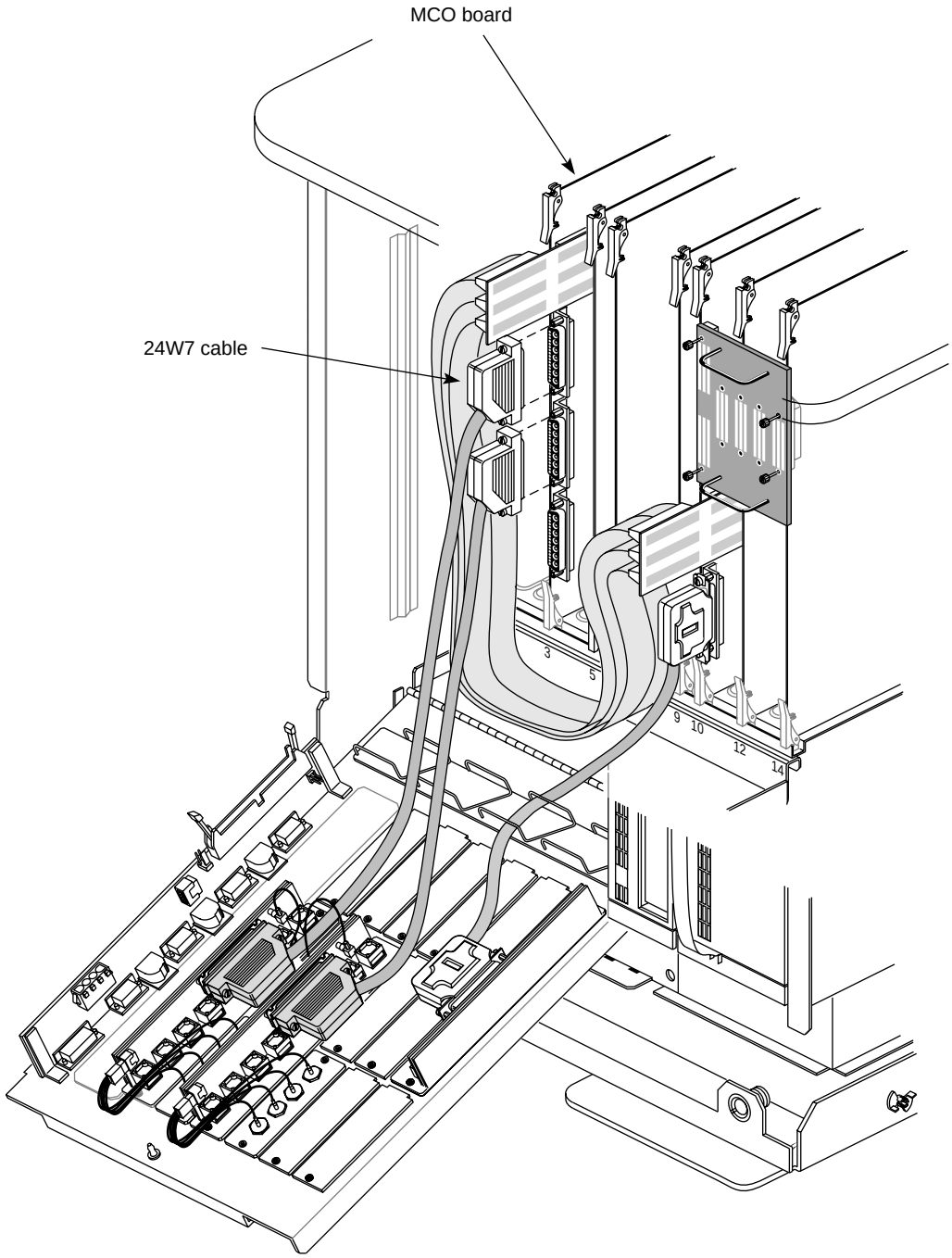


Figure 2-19 Installing 24W7 Cables

Caution: If the specific connectors on the MCO board are not cabled to the specific EF5 panels detailed in these instructions, channel output is not guaranteed.

Figure 2-20 shows all boards, cables, and panels installed in a Crimson chassis.

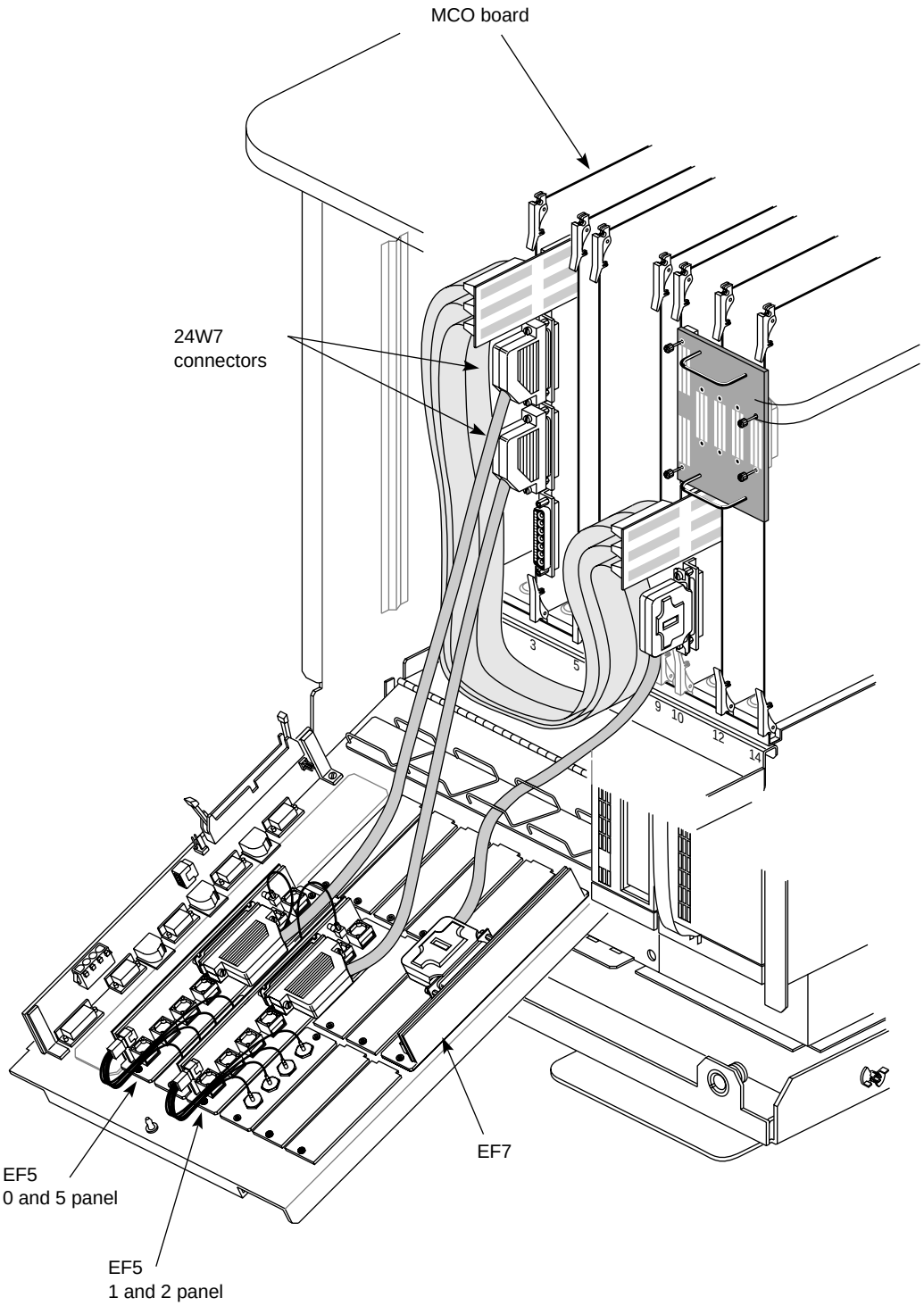


Figure 2-20 Complete Multi-Channel Option Installation for the Crimson Chassis

shows all boards, cables, and panels installed in a POWER Series chassis Figure 2-21.

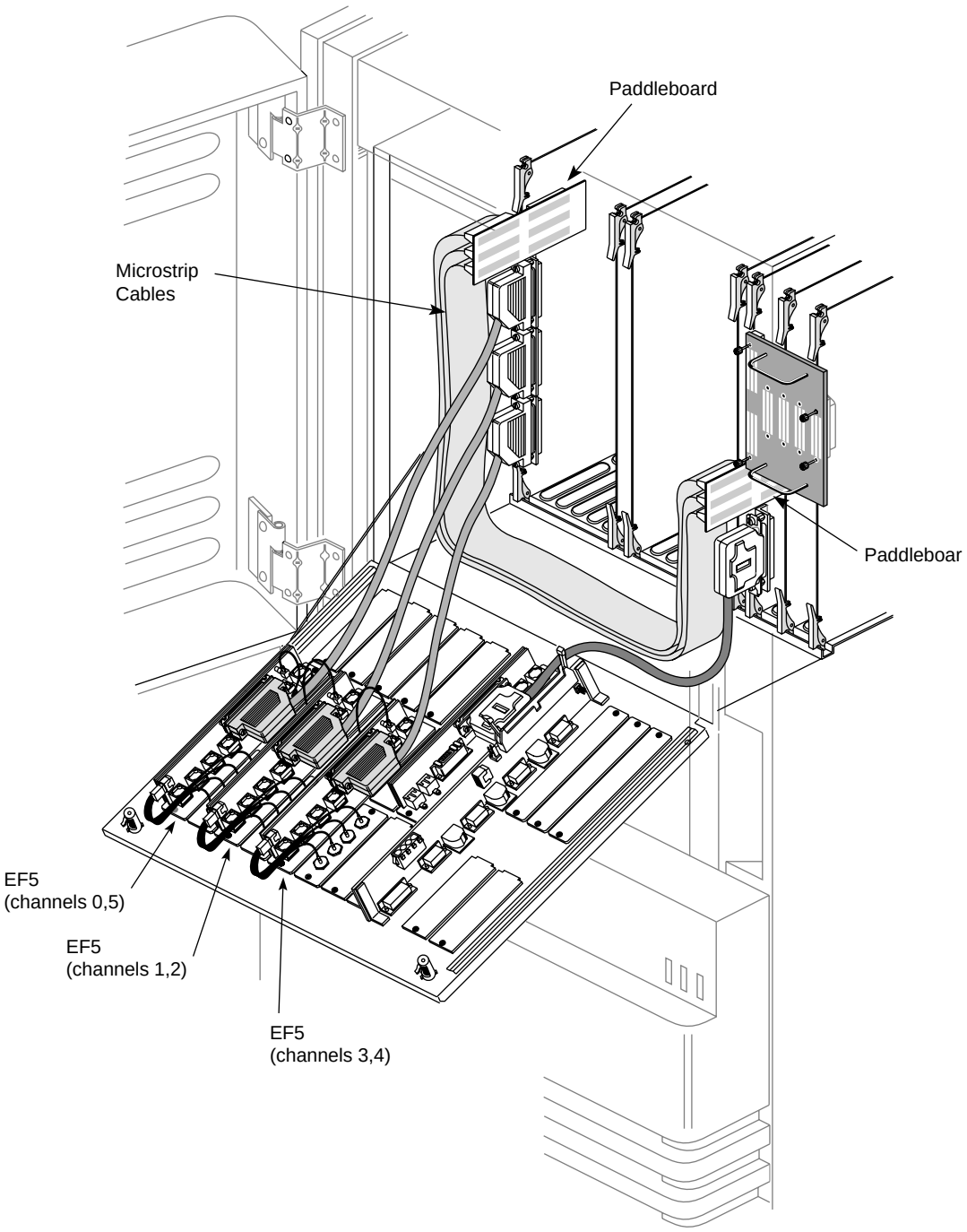


Figure 2-21 Complete Multi-Channel Option Installation for the POWER Series Chassis

Figure 2-22 shows all boards, cables, and panels installed in a SkyWriter chassis.

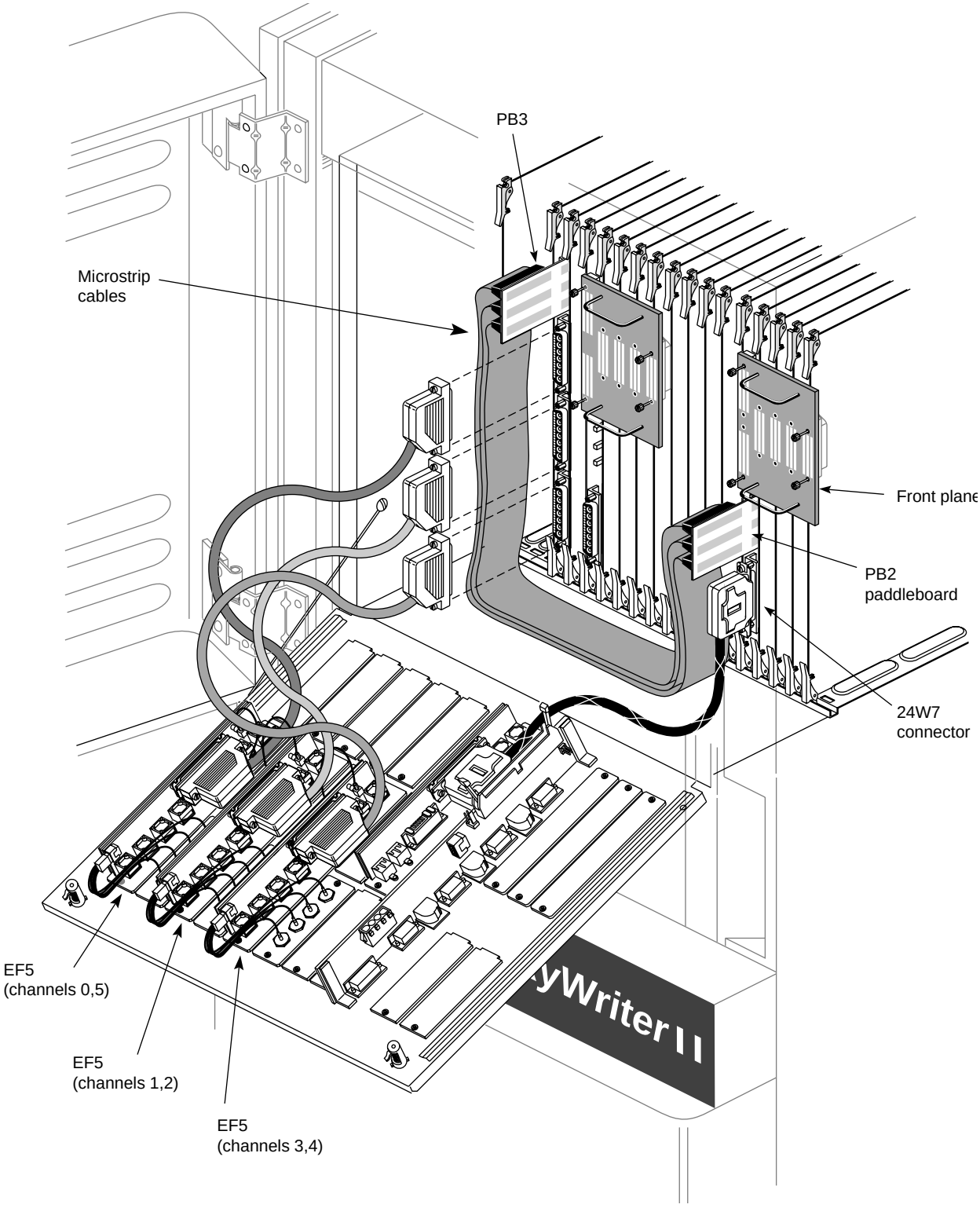


Figure 2-22 Complete Multi-Channel Option Installation for the SkyWriter Chassis

Figure 2-23 shows all boards, cables, and panels installed in an Onyx deskside chassis.

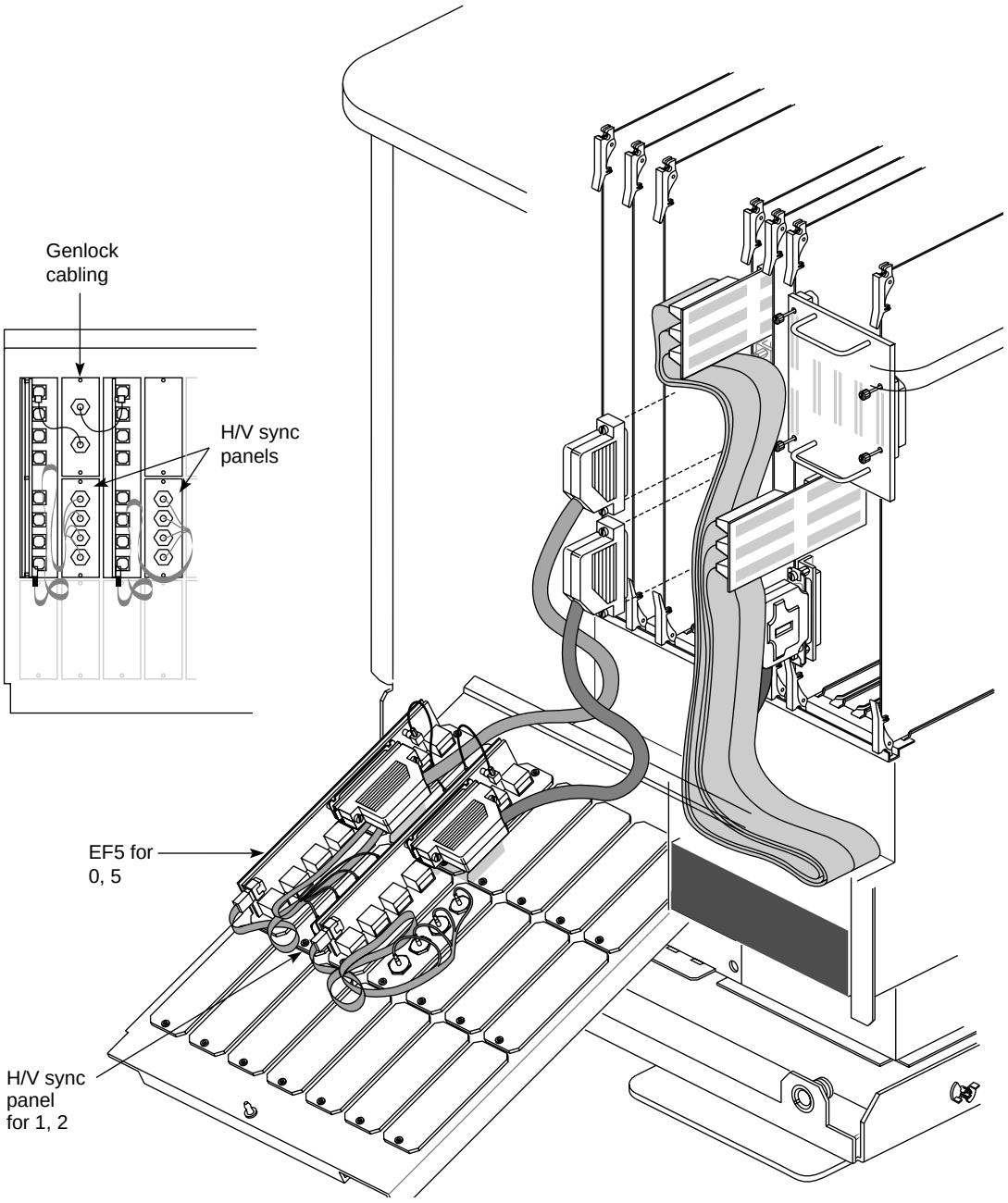


Figure 2-23 Complete Multi-Channel Option Installation for the Onyx Deskside Chassis

Figure 2-24 shows all boards, cables, and panels installed in cardcage 2 of an Onyx rackmount chassis.

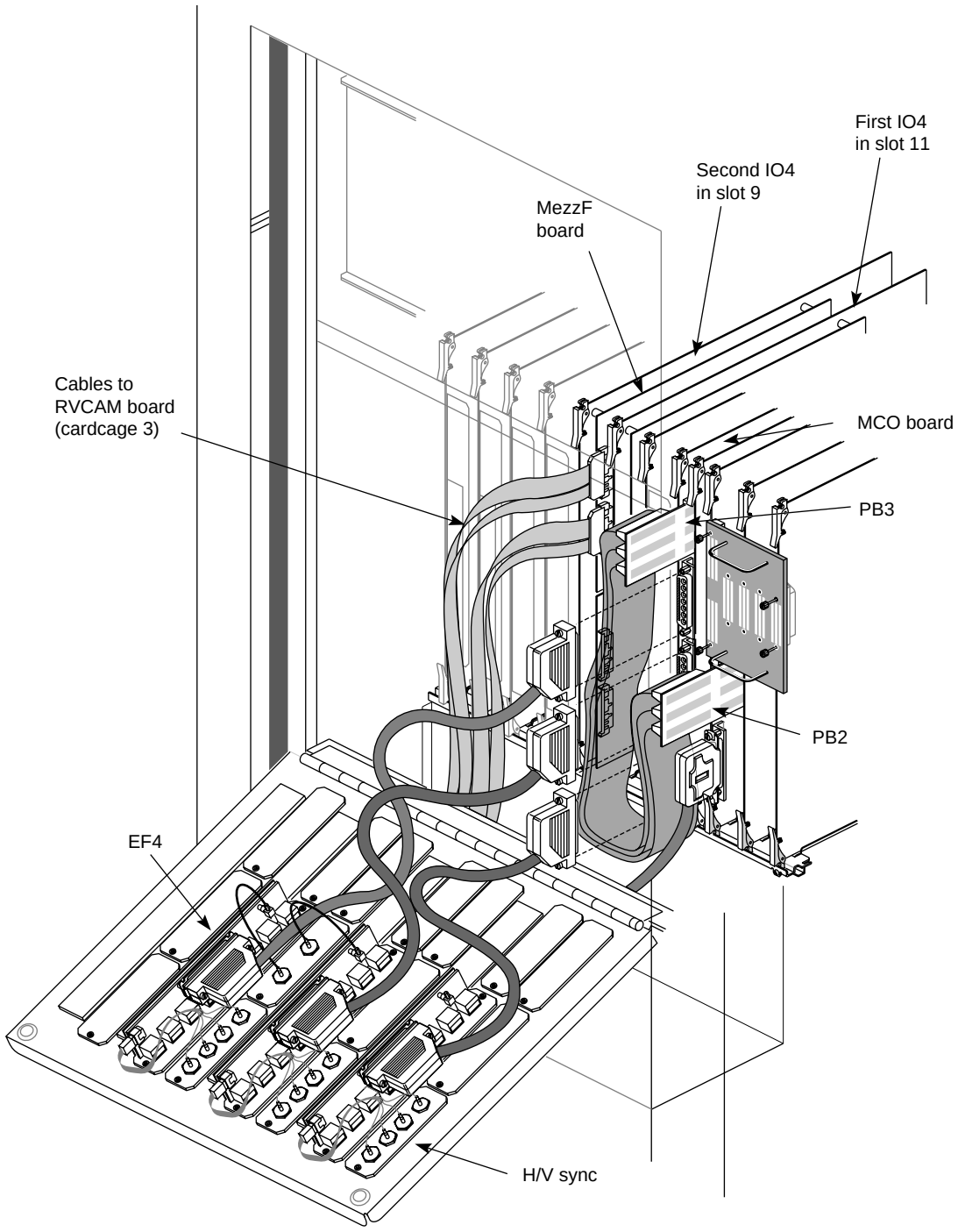


Figure 2-24 Complete Multi-Channel Option Installation for Onyx Rackmount (Cardcage 2)

Figure 2-25 shows all boards, cables, and panels installed in cardcage 3 of an Onyx rackmount chassis.

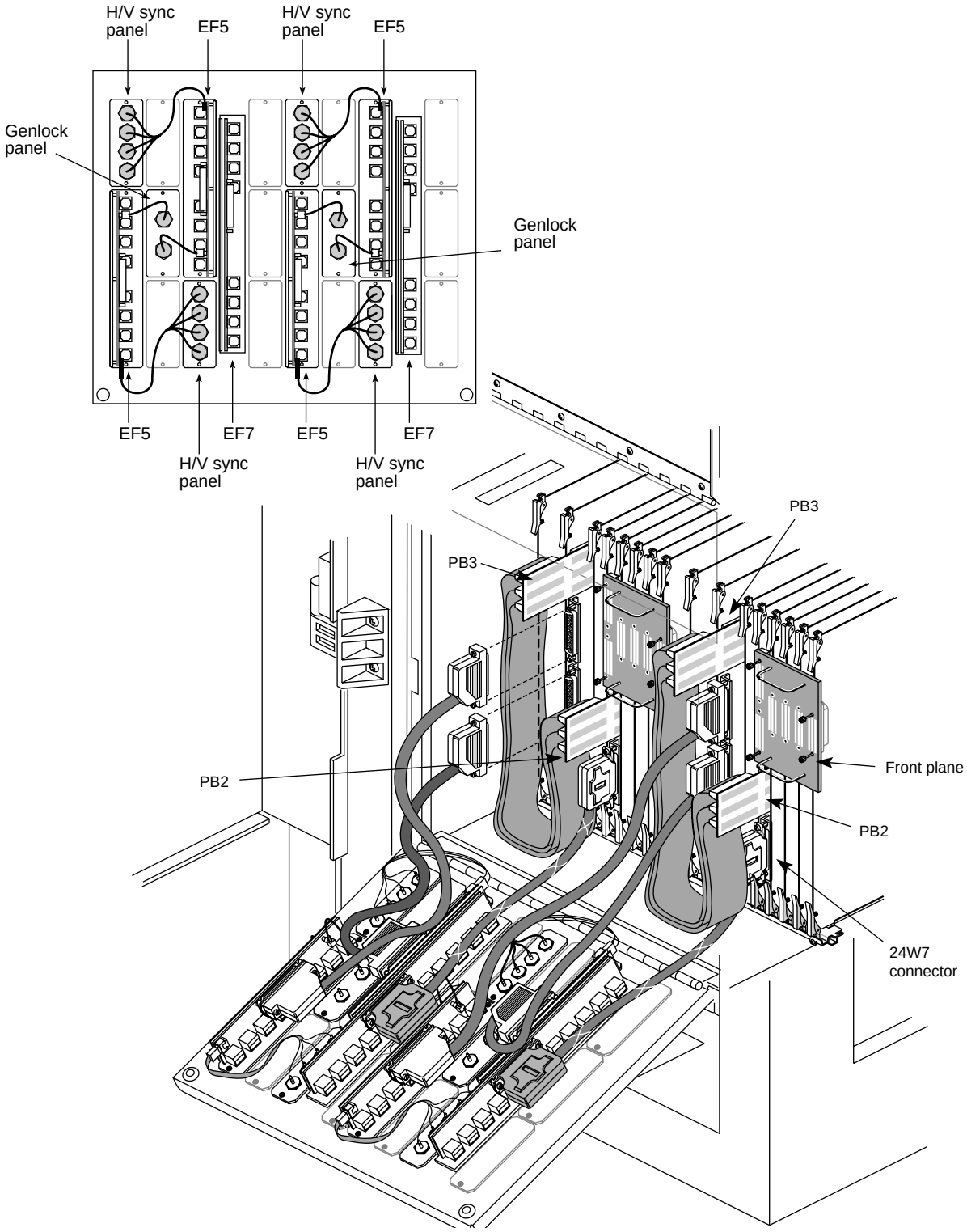


Figure 2-25 Complete Multi-Channel Option Installation for Onyx Rackmount (Cardcage 3)

2.9 Cabling the VIDI/O BOX for Use with MCO

If the customer is using a VIDI/O BOX from Truevision to convert RGB output to NTSC output (one VIDI/O BOX is required for each output channel) using the n@640x486_30i video output format, you must cable the box for use with MCO. Follow these steps:

1. Daisy-chain the MCO green output (sync on green) to the encoder green input, the decoder video input, and the sync input.
2. Set the termination switch for the sync input to **75**. Set the termination switches for the green input and video input to **OFF**.
3. Connect red and blue normally. Set the termination switches to **75**. No connection to the MCO genlock is required.

   Figure 2-26 diagrams these connections.

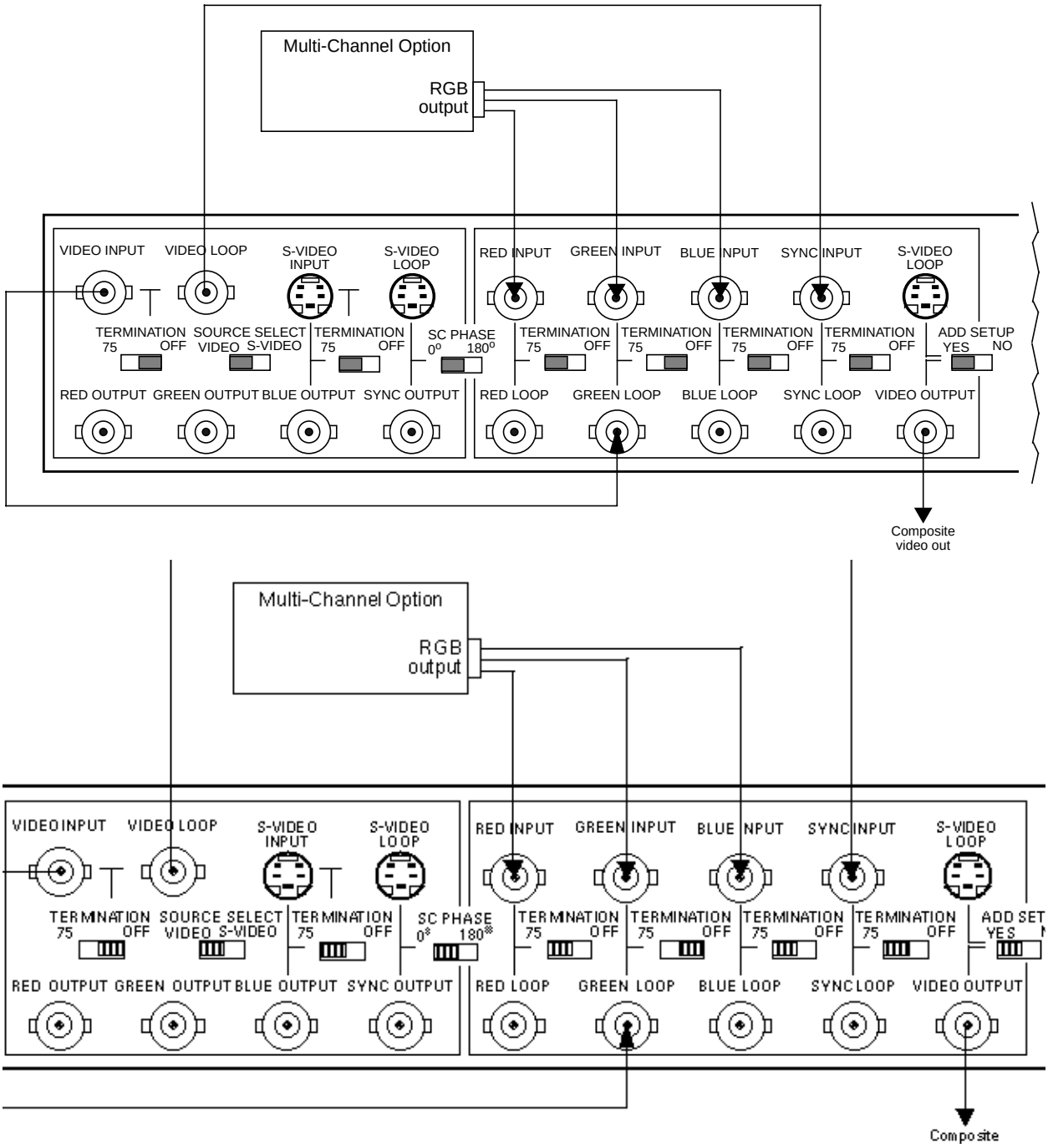


Figure 2-26 Cabling the VIDI/O BOX for Use with MCO

2.10 Restarting the System and Installing the Multi-Channel Option Software

Load the Multi-Channel Option software from the CD included in the package. Installing the Multi-Channel Option software changes some of the IRIX system files, so backup is recommended.

Caution: Do not install 4.0.5H or 5.0.1 MCO software that comes with the MCO kit if the system has 5.1 system software release or later installed. The MCO software support is completely integrated into 5.1 and later versions.

The Multi-Channel Option software images are created in *inst* format; thus, they require that the *inst* program be used. Installation software and instructions are included with the standard Silicon Graphics software products.

If you want to remove the Multi-Channel Option software after you have installed it, be sure to reinstall the standard system software afterward by running *inst* in interactive mode. Mark each installed subsystem for installation, even if the version history shows that the product is already installed.

When you are finished installing the software, proceed to Chapter 4, “Setting VME Addresses,” if you changed DIP switches on the VS2 board(s) and are installing software earlier than 5.2. Otherwise, test the installation following the instructions in Chapter 5, “Testing the Installation.”

If the X server hangs and the keyboard and mouse do not respond, use the famous Vulcan Death Grip to kill the X server. Press these four keys simultaneously:

<Left-Ctrl> <Left-Shift> <F12> <NumPad-/>

You must use the left **<Ctrl>**, left **<Shift>** and the **/** key at the top of the keypad; other keys do not work.

Chapter 3

Installing the Option: Version With Breakout Box

This chapter describes how to install the Multi-Channel Option (MCO) in a VME slot in the following IRIS chassis:

- deskside: POWER Series, Crimson (Diehard II), and Onyx (Eveready)
- rack: POWER Series (Predator), SkyWriter, and Onyx (Terminator)

The installation procedure is divided into the following steps:

1. preparing the chassis
2. installing the panels on the I/O door
3. changing the physical VME address on the board
4. attaching the paddleboards and inserting the boards
5. attaching microstrip cables to the paddleboards
6. attaching the internal cables and closing the chassis
7. cabling the breakout box
8. cabling the VIDI/O BOX from Truevision for use with MCO
9. restarting the system and installing the Multi-Channel Option software

For MCO in an Onyx, IRIX release 5.0.1 or later is required. If the Onyx is running 5.0, upgrade to 5.0.1 or later before .proceeding

For POWER Series or Crimson, 4.0.5H or later is required. If the system is running an earlier version, upgrade it before proceeding.

The system should have been upgraded to latest versions of hardware; for example, the F chips on the IO4 board must be version 2 for the Multi-Channel Option to function in the system.

Other Silicon Graphics manuals contain instructions for exchanging circuit boards. Make sure you have the appropriate one(s):

- *Single Tower Maintenance Manual* (108-7002-xxx): Crimson and POWER Series systems
- *CHALLENGE™/Onyx™ L Deskside Installation Instructions* (108-7039-xxx)
- *CHALLENGE™/Onyx™ XL Rackmount Installation Instructions* (108-7042-xxx)
- *CHALLENGE and Onyx Retrofit Instructions* (domestic version: 802-0107-002; international version: 802-0106-002)

- *Challenge/Onyx Rackmount Third Cardcage (CC3) Upgrade Instructions* (release note, 802-0105-xxx): setting up cardcage 3 for Onyx rackmount
- *SkyWriter Installation Instructions* (108-7011-xxx)

Make sure you have other pertinent release notes and Field Information Bulletins as well.

You need a flat-blade screwdriver and a Phillips screwdriver to install the Multi-Channel Option. To run diagnostics, use the IDE diagnostics CD for IRIX 5.2 (812-0119-005), 5.1 (812-0121-003), IRIX 5.0.1 (812-0121-002), or IRIX 4.0.5H (806-0007-009) as explained in Chapter 6, "Using Multi-Channel Option Diagnostics." in this document.

If you install the MCO board in slot 3 in an Onyx and leave slot 1, slot 2, or both unoccupied, you will need jumpers for the backplane or midplane:

- Onyx deskside chassis and cardcage 2 (CC2) of an Onyx rackmount chassis: up to 20 jumpers (p/n 9090003)
- cardcage 3 (CC3) of an Onyx rackmount chassis: up to four interrupt boards (p/n 030-0516-xxx)

Note: To perform with the Multi-Channel Option, the system must have at least one Raster Memory board at revision level 00101 or greater (p/n 030-0235-004). Revision level 00102 or greater (p/n 030-0337-001, 030-0338-001, 030-0359-001, or 030-0360-001) is required for field-sequential formats, in which red, green, and blue signals are multiplexed on a single cable.

3.1 Preparing the Chassis

To prepare the chassis for installing the option, follow these steps:

Caution: Board components are extremely sensitive to electrostatic discharge. Use proper antistatic procedures while handling the board.

1. Make sure all users are off the target system. To check the revision level of the RM board(s) before you shut down the system, type as root

   /usr/gfx/gfxinfo -v

   In the result, look for a line such as

   2 RM boards (rev. 00102/00102)

   To work properly with MCO, the last digit of each RM board reported must be a number other than zero. If the system is running a field-sequential format, the digit must be greater than one.

2. Shut down the system; open the chassis, removing the rear outer panel if necessary.
3. Open the rear metal panel to expose the slots.
4. Check the revision level of the VCAM in the system. Not many of these exist. Determine the revision level by inspecting O0B0 and M9C0:
   - no rework at O0B0 and no rework at M9C0: 030-0500-003
   - rework at O0B0 and no rework at M9C0: 030-0500-004

- rework at O0B0 and rework at M9C0: 030-0500-005

If the VCAM is revision level 030-0500-004, swap it for another revision level.

5. Check the revision level of the RM boards in the system. Each board must have a number other than zero (or one) as its last digit, or have one of these part numbers:
   - 030-0235-004 (00101)
   - 030-0337-001 or 030-0338-001 (00102) for field-sequential formats
   - 030-0359-001 or 030-0360-001 (00112) for field-sequential formats
6. Plan where to install the MCO board and its three I/O panels. All this hardware needs room for clearance:
   - *Internal cables attached to the three panels* The connectors and internal cables attached to the three I/O panels are bulky.
   - *Paddleboards* The paddleboards that you will attach to the MCO and DG2 boards extend into the space between the board slots and the I/O door.

     Note: For a Crimson chassis, clearance between the edges of the paddleboards and the I/O door, when closed, is only 1/10 inch.
   - *Microstrip cables connecting the paddleboards on the DG2 and the MCO board* Although they are long enough to reach the DG2 even if the MCO board is installed in the VME slot farthest from the DG2 in all chassis, these fragile cables must have enough room so that they are not chafed or crimped.
   - *Other options already in the chassis* Take into account the customer's other options, some of which you might have to move to different slots.

   If you put the board closest to the graphics head (VME slot 3 in most chassis), put the I/O panels into slots at the left side of the I/O door so that the connectors do not interfere with the paddleboards and microstrip cables.If you put the MCO board in slot 1 in most chassis, put the I/O panels into slots near the middle of the board.

   For maximum clearance for MCO components, use the lower or middle slots on the I/O door.

   - *VME slot required* To allow room for internal cables, the option should go into VME slot 3 in the Crimson or POWER Series, the VME slot closest to the DG2 board in the Onyx deskside, and any available VME slot in the SkyWriter and Onyx rackmount.

     If the appropriate slot is occupied by an existing option, move it to free the slot. If slot 1, slot 2, or both are unoccupied, you must jumper the backplane, as explained in Chapter 2.

Illustrations of complete option installations appear later in this chapter:

- Crimson chassis: Figure 3-8
- POWER Series rackmount chassis: Figure 3-9
- SkyWriter chassis: Figure 3-10
- Onyx deskside chassis: Figure 3-11
- Onyx rackmount chassis: Figure 3-12 and Figure 3-13

3.2 Installing the MCO Panels on the I/O Door

The three panels—**ANALOG 1** (p / n 018-0450-001), **ANALOG 2** (p / n 018-0451-001), and **ANALOG 3** (p / n 018-0452-001)—are not interchangeable; the free ends must be plugged into specific connectors on the VS2 board. To install the I / O panels, follow these steps:

1. Remove slot covers for the slots you have selected for the panels. Reserve the screws for use with the MCO panels.

   Note: If you are installing the option in a POWER Series or Crimson, detach the cable assembly from the panel silkscreened **ANALOG 1**. Attach the substitute panel silkscreened **ANALOG 1** (p / n 040-0897-001) from the cable kit. Repeat this step for the **ANALOG 2** and **ANALOG 3** cable assemblies.

2. Position the **ANALOG 1** panel over the leftmost slot, orienting it as shown in Figure 3-1. Screw it in using the reserved screws.

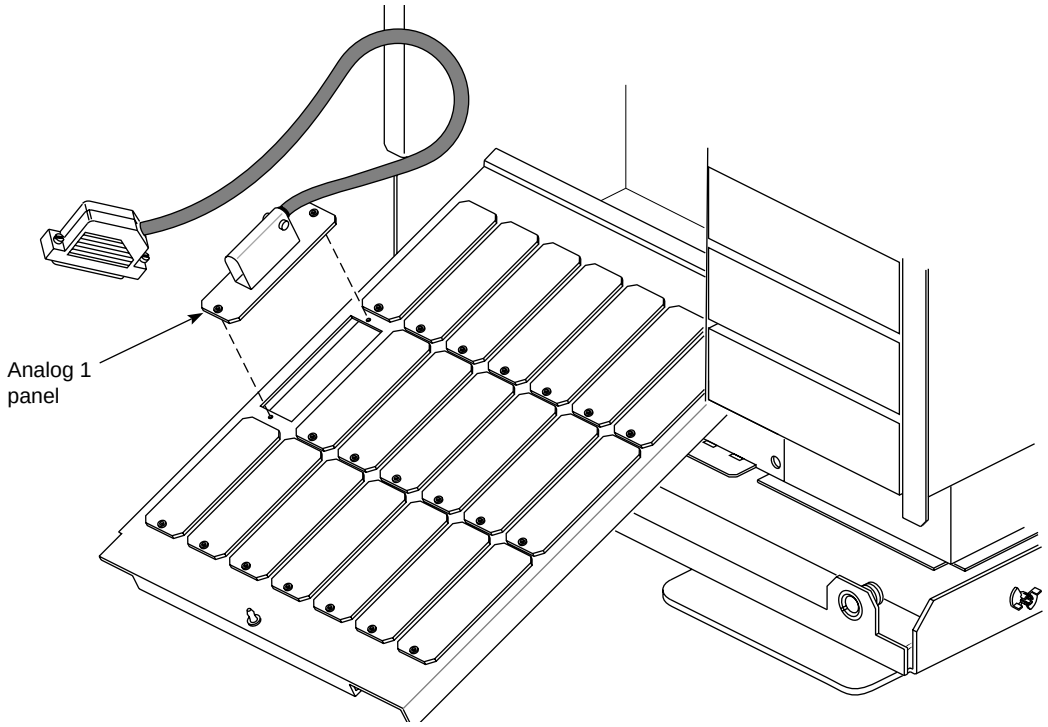


Figure 3-1 Positioning the ANALOG 1 Panel

3. Attach the other two MCO I / O panels as in step 2. In a multipipe system, attach each set of I / O panels. Figure 3-2 shows all panels installed in a single-pipe system.

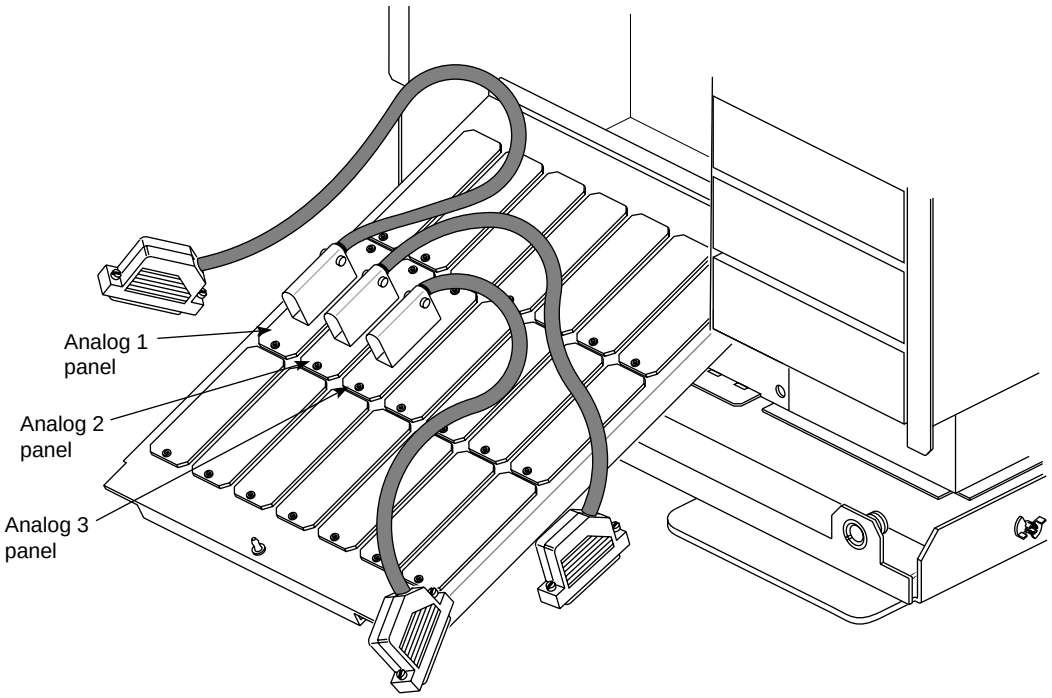


Figure 3-2 I/O Panels Installed in a Single-pipe System

3.3 Changing the Physical VME Address on the Board

Changing the default VME address for the Multi-Channel Option is required when:

- the board's address space conflicts with another A24 VME peripheral installed in the same system
- you are installing a second MCO into the same VME bus to split the graphics output from pipe 1 of a dual-head MP bus-based SkyWriter system (RealityEngine graphics)

Note: If you are installing an MCO in a Crimson or POWER Series workstation (not in a SkyWriter system) under 4.0.5H, it must be on graphics pipe 0.

Changing the MCO board's address requires resetting DIP switches, as explained in this section, and, for IRIX versions before 5.2, making software changes, as explained in Chapter 4, "Setting VME Addresses."

The VME address is factory set to `0x00800000`, corresponding to graphics pipe 0. The DIP switch on the far right is set; all others are unset. Default physical VME addresses are listed in Table 3-1.

Pipe	Name in */usr/sysgen/master.d/mem*	Physical Starting Address and Range
0 (all pipes in Onyx rackmount)	VIDEO_VS2_A24_NP_BASE_PIPE0	0x00800000 - 0x0080ffff
1 (second pipe in SkyWriter only)	VIDEO_VS2_A24_NP_BASE_PIPE1	0x00810000 - 0x0081ffff

Table 3-1 Default VME addresses

DIP switch settings for th ephysical VME addresses are diagrammed in Figure 3-3.

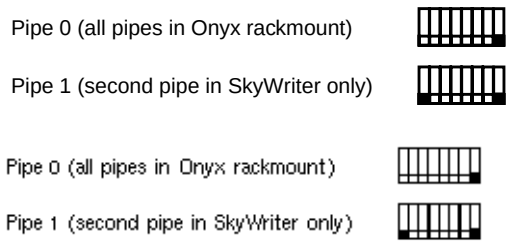


Figure 3-3 Default Physical DIP Switch Settings

To change the VME address on the second MCO board in an MP bus-based system, set the DIP switches for pipe 1 as follows:

- set leftmost switch
- leave rightmost switch set
- all others are unset

Note: For multipipe in an Onyx rackmount chassis, leave all (one, two, or three) VS2 boards set to the default DIP switch settings. Use an adapter number when configuring the DG2 EEPROM with the address for each board, as explained in Chapter 4, “Setting VME Addresses.” You must use the separate VME buses that accompany each graphics pipe in the Onyx rackmount system; otherwise, the MCO microstrip cabling cannot reach the DG2 board.

If the customer wants to use addresses other than the defaults, follow these guidelines:

- The MCO board requires an address space of 0x10000 (65536) bytes.
- For release 5.2 and later, you must choose an address from the following:

  - POWER Series, pipe 0: 0x00800000, 0x00900000, 0x0a00000, 0x0b00000, 0x0c00000, 0x0d00000, 0x0e00000, 0x0f00000
  - POWER Series, pipe 1: 0x0810000, 0x0910000,0x0a10000, 0x0b10000, 0x0c10000, 0x0d10000, 0x0e10000, 0x0f10000
  - Onyx, any pipe: any address listed at the two subbullets above
- For release 5.1 and earlier, the valid range of physical starting addresses for the MCO board is the upper 8 MB of VME A24:

  ```
  0x00800000 - 0x00ff0000
  ```

Addresses should be on 64-KB boundaries (0x10000, 65536) for proper alignment.

Note: You must also reconfigure the DG2 EEPROM and (for MP bus-based systems) the *mem* file. Instructions are in Chapter 4, "Setting VME Addresses."

For instructions on jumpering the backplane, which you must do if slot 1, slot 2, or both are unoccupied, see Section 2.5, "Jumpering the Onyx Backplane or Midplane," in Chapter 2, "Installing the Option: Older Version (No Breakout Box)," in this guide.

3.4 Attaching the Paddleboards and Inserting the Boards

In this step you attach the paddleboards to the MCO board (labeled VS2) and DG2 board, attach nylon spacers (standoffs) to each of the two paddleboards, and insert the MCO board into the chassis.

The paddleboards must be attached as follows:

- PB2 (p / n 030-0328-002) to the DG2 board
- PB3 (p / n 030-0352-001) to the MCO board

The names of the paddleboards are silkscreened onto the component side.

To attach the paddleboard to the DG2 board, follow these steps:

1. Detach the front plane so that the DG2 board is accessible. Detach the 24W7 cable connector from the EF7; leave the small cable (stereo sync) attached to the DG2 board.
2. Remove the DG2 board from the chassis and lay it on a nonstatic surface.
3. Install three nylon spacers (p / n 7430100) into the connector side of the PB2, as shown in Figure 3-4. Make sure you have the PB2 paddleboard (p / n 030-0328-001), not the PB3 paddleboard.
4. Making sure the two cables for stereo and swap ready remain connected to the two-pin connectors on the DG2, mate the three connectors (**J1**, **J2**, and **J3**) on the PB2 paddleboard to the **P6**, **P7**, and **P8** connectors on the DG2 board.

   Supporting the DG2 board from the other side, carefully push the PB2 paddleboard onto the connectors. Be careful not to bend the DG2 board.

Caution: Be extremely careful not to bend or smash the pins in the paddleboard connectors; they are very fragile. If a pin gets bent, vertical stripes appear on all MCO channels. These pins cannot be reliably repaired. If they are damaged, replace the entire paddleboard.

5. From the other side of the DG2 board, screw three nylon screws (p / n 93-00407) into the spacers.
6. Reinsert the DG2 board into its slot. Reattach the front plane and 24W7 cable.

Note: If you need to replace the DG2 board for any reason, you must reset the default address for the MCO board, which is stored in the DG2's EEPROM. Instructions are in Chapter 4, "Setting VME Addresses."

Figure 3-4 shows installation of the paddleboard onto the DG2 board.

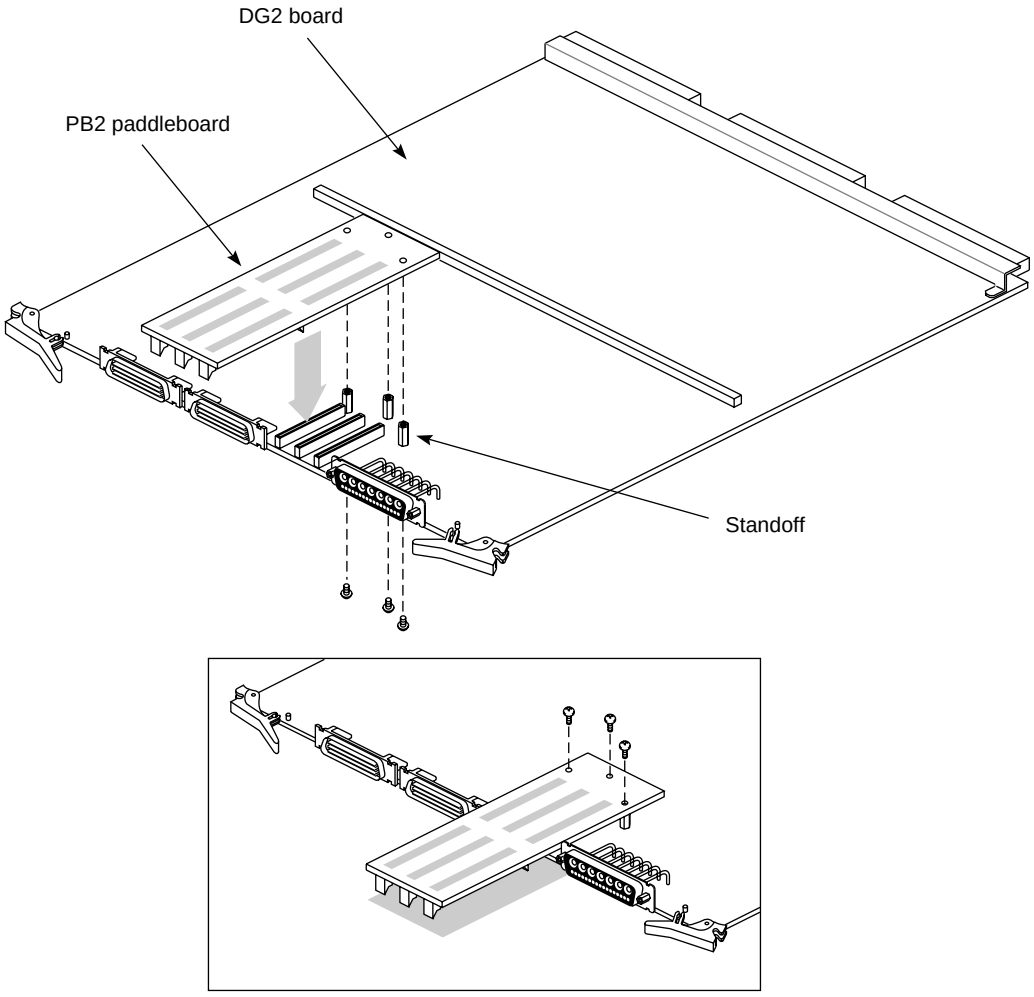


Figure 3-4 DG2 Board with PB2 Paddleboard

To attach the paddleboard to the MCO board, follow these steps:

1. Lay the MCO board on a nonstatic surface.
2. Install three nylon spacers (p / n 7430100) into the connector side of the PB3 as you did for the PB2, as shown in Figure 3-4.
3. Mate the three connectors (**J1**, **J2**, and **J3**) on the PB3 paddleboard to the three connectors (**J1**, **J2**, and **J3**) on the MCO board.

   Supporting the MCO board from the other side, ease the PB3 paddleboard onto the connector. Be careful not to flex the MCO board.

   Caution: Be extremely careful not to bend or smash the pins in the paddleboard connectors, as they are very fragile. If a pin gets bent, vertical stripes appear on all MCO channels. These pins cannot be reliably repaired. If they are damaged, replace the entire paddleboard.
4. From the other side of the MCO board, screw three nylon screws (p / n 93-00407) into the spacers.
5. Grasp the Multi-Channel Option board so that your hands are on the ejector tabs and the component side of the board faces right.

   The MCO board goes in:

   - VME slot 3 (Crimson or POWER Series chassis)
   - VME slot closest to the DG2 board (Onyx deskside)
   - any available VME slot (SkyWriter and Onyx rackmount).

   Caution: Check for ribbon cables to the immediate left of the slot you have selected. Hold any cables flat against their respective boards while inserting the Multi-Channel Option board to prevent them from being chafed by the Multi-Channel Option board components.
6. Insert the MCO board all the way into the cardcage slot. Angle the board's plastic ejectors outward so that the U-shaped grooves of the ejectors fit into the upper and lower metal frames of the system.
7. Push the upper and lower ejector tabs toward the center of the board's lower edge until both are vertical. You should hear and feel the board seat into the connectors on the backplane.

   Figure 3-5 shows both boards in place, with paddleboards attached.

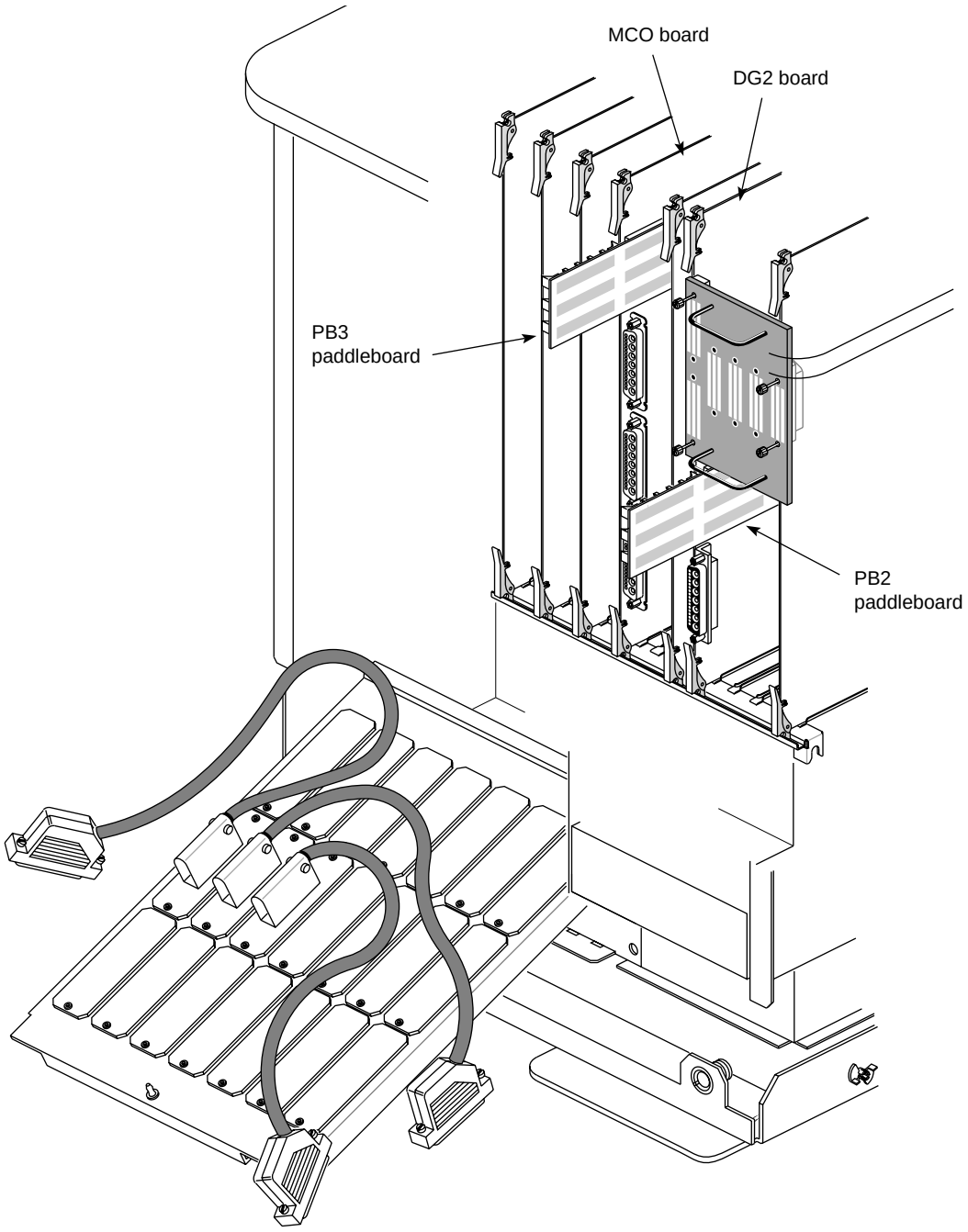


Figure 3-5 MCO and DG2 Boards in Chassis With Paddleboards Attached

3.5 Attaching Microstrip Cables to the Paddleboards

The three sets of microstrip cables that connect the two paddleboards are shipped in rolls protected by plastic.

Note: The cables, which are taped in the middle to minimize tangling, are very fragile. Exercise care in handling them.

The cables are attached as follows, so that they nest and lie flat:

- from **J4** (top socket) on the PB3 to **J4** (bottom socket) on the PB2
- from **J5** (middle socket) on the PB3 to **J5** (middle socket) on the PB2
- from **J6** (bottom socket) on the PB3 to **J6** (top socket) on the PB2

Follow these steps:

1. Holding down the metal strip connector latches on each side of a connector of a microstrip cable, insert the connector onto the top socket (**J4**) on the PB3 paddleboard. The connector is keyed. Release the connector latches to secure the cable in place.

   Holding down the connector latches, insert the connector on the other end of the microstrip cable onto the bottom socket (**J4**) on the PB2 paddleboard; release the connector latches to secure the cable in place.

2. Attach the middle microstrip cable: plug a connector into the middle socket (**J5**) on the PB3 board and insert the other connector onto the middle socket (**J5**) on the PB2 board.

3. Attach the last microstrip cable: plug a connector into the bottom socket (**J6**) on the PB3 board and insert the other connector onto the top socket (**J6**) on the PB2 board.

   Note: For the best cable routing, feed each microstrip cable underneath all of the other cables in the cable trough so that the microstrip cables actually lie on the sheet metal. The cables can lie on the floor of the cardcage.

   Figure 3-6 shows the cables attached.

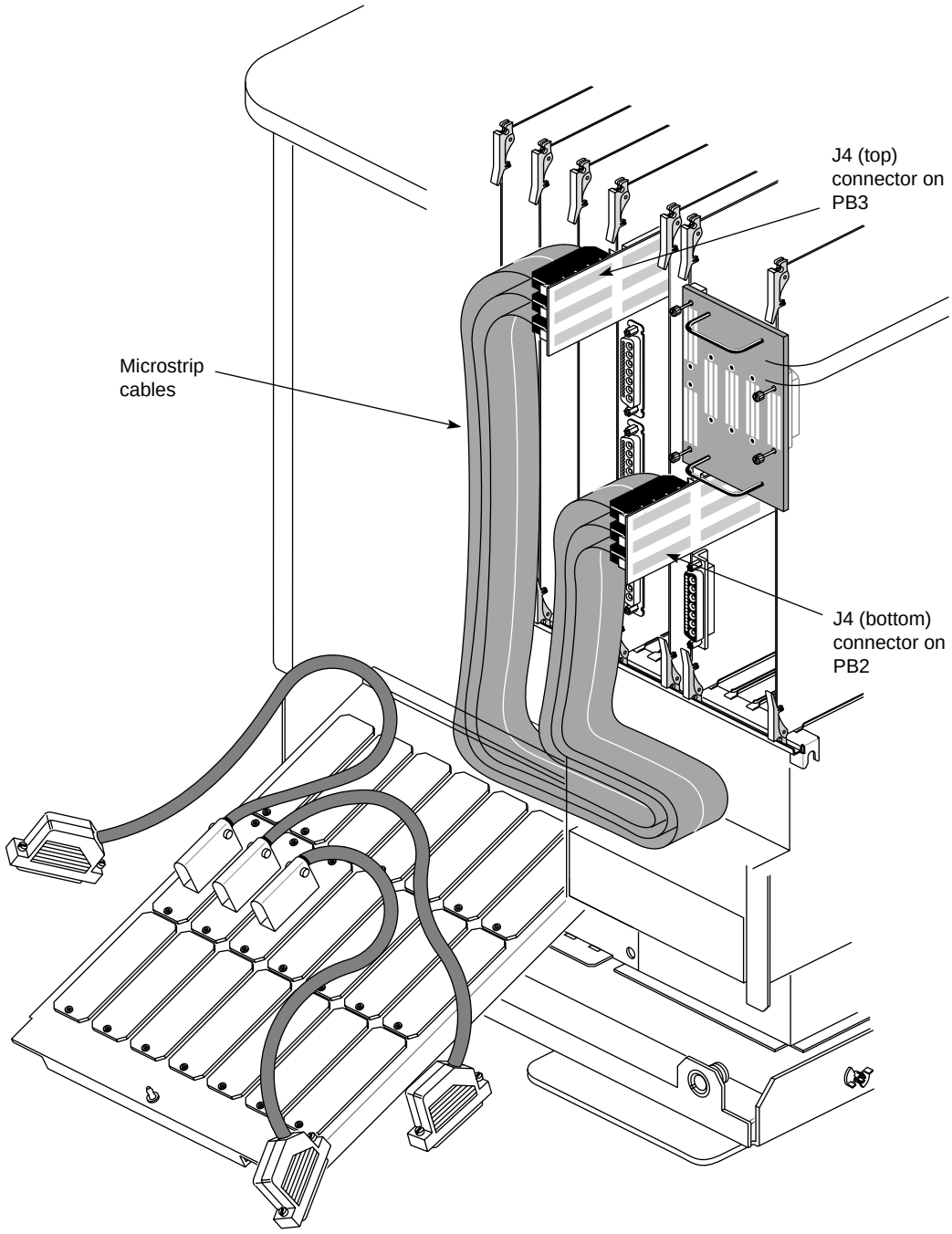


Figure 3-6 Microstrip Cables

3.6 Attaching the 24W7 Cables and Closing the Chassis

To install the free ends of the 24W7 cables onto the MCO board, follow these steps:

1. Attach the connector of the 24W7 cable from the **ANALOG 1** panel to the **J4** connector (the top 24W7 connector) on the MCO board and screw it in. The cable must exit from the bottom of the connector.
2. Attach the connector of the 24W7 cable from the **ANALOG 2** panel to the **J5** connector (the middle 24W7 connector) on the MCO board and screw it in. The cable must exit from the bottom of the connector.
3. Attach the connector of the 24W7 cable from the **ANALOG 3** panel to the **J6** connector (the bottom 24W7 connector) on the MCO board. The cable must exit from the bottom of the connector.

   Note: The 24W7 cables must be connected to the **J4** and **J5** connectors on the MCO board to complete the genlock loopthrough path. If one or both cables are not so connected, genlock performance is not guaranteed.
4. Carefully and gradually close the I/O door.

   Caution: Exercise extreme care in closing the I/O door so that the paddleboards and cables are not damaged. This process may require repositioning cables and, in the worst cases, reinstalling panels and boards in different locations.

Figures 3-7 through 3-14 show the 24W7 cables completely installed.

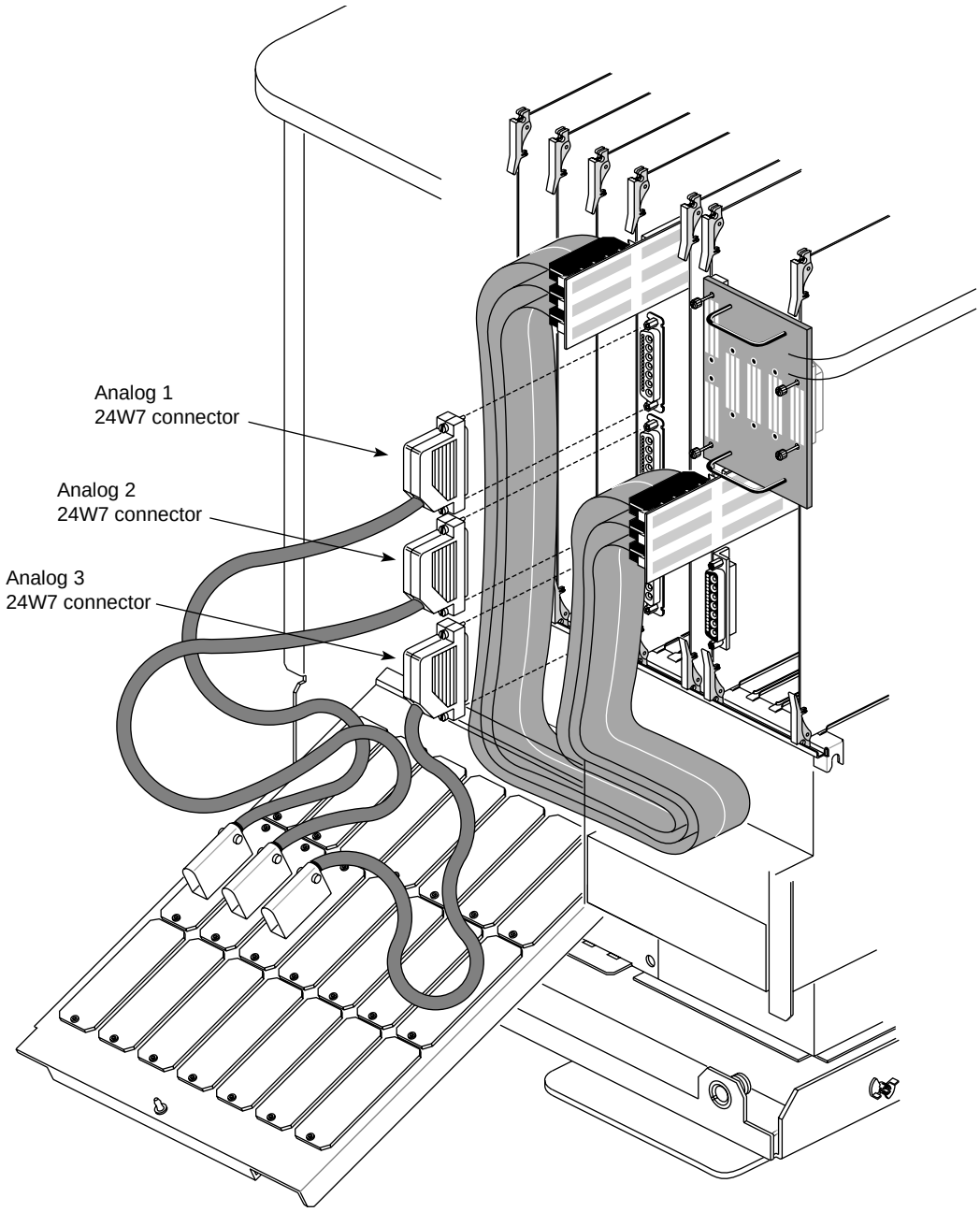


Figure 3-7 Attaching the 24W7 Cables

Caution: If the specific connectors on the MCO board are not cabled to the specific panels detailed in these instructions, channel output is not guaranteed.

Figure 3-8 shows all boards, cables, and panels installed in a Crimson chassis.

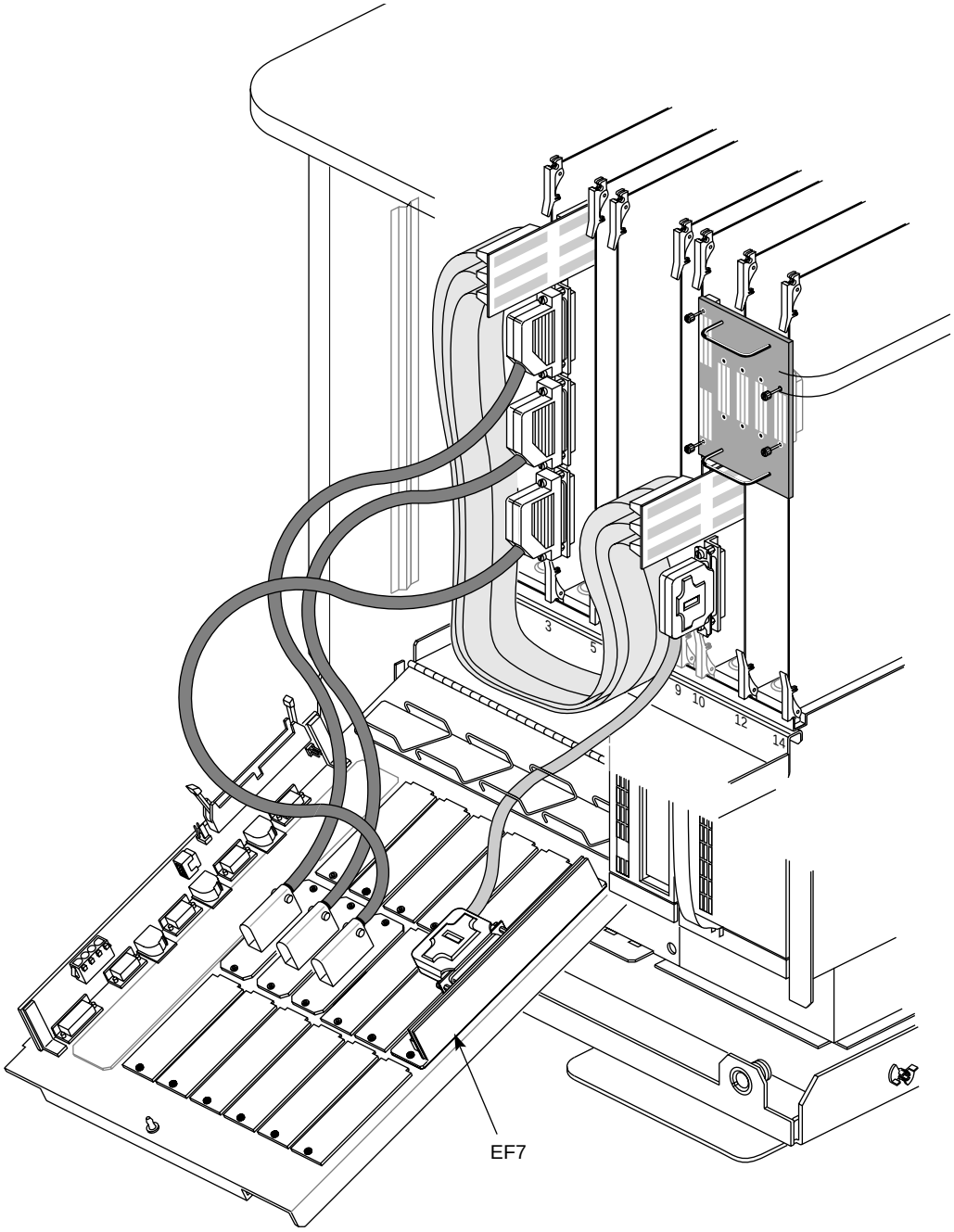


Figure 3-8 Complete Multi-Channel Option Installation for the Crimson Chassis (Breakout Box Version)

Figure 3-9 shows all boards, cables, and panels installed in a POWER Series chassis.

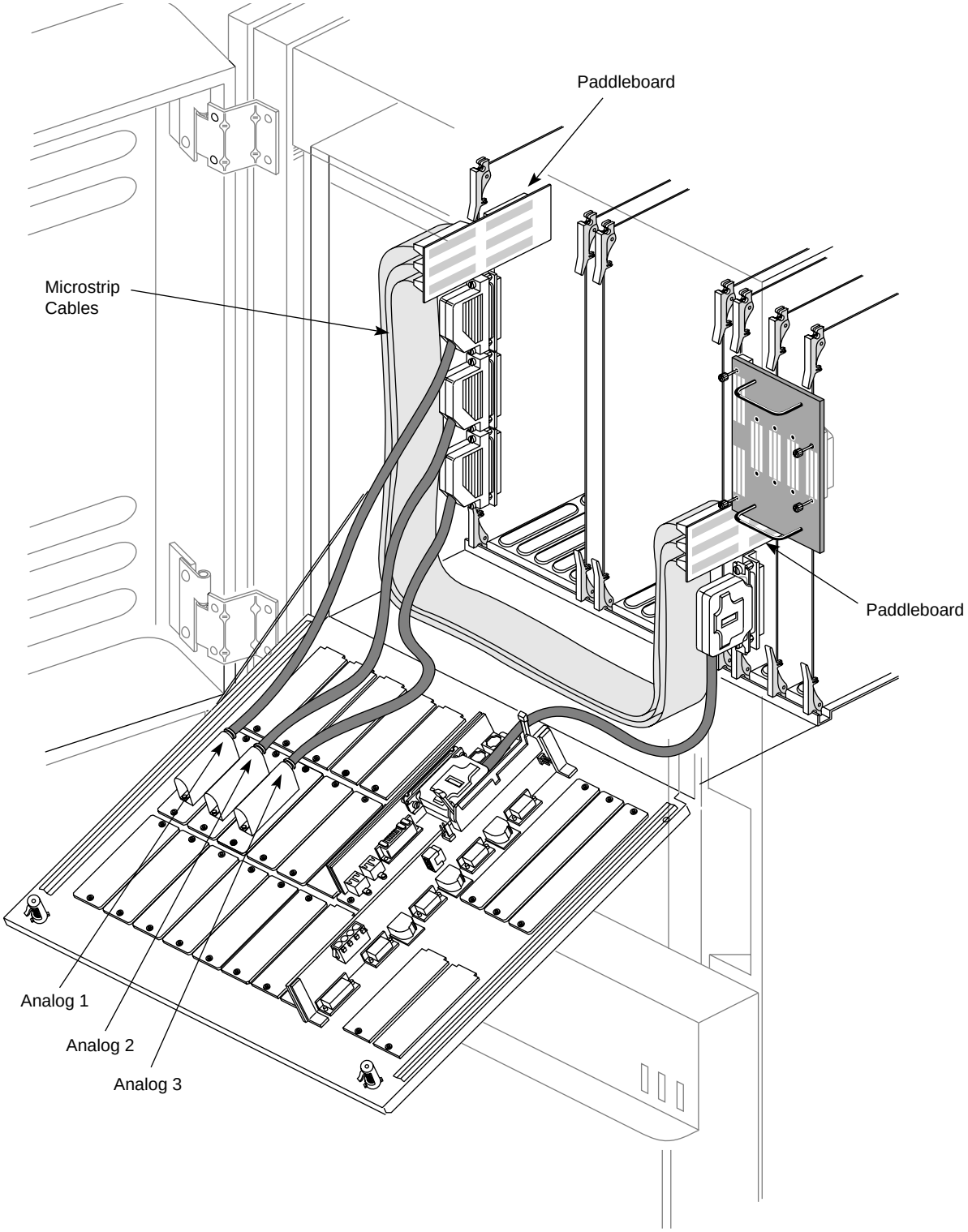


Figure 3-9 Complete Multi-Channel Option Installation for the POWER Series Chassis (Breakout Box Version)

Figure 3-10 shows all boards, cables, and panels installed in a SkyWriter chassis.

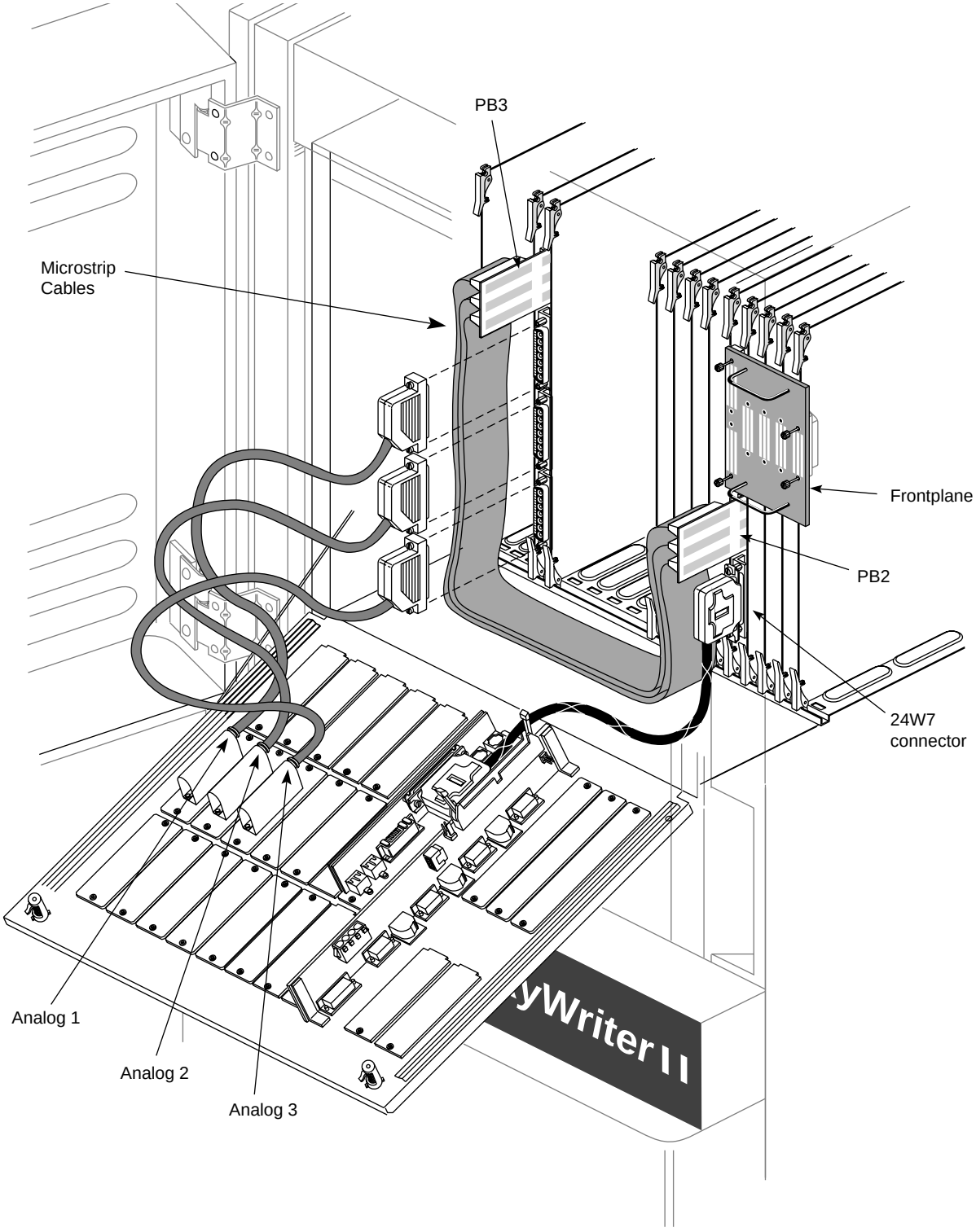


Figure 3-10 Complete Multi-Channel Option Installation for the SkyWriter Chassis (Breakout Box Version)

Figure 3-11 shows all boards, cables, and panels installed in an Onyx deskside chassis.

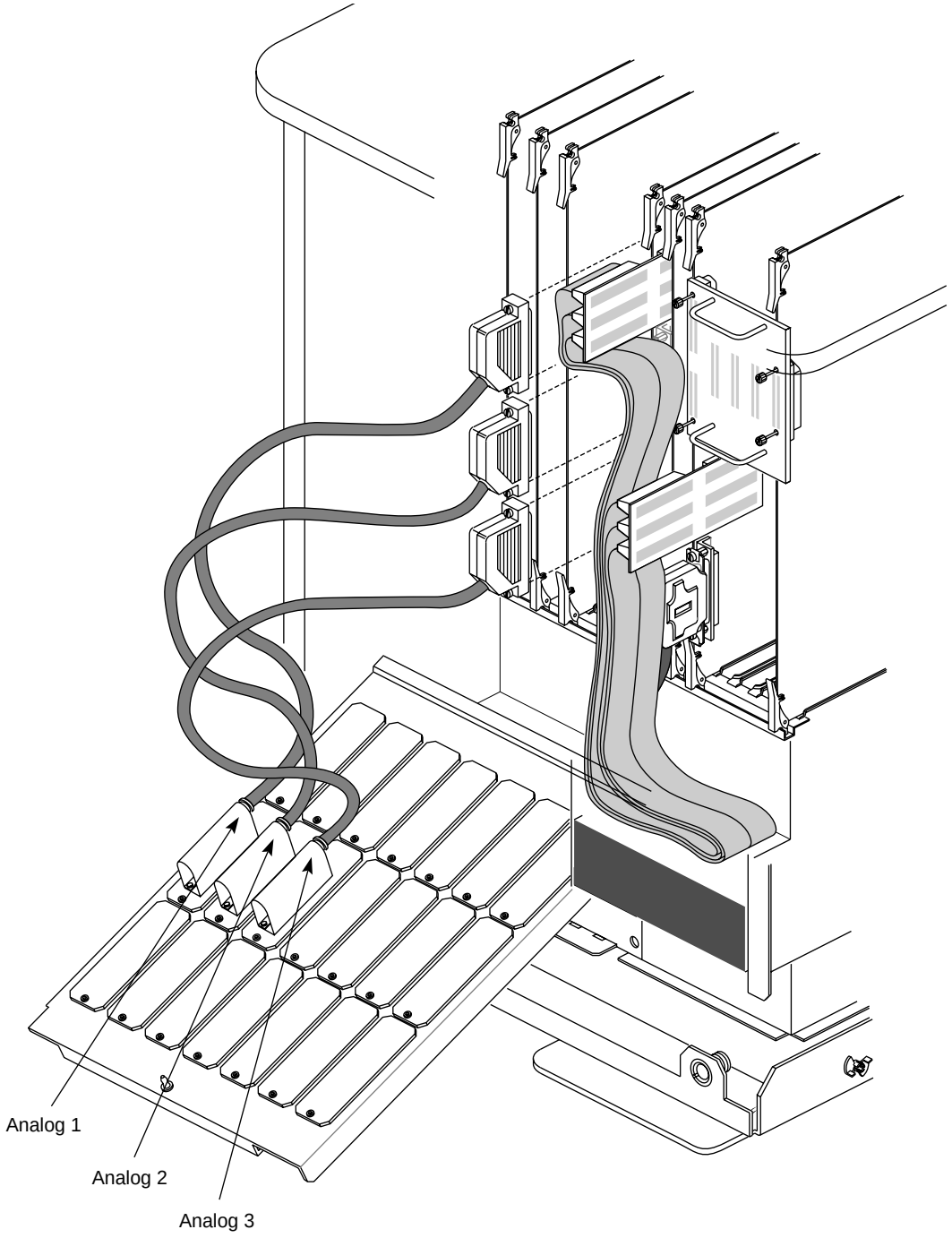


Figure 3-11 Complete Multi-Channel Option Installation for the Onyx Deskside Chassis (Breakout Box Version)

Figure 3-12 shows all boards, cables, and panels installed in cardcage 2 of an Onyx rackmount chassis.

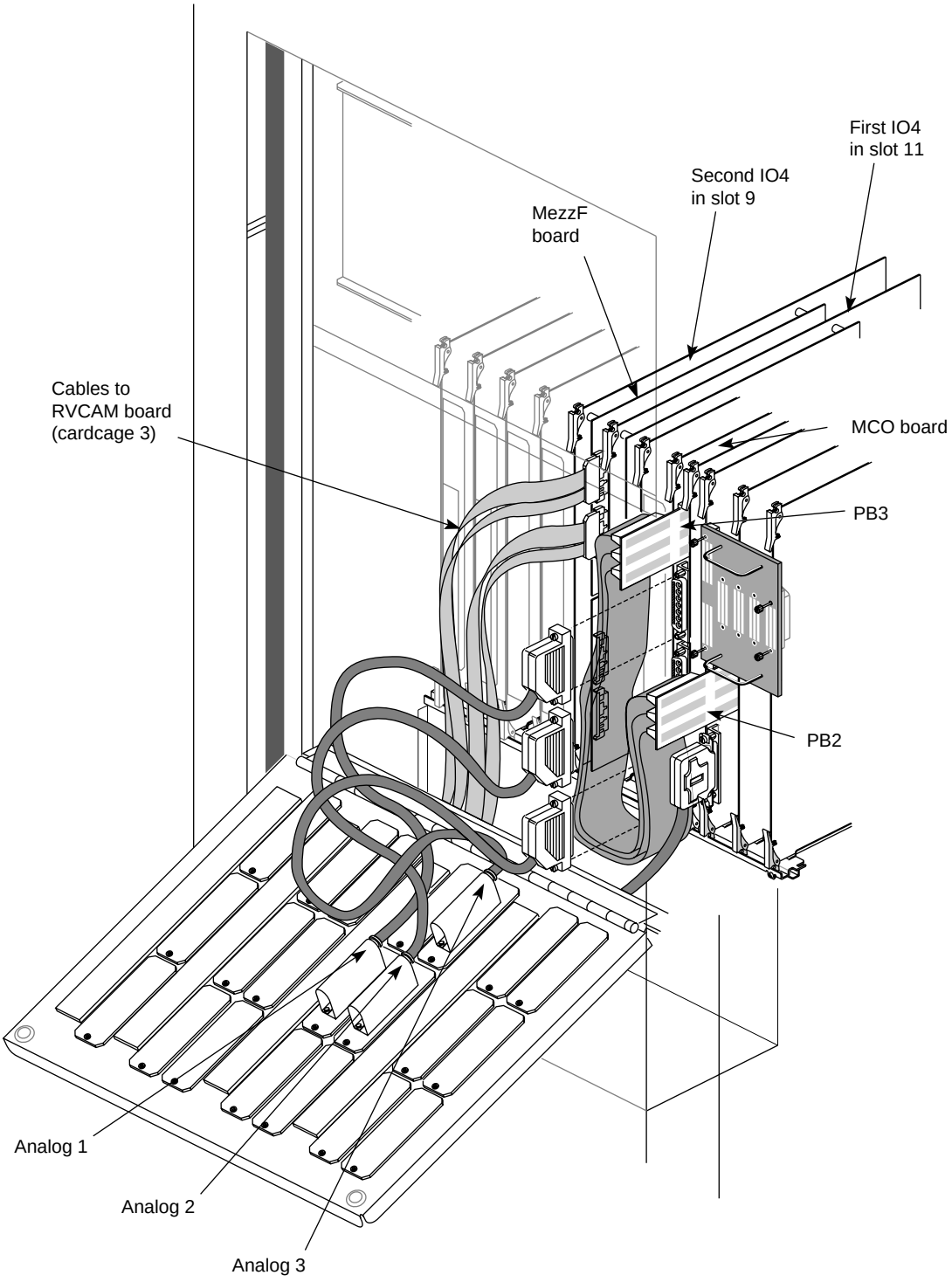


Figure 3-12 Complete Multi-Channel Option Installation for Onyx Rackmount (Cardcage 2) (Breakout Box Version)

Figure 3-13 shows all boards, cables, and panels installed in cardcage 3 of an Onyx rackmount chassis.

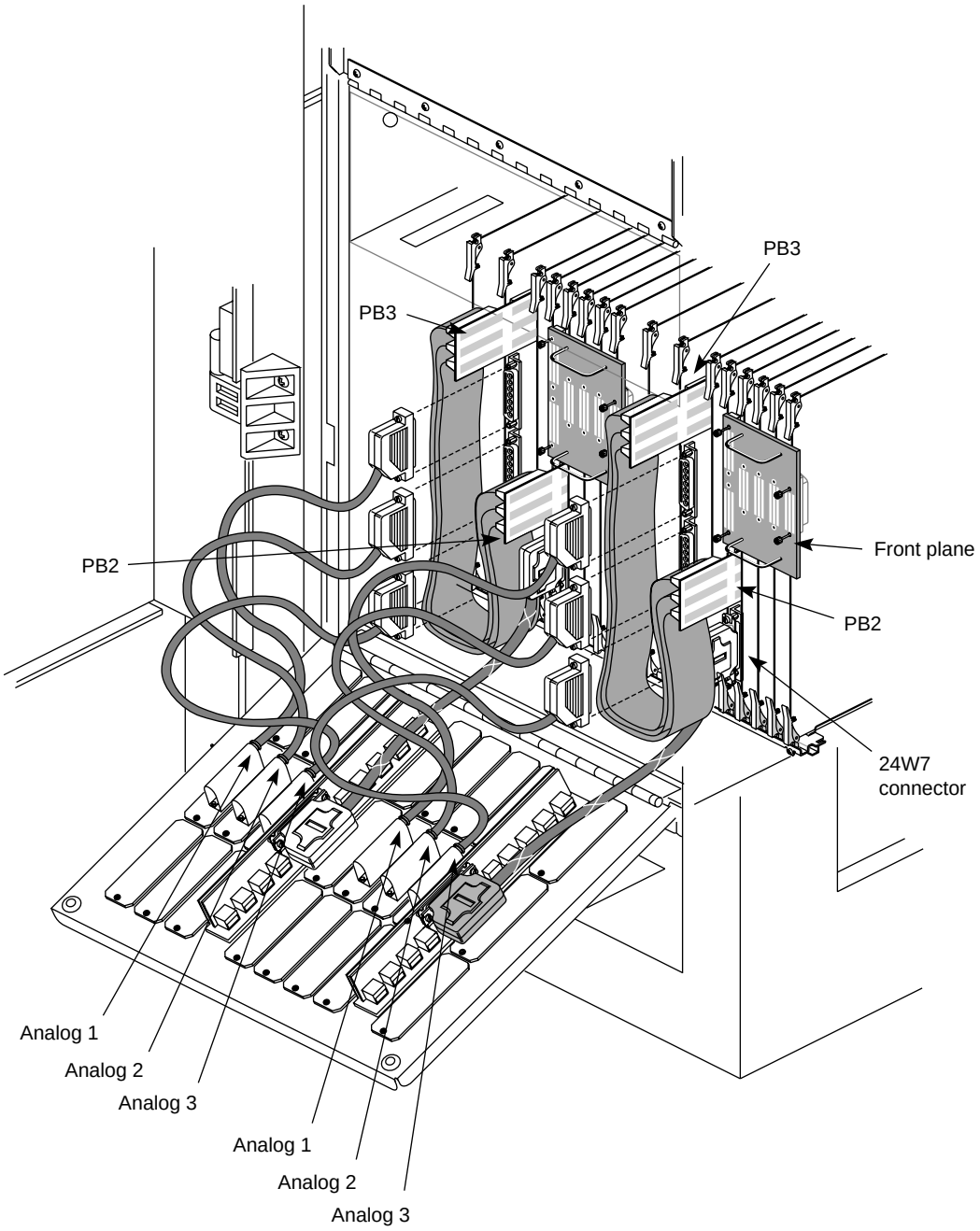


Figure 3-13 Complete Multi-Channel Option Installation for Onyx Rackmount (Cardcage 3) (Breakout Box Version)

3.7 Cabling the Breakout Box

Three identical cables connect the MCO breakout box to the **ANALOG 1**, **ANALOG 2**, and **ANALOG 3** panel connectors on the I/O door. The MCO breakout box has been designed to fit into equipment racks.

1. If the customer desires, mount the breakout box in the customer's rack, using the flanges and screws included with the breakout box. The breakout box can be mounted with its panel facing either direction, as shown in Figure 3-14.

   If appropriate, remove the plastic feet on the bottom of the breakout box to provide clearance for other equipment.

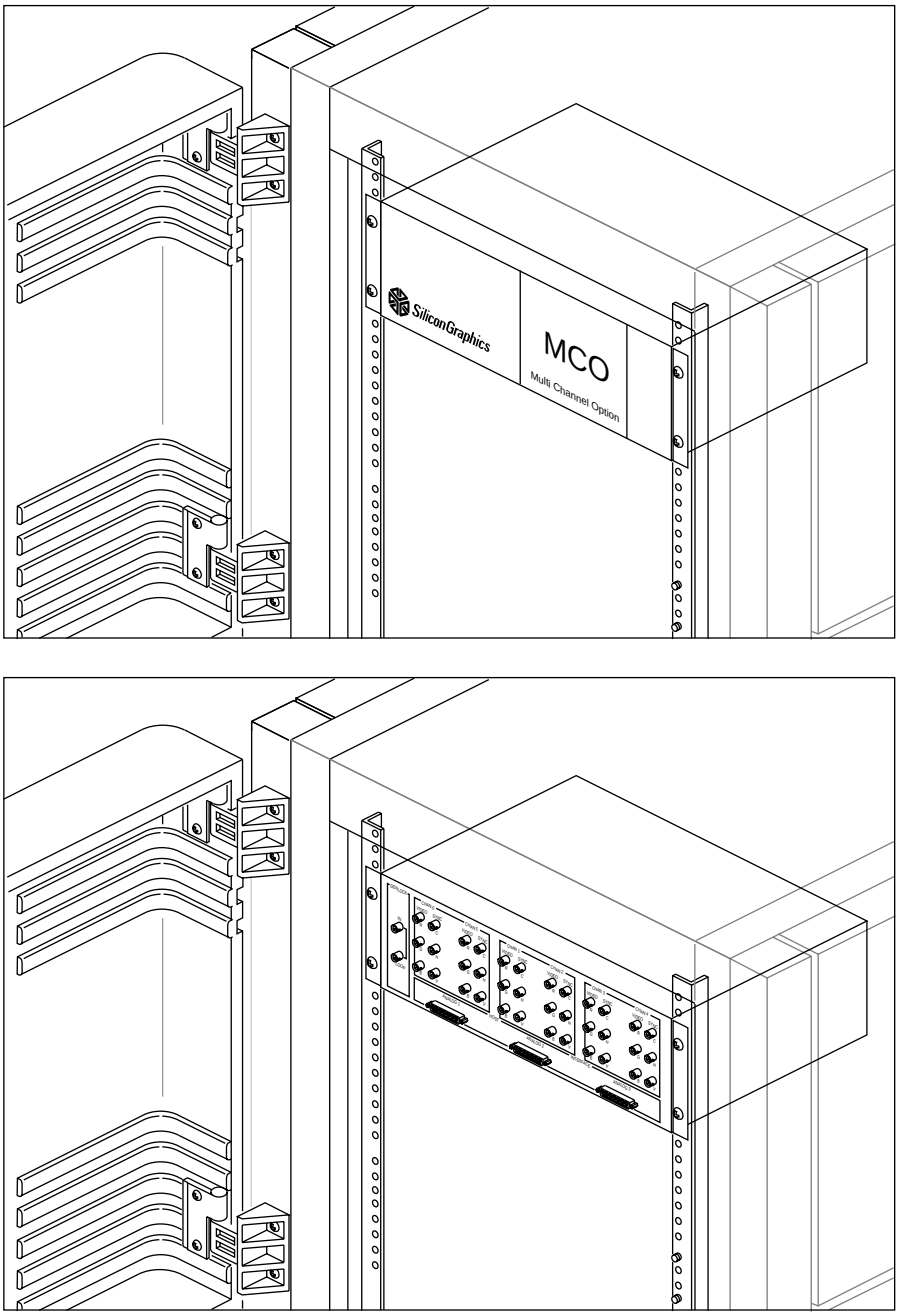


Figure 3-14 Breakout box in Customer Rack, Front and Rear Views

2. If the customer wants the breakout box placed on top of an Onyx, swap two of the feet on the breakout box for the two taller feet included with the breakout box, as shown in Figure 3-15.

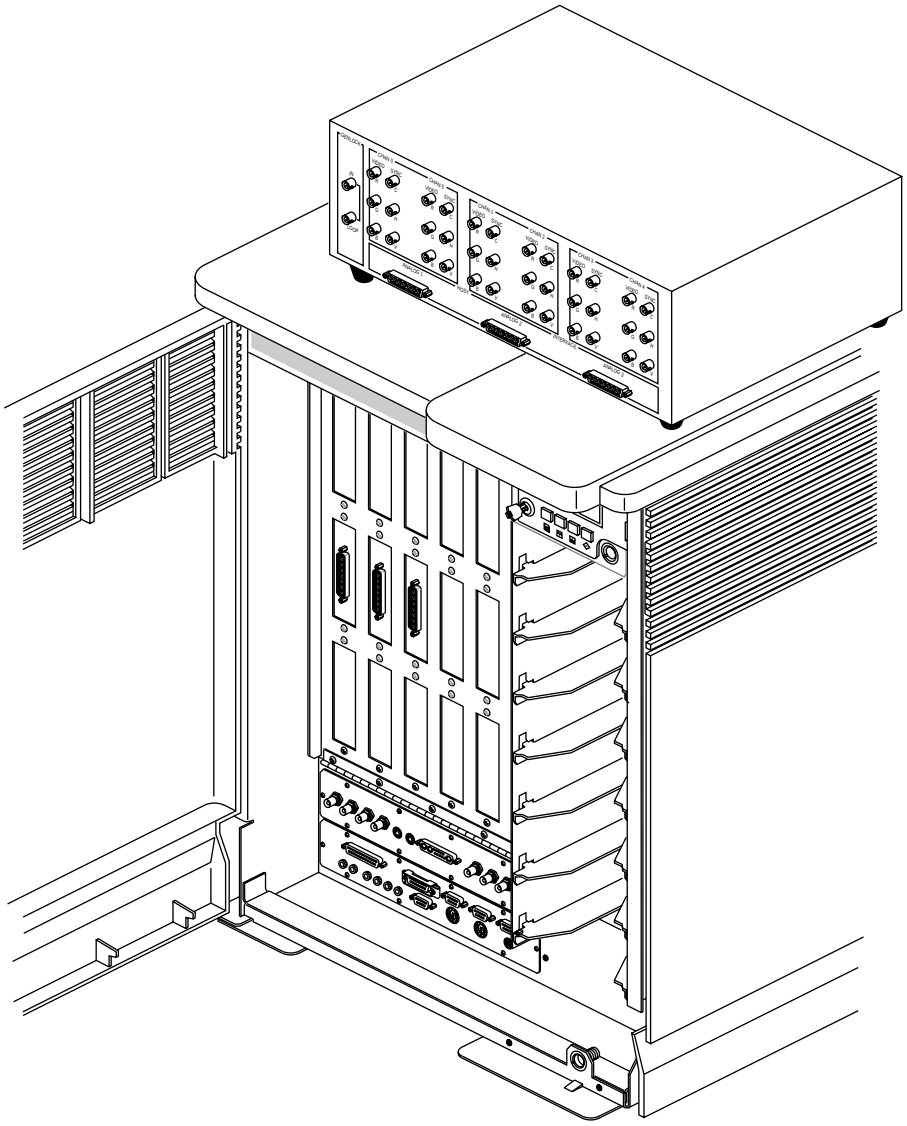


Figure 3-15 Breakout Box on Top of Deskside Chassis

3. Attach one end of one of the three external cables to the **ANALOG 1** panel on the I/O door. Attach the other end to the connector for **ANALOG 1** on the breakout box.
4. Cable the **ANALOG 2** and **ANALOG 3** connectors in a similar fashion.

   Figure 3-16 shows the breakout box cabling.

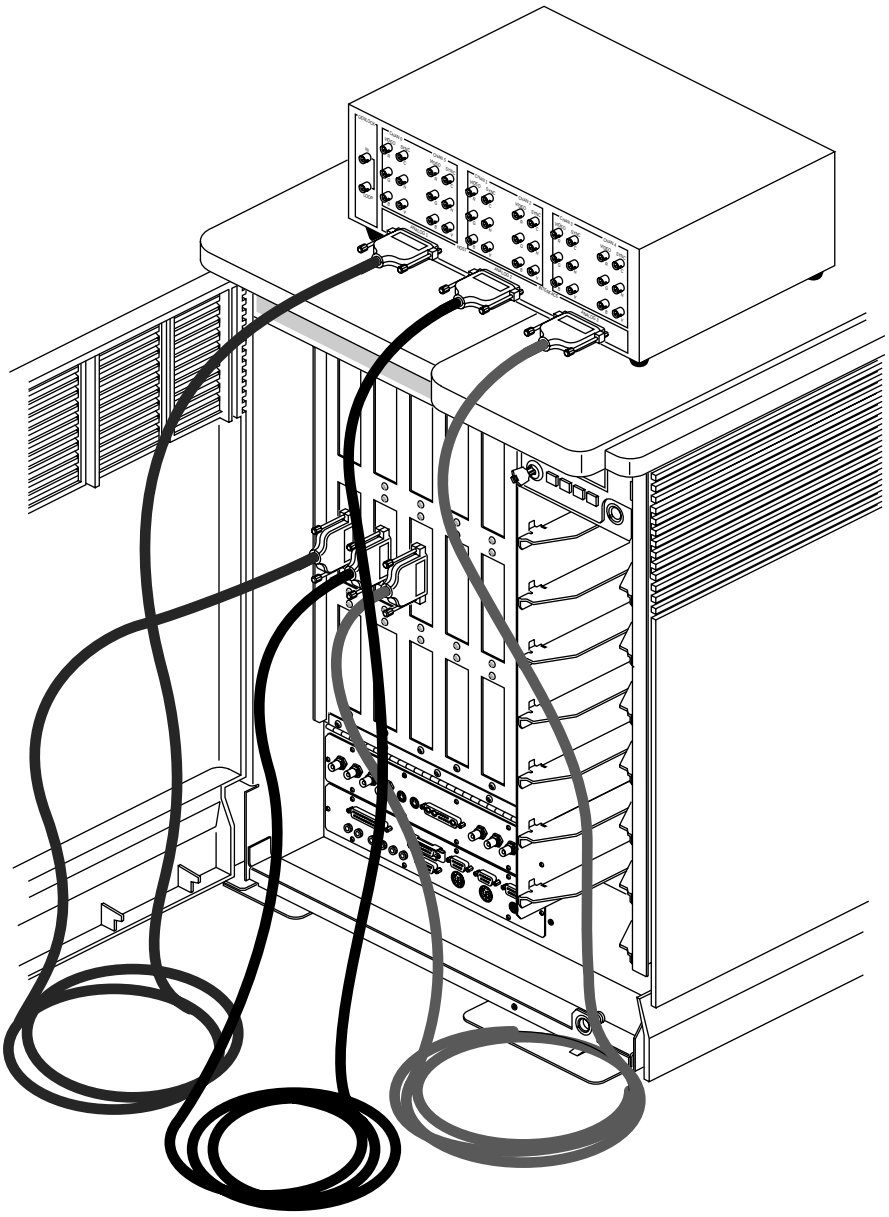


Figure 3-16 MCO Breakout Box Cabling

Note: If the customer uses the genlock input, a 75-ohm terminator (user-provided) must be attached to the end of the transmission line. Therefore, if the signal source for genlock is not being looped through the MCO to another device, this 75-ohm terminator should be attached to the **LOOP** genlock BNC.

The breakout box is passive and therefore has no power cord or power switch.

3.8 Cabling the VIDI/O BOX for Use With MCO

If the customer is using a VIDI/O BOX from Truevision to convert RGB output to NTSC output (one VIDI/O BOX is required for each output channel) using the *n@640x486_30i* video output format, you must cable the box for use with MCO. Follow these steps:

1. Daisy-chain the MCO green output (sync on green) to the encoder green input, the decoder video input, and the sync input.
2. Set the termination switch for the sync input to **75**. Set the termination switches for the green input and video input to **OFF**.
3. Connect red and blue normally. Set the termination switches to **75**. No connection to the MCO genlock is required.

   Figure 3-17 diagrams these connections.

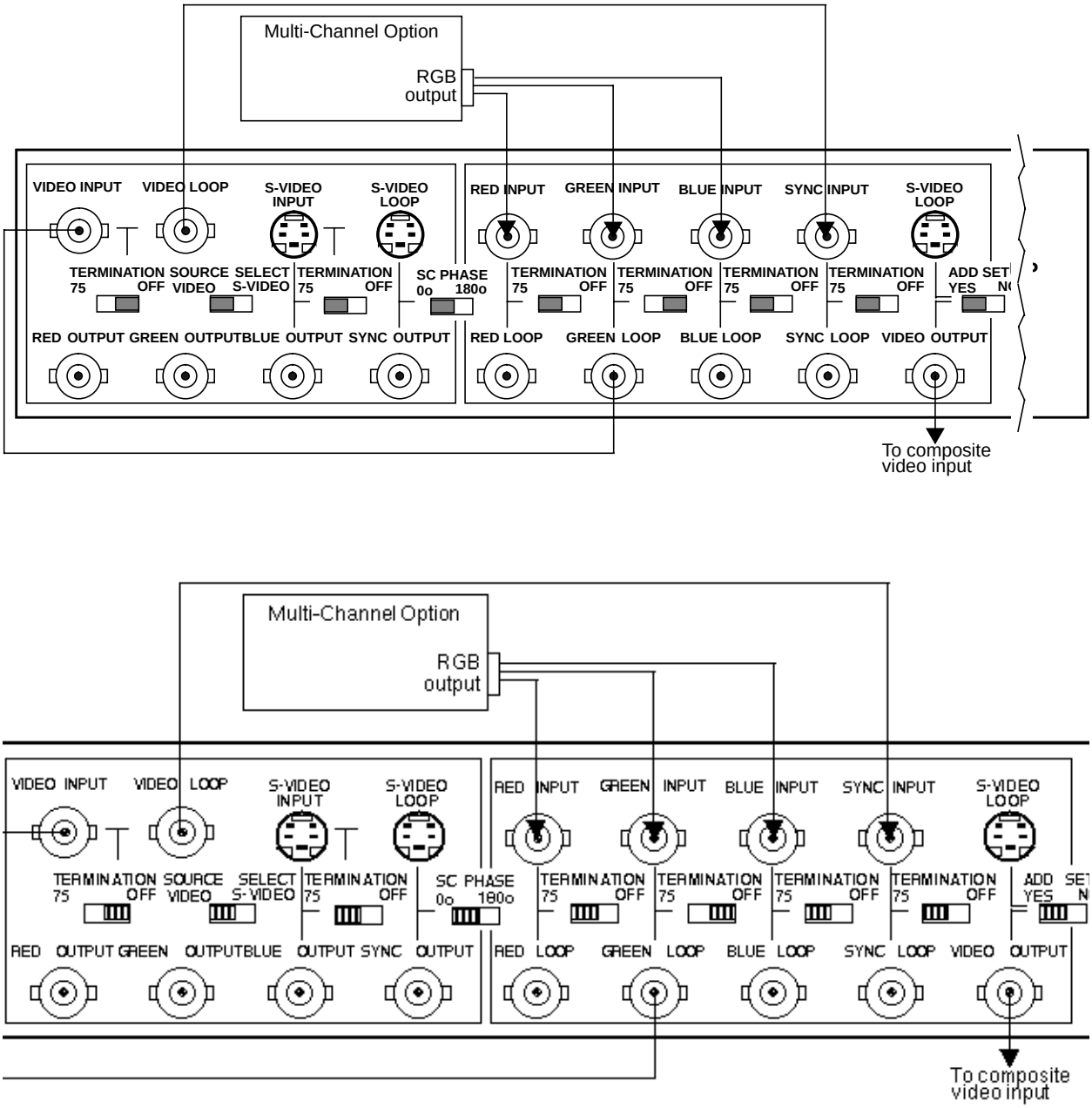


Figure 3-17 Cabling the VIDI/O BOX for Use with MCO

3.9 Restarting the System and Installing the Multi-Channel Option Software

Load the Multi-Channel Option software from the CD included in the package. Installing the Multi-Channel Option software changes some of the IRIX system files, so backup is recommended.

Caution: Do not install the 4.0.5H or 5.0.1 MCO software that comes with the MCO kit if the system has 5.1 system software release or later installed. The MCO software support is completely integrated into 5.1 and later versions.

The Multi-Channel Option software images are created in *inst* format; thus, they require that the *inst* program be used. Installation software and instructions are included with the standard Silicon Graphics software products.

If you want to remove the Multi-Channel Option software after you have installed it, be sure to reinstall the standard system software afterward by running *inst* in interactive mode. Mark each installed subsystem for installation, even if the version history shows that the product is already installed.

When you are finished installing the software, proceed to Chapter 4, “Setting VME Addresses,” if you changed DIP switches on the VS2 board(s) and are installing software earlier than 5.2. Otherwise, test the installation following the instructions in Chapter 5, “Testing the Installation.”

If the X server hangs and the keyboard and mouse do not respond, use the famous Vulcan Death Grip to kill the X server. Press these four keys simultaneously:

<Left-Ctrl> <Left-Shift> <F12> <NumPad-/>

You must use the left **<Ctrl>**, left **<Shift>** and the **/** key at the top of the keypad; other keys do not work.

Chapter 4

Setting VME Addresses

This chapter contains instructions on resetting the VME address for your Multi-Channel Option board, for example, if you install new operating system software. Resetting the board's VME address is required because system software replaces the memory mapping file with a default file. The instructions depend on the type of system (Crimson, POWER Series, SkyWriter, or Onyx), as well as the software release (4.0.5H, 5.0.1, or 5.1).

Note: IRIX version 5.2 and greater does not require setting VME addresses in software; the RealityEngine device driver finds the address of the MCO board automatically.

This chapter explains:

- setting VME addresses for Crimson, POWER Series, or SkyWriter with I IRIX 4.0.5H
- setting VME addresses for Crimson, POWER Series, or SkyWriter with I IRIX 5.1
- setting VME addresses for Onyx with IRIX 5.0.1 or 5.1
- testing VME addresses

4.1 Setting VME Addresses for Crimson, POWER Series, or SkyWriter with IRIX 4.0.5H

Table 4-1 shows the default VME base addresses for the Multi-Channel Option board in a Crimson deskside (pipe 0 only), in a POWER Series deskside or rack (pipe 0only), or in a two-pipe SkyWriter rack running IRIX 4.0.5H.

Pipe	Default Address	Default VME Base Address
0	VIDEO_VS2_A24_NP_BASE_PIPE0	0xb2800000
1	VIDEO_VS2_A24_NP_BASE_PIPE1	0xb2810000

Table 4-1 Default VME Addresses for Crimson, POWER Series, or SkyWriter Running IRIX 4.0.5H

To set the address, follow these steps:

Note: Before installing new system software, determine the VME address to which the board should be set.

1. As root, for each pipe, type **`/usr/gfx/setmon -x 60`** to bring the DG2 EEPROM up to date. For example:

```
setenv DISPLAY :0.0
/usr/gfx/setmon -x 60
setenv DISPLAY :0.1
/usr/gfx/setmon -x 60
setenv DISPLAY :0.2
/usr/gfx/setmon -x 60
```

2. Set the MCO board address pointer(s) by writing DG2 EEPROM(s):

   - On a deskside system, type as root

     `/usr/gfx/ucode/RE/vs2/vs2addrset -d -v`

   - On a multipipe system, type as root

     `/usr/gfx/ucode/RE/vs2/vs2addrset -p pipe# -a address -v verbose`

     for each pipe.

   The `pipe#` is the pipe number (0 or 1) and `address` is the address given in Table 4-1. For example, on a two-pipe SkyWriter, type:

```
/usr/gfx/ucode/RE/vs2/vs2addrset -p 0 -a 0xb2800000 -v
/usr/gfx/ucode/RE/vs2/vs2addrset -p 0 -a 0xb2800000 -v
```

3. If you are not using the default addresses given in Table 4-1, you must edit */usr/sysgen/master.d/mem*. The file looks like:

```
#include <sys/cpu.h>
#include <sys/videoaddr.h>

/*
 * This array defines the device addresses
 * that may be mapped by /dev/mmem.
 * Note: addresses MUST BE kernel virtual address,
 * not physical address.
 */
struct map mmmap_addrs[] = {
#if IP4 || IP5 || IP17
        { NBPP, SOUND_DAT_ADDR },       /* sound chip and friends */
#end
#if IP12 || IP20
        { 0x20000, PHYS_TO_K1 (HPC1MEMORY) },  /* DSP,etc. */
        /* HPC registers, in particular HPC1MISCR */
        { NBPP, PHYS_TO_K1 (HPC_0_ID_ADDR      ) },
#endif
#if IP20 || IP22
        { NBPP, (PHYS_TO_K1(RPSS_CTR)&~0xfff) },
#endif
#if IP5 || Ip17
        { 0x80000, LOGRAM_ADDR },       /* ECC logging RAM */
        { NBPP, IOTIMER_ADDR }, /* free running timer on IO3 */
        { 0x10000, VIDEO_VS2_A24_NP_BASE_PIPE0 }, /* Video Splitter 2
```

```
Pipe 0 */
        {0x10000, VIDEO_VS2_A24_NP_BASE_PIPE1 }, /* Video Splitter 2
Pipe 1 */
        {0x10000, VIDEO_VS2_A24_NP_BASE_PIPE2 }, /* Video Splitter 2
Pipe 2 */
#endif
#if IP5 || IP9 || IP17
        { 0x800000, 0xda000000, },      /* VME Vigra space for 2
boards */
#endif
        { 0, 0, } ,     /* NULL ENTRY TERMINATES THIS LIST! */
```

In */usr/sysgen/master.d/mem*, change

```
VIDEO_VS_A24_NP_BASE_PIPE0
```

or

```
VIDEO_VS2_A24_NP_BASE_PIPE1
```

to the virtual VME address you have set for the appropriate pipe.

4. Reconfigure the kernel; as root, type

   `autoconfig -f`

5. Reboot the system to use the newly configured kernel; as root, type

   `init 6`

4.2 Setting VME Addresses for Crimson, POWER Series, or SkyWriter With IRIX 5.1

Table 4-2 shows the default VME base addresses for the Multi-Channel Option board in a Crimson deskside (pipe 0 only), in a POWER Series deskside or rack (pipe 0 only), or in a two-pipe SkyWriter rack, running 5.1 software.

Pipe	Default Address	Default VME Base Address
0	VIDEO_VS2_A24_NP_BASE_PIPE0	0x800000
1	VIDEO_VS2_A24_NP_BASE_PIPE1	0x810000

Table 4-2 Default VME Addresses for Crimson, POWER Series, or SkyWriter Running IRIX 5.1

To set the address, follow these steps:

Note: Before installing new system software, determine the VME address to which the board should be set.

1. As root, for each pipe, type **`/usr/gfx/setmon -x 60`** to ensure the DG2 EEPROM is up to date. For example:

```
setenv DISPLAY :0.0
/usr/gfx/setmon -x 60
setenv DISPLAY :0.1
/usr/gfx/setmon -x 60
setenv DISPLAY :0.2
/usr/gfx/setmon -x 60
```

2. Set the MCO board address pointer(s) by writing DG2 EEPROM(s):

   - On a deskside system, type as root:

     `/usr/gfx/ucode/RE/vs2/vs2addrset -d -v`

   - On a multipipe system, type as root:

     `/usr/gfx/ucode/RE/vs2/vs2addrset -p pipe# -a address -v verbose`

     for each pipe.

   The `pipe#` is the pipe number (0 or 1) and `address` is the address given in the previous table. For example, on a two-pipe SkyWriter, type:

```
/usr/gfx/ucode/RE/vs2/vsaddrset -p 0 -a 0xb800000 -v
/usr/gfx/ucode/RE/vs2/vsaddrset -p 1 -a 0xb810000 -v
```

3. If you are not using the default addresses given in Table 4-2, you must edit */var/sysgen/master.d/mem*. The file looks like:

```
*#ident "@(#)kern-port:master.d/mem 10.2"
*#ident "$Revision: 3.21 $"
*
* MEM
*
*FLAG PREFIX SOFT #DEV DEPENDENCIES
orcs mm 1

$$$

#include <sys/cpu.h>

#if IP5 || IP17
#include <sys/videoaddr.h>
#endif

/*
 * This array defines the device addresses,
 * that may be mapped by /dev/mmem.
 * Note: addresses MUST BE kernel virtual addresses,
 * not physical addresses.
 */
struct map mmap_addrs[] = {
#if IP4 || IP5 || IP17
 { NBPP, SOUND_DAT_ADDR, }, /* sound chip and friends */
```

```
#endif
#if IP12 || IP20
 ( 0x200000, PHYS_TO_K1 (HPC1MEMORY), }, /* DSP, ETC. */
 /* HPC registers, in particular HPC1MISCSR */
 { NBPP, PHYS_TO_K1(HPC_0_ID_ADDR ), },
#endif
#if IP20 || IP22
 { NBPP, (PHYS_TO_K1(RPSS_CTR)&~0xfff) },
#endif
#if IP5 || IP17
 { 0x80000, logram_addr, }, /* ECC logging RAM */
 { NBPP, IOTIMER_ADDR, }, /* free running timer on IO3 */

/* Sirium Video */
 { 0x1000, 0xb7c03000 },

/* Video Splitter 2 (aka Multi Channel Option) Pipe 0 */
 { 0x10000, VIDEO_MP_VME_A24NPBASE + VIDEO_VS2_A24_NP_BASE_PIPE0 },
/* Video Splitter 2 (aka Multi Channel Option) Pipe1 */
 { 0x10000, VIDEO_MP_VME_A24NPBASE + VIDEO_VS2_A24_NP_BASE_PIPE1 },
/* Video Splitter 2 (aka Multi Channel Option) Pipe2 */
 { 0x10000, VIDEO_MP_VME_A24NPBASE + VIDEO_VS2_A24_NP_BASE_PIPE2 },
#endif
#if IP19
 { NBPP, EV_RTC, }, /* free running timer on Everest */
#if DEBUG
 {0x10000, 0xa0000000 }, /* Allow user to map page for HW trigger */
#endif
#endif
 { 0, 0 } , /* NULL ENTRY TERMINATES THIS LIST! */
};
```

In */var/sysgen/master.d/mem*, change

```
VIDEO_VS2_A24_NP_BASE_PIPE0
```

or

```
VIDEO_VS2_A24_NP_BASE_PIPE1
```

to the physical VME address you have set for the appropriate pip.

4. Reconfigure the kernel; as root, type

   ```
   autoconfig -f
   ```

5. Reboot the system to use the newly configured kernel. As root, type

   ```
   init 6
   ```

4.3 Setting VME Addresses for Onyx With IRIX 5.0.1 or 5.1

Table 4-3 shows the default VME base addresses for the Multi-Channel Option board in a three-pipe Onyx rack or in a deskside Onyx system (pipe 0 only) running 5.1 software:.

Pipe	Default VME Base Address	Default VME Bus Adapter Number
0	0x800000	0
1	0x800000	36
2	0x800000	37

Table 4-3 Default VME Addresses and Adapter Numbers for Onyx Deskside or Rack Running IRIX 5.0.1 or 5.1 S

Before installing new system software, determine the VME address to which the board should be set. Run *hinv* to display the bus adapters needed for each MCO. For example, a single-pipe system requires adapter 0, a two-pipe system requires adapters 0 and 36, and a three-pipe system requires adapters 0, 36, and 37.

To set the address, follow these steps:

Caution: Do not attempt to operate an MCO in a system that does not report the correct adapter number for the pipe it is associated with (for example, `pipe_0` to `adapter_0`, `pipe_1` to `adapter_36`, and `pipe_2` to `adapter_37`).

1. As root, type

   ```
   cd /dev
   MAKEDEV usrvme
   ```

2. As root, for each pipe, type /usr/gfx/setmon -x 60 to bring the DG2 EEPROM up to date. For example:

   ```
   setenv DISPLAY :0.0
   /usr/gfx/setmon -x 60
   setenv DISPLAY :0.1
   /usr/gfx/setmon -x 60
   setenv DISPLAY :0.2
   /usr/gfx/setmon -x 60
   ```

3. Set the MCO board address pointer(s) by writing DG2 EEPROM(s)

   - On a deskside system, type as root:

     ```
     /usr/gfx/ucode/RE/vs2/vs2addrset -d -v
     ```

   - On a multipipe system, type as root:

     ```
     /usr/gfx/ucode/RE/vs2/vs2addrset -p pipe# -a address -b
     bus_adapter# -v verbose
     ```

     for each pipe

The `pipe#` is the pipe number (0, 1, or 2) and `address` is the address given in Table 4-3. For example, on a three-pipe Onyx rack, type

```
/usr/gfx/ucode/RE/vs2/vs2addrset -p 0 -a 0x800000 -b 0 -v
/usr/gfx/ucode/RE/vs2/vs2addrset -p 1 -a 0x800000 -b 36 -v
/usr/gfx/ucode/RE/vs2/vs2addrset -p 2 -a 0x800000 -b 37 -v
```

4. Reconfigure the kernel; as root type:

   ```
   autoconfig -f
   ```

5. Reboot the system to use the newly configured kernel; as root, type:

   init 6

4.4 Testing VME Addresses

After you finish setting up addresses, running *hinv* should report

```
Multi-Channel Option board installed
```

for each MCO installed.

Caution: Do not attempt to run *setmon -S* on a pipe where the *hinv* command does not report properly.

Running *vs2prom -p pipe -r /dev/null* on each pipe indicates the health of each MCO VME connection by attempting to read the contents of the MCO EEPROM into a file named */dev/null*. If the command is successful, a prompt with no message appears. Test for each pipe with an installed MCO.

For example, as root, type

```
/usr/gfx/ucode/RE/vs2/vs2prom -p 0 -r /dev/null
/usr/gfx/ucode/RE/vs2/vs2prom -p 1 -r /dev/null
/usr/gfx/ucode/RE/vs2/vs2prom -p 2 -r /dev/null
```

Caution: Do not attempt to run *setmon -S* on a pipe where *vs2prom* does not succeed without complaint.

Chapter 5

Testing the Installation

This chapter explains how to make sure that the Multi-Channel Option has been installed correctly by:

- running basic system tests
- checking output
- running the Multi-Channel Option panel
- further testing

For complete information on Multi-Channel Option diagnostics, see Chapter 6, “Using Multi-Channel Option Diagnostics.”

5.1 Running Basic System Tests

Run these basic system tests:

1. Run *hinv*. Output should report the presence of a Multi-Channel Option board, for example:

```
# hinv
4 100 MHZ IP19 Processors
CPU: MIPS R4400 Processor Chip Revision: 4.0
FPU: MIPS R4010 Floating Point Chip Revision: 0.0
Data cache size: 16 Kbytes
Instruction cache size: 16 Kbytes
Secondary unified instruction/data cache size: 1 Mbyte
Main memory size: 64 Mbytes, 1-way interleaved
I/O board, Ebus slot 9: IO4 revision 1
I/O board, Ebus slot 11: IO4 revision 1
Integral IO4 serial ports: 4
RealityEngine Graphics option installed
Multi-Channel Option board installed
RealityEngine Graphics option installed
RealityEngine Graphics option installed
Integral Ethernet controller: et0, Ebus slot 11
Integral SCSI controller 91: Version WD33C95A
Integral SCSI controller 90: Version WD33C95A
Integral SCSI controller 1: Version WD33C95A
Integral SCSI controller 0: Version WD33C95A
Disk drive: unit 1 on SCSI controller 0
```

```
Integral IO4 parallel port: Ebus slot 9
Integral IO4 parallel port: Ebus slot 11
VME bus: adapter 37
VME bus: adapter 36
VME bus: adapter 0 mapped to adapter 45
VME bus: adapter 45
```

As you can see in this example, this system recognizes only one MCO, which is in pipe 2 (the reporting order is pipe 2, pipe 1, pipe 0). This system has three VME bus adapters active: 37, 36, and 0. The user can run a *setmon -S <mco_format>* only on pipe 2 in this example.

2. On each pipe in the system, run

   vs2prom -r

   If you get a complaint on a pipe that has an MCO installed, or you do not get a complaint for a pipe that does not contain an MCO, check the hardware. For IRIX versions before 5.2, make sure you have set the VME addresses correctly as detailed in Chapter 4, “Setting VME Addresses.”

5.2 Checking Output

If you are satisfied with the results of the basic system tests, bring up MCO mode. Follow these steps:

1. To test a system with one RM board. type

   setmon -S 4@640x480_60

   at the IRIX prompt. Note that the **S** is uppercase.

   To test a system with two RM boards or more, type

   setmon -S 6@640x480_60

   Note: You must run the *setmon* command on each graphics pipe in a multipipe system.

2. Switch to multi-channel mode:

   /usr/gfx/stopgfx
   /usr/gfx/startgfx

   Note: When the Multi-Channel Option is running, RealityEngine graphics does not output to the standard output display.

   Note: In IRIX 5.1, cursor control is supported in each screen (channel), that is, the cursor tracks from screen to screen. In IRIX 5.0.1 and 4.0.5H, cursor control is supported only in screen (channel) 0; if it is tracked all the way over to the right in this window, it appears on the next pipe.

3. Using the standard 21-inch multisync monitor that comes with the system, view each MCO output channel by connecting the monitor to it. Open up windows and run graphics on each channel to verify the channel’s health.

5.3 Running the Multi-Channel Option Panel

The MCO panel is a variation of the panel for RealityEngine graphics. If the system detects the presence of a Multi-Channel Option board, the panel appropriate for Multi-Channel Option board is displayed.

To run the MCO panel, follow these steps:

1. If necessary, run *setmon* as explained in the previous section.
2. Recable as necessary:
   - If no other monitors are available, use the standard 21-inch multisync monitor that comes with RealityEngine graphics.
   - If fewer monitors are available than there are outputs, cable to each Multi-Channel Option output in succession.
3. Start up the system. Log in as **su**.
4. At the prompt, type:

   ```
   setenv DISPLAY :0.<pipe#>
   usr/sbin/vout
   ```

   Or, if it is possible to remotely log in from another system, do so; type

   ```
   setenv DISPLAY <remote_system_name>:0
   usr/sbin/vout
   ```

   If the system has more than one MCO, for example, MCOs on pipes 0 through 2, you will have to run the *vout* panels locally by typing

   ```
   setenv DISPLAY :0.0
   /usr/sbin/vout
   setenv DISPLAY :0.1
   /usr/sbin/vout
   setenv DISPLAY :0.2
   /usr/sbin/vout
   ```

   In releases after 5.1, use the **-p** flag to specify the pipe. For example, for MCOs on pipes 0 through 2, type

   ```
   setenv DISPLAY :0.2
   /usr/sbin/vout -p 0
   setenv DISPLAY :0.2
   /usr/sbin/vout -p 1
   setenv DISPLAY :0.2
   /usr/sbin/vout -p 2
   ```

   Caution: Do not turn off SyncOnGreen or you will lose the display raster and the *vout* panel becomes unusable. This is one reason running the *vout* panel remotely is recommended.

   Figure 5-1 shows the panel.

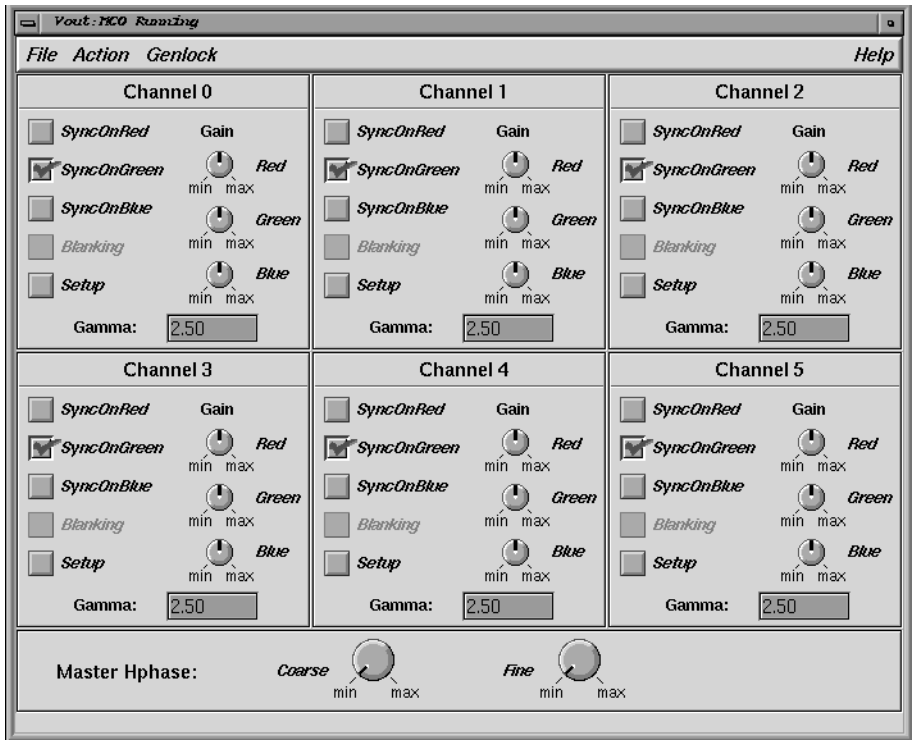


Figure 5-1 MCO Panel

5. To test panel functionality, use the dials to set gain for red, green, and blue output on various channels.

   Do not save these values or you will corrupt the user values that the factory sets for the customer. The customer can change these values if desired.

   Note: Setting coarse horizontal phase to maximum is not recommended; loss of lock can occur.

   To restore the settings to the factory settings, select “Restore Factory Values” in the File menu.

   Note: For IRIX version 5.2 and later, user-defined settings are automatically in effect after they are saved. To activate user-defined settings for IRIX versions before 5.2, run *vout* after startup.

5.4 Further Testing

This section gives solutions for some common installation problems.

Problem: Vertical stripes appear on one or more channels, but not on all channels.

Solution: Replace the VS2 board. This problem might be caused by an RM board.

Problem: Vertical stripes appear on all channels.

Solution: If the paddleboards were not carefully installed onto the VS2 and DG2 boards, the pins might have been bent. If replacing the paddleboards does not fix the problem, replace one of the following (listed in order of their likelihood of causing the problem):

- DG2 board
- RM board
- VS2 board
- DVI cable

Problem: One color is missing or the entire output of a channel is missing.

Solution: Use these remedies, in order:

1. Check 24W7 connector seating.
2. Exchange 24W7 connector cables to test the EF5 panels and the cables themselves.
3. Replace the VS2.

Problem: The *hinv* program does not see the MCO because the MCO's address is not in the DG2 EEPROM (EEPROM was erased or original DG2 was swapped out).

Solution: For IRIX version 5.2 and later, do the following:

1. Type

   ```
   vs2prom  -p pipe -a address -bw
   ```

2. Reboot. The *hinv* program should now recognize the MCO.

To test the Multi-Channel Option VME interface and DVI data path interface further, run the diagnostic tests; see Chapter 6, "Using Multi-Channel Option Diagnostics."

Chapter 6

Using Multi-Channel Option Diagnostics

The Multi-Channel Option diagnostics tests are an extension of the Integrated Diagnostics Environment (IDE) test suite. These diagnostic tests provide a thorough examination of the Multi-Channel Option.

There are three versions of the IDE tests, for MCO installed under:

- 4.0.5H
- 5.0.1
- 5.1 and 5.2

This chapter explains how to use the Multi-Channel Option diagnostics:

- installing the tests
- using the 4.0.5H test menu
- using the 5.0.1 test menu
- using the 5.1 (5.2) test menu
- running tests from the test menu
- running individual *vs2ide* tests

Note: Because the Multi-Channel Option diagnostics are incompatible with the X Window System™, a TTY console monitor is required for testing.

6.1 Installing the Tests

Use the *inst* program to load the graphics diagnostics from the CD-ROM. After installation, the system loads the diagnostics tests into the appropriate directory.

Note: You must install the operating system before you can run the Multi-Channel Option diagnostics. Refer to your operating system documentation for information on loading the software.

To install the tests from the CD-ROM, follow these steps:

1. Install IRIX from the CD (4.0.5H: 806-0007-009; 5.0.1: 812=0121-002; 5.1.1: 812-0121-003).

   When installation is complete, quit *inst*; bring up the system again.

2. Insert your CD containing the diagnostics. At the `Inst>` prompt, type

   `help beginner`

   and press **<Enter>** to display the menu.

3. Select option 7, set "[keywords] [names]" to enter interactive mode.

   The system prints messages about the installation history database and disk changes.

4. In the list

```
   diag.man.diag *     0          267+      Diagnostic Manual Pages
   diag.man.relnotes * 0          93+       Diagnostic Release Notes
   diag.sw.diag *      1381+      1760016+  Diagnostic Software
   diag.sw.mco *       0          544+      Diagnostic MCO Software
```

   request installation of `diag.sw.mco`:

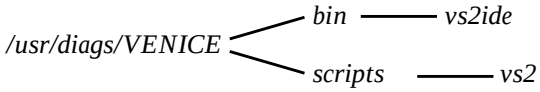
```
   diag.man.diag *     0          267+      Diagnostic Manual Pages
   diag.man.relnotes * 0          93+       Diagnostic Release Notes
   diag.sw.diag *      1381+      1760016+  Diagnostic Software
i  diag.sw.mco *       0          544+      Diagnostic MCO Software
```

   The system prints a disk space summary.

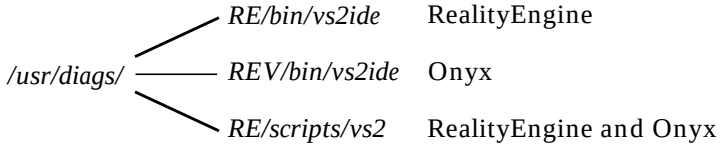
5. At the prompt, type **`go`** and press **<Enter>**.

6. When the process finishes, type **`quit`** and press **<Enter>**. The diagnostics are installed in a separate directory; the name depends on the platform:

   - for 4.0.5H:



   - for 5.0.1, 5.1 (5.1.1), and 5.2:



7. After you have completed the installation, return to the System Maintenance Menu and select option 1, "Start System. "

6.2 Using the 4.0.5H Test Menu

To run the Multi-Channel Option diagnostic tests, follow these steps:

1. Turn on the system; a login prompt appears. Type **`diag`** and press **<Enter>**.

   The system informs you that it is running 4.0.5H and RealityEngine graphics, and prints the following message:

```
To run MCO diagnostics, please do not automatically run
RealityEngine diagnostics. Type vs2 at the diag prompt instead.
Automatically run RealityEngine diagnostics? (y or n)
```

2. Type **n** or press **<Enter>**.
3. Type **vs2** and press **<Enter>** to display the test menu.

   The software tells you that results will be logged in */usr/tmp/vs2.log0* or */usr/tmp/vs2.log1*, depending on whether the Multi-Channel Option is running on pipe 0 or pipe 1.

   Note: The MCO release concurrent with this version of IRIX does not run on pipe 1.

   The software displays a menu of tests:

```
RealityEngine Multi-Channel Options Diagnostics - Test Time(mi:se)
-----------------------------------------------------------------
(Estimated test time based on a 310 system with 16MB of memory)
1- Quick Check of MCO   .. . .. . .. . .. . .. . .. . .. . .. . .1:15
2- Full Check of MCO  . .. . .. . .. . .. . .. . .. . .. . .. . .2:25
3- MCO Board Initialization Test . . . .. . .. . .. . .. . .. . 0:20
4- MCO Register Test . . .. . .. . .. . .. . .. . .. . .. . .. . 0:40
5- MCO DAC Test  . .. . .. . .. . .. . .. . .. . .. . .. . .. . .0:35
6- MCO Read DAC Test Register . . . . . .0:30
7- MCO Load Gamma Constant  . . . . . .0:25
8- MCO XILINX Test  . . . . . .0:35
9- MCO VOF Loader  .. . .. . .. . .. . .. . .. . .. . .. . .. . .0:40
10- EXIT from menu

Please choose an item (1-10) >
```

4. To check the newly installed MCO, type **2** and press **<Enter>**.

   If an error is encountered, the test does not stop running; diagnostic tests stop only after all tests have run.

5. To see if an error occurred, display test results by typing

   grep ERR /usr/tmp/vs2.log0

6.3 Using the 5.0.1 Test Menu

To run the Multi-Channel Option diagnostic tests from the test menu, follow these steps:

1. Turn on the system; a login prompt appears. Type **diag** and press **<Enter>**.

   The system informs you that it is running 5.0.1, and prints the following message:

```
To run MCO diagnostics, please do not automatically run
RealityEngine diagnostics. Type vs2 at the diag prompt instead.
Automatically run RealityEngine diagnostics? (y or n)
```

2. Type **n** or press **<Enter>**. The following message appears:

```
If you wish to run ide manually, please make sure you do the
following first:
 - /usr/gfx/stopgfx
 - setenv PIPE to the correct pipe number
 - rmib
```

```
 - if rmib detects IB2, setenv VENICE_SKIP_IB_CRCS
```

This message applies to RealityEngine or RealityEngine^2.

3. Type **vs2** and press **<Enter>** to display the test menu.

   The software displays these messages and a menu of tests:

```
In a multi-pipe MCO configuration system, test(s) will run on the
default pipe 0, and test results will be logged in /usr/tmp/vs2.log0.

If you wish to run diagnostic test(s) on a specific pipe, use Pipe
Select to change the pipe identification number.


RealityEngine Multi-Channel Options Diagnostics - Test Time(mi:se)
-----------------------------------------------------------------
(Estimated test time based on a 310 system with 16MB of memory)
1- Pipe Select
2- Quick Check of MCO   . . . . . .. 1:15
3- Full Check of MCO .. . . . . .. 3.45
4- MCO Board Initialization Test  .. . . . . .. 0:20
5- MCO Register Test .. . . . . .. 0:40
6- MCO DAC Test  . .. . . . . .. 0:35
7- MCO Read DAC Test Register . .. . . . . .. 0:30
8- MCO Load Gamma Constant  . . .. . . . . .. 0:25
9- MCO XILINX Test . .. . . . . .. 0:35
10- MCO VOF Loader . .. . . . . .. 0:40
11- View Test Output
12- EXIT from menu

Please choose an item (1-12) >
```

4. In a multipipe system, the diagnostic tests run on pipe 0. To select a different pipe from the default pipe, type **1** and press **<Enter>**. At the prompt, type the pipe identification number. The software accepts only ID numbers corresponding to pipes that are available.

   When you select a pipe, the software displays the log filename, for example:

```
Select Pipe (0-1-2) >1

PIPE = 1
Results will be logged in: /usr/tmp/vs2.log1
<CR> to return to menu
```

   Note: By default, tests run on default pipe 0 and test results are logged in */usr/tmp/vs2.log0*.

5. To check the newly installed MCO, type **3** and press **<Enter>**.

   If an error is encountered, the test does not stop running; diagnostic tests stop only after all tests have run.

6. To see if an error occurred, select **11** or display test results by typing

   grep ERR /usr/tmp/vs2.log0

   or **/usr/tmp/vs2.log1** or **/usr/tmp/vs2.log2**, depending on the pipe on which the MCO is running. In a multipipe system, tests run on default pipe 0 and test results are logged in */usr/tmp/vs2.log0*.

6.4 Using the 5.1 (5.2) Menu

To run the Multi-Channel Option diagnostic tests from the test menu, follow these steps:

1. Turn on the system; a login prompt appears. Type **diag** and press **<Enter>**.

   The system informs you that it is running 5.1 or 5.2, and prints the following message:

   ```
   To run MCO diagnostics, please do not automatically run
   RealityEngine diagnostics. Type vs2 at the diag prompt instead.
   Automatically run RealityEngine diagnostics? (y or n)
   ```

2. Type **n** or press **<Enter>**. The following message appears:

   ```
   If you wish to run ide manually, please make sure you do the
   following first:
    - /usr/gfx/stopgfx
    - setenv PIPE to the correct pipe number
    - rmib
    - if rmib detects IB2, setenv VENICE_SKIP_IB_CRCS
   ```

   This message applies to RealityEngine or RealityEngine^2.

3. Type **vs2** and press **<Enter>** to display the test menu.

   The software displays these messages and a menu of tests:

   ```
   In a multi-pipe MCO configuration system, test(s) will run
   on the default pipe 0, and test results will be logged in
   /usr/tmp/vs2.log0

   If you wish to run diagnostic test(s) on a specific pipe, use Pipe
   Select to change the pipe identification number.


   RealityEngine Multi-Channel Options Diagnostics - Test Time(mi:se)
   ------------------------------------------------------------------
   (Estimated test time based on a 32MB RE/ONYX 10-span system)

   1- Pipe Select
   2- Quick Check of MCO . . . . . .1:15
   3- Full Check of MCO .. . . . . .13.45
   4- MCO Board Initialization Test . . . . . .0:20
   5- MCO Register Test .. . . . . .0:40
   6- MCO DAC Test . . . .. . . . . . . . . . .0:35
   7- MCO Read DAC Test Register . . . . . .0:30
   8- MCO Load Gamma Constant . . . . . .0:25
   9- MCO XILINX Test . .. . . . . .0:35
   10- MCO VOF Loader . .. . . . . .0:40
   11- MCO Data Path Test . . . . . .10:00
   12- View Test Output
   13- EXIT from menu

   Please choose an item (1-13) >
   ```

4. In a multipipe system, the diagnostic tests run on pipe 0. To select a different pipe from the default pipe, type **1** and press **<Enter>**. At the prompt, type the pipe identification number. The software accepts only ID numbers corresponding to pipes that are available.

   When you select a pipe, the software displays the log filename, for example:

```
Select Pipe (0-1-2) >1

PIPE = 1
Results will be logged in: /usr/tmp/vs2.log1
<CR> to return to menu
```

Note: By default, tests run on default pipe 0 and test results are logged in */usr/tmp/vs2.log0*.

5. To check the newly installed MCO, type **3** and press **<Enter>**.

   If an error is encountered, the test does not stop running; diagnostic tests stop only after all tests have run.

6. To see if an error occurred, select **11** or display test results by typing

   grep ERR /usr/tmp/vs2.log0

   or **/usr/tmp/vs2.log1** or **/usr/tmp/vs2.log2**, depending on the pipe on which the MCO is running. In a multipipe system, tests run on default pipe 0 and test results are logged in */usr/tmp/vs2.log0*.

6.5 Running *vs2ide* Tests From the Test Menu

This section explains the tests listed in the RealityEngine Multi-Channel Options Diagnostics menu.

Note: Initialization is required for full and accurate MCO testing. Always invoke the MCO board initialization test before each MCO IDE test (script).

6.5.1 Quick Check of MCO

This test is a short dry run of the MCO hardware to check all accessible components via the VME interface. This test invokes the following MCO IDE tests, which are explained later in this chapter:

- MCO board initialization test (*vs2init*)
- MCO Register Test (*vs2regs*)
- MCO DAC Test (*vs2dac*)
- MCO Read DAC Test Register (*vs2rdactr*)

6.5.2 Full Check of MCO

The full check tests all accessible components on the MCO hardware and MCO full functionality via the VME interface. This test invokes the following MCO IDE tests, which are explained later in this chapter.

- MCO board initialization test (*vs2init*)
- MCO Register Test (*vs2regs*)
- MCO DAC Test (*vs2dac*)
- MCO Read DAC Test Register (*vs2rdactr*)
- MCO VOF Loader (*vs2vl*))
- MCO XILINX Test (*vs2xilinx*)
- MCO Load Gamma Constant (*vx2gammaconst*)
- MCO Data Path Test (*vs2datapath*), for MCO running under 5.1 or 5.2 only

Note: Ignore the message `ERROR: vd_ioctl: ioctl: Not privileged` that appears after the MCO Data Path Test runs.

6.5.3 MCO Board Initialization Test

This test initializes the MCO to a fully known state to ready it for full testing; this task can also be accomplished by invoking the MCO board initialization test (*vs2init*).

Note: For the 5.0.1, 5.1, or 5.2 IDE test, output may vary from that shown here. In a multipipe system, information on all available pipes is given.

Initialization output is:

```
MCO datecode: March 3, 1993
MCO Board Initialization Test
Mon Mar  8 21:59:09 PST 1993
Welcome to unix ide
ide>> ide>> Programming Multi-Channel Option XILINX
Initializing Multi-Channel Option VOF[0] Edge Table
VIF_SYNC_WIDTH = 0x30
VIF_HPHASE_LOOPGAIN = 0xcc
VIF_MCOUNTER = 0x0
VIF_HORZ_LENGTH = 0x5
VIF_GENSRC_CNTRL = 0xc0
VIF_BPORCH_CLAMP = 0x4f
VIF_FINE_PHASE_ADJ = 0x0
VIF_MAGIC_HIGH = 0x54
Initializing Multi-Channel Option VOF[1] Edge Table
VIF_SYNC_WIDTH = 0x14
VIF_HPHASE_LOOPGAIN = 0xcc
VIF_MCOUNTER = 0x0
VIF_HORZ_LENGTH = 0x5
VIF_GENSRC_CNTRL = 0xc0
VIF_BPORCH_CLAMP = 0x56
VIF_FINE_PHASE_ADJ = 0x0
VIF_MAGIC_HIGH = 0x54
```

Note: Initialization is required for full and accurate MCO testing. Always invoke the MCO board initialization test before each MCO IDE test.

6.5.4 MCO Register Test

This test checks every testable register on the MCO board; this task can also be accomplished by invoking the MCO IDE *vs2regs* test. The test *vs2regs* performs pattern tests (for example, 0x00, 0x55, 0xAA, 0xFF), walking ones, walking zeroes, and walking ones / zeroes tests on all accessible MCO registers. This test verifies that there is no short, open, or stuck circuitry behavior on the MCO hardware.

Note: For the 5.0.1, 5.1, or 5.2 IDE test, output may vary from that shown here. In a multipipe system, information on all available pipes is given.

Register test output is:

```
INFO:  Starting VS2 Registers Test
INFO:   (100): Starting subtest VS2 Registers Write Read ...
INFO:   (100): Write Read: vs2RegsWriteRead: Direct vs2RWregs PASSED
INFO:   (100): Write Read: Write-Only: Direct vs2WOregs PASSED
INFO:   (100): Write Read: Read-Only: Direct vs2ROregs PASSED
INFO:   (100): Write Read: Write-Only: venice_load_vs2_xilinx PASSED
INFO:   (100): Write Read: Write-Only: Indirect vs2vofWOregs PASSED
INFO:   (100): Write Read: Write-Only: Indirect vs2vifWOregs PASSED
INFO:   (100): Done subtest VS2 Registers Write Read ... PASSED
INFO:   (102): Starting subtest VS2 Registers Walk One ...
INFO:   (102): Walk One: vs2RegsWalkOne: Direct vs2RWregs PASSED
INFO:   (102): Done subtest VS2 Registers Walk One ... PASSED
INFO:   (104): Starting subtest VS2 Registers Walk Zero ...
INFO:   (104): Walk Zero: vs2RegsWalkZero: Direct vs2RWregs PASSED
INFO:   (104): Done subtest VS2 Registers Walk Zero ... PASSED
INFO:   (106): Starting subtest VS2 Registers Walk One/Zero ...
INFO:   (106): Walk One/Zero: vs2RegsWalkOneZero: Direct vs2RWregs PASSED
INFO:   (106): Done subtest VS2 Registers Walk One/Zero ... PASSED
```

If an error occurs, a message like the following appears:

```
ERROR:  (104)   Walk Zero: register3: (addr 4030), wrote ff read 7f
ERROR:  (106)   Walk One/Zero: register4: (addr 4040), wrote 20 read 0
```

The first message indicates that a failure occurred during the walk zero test (subtest 104) on register 3; the second message indicates that a failure occurred during the walk one / zero test (subtest 106) on register 4.

If an error message appears, invoke the MCO IDE directly and try to duplicate the error. A reproducible error indicates a hardware failure, requiring replacement of the board.

If the problem cannot be easily duplicated, follow these steps:

1. Shut down the IRIX system and power it off.
2. Power on the IRIS system again and restart it.
3. Start the MCO IDE directly, bypassing the script, by logging in as **`diag`**.
4. At the prompt, type **`vs2ide`**.

   To display a list of commands, type **`help`** at the `ide>>` prompt.
5. At the `ide>>` prompt, type **`repeat 10 vs2regs`** to repeat the register test ten times.

Note: For the 5.0.1, 5.1, or 5.2 IDE test, output may vary from that shown here.

If this test runs ten times with no failures, the following output appears ten times:

```
INFO:  Starting VS2 Registers Test
INFO:  (100): Starting subtest VS2 Registers Write Read ...
INFO:  (100): Write Read: vs2RegsWriteRead: Direct vs2RWregs PASSED
INFO:  (100): Write Read: Write-Only: Direct vs2WOregs PASSED
INFO:  (100): Write Read: Read-Only: Direct vs2ROregs PASSED
INFO:  (100): Write Read: Write-Only: venice_load_vs2_xilinx PASSED
INFO:  (100): Write Read: Write-Only: Indirect vs2vofWOregs PASSED
INFO:  (100): Write Read: Write-Only: Indirect vs2vifWOregs PASSED
INFO:  (100): Done subtest VS2 Registers Write Read ... PASSED
INFO:  (102): Starting subtest VS2 Registers Walk One ...
INFO:  (102): Walk One: vs2RegsWalkOne: Direct vs2RWregs PASSED
INFO:  (102): Done subtest VS2 Registers Walk One ... PASSED
INFO:  (104): Starting subtest VS2 Registers Walk Zero ...
INFO:  (104): Walk Zero: vs2RegsWalkZero: Direct vs2RWregs PASSED
INFO:  (104): Done subtest VS2 Registers Walk Zero ... PASSED
INFO:  (106): Starting subtest VS2 Registers Walk One/Zero ...
INFO:  (106): Walk One/Zero: vs2RegsWalkOneZero: Direct vs2RWregs
PASSED
INFO:  (106): Done subtest VS2 Registers Walk One/Zero ... PASSED
```

6.5.5 MCO DAC Test

This test verifies the functionality of each of the 18 DACs on the MCO board. This task can also be accomplished by invoking the MCO IDE *vs2dac* test. Via the VME bus interface, this test performs pattern tests (for example, 0x00, 0x55, 0xAA, 0xFF), walking ones, walking zeroes, walking ones / zeroes tests, and RAM tests.

Note: For the 5.0.1, 5.1, or 5.2 IDE test, output may vary from that shown here. In a multipipe system, information on all available pipes is given.

The output of this test is:

```
INFO:   Starting VS2 Bt462-DAC Test
INFO:   (200): Starting subtest DAC Regs Patterns ...
INFO:   (200): vs2Bt462RegsPatterns: DAC Regs Patterns PASSED
INFO:   (200): Done subtest DAC Regs Patterns ... PASSED
INFO:   (202): Starting subtest DAC Regs Walk One ...
INFO:   (202): vs2Bt462RegsWalkOne: DAC Regs Walk One PASSED
INFO:   (202): Done subtest DAC Regs Walk One ... PASSED
INFO:   (204): Starting subtest DAC Regs Walk Zero ...
INFO:   (204): vs2Bt462RegsWalkZero: DAC Regs Walk Zero PASSED
INFO:   (204): Done subtest DAC Regs Walk Zero ... PASSED
INFO:   (206): Starting subtest DAC Regs Walk One/Zero ...
INFO:   (206): vs2Bt462RegsWalkOneZero: DAC Regs Walk One/Zero PASSED
INFO:   (206): Done subtest DAC Regs Walk One/Zero ... PASSED
```

If an error occurs, an output message like the following appears:

```
ERROR:  (202)   Regs Walk One: Bt462_4_blue-pixel_blink_mask_reg_high:
(addr 4067), wrote 4 read 0
```

This message indicates that a failure occurred during the walk one test (subtest 202) on the pixel blink mask register high in the fifth set blue color DAC. The MCO board has six sets of three-color RGB DACs; the sets are numbered 0 through 5, and colors are ordered red, green, and blue.

6.5.6 MCO Read DAC Test Register

This test enables you to read the values currently in all the DAC test registers, making it an effective tool for verifying and debugging the MCO hardware via the VME bus interface.

Note: For the 5.0.1, 5.1, or 5.2 IDE test, output may vary from that shown here.

Invoking the read DAC test register test prints the following:

```
INFO:  (990): Starting VS2 Utility subtest Read DAC Test Reg ...

INFO:   (990): Read DAC Test Reg: addr 0x428c, dac#0, test reg value = 3f
INFO:   (990): Read DAC Test Reg: addr 0x429c, dac#1, test reg value = ff
INFO:   (990): Read DAC Test Reg: addr 0x42ac, dac#2, test reg value = ff
INFO:   (990): Read DAC Test Reg: addr 0x42bc, dac#3, test reg value = ed
INFO:   (990): Read DAC Test Reg: addr 0x42cc, dac#4, test reg value = bd
INFO:   (990): Read DAC Test Reg: addr 0x42dc, dac#5, test reg value = 8
INFO:   (990): Read DAC Test Reg: addr 0x42ec, dac#6, test reg value = fa
INFO:   (990): Read DAC Test Reg: addr 0x42fc, dac#7, test reg value = 0
INFO:   (990): Read DAC Test Reg: addr 0x430c, dac#8, test reg value = 0
INFO:   (990): Read DAC Test Reg: addr 0x431c, dac#9, test reg value = f7
INFO:   (990): Read DAC Test Reg: addr 0x432c, dac#10, test reg value =
77
INFO:   (990): Read DAC Test Reg: addr 0x433c, dac#11, test reg value =
81
INFO:   (990): Read DAC Test Reg: addr 0x434c, dac#12, test reg value =
ff
INFO:   (990): Read DAC Test Reg: addr 0x435c, dac#13, test reg value = 0
INFO:   (990): Read DAC Test Reg: addr 0x436c, dac#14, test reg value =
f3
INFO:   (990): Read DAC Test Reg: addr 0x437c, dac#15, test reg value =
ff
INFO:   (990): Read DAC Test Reg: addr 0x438c, dac#16, test reg value = c
INFO:   (990): Read DAC Test Reg: addr 0x439c, dac#17, test reg value =
c5
INFO:   (990): Done VS2 Utility subtest Read DAC Test Reg ... PASSED
```

6.5.7 MCO Load Gamma Constant

This test enables you to load a known desirable constant into the gamma table in all DACs on the MCO board. For example, to load the constant 0xFF into all gamma tables, type

```
vs2gammaconst 0xff
```

at the prompt.

This test displays no comprehensive output.

6.5.8 MCO XILINX Test

On the MCO board are two pairs of Xilinx chips: two chips for video output formats (VOFs) and two chips for video input formats (VIFs). This test verifies the functionality of the Xilinx chips by loading and verifying the Xilinx configuration files into the pairs of VOFs and VIFs.

The terse output of this test under 4.0.5H and 5.0.1 is:

```
INFO:   Starting VS2 Xilinx Test
INFO:   (400): Starting subtest VS2 Xilinx Load Verify ...
INFO:   (400): Done subtest VS2 Xilinx Load Verify ... PASSED
```

Under 5.1 or 5.2, this test gives a separate report for each of the four Xilinx chips. Under 4.0.5H and 5.0.1, this test gives one report for all four Xilinx chips.

6.5.9 MCO VOF Loader

This test enables you to load a desired VOF into an on-board Xilinx chip. It loads the default format into channels 0 and 1.

Note: For the 5.0.1, 5.1, or 5.2 IDE test, output may vary from that shown here. In a multipipe system, information on all available pipes is given.

Output is as follows:

```
ide>> Programming Multi-Channel Option XILINX
Initializing Multi-Channel Option VOF[0] Edge Table
VIF_SYNC_WIDTH = 0x30
VIF_HPHASE_LOOPGAIN = 0xcc
VIF_MCOUNTER = 0x0
VIF_HORZ_LENGTH = 0x5
VIF_GENSRC_CNTRL = 0xc0
VIF_BPORCH_CLAMP = 0x4f
VIF_FINE_PHASE_ADg VS2 Xilinx Test
INFO: (400): SJ = 0x0
VIF_MAGIC_HIGH = 0x54
Initializing Multi-Channel Option VOF[1] Edge Table
VIF_SYNC_WIDTH = 0x14
VIF_HPHASE_LOOPGAIN = 0xcc
VIF_MCOUNTER = 0x0
VIF_HORZ_LENGTH = 0x5
VIF_GENSRC_CNTRL = 0xc0
VIF_BPORCH_CLAMP = 0x56
VIF_FINE_PHASE_ADJ = 0x0
VIF_MAGIC_HIGH = 0x54
VOF path /usr/gfx/ucode/RE/vs2/vof/1280x1024_60.u
ide>> VIF_SYNC_WIDTH = 0x14
VIF_HPHASE_LOOPGAIN = 0x40
VIF_MCOUNTER = 0x0
VIF_HORZ_LENGTH = 0x4
VIF_GENSRC_CNTRL = 0xf4
VIF_BPORCH_CLAMP = 0x56
VIF_FINE_PHASE_ADJ = 0x30
```

```
VIF_MAGIC_HIGH = 0x53
VOF path /usr/gfx/ucode/RE/vs2/vof/1280x1024_60.u
ide>> VIF_SYNC_WIDTH = 0x14
VIF_HPHASE_LOOPGAIN = 0x40
VIF_MCOUNTER = 0x0
VIF_HORZ_LENGTH = 0x4
VIF_GENSRC_CNTRL = 0xf4
VIF_BPORCH_CLAMP = 0x56
VIF_FINE_PHASE_ADJ = 0x30
VIF_MAGIC_HIGH = 0x53
ide>> Programming Multi-Channel Option XILINX
Initializing Multi-Channel Option VOF[0] Edge Table
VIF_SYNC_WIDTH = 0x30
VIF_HPHASE_LOOPGAIN = 0xcc
VIF_MCOUNTER = 0x0
VIF_HORZ_LENGTH = 0x5
VIF_GENSRC_CNTRL = 0xc0
VIF_BPORCH_CLAMP = 0x4f
VIF_FINE_PHASE_ADJ = 0x0
VIF_MAGIC_HIGH = 0x54
Initializing Multi-Channel Option VOF[1] Edge Table
VIF_SYNC_WIDTH = 0x14
VIF_HPHASE_LOOPGAIN = 0xcc
VIF_MCOUNTER = 0x0
VIF_HORZ_LENGTH = 0x5
VIF_GENSRC_CNTRL = 0xc0
VIF_BPORCH_CLAMP = 0x56
VIF_FINE_PHASE_ADJ = 0x0
VIF_MAGIC_HIGH = 0x54
```

6.5.10 MCO Data Path Test

The MCO Data Path Test checks and verifies the following functional path:

1. DG2: DG2 / DVI → multistrip connectors →
2. DG2 → VS2: DG2 / paddleboard → cable → VS2 / paddleboard →
3. VS2: multistrip connectors → VS2 / DVI → line FIFOs → DACs

Note: For the MCO Data Path Test to work correctly, the DG2 DVI bus must function properly.

The DG2 board drives the DVI interface. These signals originate just before the BT462 DACs on the DG2 board. The DG2 then registers these signals before it drives the bus; the outputs of these registers are used only by the DVI bus (for details, refer to the DG2 documentation). The register outputs drive the bus through series-terminating resistors. The data and control signals go to the three multistrip connectors, which in turn connect to a paddleboard and impedance-controlled cable assembly, which then connects to the VS2 board. From here, the data passes through the VS2 DVI register, the line FIFOs, and finally to the DACs. The VS2 board has 18 BT462 DACs: six sets, each containing the three colors.

Inside each DAC is a special test register, which can capture full-speed data at the DAC gamma table output. However, the data it captures has some limitations, because the gamma table has 10 bits of input but only 8 bits of output. Also, bit 9 of the gamma table input is used as a capture trigger for the test register: when this bit is a logical one (0x1) data is latched into the test register. Thus, it is critical that all testable bits be tested; in this case, bits 0-8 are tested, because bit 9 is used as a trigger bit. The MCO Data Path Test achieves this in two separate steps, setting the gamma table to look first at bits 0 through 7, and then at bits 1 through 8.

Because the VS2's line FIFOs contain only 1130 x 5 storage locations per color bit, instead of a frame's worth (the default 1280x1024_60, for example), a special VS2 diagnostic video format called *1130x5_60.u* is used to accelerate the testing process. IRIS GL routines are used to generate an array of 1130x5 known-value pixels; each pixel is sent separately to the VS2 FIFOs. Each pixel transaction must go across the DG2 DVI to the VS2 DVI to fill up the VS2 line FIFOs. Because only one known pixel is sent, with the MSB bit per one frame's worth of 1130 pixels x 5 lines, it takes 5650 loops to complete the testing process.

Actually, for each pixel sent, the entire frame of 1130 x 5 storage locations is transmitted, not merely one pixel with the MSB set. Simply put, only one transmission of the pixel with an MSB bit turned on is rendered for the entire frame (1130x5_60) and then decoded for test results. Thus, the entire MCO Data Path Test executions are 1130 x 5 pixel / frame loops. The data with the MSB bit set triggers the test register in each BT462 DAC, which in turn outputs the gamma table output. The test register value for each DAC is then compared with the expected data for the final test result.

If the error data is interpreted properly, the failing section of the data path can be identified. For instance, if all DAC test registers fail the test, hardware failure lies most likely in the area before the VS2 line FIFOs. Partial or unique failures can help isolate the specific FIFO bank or DAC failure. The color, pixel, and error bit failures can help isolate the defect in the hardware further..

MCO Data Path Test Error Messages

MCO Data Path Test error messages are interpreted on the basis of the following information:

- six well-defined channels, 0 through 5
- three DAC colors: red, green, and blue
- five identifiable pixels, 0 through 4
- 1130 pixels in each line, x = 0 through x = 1129
- five lines, 0 through 4

For example, the error messages

```
ERROR: (800) CHANNEL#0, RED_DAC, PIXEL#0, x=1125, line=0 ,(errbits=[0x65]),
got 0x0, exp 0x65
ERROR: (800) CHANNEL#0, RED_DAC, PIXEL#0, x=1125, line=1 ,(errbits=[0x65]),
got 0x0, exp 0x65
ERROR: (800) CHANNEL#0, RED_DAC, PIXEL#0, x=1125, line=2 ,(errbits=[0x65]),
got 0x0, exp 0x65
ERROR: (800) CHANNEL#0, RED_DAC, PIXEL#0, x=1125, line=3 ,(errbits=[0x65]),
got 0x0, exp 0x65
ERROR: (800) CHANNEL#0, RED_DAC, PIXEL#0, x=1125, line=4 ,(errbits=[0x65]),
got 0x0, exp 0x65
```

can be interpreted as follows:

- There are five errors, all with the same channel number, DAC color, pixel number, and x location. All five occurred on all lines, 0 through 4. This is a classic example, showing that the problems mostly likely lie in the VS2 FIFO storage locations for channel 0, red DACs, pixel 0, at x = 1125, on lines 0 through 4.
- The problems are not caused by a bad red DAC, since everything was passed except at locations x = 1125 and line = 0-4. Also, the problems are not caused by a bad channel 0, because the problems occurred only during the test for x = 1125 and line = 0-4. Thus, the problems must have been caused by bad storage, related defective circuitry in the VS2 FIFO hardware, or both.
- If these error messages had displayed on all test register outputs (on every channel, 0 through 5, and for all DAC colors, red, green, and blue), the problems originate somewhere before the VS2 line FIFOs.

Occasionally, the message

```
Segmentation fault
```

appears when the MCO Data Path Test starts. This message is probably the result of wedged MCO EEPROM content, possibly because the MCO EEPROM is not reprogrammed when the MCO is swapped from a RealityEngine system to an ONYX system. In such cases, type

```
cd /usr/gfx/ucode/RE/vs2
vs2prom -bw /dev/null
```

The message

```
Writing default values to EEPROM....
```

appears; this procedure takes about a minute. Invoke the MCO Data Path Test again.

MCO Data Path Test Output

Output from this test is shown below.

Note: The MCO Data Path Test is available for 5.1 and 5.2 only. The test, which does 200,000 compares, takes ten minutes.

```
ide>> INFO: Starting VS2 Data Path Test
INFO: (800): Starting subtest VS2 Data Path ...
INFO: (800): DO NOT INTERRUPT! THIS TEST WILL TAKE A WHILE TO
COMPLETE...
Programming Multi-Channel Option XILINX
Initializing Multi-Channel Option VOF[0] Edge Table
vif parameters for mco channel 0:

VIF_SYNC_WIDTH = 0x12
VIF_HPHASE_LOOPGAIN = 0xe4
VIF_MCOUNTER = 0x0
VIF_HORZ_LENGTH = 0x4
VIF_GENSRC_CNTRL = 0x80
VIF_BPORCH_CLAMP = 0x37
VIF_FINE_PHASE_ADJ = 0x20
VIF_MAGIC_HIGH = 0x54
VIF_SYNC_WIDTH_INT = 0x13
VIF_GENSRC_CNTRL_INT = 0xc0
VIF_BPORCH_CLAMP_INT = 0x56
setting internal VIF0_SYNC_WIDTH = 0x13
setting internal VIF0_GENSRC_CNTRL = 0xc0
setting internal VIF0_BPORCH_CLAMP = 0x56
Initializing Multi-Channel Option VOF[1] Edge Table
vif parameters for mco channel 1:

VIF_SYNC_WIDTH = 0x12
VIF_HPHASE_LOOPGAIN = 0xe4
VIF_MCOUNTER = 0x0
VIF_HORZ_LENGTH = 0x4
VIF_GENSRC_CNTRL = 0xc0
VIF_BPORCH_CLAMP = 0x37
VIF_FINE_PHASE_ADJ = 0x20
VIF_MAGIC_HIGH = 0x54
VIF_SYNC_WIDTH_INT = 0x13
VIF_GENSRC_CNTRL_INT = 0xc0
VIF_BPORCH_CLAMP_INT = 0x56
VOF path /usr/gfx/ucode/RE/vs2/vof/vs21130x5_60.u
vif parameters for mco channel 0:

VIF_SYNC_WIDTH = 0x12
VIF_HPHASE_LOOPGAIN = 0xe4
VIF_MCOUNTER = 0x0
VIF_HORZ_LENGTH = 0x4
VIF_GENSRC_CNTRL = 0x80
VIF_BPORCH_CLAMP = 0x37
VIF_FINE_PHASE_ADJ = 0x20
VIF_MAGIC_HIGH = 0x54
VIF_SYNC_WIDTH_INT = 0x13
VIF_GENSRC_CNTRL_INT = 0xc0
VIF_BPORCH_CLAMP_INT = 0x56
setting internal VIF0_SYNC_WIDTH = 0x13
setting internal VIF0_GENSRC_CNTRL = 0xc0
setting internal VIF0_BPORCH_CLAMP = 0x56
VOF path /usr/gfx/ucode/RE/vs2/vof/vs21130x5_60.u
vif parameters for mco channel 1:

VIF_SYNC_WIDTH = 0x12
```

```
VIF_HPHASE_LOOPGAIN = 0xe4
VIF_MCOUNTER = 0x0
VIF_HORZ_LENGTH = 0x4
VIF_GENSRC_CNTRL = 0xc0
VIF_BPORCH_CLAMP = 0x37
VIF_FINE_PHASE_ADJ = 0x20
VIF_MAGIC_HIGH = 0x54
VIF_SYNC_WIDTH_INT = 0x13
VIF_GENSRC_CNTRL_INT = 0xc0
VIF_BPORCH_CLAMP_INT = 0x56
INFO: (800):
************************************************************
INFO: (800): Input test pattern: linear ramp across a line with magnitude
512
INFO: (800): Gamma table loaded with 4 by 256 linear ramps
INFO: (800): This makes gamma table ignores bits 8 and 9
INFO: (800): Bit 9 is always used to trigger DAC Test Register
INFO: (800): Now testing datapath pixel bits 0th through 7th ...
INFO: (800):
************************************************************
INFO: (800): Input test pattern: linear ramp across a line with magnitude
512
INFO: (800): Gamma table loaded with 4 fixed patterns
INFO: (800): Blocks 0 and 2 are loaded with 0
INFO: (800): Blocks 1 and 3 are loaded with 1
INFO: (800): This makes gamma table ignores bits 0-7 and 9
INFO: (800): Bit 9 is always used to trigger DAC Test Register
INFO: (800): Now testing datapath pixel bit 8th ...
INFO: (800):
************************************************************
INFO: (800): VS2 Data Path test summary:
INFO: (800): done testing the DVI datapath pixel bits 0th-7th ...
PASSED
INFO: (800): done testing the DVI datapath pixel bit 8th ... PASSED
INFO: (800): Done subtest VS2 Data Path ... PASSED
ide>>
ERROR: vd_ioctl: ioctl: Not privileged
<CR> to return to menu
```

Note: Ignore the message `ERROR: vd_ioctl: ioctl: Not privileged`.

6.6 Running Individual *vs2ide* Tests

To run an individual *vs2ide* test, follow these steps:

1. Log in as **`diag`** to bypass the *vs2ide* script (test menu).
2. At the prompt, type **`vs2ide`**.

   To display a list of commands, type **`help`** at the `ide>>` prompt. The following list appears:

   ```
   IDE Commands:
   dumpsym    -
   echo       - echo ["STRING"|VAL ...]
   ```

```
exit       - exit [VAL]
quit       - exit [VAL]
help       - displays summary of commands and statements
printenv   - printenv [ENV_VAR_LIST]
printf     - printf "FORMAT" [ARG1 ARG2...]
setenv     - setenv ENV_VAR STRING
source     - source SOURCE_PATH
stat       -
testcmd    -
unsetenv   - unsetenv ENV_VAR
status     - status [RESERVE_VAR_LIST]
reset      - reset RESERVE VARS to their default values
vs2init    - VS2 board initialization
vs2regs    - VS2 registers test
vs2eeprom  - VS2 EEPROM patterns/address test
vs2dac     - VS2 DAC regs/rams test
vs2vl      - VS2 VOF loader
vs2xilinx  - VS2 XILINX load/read/verify test
vs2gammaconst - VS2 load all DACs with gamma constant
vs2rdactr  - Read all VS2 DACs test regs
repeat n cmd
             repeat `cmd' n times
while ( expr ) cmd
             repeat `cmd' while expr is true
for ( expr1; expr2; expr3 ) cmd
             repeat `cmd' while expr2 is true
if ( expr ) cmd1 [ else cmd2 ] [fi]
             execute cmd1 if expr is true, cmd2 otherwise; `fi' is
optional
{ cmd ; cmd ... }
             commands may grouped with `{' and `}'
```

Caution: Do not use the *vs2eeprom* test, which tests the Multi-Channel Option EEPROM.

The MCO Data Path Test, *vs2datapath*, does not appear in this menu and should not be run manually. This test requires special settings, which are invoked only when the test is started from the 5.1 (5.2) version of the test menu.

Note: The *vs2cal* test, listed in the 4.0.5H version, is not currently available.

3. At the `ide>>` prompt, type a command; for example:

   `vs2init`

   or

   `repeat 10 vs2init`

   or

   `vs2dac`

4. To see if an error occurred, display test results by typing

   `grep ERR /usr/tmp/vs2.log0`

   In a multipipe system, type one of the following:

   - **`grep ERR /usr/tmp/vs2.log0`**

- **`grep ERR /usr/tmp/vs2.log1`**
- **`grep ERR /usr/tmp/vs2.log2`**

depending on the pipe on which the MCO is running. In a multipipe system, tests run on default pipe 0 and test results are logged in */usr/tmp/vs2.log0*, unless you selected a different pipe.

Note: To use the Multi-Channel Option panel for testing output, see instructions in Chapter 5, “Testing the Installation.”

Appendix A

Multi-Channel Option Error Messages

This appendix lists error messages and their explanations and solutions. The error messages fall into two groups:

- messages printed by IRIX command programs
- messages printed during boot or found in *SYSLOG*

A.1 Messages Printed by IRIX Command Programs

Listed here are messages associated with programs that use or operate the MCO. Typically, only *setmon* and SSE diagnostics cause these errors.

ERROR: couldn't get number of boards
Explanation: The operating system prevented the software from manipulating the RealityEngine graphics board.
Solution: Check software revisions.

ERROR: couldn't open /dev/graphics
Explanation: The operating system prevented the software from manipulating the RealityEngine graphics board.
Solution: Check software revisions.

setmon: can't open vof file, *filename*
Explanation: The specified MCO format file is corrupt or is from an older revision of system software. For the 5.0.1 software release only, a CD containing the MCO video output formats (VOFs) was provided. As of release 5.1, the VOFs are incorporated into the standard system software subsystem package *eoe1.sw.unix*. This error message appears if the older 5.0.1 VOFs are loaded on top of the 5.1 VOFs.
Solution: Identify and repair the file. If necessary, install the MCO software again.

setmon: cannot detect MCO in appropriate address. Is software installed properly (EEPROM written)?
Explanation: Some hardware responded at the specified VME address, but the EEPROM at that address did not contain the MCO identification sequence.
Solution: Ensure that the MCO has its EEPROM correctly loaded by running the *vs2prom* program.

setmon: internal error in *filename*
Explanation: The specified MCO format file was corrupt.
Solution: Identify and repair the file. If necessary, install the MCO software again.

setmon: no MCO board is present -- rerun setmon without -S
Explanation: Nothing responded in the address specified in the DG2 EEPROM (where the address of the MCO is specified).
Solution: Check the address of the MCO as set on MCO board DIP switches for correctness.

setmon: unexpected EOF in filename
Explanation: The specified MCO format file was not readable.
Solution: Identify and repair the file. If necessary, install the MCO software again.

The Multi-Channel Option hardware is present, but the EEPROM seems to be outdated or corrupt. Run setmon -S to repair it.
Explanation: Software has detected one of the following problems with the Multi-Channel Option EEPROM:

- the stored revision number does not match that which the software expects
- the size of the stored data does not match that which the software expects
- the checksum stored in the EEPROM is not internally consistent

Solution: Run *setmon -S* to rewrite the EEPROM.

VOF is not for VS2 (magic_number)
Explanation: The specified MCO format file did not contain the proper magic number. The magic number found in the file is shown.
Solution: Identify and repair the file. If necessary, install the MCO software again.

A.2 Messages Printed During Boot or Found in *SYSLOG*

Listed here are messages that can be printed during boot or that appear in the file */usr/adm/SYSLOG*. In the latter case, each message has the *gfxinit:* prefix.

Couldn't load DG2's special MCO VOF (filename): reason
*Explanation:*The special DG2 format file used when running MCO could not be loaded. The name of the file is printed, as is the reason the file could not be loaded.
Solution: Identify and repair the file. If necessary, install the MCO software again.

Could not open MCO VDRC file filename: reason
Explanation: The initialization software could not load a needed MCO file. The reason is specified.
Solution: Identify and repair the file. If necessary, install the MCO software again.

Error opening /dev/graphics in routine routine-name - reason
Explanation: The operating system prevented initialization from determining information about or initializing the graphics system.
Solution: Ensure that graphics have stopped before you attempt whatever caused this error. Check software revisions.

Failure in GFX_ATTACH_BOARD ioctl in routine-name - reason
Explanation: The operating system prevented initialization from determining information about or initializing the graphics system.
Solution: Ensure that graphics have stopped before you attempt whatever caused this error. Check software revisions.

Failure in GFX_MAPALL ioctl in routine-name
Explanation: The operating system prevented initialization from determining information about or initializing the graphics system.
Solution: Ensure that graphics have stopped before you attempt whatever caused this error. Check software revisions.

Failure in VENICE_VS2_SET_SHADOW ioctl in routine-name - reason
Explanation: An internal software error has caused a problem in the specified routine.
Solution: Report this problem to MCO engineering.

graphics getboardinfo() failed during MCO initialization: reason
Explanation: The operating system prevented initialization from determining information about the graphics system.
Solution: Ensure that graphics have stopped before you attempt whatever caused this error. Check software revisions.

Invalid pipe number during MCO initialization
Explanation: A pipe number was specified that was out of range of available pipes.
Solution: Report this error to MCO engineering.

MCO: bad base address address, using default
Explanation: The DG2 EEPROM contains an address for MCO that is invalid because of range or alignment.
Solution: Rewrite the address in the DG2 EEPROM with the program *vs2addrset*.

MCO: board found at address
Explanation: The MCO board was successfully located and identified.
Solution: No resolution is necessary. Consider this a happy message.

MCO: board on pipe <pipe-number> found at <address>, VME adapter <Adapter>, but not properly connected to graphics via DVI cable
Explanation: An MCO was detected at the specified location. However, a check of the DVI cable between MCO and DG2 detected a problem.
Solution: Check connection of DVI cable between MCO and DG2. If connection appears correct, you can use the MCO Data Path diagnostic and then process of elimination to determine if the problem lies in the DG2 board, MCO board, paddleboard, or cabling.

MCO: can't map VME adapter number <address> (10 slot <slot> adapter <adapter>)
Explanation: The RealityEngine device driver was unable to map the specified adapter number on which it believed the MCO was located. This indicates an error in system software.
Solution: Contact your local Technical Assistance Center (TAC), who will contact the appropriate engineers.

MCO hardware is present, but unusable because the number of RM boards has changed from %d to %d. Rerun setmon.
Explanation: Each MCO format configuration is unique to the graphics hardware configuration. When *setmon* was run previously, the MCO's EEPROM was loaded with a configuration specified for the number of RM (raster manager) boards in place at that time. This message is printed when initialization detects the number of RM boards has changed. Therefore, the format configuration in the MCO EEPROM is out of date.
Solution: Run *setmon* again, loading the MCO EEPROM properly.

MCO: unable to read signature from <address> (bad read from MCO eeprom)
Explanation: The address specified in the message is a valid address for a Multi-Channel Option, so the RealityEngine device driver attempted to read the MCO signature from that location. The MCO signature was not detected.
Solution: You will see this message whenever a device other than MCO is found in a potential address used by MCO; if another device does exist in that location, you may ignore this message.

If an MCO exists at that location, the on-board EEPROM is not responding as an MCO. Initialize the MCO board's EEPROM with the vs2prom program.

MCO: Using MCO on pipe <pipe-number> - address <address>, VME adapter <adapter>
Explanation: The RealityEngine device driver has successfully detected an MCO in the specified location.
Solution: None necessary. This behavior is correct.

Performing MCO initialization on hardware not a RealityEngine
Explanation: Initialization is being performed on a system with incorrect graphics installed; the MCO does not work.
Solution: Install RealityEngine graphics.

RE pipe <pipe-number>: can't read dg2 eeprom
Explanation: The RealityEngine device driver was unable to read the DG2 EEPROM to determine whether MCO should be enabled for output. Because the status of MCO could not be determined, output will be directed to DG2 until *setmon* is run.
Solution: Run *setmon* to reset the DG2 EEPROM.

The address of the MCO responds, but not as a MCO. Check EEPROM validity.
Explanation: A check was made to determine whether the MCO was present. The MCO identification sequence should be stored in the MCO's EEPROM. This MCO's EEPROM did not contain the identification sequence.
Solution: Initialize the MCO board's EEPROM with the *vs2prom* program. Check that the address of the MCO as specified the DG2 EEPROM is valid.

The MCO hardware is present, but unusable because DG2 hardware is down-rev
Explanation: The MCO requires a DG2 of at least a certain revision level (0101 or higher, as displayed by the *gfxinfo* program). The installed DG2 board revision is not sufficiently recent.
Solution: Install a DG2 board of recent revision.

The Multi-Channel Option hardware is present, but the EEPROM seems to be outdated or corrupt. Run setmon -S to repair it.

Explanation: Software has detected one of the following problems with the Multi-Channel Option EEPROM:

- the stored revision number does not match that which the software expects
- the size of the stored data does not match that which the software expects
- the checksum stored in the EEPROM is not internally consistent

Solution: Run *setmon -S* to rewrite the EEPROM.

The Multi-Channel Option VME address (<address>) as specified by RealityEngine device driver is unusable.
Explanation: The RealityEngine device driver specified a bad address for MCO.
Solution: Contact technical support.

Unable to find number of graphics boards during MCO initialization: reason
Explanation: The operating system prevented initialization from determining the number of graphics boards.
Solution: Check software revisions.

Unable to load filename in venice_get_vs2_xilinx_config() during MCO initialization: reason
Explanation: The specified format file could not be loaded for the reason detailed.
Solution: Identify and repair the file. If necessary, install the MCO software again.

Unable to map MCO during board probe (reason), assuming it is not present
Explanation: The initialization software was unable to map the MCO board for the specified reason.
Solution: Correct the specified problem. Check whether the file */usr/sysgen/master.d* still contains the entries describing the MCO address (shipped by default).

unable to malloc() for getboardinfo() during MCO initialization
Explanation: An internal error has kept initialization from proceeding.
Solution: Report this error to MCO engineering.

Unable to open /dev/graphics during MCO initialization: reason
Explanation: The operating system prevented the software from manipulating the RealityEngine graphics board.
Solution: Check software revisions.

Unable to open device during initialization of MCO - reason
Explanation: The specified device is the means by which MCO initialization software access the MCO hardware. The device could not be opened for the reason specified.
Solution: Correct the problem as specified in the reason. If you cannot correct the situation, report this to MCO engineering.

Unable to set diagnostic flag in routine-name - reason
Solution: The operating system prevented initialization from determining information about or initializing the graphics system.
Solution: Ensure that graphics have stopped before you attempt whatever caused this error. Check software revisions.

venice_get_vs2_xilinx_config(): Error reading xilinx config file filename
Explanation: The initialization software could not load the specified microcode file.
Solution: Identify and repair the file. If necessary, install the MCO software again.

venice_get_vs2_xilinx_config: unknown xilinx type type
Explanation: The initialization software found a microcode file of the wrong type.
Solution: Identify and repair the file. If necessary, install the MCO software again.

vs2_loaducode(): can't open vof file, filename
Explanation: The specified format file could not be opened.
Solution: Identify and repair the file. If necessary, install the MCO software again.

vs2_loaducode(): internal error in filename
Explanation: The specified MCO format file was corrupt.
Solution: Identify and repair the file. If necessary, install the MCO software again.

vs2_loaducode(): unexpected EOF in %s
Explanation: The specified MCO format file was not readable.
Solution: Identify and repair the file. If necessary, install the MCO software again.

Index

P

R

S

T

U

V