Installation and Commissioning Manual

Fiber Service Platform 3000R7

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Contents

Preface

	The illustrations in this document are for reference only. They are based on the latest hardware revision available at the time of publication. The equipment you receive might have a different appearance than the equipment shown in this document.

Safety Symbol and Message Conventions

You will see these symbols throughout the documentation. All personnel should correctly follow and not ignore any safety instructions.

Icon	Meaning	Description
	Warning	Means danger and alerts you to a situation that could cause bodily injury. Before you work on any equipment, be aware of the hazards involved and be familiar with standard practices for preventing accidents.
	Electric Voltage Warning	Means danger and alerts you to risks caused by electricity that could result in death or serious injury. Before you work on any equipment, be aware of the hazards involved with electrical circuitry and be familiar with standard practices for preventing accidents.
	Shock hazard warning. Disconnect all power plugs.	Indicates that all power sources must be disconnected before servicing to avoid shock hazard.
	Laser Radiation Warning	Warns you about the risk of possible laser radiation, which may result in a serious eye injury.
	Laser Radiation Warning – Hazard Level 3B	Warns you about the risk of possible laser radiation if the system is not used as designed or altered in any way.
	Laser Radiation Warning — Class 1 Laser	Warns you that the equipment contains Class 1 lasers, which are safe under all normal use conditions.

Icon	Meaning	Description
CAUTION LASER 1M invisible	Laser Radiation Warning – Class 1M Laser	Warns you that the equipment contains Class 1M lasers, which are safe for all conditions of use except when the beam is passed through magnifying optics. It also alerts you to the risk of possible laser radiation if the system is not used as designed or altered in any way.
CAUTION HAZARD LEVEL 1M INVISIBLE	Laser Radiation Warning – Hazard Level 1M	Warns you that in the fiber optical communication system the potential accessible laser radiation is within Hazard Level 1M, which are safe for all conditions of use except when the beam is passed through magnifying optics. It also alerts you to the risk of possible laser radiation if the system is not used as designed or altered in any way.
⚠	Caution	Alerts you to a potentially hazardous situation or condition that may result in minor or moderate injury.
⚠	Lifting Hazard Caution	Indicates a potentially hazardous situation or condition that may result in a personal injury or damage to equipment due to the weight of an object.
⚠	Skin Burn Caution	Indicates the risk of possible skin burns. When working with system components, be aware of proper handling procedures.
⚠	Electrostatic Caution	Indicates the possibility of equipment damage due to electrostatic discharge (ESD). If the ESD-prevention instructions are ignored or not followed correctly, damage can occur.
NOTICE	Notice	Indicates the risk of equipment damage, malfunction, process interruption, or negative impacts on surroundings.
📖	Documentation	Advises of the importance of carefully reading all instructions before proceeding or provides links to additional information to read. Failure to do so may result in personal injury or damage to equipment.

Icon	Meaning	Description
	Waste Disposal Alert	Points out the importance of properly disposing of waste electrical or electronic equipment and its components. Disregard of the instruction can threaten the environment.
	Note	Indicates supplemental information or helpful recommendations.

Documentation

FSP 3000R7 Documentation Suite

- *FSP 3000R7 Hardware Description*
- *FSP 3000R7 High-Density Subshelf Hardware Guide*
- *FSP 3000R7 Installation and Commissioning Manual*
- *FSP 3000R7 Maintenance and Troubleshooting Manual*
- *FSP 3000R7 Management Data Guide*
- *FSP 3000R7 Module and System Specification*
- *FSP 3000R7 NETCONF User Guide*
- *FSP 3000R7 Network Element Director (NED) Online Help*
- *FSP 3000R7 NED User Manual*
- *FSP 3000R7 Safety Guide*
- *FSP 3000R7 Secure System Configuration Guide*
- *FSP 3000R7 TL1 Commands and Syntax Guide*
- *FSP 3000R7 TL1 Maintenance and Troubleshooting Manual*
- *FSP 3000R7 TL1 Module Parameters Guide*

Accessing Documentation

Documentation Portal	https://docs.adtran.com/

Documentation Feedback

We want our documentation to be as helpful as possible. Feedback is always welcome.

Email	admin@advadocs.com

Obtaining Technical Assistance

Product Maintenance Agreements and other customer assistance agreements are available for ADVA products through your ADVA distribution channel. Our service options include:

- 24 x 7 telephone support
- Web-based support tools
- On-site support
- Technical training, both on-site and at ADVA facilities in Germany and the USA
- Expedited repair service
- Extended hardware warranty service

Customer Portal

You can use the customer portal to:

- Access company information and resources at any time.
- Find information specific to your requirements, such as networking solutions, services, and programs.
- Resolve technical issues by using online support services.
- Download and test software packages.
- Order ADVA training materials.

Access	https://www.adva.com/en/customer-portal
Questions	customer-portal-admin@adva.com

Technical Services

Technical services are available to customers who need technical assistance with an ADVA product that is under warranty or covered by a maintenance contract.

Online	https://www.adva.com/en/about-us/contact
Email	support@adva.com

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Document Revision History

> For detailed information about a specific product release, see the appropriate release notes.
>
> This table lists the changes for the past three major software releases. To view changes for an earlier release, see a previous version of this guide.

Product Release	Document Number	Document Issue	Issue Date	Description
20.1	80000061444	Issue A	September 2020	No changes made.
20.2	80000062610	Issue A	December 2020	General edits.
20.3	80000063781	Issue A	March 2021	Removed Related Documents Overview topic from Preface section and replaced it with FSP 3000R7 Documentation Suite topic
		Issue B	May 2021	Removed throughout the book, remnants of discontinued shelves and modules. Added a table under Installing SH9HU, SH7HU, and 1HU Shelves containing torque guidelines for screws and nuts.

Product Release	Document Number	Document Issue	Issue Date	Description
20.4	80000066198	Issue A	September 2021	Added Rack Mounting the SH1HU-F/E+TEMP/PF Shelf procedure under Installing Shelves topic.
21.1	80000066723	Issue A	October 2021	No changes made.
21.2	80000068208	Issue A	January 2022	Revised Heat Dissipation topic to explain how to calculate heat dissipation.
		Issue B	March 2022	Updated legal section.
21.5	80000070928	Issue A	October 2022	Minor edit made to Creating a Serial PuTTY Connection.
22.1	80000073282	Issue A	May 2023	Performed general edits to procedures. Removed references to obsolete modules.
22.2	80000073680	Issue A	July 2023	General edits Added a note and a caution about equipment disposal to Equipment Return and Repair topic. Updated legal section

Chapter 1

Express Setup

This section provides an overview of the tasks you must complete to successfully install and commission the FSP 3000R7.

The flowchart shows the installation tasks you need to perform in the sequence shown, from site preparation to testing the link. You must first successfully complete all preceding tasks before you move on to the subsequent tasks. This guide includes a separate section for each task, with each section independent from other sections. You can read the sections that contain information relevant to where you are in the installation and commissioning process. Each section has helpful background information to understand the context of the section and information relevant to the topic, if needed.

First familiarize yourself with the product and related safety requirements. Then read the installation and cabling plans for your organization to determine your system configuration.

Required Expertise

Because varying expertise is required to perform a complete installation, different team members might be involved in the installation process. The flowchart indicates where the type of required expertise changes, and where a transition might be required. In addition, each procedure describes the required level of expertise to complete the task safely and successfully. Also see Personnel Requirements.

Safety Precautions

To avoid personal injury and equipment damage, strictly adhere to all safety precautions and equipment precautions as outlined in your local safety policies and in the Prerequisites for Installation.

Figure 1: Installation Flowchart

Figure 1: Installation Flowchart
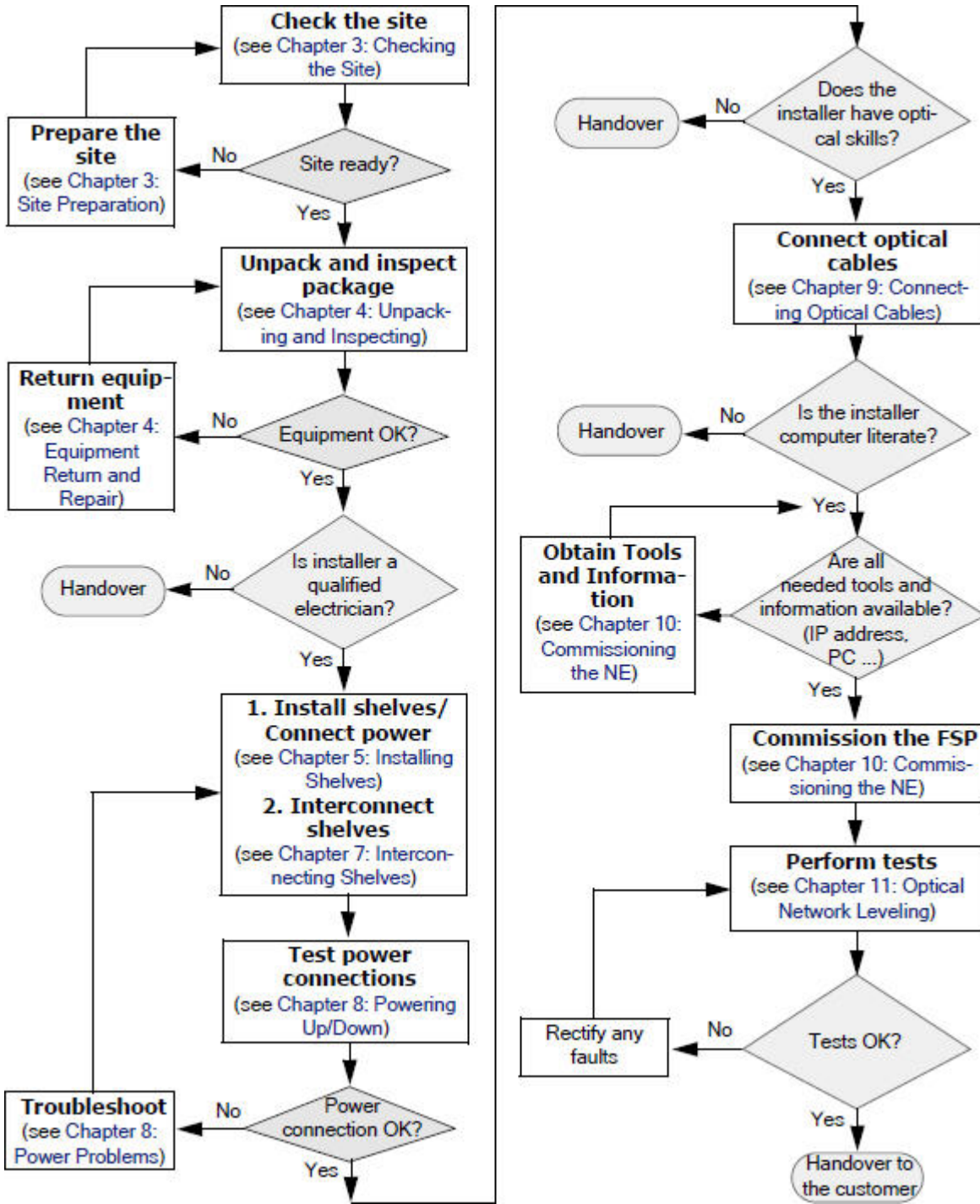
Chapter 2

Prerequisites for Installation

This section contains these topics:

Audience

The primary audience for this section includes network managers and personnel involved in the planning and preparation of the FSP 3000R7 hardware installation. The secondary audience includes customers who are considering the purchase of an FSP 3000R7 and need information about the requirements for setting up the hardware.

Safety Precautions

This section provides safety guidelines that you must follow when you install and test any equipment that involves power and laser light. This section contains these topics:

NOTICE	Safety warnings and cautions appear throughout this manual in instructions, which, if performed incorrectly, might harm you. Personnel must understand and apply the provided safety guidelines. In addition, the safety notices on the equipment labels should be strictly followed.

General Safety

This section describes general safety symbols used in this manual.

	Read this manual, as well as the *FSP 3000R7 Safety Guide* carefully and completely before installing, commissioning and testing the FSP 3000R7 system. These documents provide important information you need to know to avoid personal injury and equipment damages because of incorrect usage.

	Risk of fire, bodily injury and equipment damage • Only trained and adequately qualified personnel are allowed to install and commission the FSP 3000R7 equipment. • Do not work alone if potentially hazardous conditions exist.

	LIFTING HAZARD CAUTION Never attempt to lift a shelf by yourself. At least two people are needed to lift and mount the unit into the rack. ADVA recommends having two people to hold the unit while mounting.

	CAUTION **Risk of Isopropyl Alcohol Poisoning** Cleaning fiber-optic connectors might require the use of isopropyl alcohol. However, use of alcohol to clean fiber ends can leave a film residue. Poisoning can occur from inhalation. Long-term application to the skin can cause defatting. Avoid prolonged inhalation of alcoholic vapors and use protective gloves while using. Use only small amounts of alcohol, work in a well-ventilated area, and avoid direct skin contact.

	CAUTION
⚠️	**Risk of eye injury** • Wear safety glasses when you work with isopropyl alcohol. It can cause eye irritation on contact. • To avoid getting debris in your eyes, wear safety glasses when you work with canned compressed air.

Electrical Safety

Be aware of potential electrical accidents that can involve:

- People and equipment
- Only the equipment
- Your installation site

This section provides some basic precautions to follow for electrical safety. For more information, see the *FSP 3000R7 Safety Guide*.

	ELECTRIC VOLTAGE WARNING
⚡	**High voltage can cause electric shock. High currents can pose fire hazards.** The FSP 3000R7 equipment must be grounded in accordance with local and national electrical codes. Never defeat the ground conductor or operate the equipment in the absence of a suitably installed ground conductor.

	ELECTRIC VOLTAGE WARNING
⚡	Do not use household extension cords with your shelves. Not all power cords have the same current ratings. Household extension cords do not have overload protection and are not meant for use with the FSP 3000R7 system.

	ELECTRIC VOLTAGE WARNING
	Risk of bodily injury from electric shock. Failure to adhere to these instructions can result in personal injury and damage to electrical components.
	• Each power supply unit must be switched on or off using a circuit breaker which have to be implemented as part of the building wiring.
	• Each shelf and the rack must be properly grounded before power is applied by turning on the respective circuit breaker.
	• Any actions involving connecting or disconnecting DC or AC power cables must only be performed when no voltage is applied.

	ELECTRIC VOLTAGE WARNING
	Risk of short circuit
	Before installing a plug-in module, carefully check:
	• The plug-in board connector of a module for dirt, any deformation in the shape of the pin holes, and damage on the outside
	• The appropriate shelf backplane connector for any bent or broken off pins and other damage
	If a backplane connector of a shelf has bent or broken off pins, do not slide in a module into that shelf slot.
	If the plug-in board connector of a module is damaged, do not install this module.
	Damaged connectors can cause a short circuit or malfunction.

Eye Safety

The equipment uses lasers as sources for fiber-optic transmitters. Unless mishandled, lasers are inherently safe. The FSP 3000R7 equipment meets the specifications for a Hazard Level 1M product and a Class 1M Laser product. This safety level remains in place even if during installation or testing operations you turn a fiber-optic transmitter to Forced On (21 CFR 1040.10 and 1040.11, IEC 60825-1: 2001-08 and 60825-2: 2004-06 compliant). The term "Forced On" means that the laser or transmitter is in forced-on mode.

Eye safety for users and installation personnel is guaranteed for both the network and client output ports. Nevertheless, for your protection pay strict attention to these precautions when you work with optical equipment.

LASER RADIATION WARNING

Risk of laser infrared radiation

- Laser infrared radiation, which is not visible to the naked eye, can be emitted from a non-terminated receptacle of an optical module or an optical fiber connector if the associated fiber-optic transmitter has been powered up.
- An Optical Time Domain Reflectometer (OTDR) or other optical testing equipment can emit infrared laser light into optical fibers. Avoid direct exposure to laser beam. Remove the protective caps or blind plugs from the client and network output channel (Tx) connectors only when necessary for installation purposes. Failure to do so can cause permanent eye or skin damage and can also lead to blindness.

CAUTION

Risk of eye injury. If these instructions are ignored, the emitting laser light can cause permanent eye or skin damage and can also lead to blindness.

- Never use a magnifier to look directly into an optical fiber connector or into a non-terminated receptacle unless you are absolutely certain that no laser radiation is being emitted from the receptacle or the fiber.
- Disconnect fiber-optic jumpers at both ends before viewing with optical instruments.

LASER RADIATION WARNING

High intensity and invisible light is emitted from the optical output receptacles of amplifier modules. Ensure that all connectors are terminated properly before setting the amplifier Admin state to In Service.

Laser Safety

> **LASER RADIATION WARNING**
>
> Use of controls, adjustments, or performance of procedures other than those specified in the *FSP 3000R7 Safety Guide* and this documentation might result in hazardous radiation exposure.

Optical Output Power of the System — During Operating Conditions

Up to 64/80 channel modules feed into one fiber through passive optical filter modules, depending on the configuration.

- Each channel module feeds up to 5 mW into the passive optical modules.
- The passive optical modules add a defined attenuation to the transmission line, which reduces the optical output power that transmits to the network fiber cable.

The maximum output power of all possible system configurations depends on the current product release. ADVA implemented an automatic power reduction mechanism to ensure that the FSP 3000R7 never exceeds Hazard Level 1M. For more details contact ADVA.

Automatic Laser Shutdown

To meet laser safety requirements, all channel modules are equipped with an Automatic Laser Shutdown (ALS) system. This system will switch off the network transmitter if the transmission line is broken, damaged, or unplugged.

Optical Port Connection Requirements

The two optical port connection conditions are used ports and unused ports.

Optical Port Connection	Description
Used ports	The optical ports in use must connect to a fiber-optic cable to fulfill the specified purpose of the respective FSP 3000R7 optical module. The other end of this fiber-optic cable must connect to the designated opposite port.

Optical Port Connection	Description
Unused ports	A blind plug must close the optical ports not currently in use. This plug ships with the FSP 3000R7. When the pluggable transceiver is not in use, you must leave the dust cover in place in the optical connectors. The blind plugs and dust covers can withstand the specified optical output power.

Equipment Precautions

To prevent equipment damage, follow these guidelines for the equipment that you install:

- Install the FSP 3000R7 in a secure location to prevent unauthorized use and access.
- Mount the FSP 3000R7 shelf in an approved rack that is fastened to a stable non-combustible surface.
- Ensure that any unequipped slot in the shelf contains a dummy module to maintain cooling and EMI compliance.
- Be aware that any component of this equipment can fall and break if placed on an unstable cart, stand, or table.
- Understand that optical fibers can break if mishandled and result in permanent damage to the device. Handle fiber with extreme care.
- Do not cover or push objects through the shelf slots and openings, which can cause thermal overload.
- Do not disassemble this product. Equipment can cease to function and the warranty will be void if disassembled.

	Electrical damage risks:
NOTICE	• Electrical damage can or will result from powering this equipment with any power source other than the type indicated on the shelf supply values label.
	• Electrical damage can result from spilling liquid of any kind on the equipment.

- Before you install or remove a shelf, disconnect all power and power cables.
- Never assume that power is disconnected from a power source — always verify.
- Do not perform any action that creates a potential hazard to people or makes the equipment unsafe.
- Never install damaged equipment.

- Carefully check your work area for possible hazards such as:
  - Moist floors
  - Ungrounded power extension cords
  - Missing safety earth-grounds

	ELECTROSTATIC CAUTION
	Electrostatic sensitive modules can be damaged by electrostatic discharge (ESD) during the installation of the equipment. Observe precautions for handling electrostatic sensitive devices.

Facility Security

You must install the FSP 3000R7 in a restricted access location that meets this criteria:

- Access is allowed *only* to service personnel or by authorized personnel who:
  - Are trained to understand the reasons for the restrictions applied to the location.
  - Know what precautions to take.
- Access is gained by means of a tool, lock and key, or other means of security that the person in charge of the location controls.

Ensure that all personnel comply with local and national safety regulations, as applicable.

Personnel Requirements

This section contains these topics:

A qualified person is one who has the required skills and knowledge to safely perform a specific installation task. Service personnel need to be aware of the hazards associated with electricity and laser radiation. These personnel must also know how to reduce electrical- and laser-accident risks. These risks can result from unsafe equipment or dangerous actions and adverse environmental conditions.

	Field service personnel who install and commission the FSP 3000R7 must be adequately qualified and trained by ADVA.

Minimum Qualifications

Depending on the installation task to be performed, field service personnel should have these minimum qualifications:

- Competent knowledge of electrical engineering and electronics.
- Basic knowledge of computers and optical fiber communication systems.
- Working knowledge of lasers, laser classification, and laser hazards based on ANSI Z136.1.
- General knowledge of safety precautions for working near lasers and precautions needed to safely handle electrostatic sensitive devices (ESDs).
- Basic understanding of the FSP 3000R7 components, safety concept, and management software.

Required Expertise

Several team members who have varying qualifications might be involved in the installation process. When someone performs a specific installation task, that person might need special knowledge and appropriate skills. These skills and knowledge are often mandatory and are specified in the appropriate installation procedure.

Lack of such skills and knowledge on the part of less qualified personnel requires that involved personnel help with planning and support.

Supporting Documents and Additional Information

To install the shelves and modules in the network, you need additional information, which is available in the FSP 3000R7 Network Planner and other sources. The required information depends on the task. These documents can assist you when you install and commission the system.

Copy of the Purchase Order List	Use the purchase order list to find discrepancies between the equipment you receive and the equipment you ordered.
Site Survey Checklist	Indicates whether the site is ready for installation.
FSP 3000R7 Module and System Specification	Provides information about the functionality of and detailed technical data about the individual modules.

Fiber Service Platform Pluggable Transceiver Module Specification	Provides detailed technical information about the pluggable transceiver modules that ADVA products use.
Bill of Material (BOM), generated by the FSP Network Planner	Defines the product as ordered. The BOM lists all modules and equipment grouped by type and quantity and describes each individual item.
Jumper List, generated by the FSP Network Planner	Contains the order numbers and required quantities of each jumper type in a specific network configuration. This list complements the BOM and provides information about jumper length, fiber type, color code, and which interfaces a fiber connects to.
Information on Placement of Modules, provided by the FSP Network Planner	For each NE, provides information about which modules to insert in which slots, which shelves, and in which racks.
Optical Cabling Plan, generated by the FSP Network Planner	For each NE, shows how to interconnect the optical modules in the node. This plan contains all relevant information such as location of the shelf in the rack, locations of the modules within a shelf, jumper types and lengths, and which interfaces a fiber connects to. The plan also provides information about inter-shelf connections.
Test Instruction	Describes which test to perform to verify that the equipment is ready to transfer to the customer.
Graphical Views of the Network Topology generated by the FSP Network Planner	Use the FSP Network Planner to visualize the network topology. The graphical views show the optical modules of the network and how they connect. You can include information about fiber type, distance, and available budget for each fiber. Additionally, you can select services and view their paths through the nodes and components.
Channel Allocation Information provided by the FSP Network Planner	Shows the allocation of channels in a specific network configuration. Based on the information in the displayed table, you can identify which path segment can re-use wavelengths, if possible. You can also display channels that are not yet allocated.
Statement of Compliance/Acceptance	This document is an agreement that the customer accepted the equipment.

Required Supplies and Tools

This section lists the required supplies and tools you need to install and commission the FSP 3000R7 and contains these topics:

Adapter Brackets

In most orders, each shelf ships with pre-installed,19-inch rack-mount brackets. If you plan to install the shelf in an ETSI or NEBS compliant rack, you need to attach the appropriate brackets to the shelf side panels. These brackets also ship with the product. For more information, see Site Planning and Preparation.

Dummy Modules

You must fill any unoccupied shelf slot with an appropriate dummy module:

- DM/5HU — to populate each 5HU shelf slot
- DM/2HU5 — to populate each 2.5HU shelf slot

Dummy modules come pre-installed in the shelf, but if you need more, you can order them from ADVA.

Front Cover

Make sure that the front cover for each 7HU shelf and 9HU shelf is readily available for installation. When mounted, the front cover protects the fiber-optic connectors from external influences and prevents personnel from inadvertently pulling out the fibers.

Power Cables

Two power cables ship with each 9HU shelf, 7HU shelf, or 1HU shelf. Depending on the PSUs that are installed in the shelf, these can be:

- Two AC power cables
- Two 16 AWG DC power cables
- Two 14 AWG DC power cables
- Two 10 AWG DC power cables
- Only for the 7HU shelf: a combination of AC and DC power cables

Make sure the appropriate power cables are readily available to install. See Power Cable Requirements.

> The AC and DC power cable sets are available with the equipment, but you need to order them separately. For more information about these cables, see the *FSP 3000R7 Hardware Description*.

Earth-Grounding Kit

Use the earthing-grounding kit to earth-ground a 9HU shelf, 7HU shelf, or a 1HU shelf to the rack. Each shelf needs one earth-grounding kit, which ships with the equipment. For details, see the *FSP 3000R7 Hardware Description*.

Connecting Serial and Ethernet Cables

To connect management modules, you need a serial null modem cable or a USB cable and Ethernet cables, depending on the type of connection. See Serial Cable and Ethernet Cable Requirements. Order these items separately to include them in your shipment.

IC1/HBNCP/BNCJ/100 Coaxial Interconnect Cable

Use the IC1/HBNCP/BNCJ/100 coaxial interconnect cable to adapt the video module HD-BNC connectors to BNC connectors. Order this cable separately to include it with your shipment. For details, see the *FSP 3000R7 Hardware Description*.

IEEE 1394 Interface Cable

To connect a 40CSM/2HU-#Dxx-#Dyy and a 40CSM/2HU-#19595-#19205 to the PSCU or the 9HU shelf, a IEEE 1394 interface cable (IC300/PSCU/IEEE1394) is required. This cable automatically ships with the 40CSM/2HU-#Dxx-#Dyy and 40CSM/2HU-#19595-#19205.

Telemetry Interface Cable

Use a telemetry interface cable to connect the UTM or the 9HU shelf to device alarm inputs and external alarm devices. ADVA does not provide this cable. You need to build your own cable according to your network requirements. For the connector pinouts, see Telemetry Interface Cable Requirements.

SCU-Intercom-Kit

To interconnect two shelves within a node, use the SCU-Intercom-Kit. Order this kit separately to include with your shipment. For details, see the *FSP 3000R7 Hardware Description*.

Fiber-Optic Jumpers

Fiber-optic jumper pairs ship with the shelf. You can pre-install or package and label fiber-optic jumpers according to the shelf. See Supporting Documents and Additional Information .

Required Tools and Equipment

This section details the tools and equipment that you need to install the FSP 3000R7. Each installation procedure specifies the tools and equipment you need for that procedure.

This section contains these topics:

Basic User-Supplied Tools

Tool	Description
Torx size 10 screwdriver	To loosen knurled screws on the module faceplate.
Torx size 20 screwdriver	To attach adapter brackets.
Appropriate screwdriver	To tighten rack screws.
No. 3 Pozidriv screwdriver	To attach the earth-grounding wire to the rack.

Tool	Description
No. 1 Phillips screwdriver or flat-blade screwdriver, 1 mm x 5 mm	To attach DC power cables.
Wrench or Box spanner, wrench size of 7 mm or 0.276 in.	To tighten the earth-grounding screw nuts on the shelf.
Appropriate measuring tool	For various measuring tasks. For example, you can use a self-retracting pocket tape measure.
Wire cutting pliers	
Wire strippers	
Crimping tool	

Electrical Test Equipment

- Multimeter
- Appropriate terminal connectors to connect to the connectors on the external DC power sources

Fiber Optic Testing and Cleaning Equipment

- Signal/protocol generator or Bit Error Rate Tester (BERT).
- Multimode or single-mode fiber jumpers with LC or MU/PC connectors.
- Variable or fixed attenuator, 3 to 11 dB, or fiber spools.
- Optical power meter with wideband source, 1300 to 1650 nm. Calibrate for the required wavelengths. Input sensitivity −30 to +10 dBm.
- Multi-wavelength OTDR to measure span loss, if needed.
- Fiber-optic cleaning kit with at least these items:
  - Canned, dry, oil-free compressed air.
  - Fiber-optical cleaner, for example isopropyl alcohol, and a cartridge or pocket cleaner.
  - Lint-free, fiber-optic wipes, preferably clean room quality.
  - Various sized lint-free swabs, preferably clean room quality.
- Fiber scope to inspect male connectors and fiber jumpers.
- Video fiber scope to inspect female connectors and port connections, if required.

ESD Prevention Equipment

- Personal earth-grounding equipment:
  - Coil cord with adjustable wrist strap.
  - Heel or toe grounders or ESD protective footwear to use with a conductive or static-dissipative floor or floor mat.
- Dissipative surface or a static-dissipative mat.
- ESD-protective bags, as appropriate.

Personal Computer and Other Requirements

You need:

- A PC or laptop to perform optical power measurements and complete basic commissioning of the NE.
- A serial or Ethernet interface and a terminal emulation program such as telnet or SSH.
- An appropriate data cable. See Telemetry Interface Cable.

Commissioning Information

To commission the NE, you need this information:

- IP address
- Node number
- IP netmask
- Default gateway address of the network element

Chapter 3

Site Planning and Preparation

This section provides site planning and site preparation information that you need to install the FSP 3000R7 equipment and contains these topics:

Introduction

The condition of the installation site is extremely important for proper operation of the FSP 3000R7 platform. This section helps you plan and prepare your site and coordinate the installation process. Use the information in this section to:

- Select an installation location for the system in an appropriate area that meets all environmental, electrical, and safety requirements.
- Select the appropriate equipment rack and proper cables.

	You might need to perform and verify electrical or environmental modifications before you install the equipment.

	Any modifications to the site that are required for the FSP 3000R7 installation must comply with your local building and national electrical codes.

> This section describes planning and preparation activities for a typical installation. Local building or electrical codes are beyond the scope of this document.
>
> Double-check your site-specific plan or consult respective specialists to ensure that you follow the appropriate local building codes and local electrical and mechanical codes.

If the site meets the environmental, electrical, and safety requirements, you can safely and correctly install the FSP 3000R7 equipment.

Audience

The primary audience for this section includes network managers and personnel involved in the planning and preparation of the FSP 3000R7 hardware installation. The secondary audience includes customers who are considering the purchase of an FSP 3000R7 and need information about the requirements for setting up the hardware.

Site Planning

This section describes pre-installation activities and provides information about the FSP 3000R7 system requirements and planning guidelines. Requirements to install the OTDR are also provided. See these topics:

> For safety information, see Prerequisites for Installation.

General Site Requirements

ADVA recommends that only authorized personnel have access to the FSP 3000R7. Install the equipment in a restricted-access area that meets this criteria:

- Restrict access to personnel who have knowledge and training about the restrictions applied to the location and precautions they need to be aware of.
- Use special access tools, locks and keys, and other devices to access the location of the FSP 3000R7. Personnel who manage and control the location must control the access devices.

Ensure that the site complies with all applicable local and national safety regulations.

Follow these guidelines for the installation location.

- Ensure that the location is clean and dry with sufficient space for future network connections, for example, space for additional racks.
- Protect the area from water both from above and on the floor.
- Protect the area from excessive heat, direct sunlight, dust, and chemical exposure.

FSP 3000R7 Equipment Requirements

Compliance Criteria

Make sure that your site adheres to this compliance criteria.

The FSP 3000R7:

Environment	Equipment meets the requirements of NEBS level 3 and ETSI EN 300 019-1-3 (2004).
Degree of Protection	Offers an IP20 degree of protection according to IEC 60529. The equipment was evaluated for use in a Pollution Degree 2 environment. The product offers no protection against water. Use only for indoor controlled office environments. Applies to installation in network telecommunication facilities.
Acoustic Noise Emissions	Produces sound levels less than 60 dBA. The equipment meets the requirements of the GR 63 CORE, Issue 2006, ch. 4.6 and ETSI ETS 300 753 (1997) standards.

Electromagnetic Interference and Electrical Safety	Meets all functional requirements of: • Telcordia standard GR-1089-CORE, Issue 3, October 2002 regarding EMC and electrical safety • EMC Directive 2004/108/EC • Low Voltage Directive (LVD) 2006/95/E • Suitable for installation as part of the Common Bonding Network (BN)

System Component Specifications

This table lists the approximate dimensions and weights of the FSP 3000R7 system components.

	Dimensions in this table do not include adapter brackets.

Table 1: Dimensions and Weight of the System Components

System Components	Width	Depth	Height	Weight
SH9HU **Note**: This includes three FAN/9HU fan modules and one CEM/9HU shelf. All other slots are unpopulated.	446 mm (17.6 in.)	276 mm (10.9 in.)	399 mm (15.7 in.)	16.2 kg (35.7 lbs)
SH7HU **Note**: With a fan unit, but without plug-in modules	452 mm (17.8 in.)	270 mm (10.6 in.)	311 mm (12.3 in.)	10 kg (22 lbs)
SH1HU/2DC	482.6 mm (19 in.)	275 mm (10.8 in.)	44.55 mm (1.8 in.)	3.5 kg (7.7 lbs) Without plug-in modules
SH1HU-HP/2DC	446 mm (17.6 in.)	224 mm (8.8 in.)	44.5 mm (1.8 in.)	2.8 kg (6.2 lbs) Without plug-in modules
SH1HU-HP/E-TEMP/2DC	446 mm (17.6 in.)	224 mm (8.8 in.)	44.45 mm (1.8 in.)	3.3 kg (6.2 lbs) Without plug-in modules

Table 1: Dimensions and Weight of the System Components

System Components	Width	Depth	Height	Weight
SH1HU-F/2DC	453 mm (17.8 in.)	223 mm (8.8 in.)	44.45 mm (1.8 in.)	2.8 kg (6.2 lbs) Without plug-in modules
SH1HU-R	453 mm (17.8 in.)	363 mm (14.3 in.)	44.4 mm (1.8 in.)	4 kg (8.8 lbs) Without plug-in modules
SH1HU-R/PF	446 mm (17.6 in.)	423 mm (16.7 in.)	44.5 mm (1.8 in.)	4 kg (8.8 lbs) Without plug-in modules
SH1HU/PASSIVE	446 mm (17.6 in.)	210 mm (8.3 in.)	44.5 mm (1.8 in.)	2.9 kg (6.4 lbs) Without plug-in modules
SH1HU/PASSIVE/FT	446 mm (17.6 in.)	270.5 mm (10.6 in.)	71.5 mm (2.82 in.)	2.9 kg (6.4 lbs)
SH1HU-P/DCM	482.6 mm (19 in.)	270 mm 10.6 in.)	44.5 mm (1.8 in.)	2.1 kg (4.6 lbs) Without plug-in modules
DCF1HU-P	441.6 mm (17.4 in.)	265.5 mm (10.5 in.)	43.8 mm (1.7 in.)	6.7 kg (14.7 lbs)
FMT/1HU	443 mm (17.4 in.)	264 mm (10.4 in.)	44.5 mm (1.8 in.)	4.7 kg (10.4 lbs)

Use the appropriate adapter brackets to mount all FSP 3000R7 shelves into a 19-inch rack or an ETSI- or NEBS-compliant rack. Except for the SH1HU-R and SH1HU-R/PF, use the appropriate ETSI adapter brackets to mount all shelves back-to-back on a 600 x 600-mm standard equipment rack.

Clearance Requirements

These tables specify minimum access clearances required to install and service FSP 3000R7 shelves:

- Minimum Clearance Requirements for Shelves Mounted into 19-Inch Compliant Racks
- Minimum Clearance Requirements for Shelves Mounted into 300-mm ETSI Compliant Racks
- Minimum Clearance Requirements for Shelves Mounted into 600-mm ETSI Compliant Racks — Back-to-Back Shelves
- Minimum Clearance Requirements for Shelves Mounted into 300-mm ETSI Compliant Racks
- Minimum Clearance Requirements for Shelves Mounted into 300-mm ETSI Compliant Racks

Table 2 lists the minimum front and rear clearance requirements for shelves that mount into 19-inch compliant racks. The rear clearance specifies the minimum clearance from the shelves to the wall or equipment.

Table 2: Minimum Clearance Requirements for Shelves Mounted into 19-Inch Compliant Racks

Shelf Types	Front Clearance — Approximate	Rear Clearance
SH9HU — front power feed	90 cm (3 ft)	5 cm (0.16 ft)
SH9HU — rear power feed	90 cm (3 ft)	5 cm (0.16 ft)
SH7HU — front power feed	90 cm (3 ft)	5 cm (0.16 ft)
SH1HU/2DC, SH1HU-HP/2DC, SH1HU-F/2DC, and SH1HU-HP/E-TEMP/2DC	90 cm (3 ft)	1 cm (0.03 ft) Clearance is required only for an earth-grounding connection.
SH1HU-R and SH1HU-R/PF	90 cm (3 ft)	5 cm (0.164 ft)
SH1HU/PASSIVE and SH1HU/PASSIVE/FT	90 cm (3 ft)	1 cm (0.03 ft) Clearance is required only for an earth-grounding connection.
DCF1HU-P and SH1HU-P/DCM	90 cm (3 ft)	1 cm (0.03 ft) Clearance is required only for an earth-grounding connection.

Table 3 lists the front and rear clearance requirements for shelves that mount into 300-mm ETSI-compliant racks. The rear clearance specifies the minimum clearance from the shelves to the wall.

Table 3: Minimum Clearance Requirements for Shelves Mounted into 300-mm ETSI Compliant Racks

Shelf Types	Front Clearance — Approximate	Rear Clearance
SH9HU — front power feed	90 cm (3 ft)	1.5 cm (0.05 ft)
SH9HU — rear power feed	—	—
SH7HU — front power feed	90 cm (3 ft)	1.5 cm (0.05 ft)
SH1HU-HP/2DC, SH1HU-F/2DC, and SH1HU-HP/E-TEMP/2DC	90 cm (3 ft)	1 cm (0.03 ft) Clearance is required only for an earth-grounding connection.
SH1HU-R and SH1HU-R/PF	—	—
SH1HU/PASSIVE and SH1HU/PASSIVE/FT	90 cm (3 ft)	1 cm (0.03 ft) Clearance is required only for an earth-grounding connection.
DCF1HU-P and SH1HU-P/DCM	90 cm (3 ft)	1 cm (0.03 ft) Clearance is required only for an earth-grounding connection.

Table 4 lists the front and back-to-back clearance requirements for shelves that mount into 600-mm ETSI compliant racks. The back-to-back clearance specifies the minimum clearance between two shelves.

Table 4: Minimum Clearance Requirements for Shelves Mounted into 600-mm ETSI Compliant Racks — Back-to-Back Shelves

Shelf Types	Front Clearance — Approximate	Back-to-Back Clearance
SH9HU — front power feed	90 cm (3 ft)	3 cm (0.1 ft)
SH9HU — rear power feed	—	—
SH7HU — front power feed	90 cm (3 ft)	3 cm (0.1 ft)
SH1HU/2DC, SH1HU-HP/2DC, SH1HU-F/2DC, and SH1HU-HP/E-TEMP/2DC	90 cm (3 ft)	3 cm (0.1 ft)

Table 4: Minimum Clearance Requirements for Shelves Mounted into 600-mm ETSI Compliant Racks — Back-to-Back Shelves

Shelf Types	Front Clearance — Approximate	Back-to-Back Clearance
SH1HU-R and SH1HU-R/PF	—	—
SH1HU/PASSIVE and SH1HU/PASSIVE/FT	90 cm (3 ft)	1 cm (0.03 ft)[1] Clearance is required only for an earth-grounding connection.
DCF1HU-P and SH1HU-P/DCM	90 cm (3 ft)	1 cm (0.03 ft) Clearance is required only for an earth-grounding connection.

Table 5 lists the front and rear clearance requirements for shelves mounted into 23-inch NEBS compliant racks. The rear clearance specifies the minimum clearance from the shelves to the wall or equipment.

Table 5: Minimum Clearance Requirements for Shelves Mounted into 23-Inch NEBS Compliant Racks

Shelf Types	Front Clearance — Approximate	Rear Clearance
SH9HU — front power feed	90 cm (3 ft)	5 cm (0.16 ft)
SH9HU — rear power feed	90 cm (3 ft)	5 cm (0.16 ft)
SH7HU — front power feed	90 cm (3 ft)	5 cm (0.16 ft)
SH1HU-HP/2DC, SH1HU-F/2DC, and SH1HU-HP/E-TEMP/2DC	90 cm (3 ft)	1 cm (0.03 ft) Clearance is required only for an earth-grounding connection.
SH1HU-R and SH1HU-R/PF	90 cm (3 ft)	5 cm (0.16 ft)
SH1HU/PASSIVE and SH1HU/PASSIVE/FT	90 cm (3 ft)	1 cm (0.03 ft) Clearance is required only for an earth-grounding connection.
DCF1HU-P and SH1HU-P/DCM	90 cm (3 ft)	1 cm (0.03 ft) Clearance is required only for an earth-grounding connection.

Table 6:   General Minimum Aisle Clearance Requirements — Approximations

Aisle width	130 cm (4.3 ft)	To move a shelf through an aisle
Turn radius of a shelf	130 cm (4.3 ft)	To turn a shelf

Be careful to avoid placing shelves too close together, which can make maintenance and reconfiguration difficult. Plan for adequate access to both the front and rear sides of a shelf.

Environmental Requirements

The FSP 3000R7 requires a climate-controlled environment. Install the FSP 3000R7 in an air-conditioned equipment room with year-round humidity control and recirculated, filtered air.

For proper operation, ensure that your site fulfills the ambient temperatures and relative humidity level requirements for storage, transportation, and stationary operation. The location where you install the equipment must comply with the qualifications specified in these documents:

- GR-63-CORE, Issue 3, March 2006 (NEBS level 3)
- ETSI EN 300 019-1-1 V2.1.4 (2003-04) Storage Class 1.2
- ETSI EN 300 019-1-2 V2.1.4 (2003-04) Transportation Class 2.3
- ETSI EN 300 019-1-3 V2.2.2 (2004-07) Stationary use at weather-protected locations Class 3.1

	When you receive your FSP 3000R7, leave the equipment in its shipping boxe at their final installation location for a minimum of 24 hours. An adjustment time is necessary for the equipment to acclimate to room temperature. This process prevents thermal shock to the equipment caused by rapid temperature change and surface condensation.

Cooling Requirements

Heat Dissipation

A significant amount of the electrical energy that an equipment shelf consumes converts into heat. The type of power supplies and the type and the number of modules installed determine the power draw and heat release from a shelf. To ensure the safety, performance,

and reliability of the system, excessive heat that modules generate must dissipate into the surrounding air. Ventilation accelerates dissipation.

Your configuration might require an air conditioning system to cool the equipment to acceptable operating temperatures. The air-conditioning system capacity must be sufficient to dissipate the heat that all equipment in the area generates. If the temperature of the intake air flow is too high, an overtemperature condition occurs.

To estimate the heat flow volume that your cooling system must dissipate, calculate the quantity of heat produced by each shelf when it consumes its required power.

Use this watt/BTU formula to calculate heat dissipation for each system component, based on its power consumption, typical and maximum, as provided for each component:

```
P(BTU/h) = 3.412141633 x P(Watt)
```

📝	When you calculate the heat dissipation based on the total system power, also consider the fan power consumption. Around 30% of the fan power converts to kinetic energy of air flow, which is when the fan operates in the best operating area in the PQ (pressure and airflow) curve. Power loss accounts for the other 70% of the power consumption. Power loss then converts into heat and dissipates into the environment.

⚠️	**CAUTION** **Elevated Operating Ambient Temperature** If installed in a cabinet or multi-rack assembly, the operating ambient temperature of the rack environment can be greater than room temperature. Be careful to install the equipment in an environment that is compatible with the maximum ambient temperature (Tma) specified by ADVA.

⚠️	**WARNING** To prevent the system from overheating, do not operate it in an area that exceeds the maximum recommended ambient temperature of 40°C (104°F).

📝	To prevent overheating and module failure, only operate the FSP 3000R7 shelves with occupied slots. To prevent potential system damage, cover each unoccupied shelf slot with the appropriate slot cover to maintain proper cooling for the other modules.

Airflow Considerations

Adhere to these guidelines when you plan your installation site:

Guideline	Description
Sufficient air circulation	Ensure that the installation site provides sufficient air circulation, without which the ambient air temperature might not cool the FSP 3000R7 equipment to admissible operating temperatures. Excessive operating temperatures can cause malfunctions and cause the system to experience emergency shutdowns.
Air intake	• Ensure that the site air conditioning system cools intake air to the FSP 3000R7 system and to the OTDR, and that the site is as dust free as possible. • Ensure that the intake air enters at the front of the 7HU shelf or 9HU shelf and exits from both sides and the rear. • Ensure that the intake air enters at the front of the OTDR and exits from the rear. • Ensure that the inlet air enters at the right side of the 1HU shelf and exits from the left side.
Clearance	• Allow sufficient clearance around the inlet and exhaust openings and on the shelf (at least 5 cm [2 in.]) to prevent airflow restriction. If airflow is restricted, an over-temperature condition can occur. • Leave at least 90 cm (ca. 35 in.) at the front of each shelf so that personnel can access components in the shelf. For example, you might need to replace the air filter pad, fan modules, or the plug-in fan unit. • When you mount a DCM shelf below a 7HU shelf, leave a minimum of 1HU of space between the bottom of a 7HU shelf and the top of a DCM shelf.
Unused module slots	Ensure that you fill any unused module slots of an equipment shelf with the appropriate dummy modules. Air leaks can get into a shelf with open slots. These leaks reduce the flow of cooling air across the installed modules installed, which can adversely affect module cooling.
Adequate ventilation	• Do not block or cover the shelf and OTDR ventilation openings. • When installing shelves in an enclosed rack, make sure that there is adequate ventilation.
Air circulation	Take care to prevent recirculation of exhaust air within a rack.
Organization of jumpers	Keep fiber-optic jumpers organized to minimize interference with the perforated part of the fiber tray.
Avoiding heat	Never place a shelf near a radiator or heating vent.

Guideline	Description
Planning for later expansion	Consider cooling requirements for additional shelves for later expansion of the system.

📝	Failure to follow these guidelines can cause overheating and affect the reliability and warranty of your equipment.

Power Source and Earth-Grounding Requirements

📝	Use the information in this section as a guide when you plan the FSP 3000R7 system power supplies.

Shelf Power System

An FSP 3000R7 shelf ships ready to install in an equipment rack. Each shelf is equipped with at least one power supply unit (PSU), either AC or DC. The PSU connects to the appropriate power source. Input power enters the PSU, which provides the required power to the modules in the shelf.

For the SH9HU, SH7HU and SH1HU-R shelves, use two PSUs in a power-redundant operation. If a single PSU fails, the system continues to operate.

The 7HU shelf supports a combination of these PSUs:

- PSU/7HU-DC
- PSU/7HU-AC
- PSU/7HU-DC-HP
- PSU/7HU-AC-HP

General Requirements for the Site Wiring Systems

When you install the site wiring systems, you must follow national and local electrical codes and comply with these requirements.

Requirement	Definition
National and local codes	Comply with your national and local electrical codes: • In the United States: United States National Fire Protection Association (NFPA) 70 and United States National Electrical Code (NEC) • In Canada: Canadian Electrical Code, part I, CSA C22.1 • In Continental Europe: International Electrotechnical Commission (IEC) 60364, Part 1 through Part 7 • In other countries: If local and national electrical codes are not available, refer to IEC 60364, Part 1 through Part 7.
Redundancy	If full redundancy is required, provide two separate and independent power sources for each shelf. A separate circuit breaker at the power distribution point must control each power source. Use one power source for Power A, the primary power supply, and the other for Power B, the backup power supply.
Clean power	Each external power source must provide clean power to the installation site. If necessary, install a power conditioner.
Earth ground	Proper earth-grounding is mandatory at the site. Grounding prevents damage to the equipment or personal injury in dangerous fault conditions, such as lightning or over-voltages. **ELECTRIC VOLTAGE WARNING** When installing the equipment in a multi-unit rack assembly, the total electrical current loss through leakage should not exceed the maximum allowable limit. **Note**: Your facilities manager or a certified electrician can confirm whether appropriate earth-grounding is available at your site.
Overcurrent protection	The FSP 3000R7 relies on the building installation for overcurrent protection of conductors and equipment, which should be available at the installation site.
Power circuits	Power circuits and associated circuit breakers must provide sufficient power.

Requirement	Definition
Planning	When you plan the power supply for the location, consider the power requirements for any external terminals and test equipment, and for any later expansion.

DC Power Requirements

The DC-powered shelf operates at nominal –48 VDC. You can connect the positive conductor of the power source to the earth ground or isolate the positive conductor from earth ground. Normally, the DC-powered 9HU shelf and 7HU shelf have two hot-swappable DC power supply units (PSUs) installed, which provides two redundant power feeds.

The SH1HU-F/2DC, SH1HU-HP/2DC, and SH1HU/2DC shelves have one built-in DC power supply with dual power feeds, which provides power redundancy. Each PSU has autoranging capability.

See the *FSP 3000R7 Module and System Specification* for detailed specifications about the power requirements for the DC-powered shelves.

Ensure that the DC power supply fulfills these requirements:

- Has an isolated DC return (DC-I).
- Has a common DC return (DC-C).
- For input power redundancy, include two –48 V battery-based power supplies or DC rectifiers, isolated from each other.
- Provide one customer-supplied power distribution unit (PDU) per rack.
- ADVA recommends that you install the PDU on the top of a rack. The PDU must provide power at nominal –48 VDC to each shelf in the rack.

ELECTRIC VOLTAGE WARNING

The DC-powered shelf is not intended to be directly connected to a centralized DC-power system.

- Use dedicated circuit breakers in the –48 VDC path to switch the equipment on or off. For a 7HU shelf, use 20 A. For a 9HU shelf, use 35 A.
- The recommended circuit breakers for DC circuits are hydraulic magnetic circuit breakers.
- Implement the circuit breakers in the building wiring between the shelf PSU input terminals and the DC power source.

- Ensure that each shelf PSU has its own dedicated circuit breaker.

- Reliably connect the rack and DC PDU to a protective earth ground.

- For operation in USA and Canada only:
  Incorporate a readily accessible disconnecting device rated 35 A (9HU shelf) or 20 A (7HU shelf) in the building installation between the shelf PSU input terminals and the DC power source.

AC Power Source Requirements

The AC-powered shelf operates either at nominal 110 V/60 Hz or 230 V/50 Hz. Normally, each AC-powered shelf has two hot-swappable AC PSUs installed, which provides two redundant power feeds. The AC PSU works with power systems that have a neutral conductor. Each PSU has autoranging capability.

	See the *FSP 3000R7 Module and System Specification* for detailed specifications about the power requirements that each AC-powered shelf needs.

Ensure that the AC power supply fulfills these requirements:

- To achieve power redundancy, each shelf PSU has its own AC receptacle. To increase the reliability, connect the receptacles to different power phases.

- The AC receptacles are a three-conductor grounding type and on separate circuits.

- The AC receptacles are easily accessible and located within a reasonable distance, without requiring an extension cord.

- Incorporate a readily accessible, double-pole circuit breaker or fuse with the correct electric ratings according to local safety standards in each circuit.

- Locate an on-off switch between the AC receptacle and the PSU of the shelf. Instead of a dedicated on-off switch, you can consider the IEC 60320 appliance coupler as the line power disconnect.

- The AC wall attachment plug of the power cable is a three-conductor grounding type and approved for use in the specific region or country.

- Site wiring includes a ground connection to the AC power source.

Power Cable Requirements

Overview

Consider the power requirements when you connect one of these shelves to a DC power source or to the line power:

- The PSUs of a 7HU shelf
- A 40CSM-OJG/3HU shelf
- A 1HU shelf.

If redundancy is required, use two detachable DC or AC power cables. One cable is for Power A, the primary power supply, and the other for Power B, the backup power supply. Two power cables of the same length and with the same connectors constitute a cable set that belongs to a specific shelf.

A protective ground conductor is required to ground a shelf.

DC Power Cable Requirements

The detachable power cables that you use at your site depend on the type of DC power supplies you use, the voltages used, and the altitude of the site of operation. Use UL-listed flexible power cables that comply with the minimum requirements described in Table 7.

Table 7:   DC Power Cable Minimum Requirements

Number of Conductors	Minimum Wire Size	Temperature Range	Minimum Flame Resistance	Maximum Cable Length	Supply End	Equipment End	Connects To
2	10 AWG flexible	−20 to +105°C (− 4 to +221°F)	VW-1 or FT-1	3.0 m (9.84 ft)	Depends on the DC power source	Power plug D-SUB3 40 A 1x2	9HU shelf **Note**: The use of the ADVA-provided CBL/DC/300/2AWG10/SUB-D cable is mandatory.
3	14 AWG AWM-Style 1015 jacketed cable	−20 to +105°C (− 4 to +221°F)	VW-1 or FT-1	3.05 m (10.0 ft)	Depends on the DC power source	Ring lugs for terminal screws M3.5	PSU/7HU-DC-HP
3	14 AWG flexible jacketed cable	−40 to +90°C (−40 to 194°F)	VW-1 or FT-1	3.05 m (10.0 ft)	Depends on the DC power source	Ring lugs for terminal screws M3.5	PSU/7HU-DC

Table 7:   DC Power Cable Minimum Requirements

Number of Conductors	Minimum Wire Size	Temperature Range	Minimum Flame Resistance	Maximum Cable Length	Supply End	Equipment End	Connects To
4	16 AWG flexible jacketed cable	–40 to +90°C (–40 to 194°F)	VW1 or FT1	3.05 m (10.0 ft)	Depends on the DC power source	4-Pole Power Plug	SH1HU-HP/2DC**Note**: The use of the ADVA-provided CBL/DC/300/2AWG16/1HU-HP cable is mandatory.
2	16 AWG flexible jacketed cable	–40 to +90°C (–40 to 194°F)	VW-1 or FT-1	3.05 m (10.0 ft)	Depends on the DC power source	Ring lugs for terminal screws M3.5	SH1HU/2DC, SH1HU-F/2DC

> For detailed information about the power cables, see the *FSP 3000R7 Hardware Description* and *FSP 3000R7 Module and System Specification*.

Use a flat blade or isolated ring lug to fit the end of the cable that attaches to the terminal block of the shelf PSU. The ring lug should accept retaining screws with metric threads M3.5 for the PSU/7HU-DC, PSU/7HU-DC-HP, and 1HU shelf types. Fit the wires at the other end of the cable with terminals that match the connectors of the power source. The DC power cable length depends on the location of the shelf within the rack and its proximity to the PDU power connectors. DC power cables of different lengths are required.

> DC power cables fitted with ring lugs on one end are available to ship with the equipment, but you must order them separately. To place an order, contact ADVA. See the *FSP 3000R7 Hardware Description* for information about the power cables. As the customer, it is your responsiblity to assemble the appropriate terminal connectors at the wiring end that attaches to the external DC power source.

AC Power Cable Requirements

To connect a PSU/7HU-AC to line power, use a detachable, flexible AC power cable that has the correct electrical and insulation ratings in accordance with your local safety standards. The power cable and assembled connectors must display the safety agency certification mark for the specific region or country intended for installation.

Ensure that the AC power cables comply with the minimum requirements described in Table 8.

	For detailed information about the power cables, see the *FSP 3000R7 Hardware Description* and *FSP 3000R7 Module and System Specification*.

Table 8:   AC Power Cable Minimum Requirements

Region	Approvals	Number of Conductors	Minimum Wire Size	Temperature Rating	Supply End	Equipment End
North America	UL Listed, CSA certified	3	18 AWG flexible	105°C (221°F) minimum VW-1, SVT type	plug types: 18/3 SVT, NEMA 5-15P, NEMA 6-20P, L, N, PE pins plug rating: 125 VAC, 10 A	female AC appliance coupler according to IEC/EN 60320-C13
Continental Europe	VDE certified, European	3	H05W-F 1.5 mm^2 flexible	105°C (221°F)	plug type: CEE 7/7, CEE 7/4, L, N, PE pins, plug rating: 250 VAC, 10 A	
International	UL Listed, VDE certified or harmonized	3	1.5 mm^2 flexible		according to local and national electrical codes with L, N, PE pins, plug rating: 250 VAC, 10 A	

For North America, the power cable must be no longer than 4.5 meters (14.76 ft). Contact a qualified electrician for additional assistance.

	AC power cables for operation in North America, Continental Europe, and the United Kingdom can be delivered with the equipment, but must be ordered separately. For information about placing an order, contact ADVA.

	ELECTRIC VOLTAGE WARNING Do not attempt to modify or use an AC power cable that is not the exact type required.

System Earth-Grounding Conductor Requirements

To earth-ground a shelf to have a functional earth connection or protective earth connection, use an earth-grounding conductor that has these features:

Shelf type	• 9 HU shelf: Minimum 10 AWG solid or stranded copper wire • 7HU shelf, 40CSM-OJG/3HU shelf and 1HU shelf types: Minimum 12 AWG solid or stranded copper wire
Terminal types to for attaching to the shelf	• Ring lug terminal for bolt size M4, (hole diameter of 4 mm to 6 mm) • UL-listed two-hole lug, (0.25 inch holes on 0.625 centers,) for example, Thomas&Betts54205) • 6.3 mm Faston wire receptacle, female type
Insulation color	green or green and yellow stripes

	An earth-grounding conductor with ring lug terminals on either end is available and included in the earthing kit. The earthing kit ships with the equipment. For details, see the *FSP 3000R7 Hardware Description*.

Serial Cable and Ethernet Cable Requirements

Overview

Depending on the connections that you plan to create, you need Ethernet cables and a serial null modem cable or a USB cable to connect the management modules. This table lists the cable types you need for one shelf.

Table 9: Serial and Ethernet Cable Types

Data Cable Types	Interconnections
Serial null modem cable	Between NCU-II, NCU-3, NCU-S, or NCU-II-P, and the management PC

Table 9: Serial and Ethernet Cable Types

Data Cable Types	Interconnections
Ethernet straight-through cable	• Between OSCM and the management PC • Between OSCM and NCU-II, NCU-3, NCU-S, or NCU-II-P • From the CPE to a channel module SFP/GBE/ELECTRICAL/RJ45
Ethernet crossover cable	• Between NCU-II, NCU-3, NCU-S, or NCU-II-P, and the management PC • Between SCU-S to SCU-S and SCU-II to SCU-II
USB cable	Between NCU-II, NCU-3, NCU-S, or NCU-II-P and a management PC
SCU-Intercom-Kit	SCU-II or SCU-S

Serial Null Modem Cable Requirements

You must separately order the cables listed in Table 9 to include them with the equipment that ships from ADVA. For information about how to place an order, contact ADVA.

To use the serial port to connect the NCU to the management PC, you need a serial null-modem cable with two female SUB-D9 connectors. Table 10 shows the wiring information for the serial null-modem cable.

Table 10: Wiring for Serial Null Modem Cable

Pin Signal	Pin	X-Link	Pin	Pin Signal
CD — Carrier Detect	1	—	4	DTR
RxD — Receive Data	2	—	3	TxD
TxD — Transmit Data	3	—	2	RxD
DTR — Data Terminal Ready	4	—	1	DCD
GND — Signal Ground	5	—	5	GNGD
DSR — Data Set Ready	6	—	4	DTR
RTS — Request To Send	7	—	8	CTS
CTS — Clear To Send	8	—	7	RTS
RI — Ring Indicator	9	—	9	RI

Ethernet Straight-Through Cables and Crossover Cables Requirements

Use Cat 5e and Cat 6 cables that terminate with RJ45 connectors. You must use shielded Cat 5e or Cat 6 STP/FTP for all Ethernet cable lengths to ensure EMC compliance. The cables must comply with the IEEE 802.3:1998 Ethernet standard. See Table 11 for details.

📝	In this table, the maximum segment cable distance = 100 meters (328 ft)

Table 11: Ethernet Cable Types for Use with the FSP 3000R7

Cable Category Level	Cable Type	Frequency Bandwidth	Uses
Cat 5e (TIA/EIA-568-B.2)	4-pair STP	100 MHz or lower	100BASE-TX, 10Base-T
Cat 6 (ANSI/TIA/EIA-568-B.2-1)	4-pair STP/FTP	250 MHz or lower	1000Base-T, 100BASE-TX, 10Base-T

The Cat 5/Cat 6 cable wiring scheme is based on the EIA/TIA-568 standard. Whether you use striped twisted pair or solid-color twisted pair wiring, follow the appropriate wiring diagrams according to 568B, as shown in Table 12 to Table 13.

📝	In the tables that follow, for RJ45 connectors, be aware that incorrectly connected, unused wires generate noise on long lengths.

Table 12: Wiring for 10BASE-T and 100BASE-TX Straight Through and Crossover Cables

Pinout		Straight Through	Crossover	Striped Color	Solid Color
Pin 1 (TX+/RX+)		(TX+) Pin 1	(RX+) Pin 3	White/Orange	Green
Pin 2 (TX–/RX+)		(TX–) Pin 2	(RX–) Pin 6	Orange	Yellow
Pin 3 (RX+/TX+)		(RX+) Pin 3	(TX+) Pin 1	White/Green	Blue
Pin 4	(not used by 10BASE-T and 100BASE-T)	Pin 4	Pin 4	Blue	Red

Table 12: Wiring for 10BASE-T and 100BASE-TX Straight Through and Crossover Cables

Pinout		Straight Through	Crossover	Striped Color	Solid Color
Pin 5	(not used by 10BASE-T)	Pin 5	Pin 5	White/Blue	Black
Pin 6 (RX–/TX–)		(RX–) Pin 6	(TX–) Pin 2	Green	Orange
Pin 7	(not used by 10BASE-T and 100BASE-T)	Pin 7	Pin 7	White/Brown	Brown
Pin 8	(not used by 10BASE-T and 100BASE-T)	Pin 8	Pin 8	Brown	Grey
Cable End 1				Cable End 2	
Striped Color	RJ45	1000BASE-T Signal	RJ45	Striped Color	
White/Orange	Pin 1	BI_DA+ (Bi-directional Data pair +A) to BI_DA+	Pin 1	White/Orange	
Orange	Pin 2	BI_DA- (Bi-directional Data pair -A) to BI_DA–	Pin 2	Orange	
White/Green	Pin 3	BI_DB+ (Bi-directional Data pair +B) to BI_DB+	Pin 3	White/Green	
Blue	Pin 4	BI_DC+ (Bi-directional Data pair +C) to BI_DC+	Pin 4	Blue	
White/Blue	Pin 5	BI_DC– (Bi-directional Data pair –C) to BI_DC–	Pin 5	White/Blue	
Green	Pin 6	BI_DB– (Bi-directional Data pair -B) to BI_DB–	Pin 6	Green	
White/Brown	Pin 7	BI_DD+ (Bi-directional Data pair +D) to BI_DD+	Pin 7	White/Brown	
Brown	Pin 8	BI_DD– (Bi-directional Data pair -D) to BI_DD–	Pin 8	Brown	

Table 13: Wiring for 1000Base-T Crossover Cable According to 568B

Cable End 1				
Striped Color	**RJ45**	**1000BASE-T Signal**	**RJ45**	**Striped Color**
White/Orange	Pin 1	BI_DA+ to BI_DB+	Pin 3	White/Orange
Orange	Pin 2	BI_DA+ to BI_DB–	Pin 6	Orange
White/Green	Pin 3	BI_DB+ to BI_DA+	Pin 1	White/Green
Blue	Pin 4	BI_DC+ to BI_DC+	Pin 7	Blue
White/Blue	Pin 5	BI_DC– to BI_DC–	Pin 8	White/Blue
Green	Pin 6	BI_DB– to BI_DA+	Pin 2	Green
White/Brown	Pin 7	BI_DD+ to BI_DD+	Pin 4	White/Brown
Brown	Pin 8	BI_DD– to BI_DD–	Pin 5	Brown

USB Cable Requirements

To use the USB port to connect the NCU, NCU-II, and NCU-II-P to the management PC, use a USB port. The USB cable must be assembled with a standard USB type A plug on one end and a 5-pin Mini-USB type A plug on the other end. Table 14 and Table 15 show the pinouts of the plugs.

Table 14: Standard USB Type A Plug Pinout
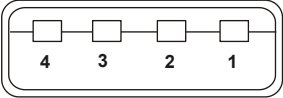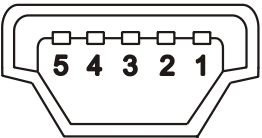
Standard A-Plug	Pin	Function	Description	Wire Color
	1	V BUS	USB power	Red
	2	D–	Negative data signal	White
	3	D+	Positive data signal	Green
	4	GND	Signal ground	Black
	Shell	Shield		Drain

Table 15: Mini-USB Type A Plug Pinout and Cable Color Code

Mini-A USB Plug	Pin	Function	Description	Wire Color
	1	V BUS	USB power	Red
	2	D–	Negative data signal	White
	3	D+	Positive data signal	Green
	4	ID	Identification	Joins to pin 5
	5	GND	Shield	Black

Telemetry Interface Cable Requirements

📝	A USB connection requires a corresponding driver in the management PC, which you can order from ADVA.

To connect the UTM to device alarm inputs and to external alarm devices, use both of these:

- A telemetry interface cable with an adequate wire gauge and
- A female HD SUB-D44 connector at one end.

Table 16: Female HD SUB-D44 Connector Pinout

Female HD SUB-D44 Connector	Pin Number	Relay Number	Signal
	31, 16, 1	Relay 1	Output 1
	32, 17, 2	Relay 2	Output 2
	33, 18, 3	Relay 3	Output 3
	34, 19, 4	Relay 4	Output 4
	5, 20		Input 1
	6, 21		Input 2
	7, 22		Input 3
	8, 23		Input 4
	9, 24		Input 5
	10, 25		Input 6
	11, 26		Input 7
	12, 27		Input 8
	13, 28		Input 9
	14, 29		Input 10
	15, 30		Input 11
	44, 43		Input 12
	42, 41		Input 13
	40, 39		Input 14
	38, 37		Input 15
	36, 35		Input 16

IEEE 1394 Interface Cable Requirements

Use the IEEE 1394 interface cable (IC300/PSCU/IEEE1394) to connect a 40CSM/2HU-#Dxx-#Dyy and a 40CSM/2HU-#19595-#19205 to the PSCU. The ends of this cable are assembled with 6-pin, male IEEE-1394 connector plugs. The IEEE 1394 interface cable is 3 meters (9.84 feet) in length. This cable ships with the 40CSM/2HU-#Dxx-#Dyy and 40CSM/2HU-#19595-#19205.

SCU-Intercom-Kit

To interconnect SCU modules, one SCU-Intercom-Kit is required. The kit includes:

- Four SFP transceivers: SFP/2G1/850I/MM/LC or SFP/2G5U/1310S/SM/LC.
- One multimode patch cable with duplex LC connectors on both ends: J/MM62/LC/DUP/0090/RED with a length of 90 cm (2.953 ft).
- One multimode patch cable with duplex LC connectors on both ends: J/MM62/LC/DUP/0500/RED with a length of 5.0 m (16.405 ft).

The number of SCU-Intercom-Kits required depends on your network element configuration.

- Use two pluggable transceivers and one patch cable with a length of 90 cm (2.953 ft) to establish an unprotected connection between two 9HU shelves, 7HU shelves, or 1HU shelves.
- Use the patch cable with a length of 5.0 m (16.405 ft) for a GbE SCU ring configuration.

	For more information, see the *FSP 3000R7 Hardware Description*.

	You must separately order the SCU-Intercom-Kit to ship with the equipment. For information about how to place an order contact ADVA.

Fiber-Optic Cable Requirements

Fiber-Optic Jumpers

When you connect optical modules within a shelf and connect adjacent shelves in a rack, you use optical jumpers in pairs. ADVA provides fiber-optic jumpers of different lengths to use for this purpose. Each jumper is color-coded and labeled according to usage. Use the labels to guide you when you connect two fibers between pairs of ports on two modules at the same time so that signal paths are clear. Client ports use multimode (core size of 62.5 µm), single-mode (core size of 9 µm), or a combination of both jumper types, depending on the type of channel module. Network ports require only single-mode fibers (9 µm), according to ITU-T G.652, G.653 and G.655.

Client Interface Fiber-Optic Patch Cables

Each channel module uses a pair of fiber-optic cables — transmission fiber and reception fiber — to connect to the CPE. In most cases, these cables terminate with LC connectors on one end and user-specific connectors on the other end. The type of cable, multimode or single-mode, and the connector can differ depending on the channel module ordered. You must supply the parts of fiber-optic cables, LC or MU to your specific connector, and adapters required to establish the optical link to the CPE. According to your requirements, you can also order these cables from ADVA, who recommends that you label the cables according to usage.

Network Interface Fiber-Optic Patch Cables

In most cases, two pairs of fiber-optic cables are required between sites, one for the east and one for the west direction.

- If you order cables from ADVA, a pair of single-mode fiber-optic cables — LC to customer-specific connector — ships with the FSP 3000R7 for each direction.
- If you supply your own cables, you must supply the adapters and additional single-mode cables required to connect to the network fiber-optic link.

ADVA recommends that you label the cables according to usage.

Optical Fiber Bundles

You can use ADVA optical fiber bundles to connect a 40-port MUX/DMX channel splitter and combiner shelf to multiple optical modules. Two variants of optical fiber bundles are available:

- J/SM/LC/OCT/0800
- J/SM/LC/HEX/0800

Optical Link Testing

To avoid issues with your installation, first test and certify all upstream and downstream fiber spans. For parameters required for testing optical links on the client side such as the ones listed here, see the appropriate channel module specifications.

- fiber type
- maximum link distance
- wavelengths
- link loss budgets

To ensure proper FSP 3000R7 system operation, network-side optical links must be pre-tested. If no test report is available, measure the loss and length in optical fibers. Table 17 lists the link tests required, the unit of measurement, and the instruments that you need to perform the tests.

Table 17: Network Span Tests

Test Description	Unit of Measurement	Measurement Instrument
Optical loss of the link at 1550 nm	Decibels (dB)	Laser source at 1550 nm and a power meter or an OTDR
Distance kilometers (km) OTDR	Kilometers (km)	OTDR
Optical return loss at 1550 nm	Decibels (dB)	Reflectometer or OTDR with reflection measurement

Cabling Requirements

- Keep power cables, data cables, and fiber-optic cables clear of foot traffic. Route power cables and fiber-optic cables in vertical cable ducts on the rack:
  - under the floor
  - through the ceiling, or
  - in protective channels or raceways.
- Maintain all limitations or restrictions for cable lengths.

Requirements for Installing the OTDR

Power Supply Requirements

The OTDR is available with AC-integrated power supplies. Each OTDR unit has its own independent power supply. The power supplies can operate at 100 to 240 V ±10%, at a frequency of 50 to 60 Hz. The OTDR total maximum power consumption is 108 W.

Earth-Grounding Conductor Requirements

Use these conductors to earth-ground the OTDR:

- For the OTDR/THC/2HU/AC, use 10 to 12 AWG solid or stranded copper wire. For the OTDR/8-OTH/1HU/AC, use 6 AWG solid or stranded copper wire.
- To attach the module to the shelf, use these terminal types:
  - Ring lug terminals large enough for the THC earth screw and rack screw to fit through the hole.
  - Appropriate UL-listed two-hole lug for the OTH earth screws and a ring lug large enough for the rack screw to fit through the hole.
- Insulation color: green or green and yellow stripes.

Power Cable Requirements

To meet international safety standards, the OTDR apparatus uses two 3-wire AC power cables. The type of power cable that ships with each OTDR depends on the country of destination. The AC power cables must comply with the requirements described in . requirements.

Table 18: AC Power Cable Requirements

Region	Minimum Wire Size	Temperature Rating	Supply End	Equipment End	Minimum Cable Rating
North America	18 AWG flexible	105°C (221°F) minimum VW-1	Plug types: 18/3 SVT, NEMA 5-15P, NEMA 6-20P, L, N, PE pins; wall plug rating: 125 VAC, 10 A	Female AC appliance coupler according to IEC/EN 60320-C13	125 VAC, 10 A
Continental Europe	H05W-F 1.5 mm flexible	105°C (221°F)	Plug type: CEE 7/7, CEE 7/4, L, N, PE pins, wall plug rating: 250 VAC, 16 A		250 VAC, 10 A
International	1.5 mm flexible		According to local and national electrical codes with L, N, PE pins, wall plug rating: 250 VAC, 10 A		250 VAC, 10 A

Data Cable Requirements

This table provides an overview of the cable types required to connect the OTDR.

Table 19: Data Cable Requirements

Data Cable Requirements	Connections
SCSI bus interface cable, ships with the OTDR	OTH to the THC
Shielded Ethernet straight-through cable with RJ45 connectors (CAT5e)	OTDR to management PC
Shielded Ethernet straight-through cable with RJ45 connectors (CAT5e)	OTDR to NCU-II, NCU-II-P, NCU-3, or NCU-S

All Ethernet cables must comply with the IEEE 802.3:1998 Ethernet standard.

Fiber-Optic Cable Requirements

Each OTH optical port uses a patch cable with these features to connect to the test fiber terminating port:

- FC/APC 8 degrees-angled connector for 1650-nm OTDR monitoring.
- Single-mode fiber.

Site Preparation

These sections describe the required tasks to prepare your site for product installation and specify the responsible team member for each task.

Shared Responsibilities

You, the customer, and ADVA share these site-preparation responsibilities:

- Identify who will install and test the FSP 3000R7 system.
- Identify where to physically locate the equipment.
- Determine the cable routing paths and routing methods such as the cable tray, conduit, or other cabling method.
- Calculate the cable distance and optical budget, and then order the appropriate cables.
- Assemble the required Ethernet cables, the serial cable, and the USB cable with the appropriate connectors, if necessary.
- Prepare the floor.

These responsibilities are included in the pre-installation process.

📄	The customer and ADVA are jointly responsible for online testing.

ADVA Responsibilities

ADVA personnel perform these installation activities as part of the FSP 3000R7 installation:

- Install the hardware at the designated location, which constitutes the basic installation.
- Earth-ground the equipment and connect the power.
- Use the appropriate cables to interconnect the network management modules.
- Connect all fiber-optic cables.
- Test the hardware and communication link, off-line.
- Commission the system, if required.

ADVA personnel use this checklist to ensure the site is ready for installation:

Task	Completed
Verify that the equipment location has an acceptable clearance for service.	
Install the PDU and test it for proper voltage.	
Install AC-power receptacles of a three-conductor earth-grounding type on separate fused circuits.	
Install and clearly label fiber-optic interface cables.	
Test the local input power. Confirm that the available power is within the power budget.	
Test client and network lines. Confirm that they do not exceed the optical budget.	
Verify that the floor tile cutouts for cable access are the correct size.	
Ensure that the site meets all temperature and humidity specifications.	
Test the fiber communication network for correct operation.	

Customer Responsibilities

All customers are responsible for these site-preparation tasks and must provide the necessary support personnel to assist with the installation.

- Provide cutouts in the floor tiles or ceiling for cable access, if necessary.
- Purchase, install, and label the racks.
- Provide all fiber-optic patch cables with the appropriate connectors. Route the cables from the FSP 3000R7 system to the existing fiber-optic network. Label all cables.
- Test and record any individual line losses.

- Install a separate PDU on the top of the rack and ensure that it supplies –48 VDC.
- Install separate branch circuits with power receptacles of a three-conductor earth-grounding type to provide AC power (100/240 V AC, 60/50 Hz), if necessary.
- Provide full-system online test.

	The customer must ensure that the site consistently conforms to all requirements and that the necessary peripherals are available to ADVA service personnel during installation.

Checking the Site

Before you install the FSP 3000R7, ensure that your site complies with the previously described requirements. To prepare an existing site for the FSP 3000R7 equipment installation, read and review the required documents. Verify that your site meets requirements for these aspects of the installation:

- Personal safety
- General location
- Equipment rack
- Ventilation
- Clearance
- Environmental
- Power source
- Cable and cabling

	Before you begin the installation process, ensure that you correct any unacceptable conditions.
NOTICE	

This section contains these topics:

Required Expertise

Only a qualified electrician must check and verify power requirements and power cable requirements.

Required Tools and Equipment

- Common measuring tools, such as a self-retracting pocket tape to measure to evaluate space requirements.
- A multimeter to measure and verify power requirements.

Associated Documentation

- Site plan or floor plan.
- Installation plan that includes details about the current electrical systems.
- Cabling plan to follow when you interconnect the modules and shelves, if required.

Chapter 4

Unpacking and Inspecting the Equipment

This section describes how to:

- Unpack and inspect the FSP 3000R7 equipment.
- Verify that you received all components.
- Verify that no shipping damage occurred.

This section also includes safety guidelines to prevent personal injury and damage to the equipment and information about how to return and repair equipment, if needed.

This section contains these topics:

Introduction

Depending on your specific order, the complete FSP 3000R7 shipment can consist of multiple boxes. Each box contains a summary of the contents and specifies the number of boxes shipped.

For most orders, the FSP 3000R7 shelf ships pre-configured in a separate box, which includes accessories and related documentation. This table provides the approximate dimensions and average weight of the shipping boxes.

> The shipping box weight is based on your specific shelf configuration.

Shelf	Outer Dimensions (H x W x D)	Weight
SH9HU	62 x 72 x 46 cm (2.1 x 2.4 x 1.5 ft)	34 kg (75.0 lbs)
SH7HU	53 x 72 x 46 cm (1.7 x 2.4 x 1.5 ft)	26.5 kg (58.4 lbs)
SH1HU-F/2DC, SH1HU/2DC, SH1HU-HP/2DC, or SH1HU-R	16 x 70 x 35 cm (0.5 x 2.3 x 1.2 ft)	5.5 kg (12.1 lbs)
SH1HU-P/DCM	13 x 60 x 40 cm (0.4 x 2.0 x 1.3 ft)	4 kg (8.8 lbs)
DCF1HU-P	15 x 68 x 43 cm (0.5 x 2.2 x 1.4 ft)	8.5 kg (18.7 lbs)
FMT/1HU	17.5 x 56 x 39 cm (0.6 x 1.8 x 1.3 ft)	6 kg (13.2 lbs)
SH1HU/PASSIVE	21 x 50 x 30 (0.7 x 1.6 x 1.0 ft)	3 kg (6.6 lbs)

Shipments for individual modules of any type, spare parts and replacement parts, or other equipment arrive in specialized boxes. After you receive your shipment, inspect the shipping boxes and their contents for any damage that might occur during shipment. Promptly assert any claims for shipment damage with the applicable transportation carrier.

When the equipment reaches its final installation location, service personnel can unpack the equipment:

- Remove the equipment — each shelf and its accessories— from the shipping box.
- Check and verify the inventory.
- Inspect the equipment.

If you discover any discrepancies, contact ADVA or your ADVA customer service representative. Save all packing material until you complete the operational inspection of the FSP 3000R7 equipment.

> Store all the shipping boxes and packing material for later use to repack the FSP 3000R7 components. For example, you might need to transport the components to another installation site or return them to the factory for repair.

Audience

This section is for trained personnel who install the FSP 3000R7. ADVA assumes that all involved personnel are aware of ESD prevention measures.

Verifying Your Shipment

To ensure that you receive a complete and accurate shipment, you need these items. FSP Network Planner provides or generates the last three items.

- A copy of the purchase order list or an equipment list.
- Information about placement of modules.
- List of jumpers.
- Optical cabling plan.

Precautions

The topics in this section provide special precautions you must take to prevent injury to yourself and damage to the equipment when you store, move, and unpack the FSP 3000R7.

Temporarily Storing Shipping Boxes

To temporarily store the shipping box, follow these guidelines:

- After you receive the encryption modules, protect them from unauthorized access until their final use.

- Examine the exterior of the shipping box for dents and punctures that would indicate possible shipping damage. Make note of any damage.

- Leave the FSP 3000R7 in the shipping box until the site is ready for the installation.

- Place each shipping box in an area that fulfills the climatic conditions specified in ETSI EN 300 019-1-1 V2.1.4 (2003-04).

- Do not expose the shipping box to

    ○ High levels of dust, smoke, or moisture.

    ○ Direct sunlight or heat sources.

Moving Your Shipment to the Installation Location

Follow these guidelines when you move the shipping box to the installation location:

- Do not move or handle the FSP 3000R7 unnecessarily.

- Before you move the shipping box to the installation location, make sure that you first properly prepare the location.

- Consolidate all ancillary equipment and any associated equipment.

- Use an appropriate moving device such as a hand truck, pushcart, or dolly to move the shipping box with the 9HU shelf or 7HU shelf to the installation location.

- Store the shipping box where adequate space is available to safely unpack the shelf.

- Place the shipping box above the ground no lower than knee height to minimize how high you need to lift the box.

- To avoid equipment damage, do not expose the shipping box or the unpacked shelf to excessive heat or direct sunlight.

- Keep the shipping box in the installation location for a minimum period of 24 hours. This necessary step prevents rapid temperature change (thermal shock) and surface condensation that can occur during unpacking.

Precautions for Lifting and Carrying the 9HU or 7HU Shelf

A fully configured 9HU shelf weighs approximately 34 kg (75.0 lbs). A fully configured 7HU shelf weighs about 27 kg (59.5 lbs). To prevent bodily injury when you unpack a shelf, you must take special precautions, as described in this section.

	LIFTING HAZARD CAUTION To avoid personal injury and/or damage to equipment, use two persons to lift and move this shelf.

Process	Lifting Guidelines for Two People to Lift a 9HU or 7HU Shelf
Lifting the Shelf	• Never attempt to lift a fully configured 9HU shelf or 7HU shelf by yourself. • Make sure a second person is available to help lift and move the 9HU or 7HU shelf. • One person needs to position him or herself at each side of the shelf and then both people slowly and simultaneously lift it. When lifting, follow these movements: • Place your feet close to the shelf and ensure that your footing is solid. • Squat down as you bend your knees and keep your back slightly arched. • Securely grasp the shelf, and then gently lift it straight up. • Lift with your legs, not with your back. • Do not twist your body while you lift.
Carrying the shelf	• Keep your back straight and walk slowly and steadily. • Do not twist your back. • To change directions, shift your feet instead of your torso.
Setting the shelf down	• Position yourself where you want to place the shelf. • Squat down, and allow your legs do the work. • Do not twist your body as you set the shelf down. • Place the shelf on a smooth surface. • Wait until the shelf is securely in place, and then release your grip.

Preventing ESD Damage

> **ELECTROSTATIC CAUTION**
>
> Each FSP 3000R7 shelf contains modules which are sensitive to electrostatic discharge. Contact to electrostatically charged persons or objects endanger these modules.
>
> Observe precautions for handling electrostatic sensitive devices. Failure to follow ESD precautions can cause irreparable damage to modules.

Always carefully handle each FSP 3000R7 shelf. Common electrostatic charges that accumulate on humans, tools, and other non-conductors or semiconductors can damage or effectively destroy modules. Electrostatic discharge (ESD) can be inconspicuous.

To avoid ESD damage, observe these precautions:

- Exclusively and always use ESD protective packaging to transport and store the shelf and its single electrostatic-sensitive parts, even if only temporarily.
- Keep the shelf in its ESD protective bag until you are ready to unpack, inspect, and mount the shelf into the rack.
- When you are ready, remove the shelf and its single electrostatic-sensitive parts from the ESD protective packaging only in a static-safe work area.
  A static-safe work area must at least consist of a
    - Dissipative mat.
    - Wrist strap for each person.
    - Common grounding facility for Earth Bonding Points.
- Immediately remove secondary packaging material, such as polyethylene bags, cardboard boxes, and so on, from the work area. These items can be a source of electrostatic charge.
- When you visually inspect the shelf for damage or prepare the shelf to mount in the rack, always place the shelf on a dissipative surface or a static dissipative mat.
- Handle the shelf only by its edges. Make sure that any exposed contact pins of interface ports have an attached cable before you touch the ports.
- Only remove a module from the shelf if you are personally earth-grounded.
- Do not hold the shelf or a module against your clothing. Even if you wear a wrist strap, your body is earth-grounded, but your clothing is not.
- Do not stack shelves or modules on top of each other.
- Always be properly earth-grounded when you add, remove, or replace modules. When you handle modules, always use an ESD kit:

- anti-static-discharge wrist strap
- wrist cord
- static dissipative mat

- Before you connect any interface cables, earth-ground yourself to dissipate any static charge you might carry.
- When you transport or store reusable shelves or electrostatic-sensitive modules, always place them in anti-static packing material.
- Do not use brushes with synthetic bristles or acid brushes to clean the shelf.

See the *FSP 3000R7Safety Guide* for additional precautions and ESD information.

Checking the Equipment Packaging Security Labels

ADVA ships a pre-configured shelf in appropriate antistatic transport bags. The contents of these bags include encryption modules, individual encryption modules, and optical modules. Unique, tamper-evident security labels seal the protective bags to ensure that no alterations or tampering occur to the equipment after it leaves ADVA. Figure 2 to Figure 4 show the packaging label location.

Figure 2:   Tamper-Evident Seal Security Label on the Antistatic Bag Closure for Optical Modules

Figure 3:   Tamper-Evident Seal Security Label on the Antistatic Bag Closure for FIPS-Certified Products

Figure 4:   Tamper-Evident Seal Security Label on the ESD Protective Bag for a Shelf

The security label is a self-adhesive, tamper-indicating sticker with the ADVA logo and a holographic image. Any attempts to remove or tamper with the contents destroy this seal. ADVA applies the seal to the packaging to protect it. At the first attempt to remove the label, the label delaminates and leaves behind a checkered pattern on the packaging material, which is clearly and permanently visible and reveals any tampering attempt.

Figure 5:   ADVA Security Label

The red security label is a self-adhesive, tamper-indicating sticker with the ADVA logo and the words Security Seal. ADVA applies this label to the packaging to protect the contents. If anyone attempts to remove the label, the label immediately delaminates and reveals the words VOID and OPEN, which makes any tampering attempt clearly and permanently visible. Figure 6 shows the security label for FIPS-certified products.

Figure 6:   ADVA Security Label for FIPS-Certified Products

📄	When you first receive your shipment, immediately check the security label for signs of tampering.

To verify tamper evidence, lift any part of the label half-way off. The major part of the label must remain adhered to the packaging material and show no signs of tampering. If so, the label is intact, and no tampering occurred. An intact transport label indicates that the packaging was not opened, and the equipment inside was not modified. A label that you can easily and completely remove from the packaging material, below which you see a

printed checkered pattern that remains on the packaging material, is criterion for tamper evidence.

Any evidence of tampering indicates that the authenticity of the encryption modules might be questionable. Receiving or authorized personnel must proceed with identification and qualification of the tampering.

📝	Do not use the equipment if the security label is broken or damaged in any way.

Shipment Contents and Accessories

1HU Shelf, 7HU Shelf, and 9HU Shelf Shipments

Each 1HU shelf and 7HU shelf (SH7HU) shipment consists of one equipment package that ships with the standard items and the accessories listed in this next table . A 1HU equipment shelf shipment can include a SH1HU-F/2DC, SH1HU/2DC, SH1HU-HP/2DC, or SH1HU-R shelf.

The 9HU shelf (SH9HU) ships without the CEM/9HU and the fan modules and therefore can consist of multiple packages.

Table 20: 1HU Shelf, 7HU Shelf, and 9HU Shelf Shipments — Standard Items

Quantity	Standard Items	Remarks
1	1HU shelf, 7HU shelf, or 9HU shelf with two appropriate 19-inch rack mount brackets, pre-installed.	Pre-configured as ordered
1	Front cover (7HU shelf and 9HU shelf only)	Pre-installed, if ordered
1	ESD adapter pack (7HU shelf only) including: • 1 ESD connection adapter • 2 mounting screws M 3x8	Included
1 pair	ETSI customized brackets for a 1HU shelf, 7HU shelf, or 9HU shelf	Included
1 pair	ETSI brackets for a 1HU shelf, 7HU shelf, or 9HU shelf	Included

Table 20: 1HU Shelf, 7HU Shelf, and 9HU Shelf Shipments — Standard Items

Quantity	Standard Items	Remarks
1 pair	23-inch NEBS brackets for a 1HU shelf, 7HU shelf, or 9HU shelf	Included
1	Earth-grounding kit for a 9HU shelf, 7HU shelf, and 1HU shelf, which includes: • 1 protective earth-grounding conductor with ring lugs on each end. The length is 50 cm (1.641 ft), 5.26 mm lug, 10 AWG wire. • 2 cage nuts M6 1.83-2.64 mm, which consists of 2 parts • 2 Pozidriv screws M6X16 • 2 lock washers M6 • 2 plain washers M6	Included
1	Introduction Folder containing: • Cover sheet, printed • FSP 3000R7 User Documentation Suite • Critical Warnings, printed • Shipment Contents list, printed • *FSP 3000R7 Safety Guide*, printed	Included

Table 21: 1HU Shelf, 7HU Shelf, and 9HU Shelf Shipments — Accessories

Quantity	Accessories	Remarks
1	FAN/1HU, only for the SH1HU-R/PF	If ordered
1	FAN-FILTER-SET/1HU pack, which includes: • 10 x replaceable air filter pad for the SH1HU-R/PF • 20 x replaceable air filter pad for the PSU/1HU-R-AC-200 and the PSU/1HU-R-DC-200	If ordered
2	3-conductor DC power cable, 3 m (9.8 ft) long, PC300/3WIRE/RED/BLACK/14AWG, only for the 7HU shelf	If ordered
2	2-conductor DC power cable, 3 m (9.8 ft) long, CBL/DC/300/2AWG16/TB, only for the 1HU shelf	If ordered
2	2-conductor DC power cable, 3 m (9.8 ft) long,CBL/DC/300/3AWG14/TB, only for the 7HU shelf only	If ordered

Table 21: 1HU Shelf, 7HU Shelf, and 9HU Shelf Shipments — Accessories

Quantity	Accessories	Remarks
2	2-conductor DC power cable, 3 m (9.8 ft) long, CBL/DC/300/2AWG10/SUB-D, only for the 9HU shelf only	If ordered
2	DC power cable equipped with a 4-pole power plug, 3 m (9.8 ft) long, CBL/DC/300/2AWG16/1HU-HP, only for the SH1HU-HP/2DC shelf	If ordered
2	Country-specific AC power cable, each 2.0 m (6.5 ft) long, for the AC-powered 7HU shelf and 1HU shelf rear power access	If ordered
2	Power cable locking clamps, only for AC-powered 1HU shelves	If ordered
1	SCU-Intercom-Kit pack that includes: • 4 SFP transceivers, SFP/2G1/850I/MM/LC or SFP/2G5U/1310S/SM/LC • 1 duplex patch cable with LC connector (J/MM62/LC/DUP/0090/RED), 90 cm (2.953 ft) in length • 1 duplex patch cable with LC connector (J/MM62/LC/DUP/0500/RED), 5.0 m (16.405 ft) in length	If ordered
1	Standard A-to-Mini-USB-A cable	If ordered
1	Serial null modem cable that has two female SUB-D9 connectors	If ordered
1	Ethernet straight-through cable	If ordered
1	Ethernet crossover cable	If ordered
as ordered	IC1/HBNCP/BNCJ/100 coaxial interconnect cable equipped with an HD-BNC plug and BNC jack	If ordered
as ordered	Optical jumpers to use for both inter-shelf or external connections	If ordered
1	Attenuator kit pack that includes 10 x 3 dB, 10 x 5 dB, 10 x 10 dB, and LC type connectors	If ordered
1	NEBS-KIT/9HU kit pack that includes: • 1 pair air baffles • 2 mounting screws, M3x8 CSK TORX-T10 ZN	If ordered

Table 21: 1HU Shelf, 7HU Shelf, and 9HU Shelf Shipments — Accessories

Quantity	Accessories	Remarks
1	COVER EXTENSION/7HU/9HU kit pack that includes: • 1 pair front-cover adapter slide • 1 pair front-cover adapter base • 8 screws, M3X4 CSK TORX-T10 A2	If ordered

Shipments for the DCM Shelf, Passive Shelf, and Fiber Management Shelf

Each DCF1HU-P, SH1HU/PASSIVE, and FMT/1HU shipment contains one equipment pack that ships with the standard items listed in this table.

Table 22: Shipment Items for the SH1HU/PASSIVEShelf

Quantity	Standard Items	Remarks
1	An SH1HU/PASSIVE shelf with two pre-installed, 19-inch rack-mount brackets. A front panel covers each slot.	Ships without optical filter modules
1 pair	ETSI brackets	Included
1 pair	23-inch NEBS brackets	Included

Table 23: Shipment Items for the DCF1HU-P Shelf Shipment

Quantity	Standard Items	Remarks
1 Package	A DCF1HU-P shelf with an integrated DCF spool	Shelf variant as ordered
1 pair	19-inch brackets	Included
1 pair	ETSI brackets	Included
1 pair	23-inch NEBS brackets	Included

Table 24: Shipment Items for the FMT/1HU Shelf

Quantity	Standard Items	Remarks
1	FMT/1HU shelf	
1 pair	19-inch brackets	Included
1 pair	ETSI brackets	Included
1 pair	23-inch NEBS brackets	Included

Unpacking a 7HU Shelf

A pre-configured 7HU shelf ships in an appropriate shipping carton. The inner packaging is an ESD protective bag sealed with a unique tamper-evident security label.

⚠	**CAUTION** Only service personnel are allowed to perform this procedure.

📖	Review the guidelines in Precautions before you open the shipping box and unpack a 7HU shelf.

📝	To ensure module integrity, do not allow any unauthorized person access to pre-configured shelves that contain encryption modules, either classified or unclassified.

NOTICE	Use caution when you handle and transport an empty FSP 3000R7 shelf. To prevent damage to the backplane connectors, make sure that no items fall into the shelf or onto the backplane.

Required Tools and Equipment

- Utility scissors or a utility knife
- An appropriately grounded surface or an anti-static mat where you can place the shelf

Procedure

📝	Make sure that the shipping box stays was in the installation location for a minimum of 24 hours. This precaution prevents thermal shock and surface condensation when you unpack the box.

⚠	**LIFTING HAZARD CAUTION** The 7HU shelf is heavy. To avoid personal injury and/or damage to equipment, use two persons to remove the shelf from the shipping box, one at each side.

⚠	**ELECTROSTATIC CAUTION** Keep the shelf in its ESD protective bag until you are ready to inspect it.

1. Using two people, move the shipping box with the 7HU shelf to the location where you plan to install the shelf.
2. Open the shipping box:
   a. Use a utility knife or scissors to cut open the band-clamps strapping on the shipping box.
   b. Lift the cap with the handles on the right side and left side of the box to open it.
3. Lift the tray from the top of the shelf and set the tray aside.
4. Inventory the contents.
   A packing slip is located on the cap front side. Compare the contents of the trays with the packing slip and the copy of the purchase order list or equipment list. ADVA provides this list to ensure complete and accurate shipment. Make a note of any missing items, if necessary.
5. Visually inspect and check all standard items and accessories for external damage. Make a note of any damage, if applicable.
6. Remove the 7HU shelf from the shipping box.

1. Place your feet close to the shelf, with one person at each side.
2. Securely grasp the underside of the shelf body with your hands.
3. At the same time, gently lift straight up.
4. Use extreme care when you lift the shelf out of the shipping box, especially if no front cover is mounted, to prevent damage to the fiber-optic connectors or the optical fiber jumpers.
5. Move the shelf to the prepared work area.
6. While the shelf is still protected in its ESD protective bag, place the shelf on a static dissipative mat. Ensure that the shelf is secure before you release your grip.

NOTICE	Do not drop the shelf on a hard surface, which can damage internal components.

Continue with these steps.

1. Check the security label on the ESD protective bag for signs of tampering, as described in Checking the Equipment Packaging Security Labels.

   - If the security label is damaged in any way, stop unpacking, contact your manager, and immediately notify your customer service representative or ADVA.
   - If the security label is intact, go to the next step.

2. Break the security label seal, remove the ESD protective bag from the shelf, and set the bag aside.

3. If the front cover is mounted, remove it from the shelf and set it aside.

4. Verify that you have the proper shelf type. To identify the shelf type, look at the label:

   - On the 7HU shelf rear panel
   - On the top of 1HU shelf

5. Check the shelf for shipping damage, completeness, and proper configuration, as described in Inspecting an FSP 3000R7 Shelf and Identifying Modules.

6. Make a note of any damaged or missing items, if applicable.

7. Save the shipping box and the packaging material for re-use.

	Do not destroy or discard the shipping box. Flatten and save the box and the packaging material. You can use the box and packaging materials to safely transport a shelf, or if necessary, return the shelf to the factory for repair.

If any item is missing or damaged, immediately notify your customer service representative or ADVA.

Unpacking a 1HU Shelf

A pre-configured 1HU shelf ships in an appropriate shipping carton. The inner packaging, an ESD protective bag, is sealed with a unique tamper-evident security label. A 1HU shelf can be an SH1HU-F/2DC, SH1HU-HP/2DC, SH1HU-R, or SH1HU-R/PF.

	CAUTION Only service personnel are allowed to perform this procedure.

	Review the guidelines in Precautions before you open the shipping box and unpack a 1HU shelf.

	To ensure module integrity, do not allow any unauthorized person access to pre-configured shelves that contain encryption modules, either classified or unclassified.

NOTICE	Use caution when you handle and transport an empty FSP 3000R7 shelf that does not containsystem modules. To prevent damage to the backplane connectors, make sure that no items fall into the shelf or onto the backplane.

Required Tools and Equipment

- Utility scissors or a utility knife
- An appropriately grounded surface or an anti-static mat where you can place the shelf

Procedure

	Make sure that the shipping box stays was in the installation location for a minimum of 24 hours. This precaution prevents thermal shock and surface condensation when you unpack the box.

	ELECTROSTATIC CAUTION Keep the shelf in its ESD protective bag until you are ready to inspect it.

1. Move the cardboard box that contains the 1HU shelf to the location where you plan to install the shelf.

2. Open the cardboard box on the upper side:
   a. Use a utility knife or scissors to cut open the adhesive tape. Do not damage the flaps.
   b. Lift the flaps towards you so that the box is completely open.

3. Inventory the contents.
   Compare the contents of the box with the packing slip and the copy of the purchase order list or equipment list. ADVA provides this list to ensure complete and accurate shipment. Make a note of any missing items, if applicable.

4. Visually check all items and accessories for external damage. Make a note of any damaged or missing items, if found.

5. Check the security label on the ESD protective bag for signs of tampering, as described in Checking the Equipment Packaging Security Labels.
   If the security label is damaged in any way, stop unpacking, contact your manager, and immediately notify your customer service representative or ADVA. If the security label is intact, go to the next step.

6. Break the security label seal, and then remove the 1HU shelf and the accessories from the cardboard box.

7. Keep the shelf wrapped in its ESD protective bag, and then place the shelf on an antistatic mat.

8. When you are ready to inspect the shelf, remove the ESD protective bag from the shelf and set it aside.

9. Verify that you have the proper shelf type. To identify the shelf, look at the shelf type label on the top of the shelf.

10. Check the shelf for shipping damage and proper configuration, as described in Inspecting an FSP 3000R7 Shelf and Identifying Modules.

11. Save the cardboard box and the packaging material for re-use.

	Do not destroy or discard the shipping box. Flatten and save the box and the packaging material. You can use the box and packaging materials to safely transport a shelf, or if necessary, return the shelf to the factory for repair.

If any item is missing, or if any item is damaged, notify your customer service representative or ADVA immediately.

Unpacking a DCM Shelf

Each DCM shelf shipment consists of one equipment pack. The DCM-P/xx modules are not included and ship separately. The DCM shelf ships with two 19-inch rack mount brackets, pre-installed. Each slot is covered by a front panel.

	CAUTION
	Only service personnel are allowed to perform this procedure.

	Review the guidelines in Precautions before you open the shipping box and unpack a DCM shelf.

Required Tools and Equipment

- Utility scissors or a utility knife
- An appropriately grounded surface or an anti-static mat where you can place the shelf

Procedure

	Make sure that the shipping box stays was in the installation location for a minimum of 24 hours. This precaution prevents thermal shock and surface condensation when you unpack the box.

	ELECTROSTATIC CAUTION
	Keep the shelf in its ESD protective bag until you are ready to inspect it.

1. Move the cardboard box with the DCM shelf to the location where you plan to install the shelf.

2. Open the cardboard box on the upper side:
   a. Use a utility knife or scissors to cut open the adhesive tape. Do not damage the flaps.
   b. Lift the flaps toward you so that the box is completely open.

3. Remove all of the contents from the cardboard box.

4. Verify that you have the proper shelf type. To identify the shelf type, look at label on the top side.

5. Verify that you have these items. Make a note of any missing items, if applicable.
   - 1 x ETSI bracket pair
   - 1 x ETSI customized bracket pair
   - 1 x 23-inch NEBS bracket pair
   - 1 x Introduction Folder that contains
     - Cover sheet (printed)
     - *FSP 3000R7 Safety Guide* (printed)
     - Critical Warnings (printed)

6. Visually check the DCM shelf for signs of external damage. Make a note of any damaged or missing items, if applicable.

7. If you do not immediately mount the DCM shelf to the rack, return the shelf to the cardboard box and close the box. Otherwise, save the cardboard box and the packaging material for re-use.

> Do not destroy or discard the shipping box. Flatten and save the box and the packaging material. You can use the box and packaging materials to safely transport a shelf, or if necessary, return the shelf to the factory for repair.

For any issues, see these solutions:

1. If the product was damaged during transit, immediately file a claim with the transportation company and report the extent of any damage. Notify your ADVA customer service representative or ADVA. Have this information ready:
   - Shipper's invoice number
   - Name of the damaged unit
   - Serial number and item number of the damaged unit
   - Description of the damage
   - Effect of the damage on the installation

If you need to return a damaged unit to the factory, see Equipment Return and Repair. Order replacement equipment, if necessary.

2. If any standard item is missing, immediately notify your ADVA customer service representative or ADVA .

3. If your shipment contained an incorrect unit, contact ADVA customer service representative or ADVA. For contact details, see the Preface.

Unpacking a Module-Integrated DCM Shelf

Each DCF1HU-P shipment consists of one equipment pack. The DCF1HU-P shelf and accessories ship in a cardboard master box that contains the shelf in a Styrofoam unit box.

⚠	**CAUTION** Only service personnel are allowed to perform this procedure.

👤📖	Review the guidelines in Precautions before you open the shipping box and unpack a DCF1HU-P.

Required Tools and Equipment

- Utility scissors or a utility knife
- An appropriately grounded surface or an anti-static mat where you can place the shelf

Procedure

⚠	**ELECTROSTATIC CAUTION** Keep the shelf in its ESD protective bag until you are ready to inspect it.

1. Move the cardboard box with the DCF1HU-P to the location where you plan to install the shelf.

2. Open the cardboard box on the upper side:
   a. Use a utility knife or scissors to cut open the adhesive tape. Do not damage the flaps.
   b. Lift the flaps toward you so that the box is completely open.

3. Remove the Styrofoam unit box that contains the shelf and place the Styrofoam box on a grounded surface or an anti-static mat.

4. Remove all contents from the cardboard box.

5. Verify that you received the required rack-mounting hardware:
    - 1 x 19-inch bracket pair
    - 1 x ETSI bracket pair
    - 1 x ETSI customized bracket pair
    - 1 x 23-inch NEBS bracket pair
    - 1 x screw pack that includes eight screws to fit the brackets

    Make a note of any missing items, if applicable.

6. Inspect all items for damage.

7. Open the unit box and remove the cover.

8. Remove the DCF1HU-P shelf from the unit box and place the shelf on a grounded surface or an anti-static mat.

9. Visually check the DCF1HU-P for signs of damage. Make a note of any damaged or missing items, if applicable.

10. Verify that you have the proper DCF1HU-P shelf type. Identify the shelf by looking at the shelf type label on the side of the shelf.

11. If you do not immediately mount the DCF1HU-P to the rack, return the shelf to the unit box and close the box. Otherwise, save the unit box for re-use including all shipped contents: the rack-mounting hardware, packaging material, and the cardboard box.

> Do not destroy or discard the shipping box. Flatten and save the box and the packaging material. You can use the box and packaging materials to safely transport a shelf, or if necessary, return the shelf to the factory for repair.

For any issues, see these solutions:

1. If the product was damaged during transit, immediately file a claim with the transportation company and report the extent of any damage. Notify your ADVA customer service representative or ADVA. Have this information ready:
    - Shipper's invoice number
    - Name of the damaged unit
    - Serial number and item number of the damaged unit
    - Description of the damage
    - Effect of the damage on the installation

    If you need to return a damaged unit to the factory, see Equipment Return and Repair. Order replacement equipment, if necessary.

2. If any standard item is missing, immediately notify your ADVA customer service representative or ADVA .

3. If your shipment contained an incorrect unit, contact ADVA customer service representative or ADVA. For contact details, see the Preface.

Unpacking a 1HU Passive Shelf

The FSP 3000R7 1HU passive shelf shipment can contain:

- The SH1HU/PASSIVE/FT that ships with a fiber management tray.
- The SH1HU/PASSIVE that ships without a fiber management tray.

In this document, the term *1HU passive shelf* refers to both the SH1HU/PASSIVE/FT and the SH1HU/PASSIVE.

Required Tools and Equipment

- Utility scissors or a utility knife
- An appropriately grounded surface or an anti-static mat where you can place the shelf

Procedure

1. Move the cardboard box with the 1HU passive shelf to the location where you plan to install the shelf.

2. Open the cardboard box on the upper side:
   a. Use a utility knife or scissors to cut open the adhesive tape. Do not damage the flaps.
   b. Lift the flaps towards you so that the box is completely open.

3. Remove the Styrofoam unit box that contains the shelf and all other contents from the cardboard box.

4. Verify that you received the rack-mounting hardware for front mounting:
   - 1 x ETSI bracket pair
   - 1 x NEBS bracket pair
   - 1 x 19-inch bracket pair
   - 4 x screw M5x10 CSK TORX-T25 A2

   Make a note of any missing items, if applicable.

5. Visually check the 1HU passive shelf for signs of external damage and that all parts are

complete.

6. Save the cardboard box and the packaging material for re-use.

📝	Do not destroy or discard the shipping box. Flatten and save the box and the packaging material. You can use the box and packaging materials to safely transport a shelf, or if necessary, return the shelf to the factory for repair.

If any items are damaged or missing, immediately notify your customer service representative or ADVA.

Unpacking a ROADM-C40/40/2-3HU-2DC Shelf

Each ROADM-C40/40/2-3HU-2DC shelf shipment contains one ROADM-C40/40/2-3HU-2DC shelf, an installation kit, and fiber jumper labels.

⚠️	**CAUTION** Only service personnel are allowed to perform this procedure.

📖	Review the guidelines provided in Precautions before you open the shipping box and unpack a ROADM-C40/40/2-3HU-2DC shelf.

Required Tools and Equipment

- Utility scissors or a utility knife
- An appropriately grounded surface or an anti-static mat where you can place the shelf

Procedure

⚠️	**ELECTROSTATIC CAUTION** Keep the shelf in its ESD protective bag until you are ready to inspect it.

1. Move the cardboard box with the ROADM-C40/40/2-3HU-2DC shelf to the location where you plan to install the shelf.

2. Open the cardboard box on the top:

   a. Use a utility knife or scissors to cut open the adhesive tape. Do not damage the flaps.

   b. Lift the flaps toward you so that the box is completely open.

3. Remove all contents.

4. Look at the shelf label on the side to identify that you have the proper shelf type.

5. Verify that you have:

   - Mounting brackets, 19 inch to 23 inch (only for 23-inch rack installations)

   - Shelf mounting screws

   - Red 14 -gauge wire

   - Black 14 -gauge wire

   - Ring terminals

   - 10 A fuses

   Make a note of any missing items, if applicable.

6. Visually check the ROADM-C40/40/2-3HU-2DC shelf for signs of external damage.

7. If you do not immediately mount the ROADM-C40/40/2-3HU-2DC shelf in a rack, return the shelf to its cardboard box and close the box. Otherwise, save the cardboard box and all packaging material for re-use.

	Do not destroy or discard the shipping box. Flatten and save the box and the packaging material. You can use the box and packaging materials to safely transport a shelf, or if necessary, return the shelf to the factory for repair.

For any issues, see these solutions:

1. If the product was damaged during transit, immediately file a claim with the transportation company and report the extent of any damage. Notify your ADVA customer service representative or ADVA. Have this information ready:

   - Shipper's invoice number

   - Name of the damaged unit

   - Serial number and item number of the damaged unit

   - Description of the damage

   - Effect of the damage on the installation

   If you need to return a damaged unit to the factory, see Equipment Return and Repair. Order replacement equipment, if necessary.

2. If any standard item is missing, immediately notify your ADVA customer service representative or ADVA .

3. If your shipment contained an incorrect unit, contact ADVA customer service representative or ADVA. For contact details, see the Preface.

Unpacking an FMT/1HU Shelf

Each FMT/1HU fiber management shelf shipment consists of one equipment pack. The DCF1HU-P shelf and accessories ship in a cardboard master box that contains the shelf in a Styrofoam unit box.

	CAUTION Only service personnel are allowed to perform this procedure.
	Review the guidelines in Precautions before you open the shipping box and unpack a FMT/1HU shelf.

Required Tools and Equipment

- Utility scissors or a utility knife
- An appropriately grounded surface or an anti-static mat where you can place the shelf

Procedure

	ELECTROSTATIC CAUTION Keep the shelf in its ESD protective bag until you are ready to inspect it.

1. Move the cardboard box that contains the fiber management shelf to the location where you plan to install the shelf.
2. Open the cardboard box on the top:
    - Use a utility knife or scissors to cut open the adhesive tape. Do not damage the flaps.
    - Lift the flaps towards you so that the box open completely open.
3. Remove the Styrofoam unit box that contains the shelf and all other contents from the cardboard box.

4. Verify you have this rack-mounting hardware:

   - 1 x 19-inch bracket pair. The shelf is pre-installed with 19-inch brackets.
   - 1 x ETSI bracket pair.

   Make a note of any missing items, if applicable.

5. Visually check the fiber management shelf for completeness and signs of external damage.

6. If you do not immediately mount the fiber management shelf to the rack, return the shelf to the cardboard box and close the box. Otherwise, save the cardboard box and the packaging material for re-use.

> Do not destroy or discard the shipping box. Flatten and save the box and the packaging material. You can use the box and packaging materials to safely transport a shelf, or if necessary, return the shelf to the factory for repair.

For any issues, see these solutions:

1. If the product was damaged during transit, immediately file a claim with the transportation company and report the extent of any damage. Notify your ADVA customer service representative or ADVA. Have this information ready:

   - Shipper's invoice number
   - Name of the damaged unit
   - Serial number and item number of the damaged unit
   - Description of the damage
   - Effect of the damage on the installation

   If you need to return a damaged unit to the factory, see Equipment Return and Repair. Order replacement equipment, if necessary.

2. If any standard item is missing, immediately notify your ADVA customer service representative or ADVA .

3. If your shipment contained an incorrect unit, contact ADVA customer service representative or ADVA. For contact details, see the Preface.

Inspecting an FSP 3000R7 Shelf

When you receive your shelf:

- Look for any visible damage.
- Ensure the parts are complete.

- Confirm proper configuration of the shelf.
- Verify that all modules are installed, seated, and securely fastened.

	For convenience in this document, these shelf types are referred to as the shelf: the 9HU shelf, 7HU shelf, 40CSM-OJG/3HU shelf, and the 1HU. Any differences between these types are noted.

	CAUTION Only service personnel are allowed to inspect all FSP 3000R7 shelves and perform the procedures in this section.

	ELECTROSTATIC CAUTION To avoid possible ESD damages to sensitive circuit boards, implement and maintain adequate measures of ESD damage prevention.

	ADVA assumes that you are familiar with the FSP 3000R7 equipment and aware of the precautions you need to take to avoid damage to the equipment.

Complete the instructions in these sections to comprehensively inspect an FSP 3000R7 shelf:

Verifying the FSP 3000R7 Shelf Configuration

Many customers order their shelves pre-configured based on their specific requirements. Any changes that you make to your configuration requirements as the ship date approaches can cause differences between your site plan and the delivered configuration.

Each shelf ships with two pre-installed 19-inch rack-mount brackets. An appropriate dummy module occupies each empty shelf, if applicable. Jumper pairs interconnect optical modules. Unused optical ports are equipped with blind plugs or dust plugs, which are pluggable transceivers.

Required Tools and Equipment

- ESD-preventive wrist strap or other personal grounding device.
- Suitable grounded surface or an anti-static mat where you will place the shelf.
- FSP Network Planner generates a shelf view that shows the types and placement of all modules within the shelf. Print and use this shelf view for guidance when you inspect the shelf.
- FSP Network Planner-generated optical cabling plan.

Procedure

Complete these steps to check the optical jumper connections:

1. Verify that the optical modules interconnect as specified in the optical cabling plan that FSP Network Planner generates.
2. Visually inspect the optical jumpers and connectors for any possible damage.
3. Verify that the connectors on both ends of the jumpers are properly engaged.
4. If a plug slips from its optical port, see the generated FSP Network Planner optical cabling plan for information.
5. Clean the slipped connector plug of the optical jumper. Use an alcohol swab or lint-free absorbent wipes to clean the ferrules of the optical connector.
6. Use a fiber scope to inspect disconnected optical receptacles for cleanliness. If the receptacle is soiled and dirty, use a fiber-optic cleaning kit to carefully clean the receptacle. See Basic User-Supplied Tools.
7. Gently reconnect the jumper to the corresponding optical port. Be sure the plug clicks into place to ensure that it is properly seated.

Continue with these steps.

1. Check that each optical port that does not contain an optical jumper is equipped with a blind plug or a dust plug, which are pluggable transceivers. If not, insert a proper blind plug or dust plug into the open receptacle.
2. If available, re-mount the front cover to the shelf.
3. If you do not need to immediately mount the shelf to the rack, completely and securely place the shelf in the ESD protective bag. If you do mount the shelf right away, save the ESD protective bag and the original shipping box.

> Do not destroy or discard the ESD protective bag. Fold the bag and save it with the other packaging material. You can use the bag later to safely transport a shelf or, if necessary, return the shelf to the factory for repair.

4. Detach the wrist strap from your wrist and remove the ground plug from the grounded ESD jack.

For any issues, see these solutions:

1. If the product was damaged during transit, immediately file a claim with the transportation company and report the extent of any damage. Notify your ADVA customer service representative or ADVA. Have this information ready:
    - Shipper's invoice number
    - Name of the damaged unit
    - Serial number and item number of the damaged unit
    - Description of the damage
    - Effect of the damage on the installation

    If you need to return a damaged unit to the factory, see Equipment Return and Repair. Order replacement equipment, if necessary.

2. If any standard item is missing, immediately notify your ADVA customer service representative or ADVA .

3. If your shipment contained an incorrect unit, contact ADVA customer service representative or ADVA. For contact details, see the Preface.

Continue with these steps:

1. Use the printed shelf-view diagram to verify that each module within the shelf is the proper type. See Identifying Modules.
2. Verify that each module in the shelf is in its proper physical location.
3. Verify that each module is tightly secured in the slot. If necessary, use your thumb and forefinger to tighten the knurled screws on the faceplate.
4. Ensure that each pluggable-based channel module is correctly fitted with pluggable transceivers:
    a. Identify each transceiver type and verify that it is inserted in the corresponding cage of the proper channel module. See Identifying Pluggable Transceivers.
    b. If the transceivers are not yet inserted, separate boxes in the shipment include the transceivers that you ordered. Make sure that you insert the correct transceivers into the corresponding cages of the proper channel module based on the configuration that you ordered. You can use the shelf view or optical cabling plan for help.
    c. Verify that each transceiver is properly inserted in the cage.

Identifying Modules

This section describes how to identify FSP 3000R7 plug-in modules such as:

- PSUs

- Management supervision

- Optical protection switch modules

- Channel modules

- Optical filter modules

- Optical amplifiers

- Dispersion Compensation Modules.

To accurately identify a module, look at the module faceplate label and the module type label for the module name, serial number, and item number. Each item number has ten digits that begin with the numbers 006370.

Faceplate

The module name, serial number and item number are located on each module faceplate. Figure 7 shows an example.

Figure 7:   Example of Type Designations on the SCU Faceplate
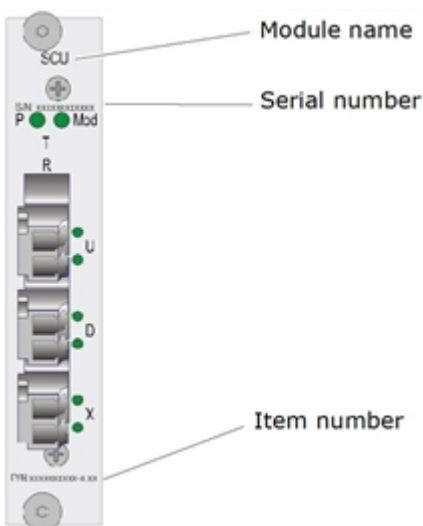
To ensure that you have the proper module, use this guideline:

> The printed item number of specific module faceplate = The item number of this module as listed in the packing slip and in your copy of the purchase order list.

Module Type Label

Look at the module type label located on the board cover of each module to find this information. See Figure 8.

- Module name
- Serial number

- Item number
- Relevant module-specific information.

Figure 8:   Example of a SCU-II Module Type Label
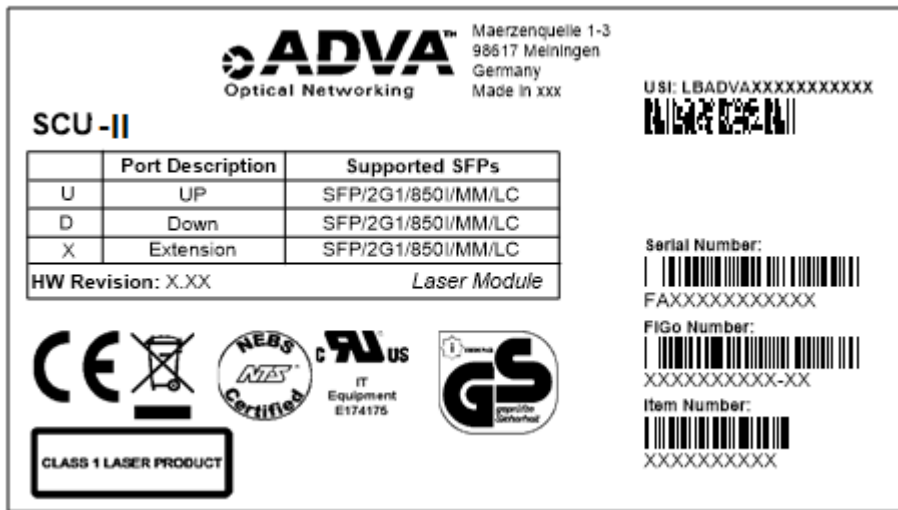
Reading the Module Type Label

	ELECTROSTATIC CAUTION
⚠️	To avoid possible ESD damages to sensitive circuit boards, ensure that you are grounded with a wrist strap or equivalent while removing and reinserting a module.

This procedure is common and applies to all module types. When you perform this procedure, we assume that you are:

- Familiar with how to handle FSP 3000R7 modules and optical fibers.
- Aware of the precautions you need to practice to avoid damage to the equipment.

Procedure

1. Attach a wrist strap to your wrist and snap the ground wire to the wrist band. Insert the ground plug into a grounded ESD jack.
2. Loosen the knurled screws on the module faceplate.
3. Carefully pull the module out of the shelf until you can see the side label. Ensure that the optical jumpers bend no more than a radius of 30 mm.
4. Use the FSP Network Planner optical cabing plan to compare the items on the module type label with the designations for this module in your plan.
5. Reinsert the module and tighten the screws.
6. Detach the wrist strap from your wrist and remove the ground plug from the grounded ESD jack.

Identifying Pluggable Transceivers

The term *pluggable transceiver* always refers to any *x*FP transceiver, such as SFP transceivers, XFP transceivers, and CFP transceivers.

The type label affixed to the top of each ADVA-approved pluggable transceiver accurately identifies the transceiver type. The label includes the transceiver type, serial number, item number, and other relevant information, as shown in Figure 9.

Figure 9:   Example of a DWDM SFP Transceiver Type Label

	For more information about pluggable transceiver naming and labeling, see the *FSP 3000R7 Hardware Description*.

	ELECTROSTATIC CAUTION To avoid possible ESD damages to sensitive circuit boards, ensure that you are grounded with a wrist strap or equivalent while removing and reinserting a pluggable transceiver.

This procedure is common and applies to all pluggable transceiver types. When you perform this procedure, we assume that you are:

- Familiar with how to handle pluggable transceivers and optical fibers.
- Aware of the precautions you need to practice to avoid damage to the equipment.

Procedure

	The transceiver is locked in the cage. Never pull on the fibers in an attempt to extract the transceiver. Always disconnect the fibers before you extract the transceiver. If you pull on the fibers to extract the transceiver, damage to equipment will occur.

1. Attach a wrist strap to your wrist and fasten the earth-grounding cable to the ESD grounding point located in your work environment.
2. Disconnect the fiber pair from the transceiver port. Be careful to avoid any damage to the optical fibers and connectors.
3. To remove the pluggable transceiver from the cage:
   a. Unlock the transceiver, and then gently pull the bale-clasp downwards.
   b. If you cannot grasp the transceiver with your fingers, use a small flat blade screwdriver.
   c. Grasp the bale-clasp to pull the transceiver from the cage.

	If you have to use a force that exceeds 11 Newton (ca. 2.5 lbf) to extract a pluggable transceiver, stop immediately. Ensure that the component is truly unlocked and try again. Do not forceably remove the transceiver.

4. Read the label. Compare the items on the label with the designations for this transceiver in the FSP Network Planner optical cabling plan .

5. Reinsert the pluggable transceiver into the empty cage:

   a. Use your thumb and forefinger to grasp the transceiver on the narrow sides. The optical port should be facing toward you, with the host connector on the left.

   b. Ensure that the bale-clasp is in the upright position and moves toward you.

   c. Gently insert the pluggable transceiver into the empty cage until it locks into place. Listen for the click to confirm that you completely inserted the transceiver and that it is securely seated in the cage. If you cannot completely insert the transceiver, remove it, turn it over, and insert it again.

6. Reconnect the fiber pair to the transceiver port.

7. Detach the wrist strap from your wrist and disconnect the earth-grounding cable from the ESD grounding point.

Inspecting the ROADM-C40/40/2-3HU-2DC Shelf

Complete these steps to check the ROADM-C40/40/2-3HU-2DC shelf for external damage when you receive the shelf. Follow the same guidelines as described in Inspecting an FSP 3000R7 Shelf.

Procedure

1. Attach a wrist strap to your wrist and snap the ground wire to the wrist band. Insert the ground plug into a grounded ESD jack.

2. Place the ROADM-C40/40/2-3HU-2DC on a grounded surface or antistatic mat.

3. Visually inspect the shelf housing for signs of external damage. If the shelf receives any damage during transit, make a note of it.

4. Verify that you have the proper shelf type. Check the shelf label located on the side of the shelf.

5. Print the FSP Network Planner shelf view to help you verify that the shelf is complete. Make a note of any missing items.

> 📝 Because the ROADM-C40/40/2-3HU-2DC ships with no installed SFP modules in the management ports, be sure to separately order these modules.

6. Detach the wrist strap from your wrist and remove the ground plug from the grounded ESD jack.

If you discover any discrepancies, report them to ADVA customer service. See Inspecting an FSP 3000R7 Shelf.

Unpacking and Inspecting Optical Modules

Complete the steps in this section to unpack and inspect optical modules and verify that no shipping damage and tampering occurred in transit. Unless otherwise specified, the term optical module refers to:

- all types of channel modules
- encryption modules
- optical filter modules
- optical protection switch modules
- OSC modules
- reconfigurable optical layer devices
- optical amplifiers
- dispersion compensation modules

If instructions apply only to a specific module type. for example, an encryption module, that type is specified.

Each optical module is placed in an antistatic bag sealed with a tamper-evident transport label to ensure product integrity. The bag with the module ships in an anti-static foam container. As soon as you receive the shipment, check the optical modules for shipping damage and perform a performance test on the module.

	In most situations, the receiving department will verify only the external packaging material.

	CAUTION Only service personnel are allowed to perform this procedure.

	ELECTROSTATIC CAUTION To prevent damage from electrostatic discharge (ESD) take standard anti-static precautions when unpacking and inspecting optical modules. It is important that the antistatic bags only be opened at static-free work stations.

> To ensure module integrity, do not allow any unauthorized person access to pre-configured shelves that contain encryption modules, either classified or unclassified.
>
> When modules might be unattended, store them in a secured and locked location that has limited access, such as a cabinet, lock box, and so forth.

Required Tools and Equipment

- Utility scissors or a utility knife to open the shipping box.
- ESD-preventive wrist strap or other personal grounding device.
- Suitable grounded surface or an anti-static mat to place the shelf.

Procedure

> **NOTICE**
>
> Do not use the encryption module if the security label is cut or broken, or the antistatic bag is damaged.
>
> If any evidence of tampering occurs, do not use the encryption module under any circumstances. Immediately contact your manager.

1. Unpack the equipment from the shipping carton. Use the packing list to verify that all items are present.
2. Remove the antistatic bag that contains the module from the anti-static foam shipping container.
3. Before you unpack the module from the antistatic bag, check the security label on the bag for any evidence of tampering. See Checking the Equipment Packaging Security Labels.

   - An intact security label indicates that the packaging was not opened, and that the optical module was not modified after the manufacturer shipped it.
   - If the security label is cut or broken, or the bag is damaged, stop unpacking and contact your manager.
   - If the transport label and the bag are intact, go to the next step.

1. Break the ADVA transport label seal and open the bag.
2. Carefully remove the module from the antistatic bag, and then immediately place it on a grounded surface or an antistatic mat to avoid ESD damage.

   - Do not slide the component over any surface.
   - Avoid touching areas of integrated circuitry.

3. Verify that the module is the proper type. For help, see Identifying Modules.

Complete these steps to visually inspect the module for any physical damage and impurities incurred during shipment.

1. If necessary, use canned, dry, oil-free compressed air to blow away any impurities.
2. Carefully check the plug-in board connector of the optical module for dirt, any deformation in the shape of the pin holes, or any exterior damage.
3. Check for damage on the EMI shielding gasket on the module faceplate edges.
4. Check the fiber-optic connector receptacles on the faceplate for damage and whether the receptacles are fully fitted with protective plugs.
5. For channel modules with pluggable interfaces, check whether the appropriate dust plugs cover the interface cages.
6. Make sure that the knurled screws are not bent or damaged in any way.
7. Check for loose parts.
8. For encryption modules, check the module for visible signs of tampering. The most obvious signs the module was tampered with are:
   - Damaged rivet heads and screws.
   - Tiny scratch marks, showing fresh, shiny metal around the rivets or screws.
   - Tiny nicks around the edges of the cover.
   - Dents and scuff marks on the cover as a result of brute force.
   - Damaged security seals on the module (currently WCC-PCN-100G-F only).
   If you find no damage or evidence of tampering, the module is ready to be installed.

Continue with these steps:

1. If you accidentally drop the optical module on a hard surface or damage the module in any way, do not install it. Return the damaged module to ADVA for examination and repair. See Equipment Return and Repair.
2. Save the cardboard box and the antistatic packing material to store the equipment or to reship the equipment if needed. If you ship the equipment without the original packing material, ADVA can void the warranty.

Equipment Return and Repair

These sections provide information about how to request a Return Merchandise Authorization (RMA) and instructions to return damaged or defective hardware to ADVA:

> ⚠️ **CAUTION**
>
> Dispose of this product according to the laws and regulations of your country and local government authorities. Do not dispose of this product in ordinary garbage containers. It is your responsibility to delete your private data before you dispose the product.

Obtaining an ADVA RMA Number

Before you send damaged or defective hardware to the manufacturer for repair or replacement, first obtain a Return Materials Authorization (RMA) number from ADVA. This number confirms that the defective hardware is eligible to return for repair. ADVA will only process shipments that have an RMA number and will return any shipments without an RMA number to the sender at the sender's expense.

Complete these steps to obtain an RMA number from ADVA.

1. Log in with your partner login at: www.adva.com.
2. Enter the RMA service call as directed in the web site, and then save the Repair and Return Request-Form (RRF) on your computer.
3. Fill out all questions on the RRF. Make sure you have this information ready:
   - Your company name and the correct address, contact person, phone number, fax number, and E-mail address.
   - Item number and serial number of the unit to be repaired.
   - Description of the damage to the unit.

> 📝 ADVA will only allocate the RMA number if you submit this form, and the form contains all requested information.

4. Print and sign the RRF.
5. Fax the completed and signed RRF to ADVA to:
   +49 (89) 8906 65847
   ADVA will send you the allocated RMA number.

> 📝 After you receive the RMA number, you are then authorized to ship the defective unit to ADVA. Use the RMA number to track the status of the request.
>
> For more information about the ADVA RMA policy, e-mail support@adva.com.

Returning FSP 3000R7 Hardware

Follow these guidelines when you return damaged or defective hardware to ADVA for repair:

- First perform a full factory reset before you return a failed encryption module to the manufacturer as an RMA. This process deletes all critical security parameters stored on the module. For details, see *FSP 3000R7 Network Element Director (NED) Online Help*. Use a tamper-evident packaging.
- Use the original shipping box and packing material for optimum equipment protection. Insert the component into a static shielding bag to avoid ESD damage.
- Carefully package your unit to ensure a safe shipment.
- Clearly mark the outside of the shipping box with the appropriate RMA number.
- Ship only equipment that ADVA authorizes.
- Include the packing slip and the approved RRF (RMA acknowledgment) in the shipping box with the unit.
- Unless otherwise contractually agreed to, send the defective unit to this address:

  ADVA
  Attention: RMA Return
  Maerzenquelle 1-3
  98617 Meiningen-Dreißigacker
  Germany

Chapter 5

Installing Shelves

This section contains these topics:

Introduction

	Before you install the FSP 3000R7 system, carefully read Prerequisites for Installation and Site Planning and Preparation in this guide. Also carefully read the *FSP 3000R7 Safety Guide*. These documents provide important information to help you avoid personal injury and equipment damage because of incorrect usage.

	CAUTION All actions involving power and tool usage must be performed only by qualified service personnel, but never by users.

You can install the FSP 3000R7 equipment during normal working hours with no need to schedule the installation during non-operating hours.

Based on the configuration of your order, the FSP 3000R7 shelves ship with or without pre-installed system modules. Carefully handle empty shelves during transport and installation to avoid any damage to the backplane connectors. To protect backplane connectors from bent pins or other damage, observe these precautions when you handle an empty FSP 3000R7 shelf:

- Use caution when you handle and transport an empty FSP 3000R7 shelf. After you remove the protective covering, pay attention that no items fall into the shelf and onto the backplane.
- Do not set hand tools or other objects down inside the shelf.
- Use an empty FSP 3000R7 shelf only for its intended use.
- Avoid inappropriate use of mechanical tools.
- Do not touch the backplane connector pins.

The preferred mounting for all FSP 3000R7 shelf types is a 19-inch rack or cabinet. You can also mount a shelf into a standard NEBS open rack or an ETSI-compliant rack by using the appropriate adapter brackets. Mount each shelf by bolting its bracket pair to the rack.

ADVA does not deliver racks or cabinets. For information about how to install the cabinets or racks and the cable management kits, see the manufacturer's instructions. Be careful to not compromise the stability of the racks when you install the equipment.

Here are some more guidelines.

1. Customers must provide the PDU, based on the rack type. For detailed information about how to install a PDU and connect power, see the manufacturer's instructions.
2. Only qualified or licensed electricians or other professionals must perform the steps to earth-ground the power and set up protective earth-grounding from the site to the racks or cabinets.
3. To avoid equipment damage, first complete the installation procedures in this section. Then apply power.
4. Two people are necessary to move and mount a fully populated 9HU shelf or 7HU shelf, which is heavy and cumbersome to move.
5. Take this precaution when you install a shelf that was not pre-staged with modules, or if you make changes to existing installations:
   After you remove the protective covering, ensure that no items fall into the shelf and onto the backplane.

	The illustrations in this section are for reference only and based on the latest hardware revision available at the time of document creation. The equipment you receive might look different from the these illustrations.

> 📄 In all descriptions of a position relative to a unit, the reference point is that of you facing the front edge of the unit. Any exceptions clearly stated.
>
> The term *NCU* applies to the NCU-3, NCU-II, NCU-II-P, and NCU-S modules.

Audience

This section is for service personnel and qualified and trained equipment installers. These personnel will rack-mount and earth-ground a shelf and complete power-cabling tasks. To be qualified, personnel must have the knowledge and practical experience of mechanics and electrical engineering. They must be aware of the various hazards associated with working on a shelf and know how to take reasonable precautions to prevent personal injury and equipment damage.

Associated Documentation

FSP Network Planner generates the last three items.

- Installation plan
- Optical cabling plan
- Information about the placement of modules and shelves
- Jumper list

Installing the SH9HU, SH7HU, and 1HU Equipment Shelves

Complete the procedures in this section to rack-mount these shelves:

- FSP 3000R7 9HU shelf (SH9HU)
- 7HU shelf (SH7HU
- 1HU equipment shelf — a SH1HU-F/2DC, SH1HU-HP/2DC, or SH1HU-R/PF

This section also includes steps to earth-ground the shelves, install power cables, and test earth-grounding and DC power connections. Additionally, this section provides relevant safety and equipment precautions.

	CAUTION
⚠️	Only service personnel are allowed to complete the procedures in this section.

This section contains these topics:

Fitting the ESD Connection Adapter to a Shelf Bracket

All shelf modules are ESD-sensitive devices. When you physically work with modules in an operating shelf, you must always ground your body by wearing a wrist strap. This strap connects to the ESD connection adapter, which attaches to the shelf bracket. This precaution prevents ESD damage to the sensitive circuit boards of the modules.

	ELECTROSTATIC CAUTION
⚠️	To avoid possible ESD damages to sensitive circuit boards, do not remove the shelf from anti-static packaging until you are ready for fitting the ESD connection adapter to the appropriate bracket.
	Observe standard precautions for handling shelves containing ESD-sensitive devices.

We assume that you are familiar with the ESD-prevention precautions you must take to avoid ESD damage to the equipment.

Required Tools and Equipment

- ESD adapter pack that contains 1 ESD connection adapter and 2 M3x8 mounting screws, included in the shipping box.
- Torx screwdriver TX10 for the ESD-adapter screws M3x8.
- Torx screwdriver TX20 for the adapter-bracket screws.
- Appropriate grounded surface or an antistatic mat where you can place the shelf.

Procedure

1. Remove the 7HU shelf from its shipping box and place the shelf on a grounded flat surface or antistatic mat.

2. Remove the ESD protective bag from the box and set the bag aside.

3. If the front cover is mounted, press the outer black latches and pull the shelf toward you to remove the cover.

4. Set the front cover aside.

5. Determine whether to fit the ESD adapter to the left or right bracket of the shelf.

To fit the ESD adapter to a 19-inch bracket or to a NEBS/ETSI bracket, consider the these guidelines:

- Before you fit the shelf to a 19-inch bracket, to avoid damage to the pre-installed jumpers, use the Torx screwdriver TX20 to remove the ESD adapter bracket. Turn the two screws that fix the 19-inch bracket counter-clockwise until you completely remove them from the threaded holes. Set the screws aside for reuse.

- When you fit the shelf to a NEBS or ETSI bracket, you can fit the ESD adapter to the bracket if attached to the shelf. For this reason, you can first replace the pre-installed 19-inch brackets described in Fitting a 7HU Shelf with ETSI or NEBS Brackets.

Continue with these steps.

1. Remove the ESD connection adapter and the two mounting screws from their packaging. Set these aside so you can reinsert them when ready.

2. Grasp the ESD adapter and align the two threaded holes and the appropriate two holes of the disconnected bracket.

3. Verify that the position or direction you plan to use to attach the ESD adapter is correct.

4. Insert the two M 3x8 mounting screws into the threaded holes.

5. To secure the ESD adapter bracket, use a Torx screwdriver TX10 to tighten the screws.

6. After you fit the ESD adapter to a 19-inch bracket, reattach the bracket to the shelf (see Figure 10):

a. Align the three threaded holes of the shelf side panel with the bracket holes.

b. Reinsert the three fixing screws into the threaded holes.

c. Use a Torx TX20 screwdriver to tighten the bracket to the shelf and secure the bracket.

Figure 10:   Attached ESD Connection Adapter
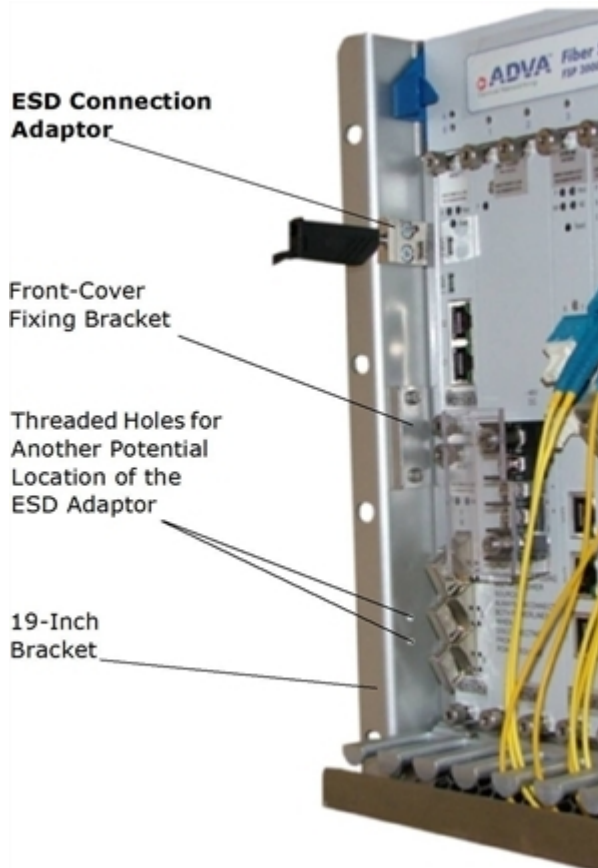
7. Whether you complete the installation or plan to resume the installation at a later time, reattach the front cover. (see Figure 10).

Fitting the 9HU, 7HU, and 1HU Shelves with ETSI or NEBS Brackets

You can mount the FSP 3000R7 9HU shelf, 7HU shelf types, and 1HU equipment shelf types to open racks or into customer cabinets of the specified standard widths: 19 inch, 21 inch, and 23 inch. These shelves also fit into a 300-mm (0.984 ft) deep ETSI rack.

The 9HU shelf, 7HU shelf types, and 1HU equipment shelf types ship pre-installed with 19-inch brackets. If you plan to mount a shelf to an ETSI or NEBS compliant rack, first remove the 19-inch brackets, and then fit the appropriate adapter bracket pair.

The ETSI, NEBS, and 19-inch brackets are fitted on the outside of the left and right side walls. The ETSI and NEBS brackets ship with the 9HU shelf, 7HU shelf, and 1HU equipment shelves.

Complete the steps in these topics to fit the brackets and mounting the shelves to the rack:

Fitting a 9HU Shelf with ETSI or NEBS Brackets

Bracket requirements:

- ETSI brackets to adapt the 9HU shelf to the ETSI standard rack dimensions.
- NEBS brackets to adapt the 9HU shelf to the NEBS standard rack dimensions.

⚠️	**ELECTROSTATIC CAUTION** To avoid possible ESD damages to sensitive circuit boards, do not remove the shelf from anti-static packaging until you are ready to commence fitting it with the appropriate brackets. Observe standard precautions for handling shelves containing ESD-sensitive devices.

We assume that you are familiar with the ESD-prevention precautions you must take to avoid ESD damage to the equipment.

Required Tools and Equipment

- 1 x ETSI bracket pair or 1 x NEBS bracket pair
- Torx screwdriver TX10 for the bracket screws
- Torx screwdriver TX20 for the adapter bracket screws
- Approrpriate earth-grounded ed surface or an antistatic mat to place the shelf

The shipping box contains the ETSI and NEBS bracket pairs.

Figure 11: ETSI and NEBS Adapter Brackets for a 9HU Shelf
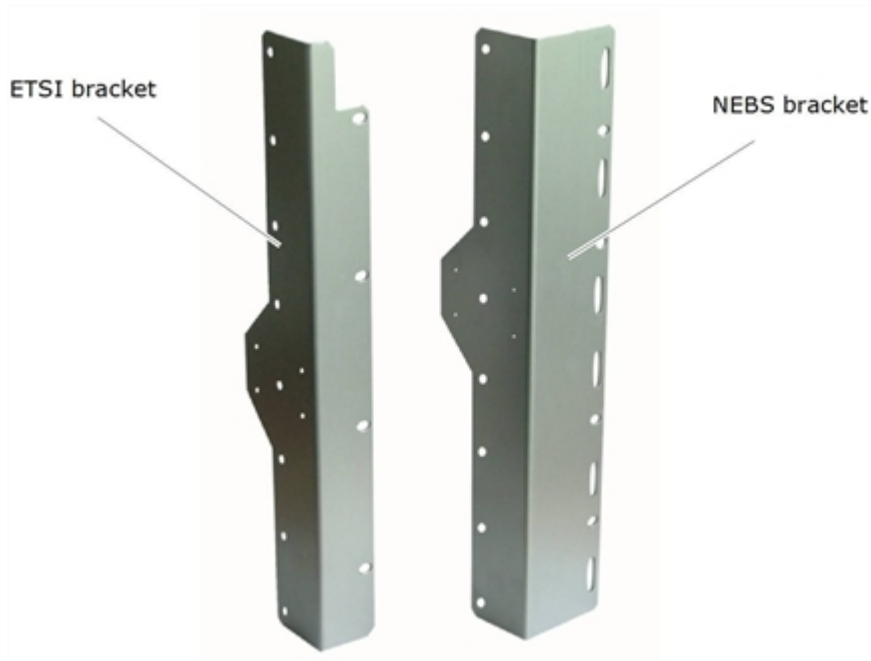
Procedure

1. Remove the 9HU shelf from its shipping box and place the shelf on an earth-grounded surface or antistatic mat.

2. Remove the ESD protective bag from the shelf and set the bag aside.

3. Remove the ETSI or NEBS brackets included in the rack-mount kit from the plastic bag.

4. If the front cover is mounted, press the outer black latches and pull the cover toward you to remove it.

5. Set the front cover aside.

6. Remove the 19-inch bracket on one side panel of the shelf:

   a. Use the Torx screwdriver TX20 to turn the four screws that affix the 19-inch bracket in the counter-clockwise direction. Continue to turn the screws until you completely remove them from the thread holes and set them aside.

   b. Remove the bracket.

   A small fixing bracket that holds the front cover in place attaches to the dismounted 19-inch bracket (see Figure 12).

Figure 12:   Front Cover Fixing Bracket on the 19-Inch Bracket

Front-Cover
Fixing Bracket
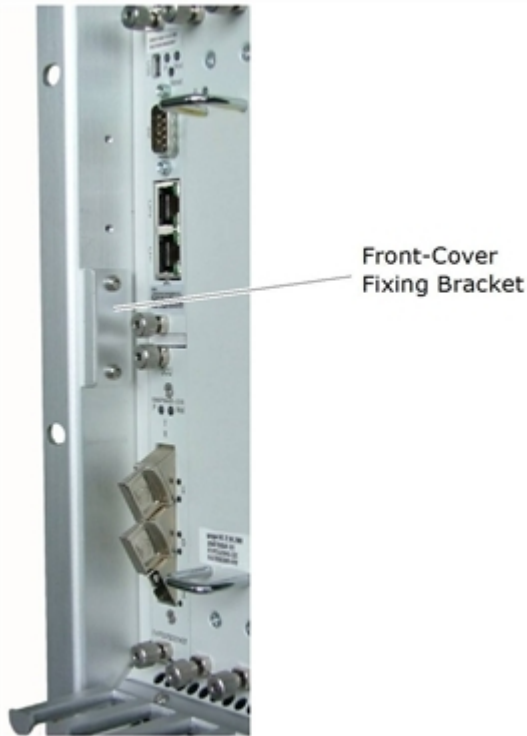
7. Remove the fixing bracket from the 19-inch bracket and set it aside.

   a. Use the Torx TX10 screwdriver to turn the two screws of the fixing bracket in the counter-clockwise direction until you completely remove them from the threaded holes. Set the screws aside.

   b. Remove the fixing bracket.

8. Reattach the fixing bracket to the ETSI or NEBS bracket:

   a. Place the fixing bracket on the ETSI or NEBS bracket as shown in Figure 13.

   b. Align the two threaded holes of the fixing bracket with the holes of the ETSI or NEBS bracket.

   c. Insert the two screws into the threaded holes.

   d. Use a Torx TX10 screwdriver to tighten the screws and secure the fixing bracket to the NEBS or ETSI bracket.

9. Fit the ETSI or NEBS bracket to the shelf:

   a. Place the appropriate ETSI or NEBS bracket on the same side of the shelf in the correct position as illustrated in Figure 17. Align the four threaded holes in the shelf side panel and the holes of the bracket.

   b. Reinsert the four fixing screws into the threaded holes.

   c. Use a Torx TX20 screwdriver to tighten the screws and secure the bracket to the shelf.

Figure 13:   Fitting the ETSI and NEBS Adapter Brackets to a 9HU Shelf
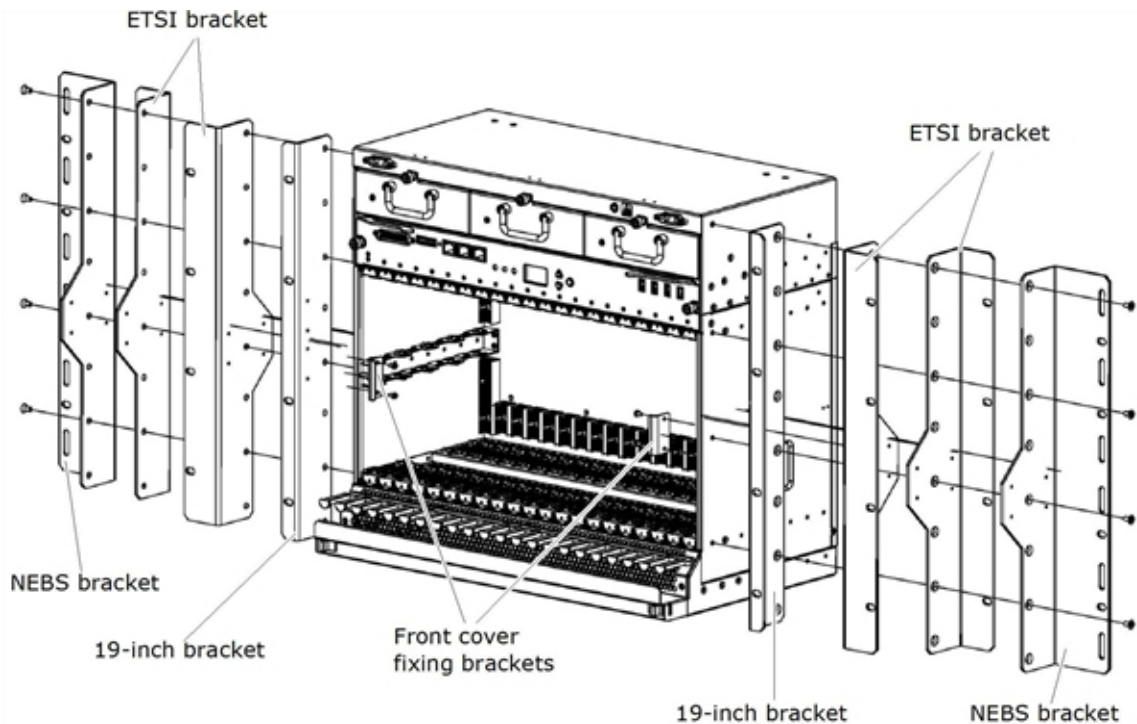
Continue with these steps.

1. Save the 19-inch bracket with the packaging material.

2. Repeat previous set of steps for the opposite side.

3. To reattach the front cover, press the outer black latches and release them onto the fixing brackets after you complete the procedure.

Fitting the 9HU Shelf with Air Baffles

If your configuration is for NEBS applications, your installation requires front-aisle to rear-aisle airflow. In this case, use only the manufacturer-provided air baffles (plates) for the 9HU shelf (SH9HU). If no air baffles are required, you must cover the air outlets at the top of the 9HU shelf side panels.

NOTICE	Do not fit the air baffles if you plan to use the 9HU shelves in back-to-back configurations. The use of air baffles in a back-to-back configuration causes the shelves to accumulate excessive heat and the modules to overheat.

⚠	**ELECTROSTATIC CAUTION** To prevent damage from ESD wear an ESD wrist strap or use a similar individual grounding device when fitting the air baffles.

We assume that you are familiar with the ESD-prevention precautions you must take to avoid ESD damage to the equipment.

Required Tools and Equipment

- 1 air baffle pair
- 2 mounting screws M3x8 CSK to affix the air baffles
- Torx screwdriver TX10
- Appropriate earth-grounded surface or an antistatic mat to place the shelf

Figure 14:   Air Baffles for the SH9HU — Exterior Surface
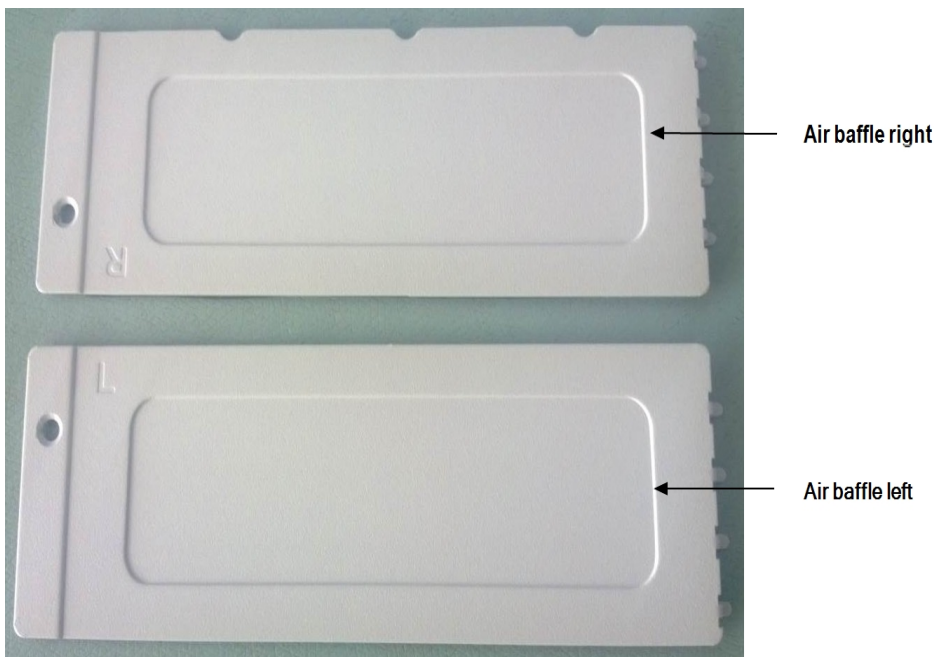
Figure 15:   Air Baffles for the SH9HU — Reverse Side
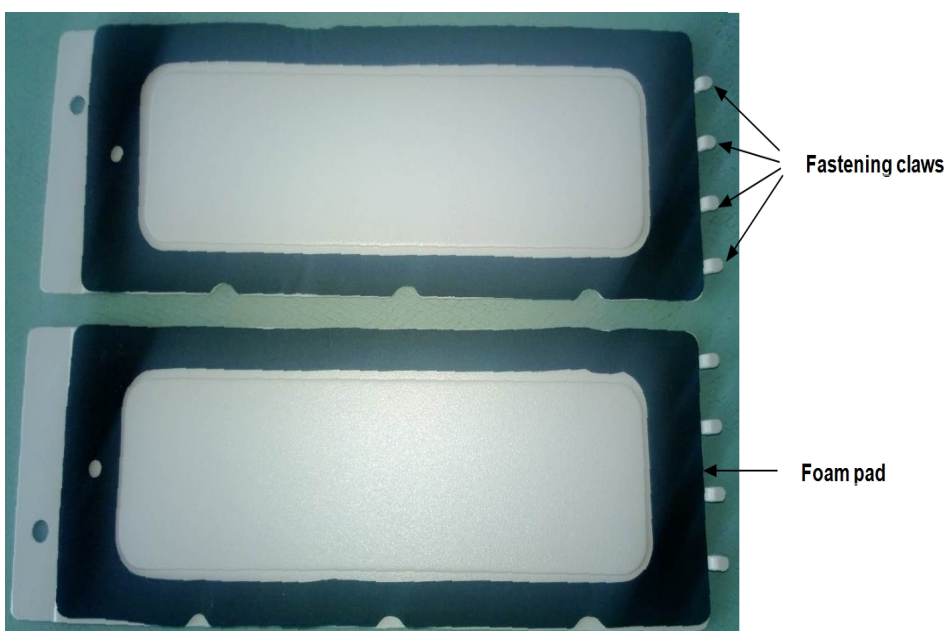
The air baffles are marked with R for the right and L for the left side panels on the shelf. One side of the baffles has a foam pad to for noise reduction and to protect the baffle when mounted.

Procedure

1. Place the SH9HU on an earth-grounded surface or antistatic mat.
2. Remove the air baffles and the mounting screws from the plastic bags, which are included in the NEBS-KIT/9HU.
3. Use the TX10 screwdriver to turn the screw that affixes to the side panel in the counter-clockwise direction until you completely remove it from thread hole. Set the panel aside.
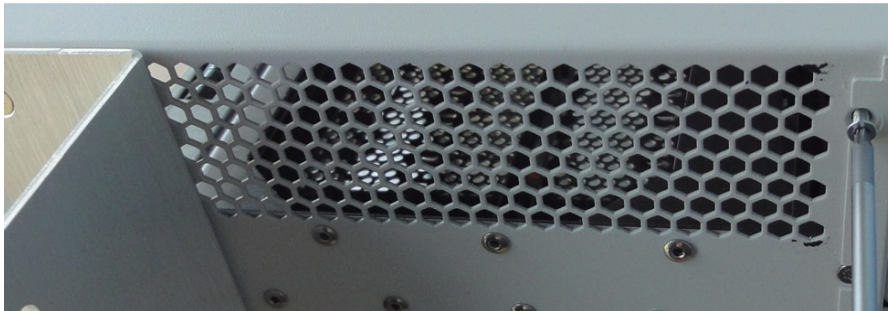
4. Fit the air baffle to the side panel:
   a. Hold the appropriate air baffle and insert the fastening claws into the corresponding air outlets (holes) as shown in the next figure.
   b. Move the other end of the baffle toward the shelf side panel so that the threaded hole aligns with the hole in the baffle.

5. Insert the supplied mounting screw M3x8 into the threaded hole.

6. Use the TX screwdriver to tighten the baffle to the shelf side panel and secure the panel.

7. Save the screw for later use.
8. Repeat this procedure on the opposite side.

Fitting a 7HU Shelf with ETSI or NEBS Brackets

Required brackets:

- ETSI brackets to adapt the SH7HU (*7HU shelf*) to the ETSI standard rack dimensions.
- NEBS brackets to adapt the 7HU shelf to the NEBS standard rack dimensions.

	ELECTROSTATIC CAUTION
⚠	To avoid possible ESD damages to sensitive circuit boards, do not remove the shelf from anti-static packaging until you are ready to commence fitting it with the appropriate brackets.
	Observe standard precautions for handling shelves containing ESD-sensitive devices.

We assume that you are familiar with the ESD-prevention precautions you must take to avoid ESD damage to the equipment.

Required Tools and Equipment

- 1 x ETSI bracket pair or 1 x NEBS bracket pair
- Torx screwdriver TX10 for the front-cover fixing brackets
- Torx screwdriver TX20 for the adapter-bracket
- Appropriate grounded surface or an antistatic mat to place the shelf

The ETSI and NEBS bracket pairs shown Figure 16 are included in the shipping box.

Figure 16:   ETSI and NEBS Adapter Brackets for a 7HU Shelf
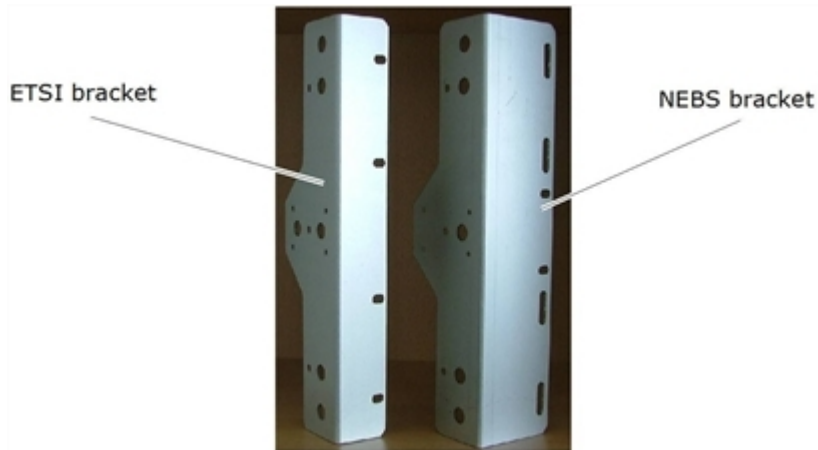
Procedure

1. Remove the 7HU shelf from its shipping box and place the shelf on a grounded flat surface or an antistatic mat.

2. Remove the ESD protective bag from the shelf and set the bag aside.

3. Remove the ETSI or NEBS brackets from the plastic bags. The brackets are included in the rack-mount kit.

4. If the front cover is mounted, press the outer black latches to remove the cover from the shelf and pull the cover toward you.

5. Set the front cover aside.

6. Remove the 19-inch bracket on one side panel of the shelf:
   a. Use the Torx screwdriver TX20 to turn the three screws that affix the 19-inch bracket in the counter-clockwise direction until you completely remove the screws from thread holes. Set the screws aside.

   b. Remove the bracket.

A small fixing bracket that holds the front cover attaches to the dismounted 19-inch bracket, shown here.
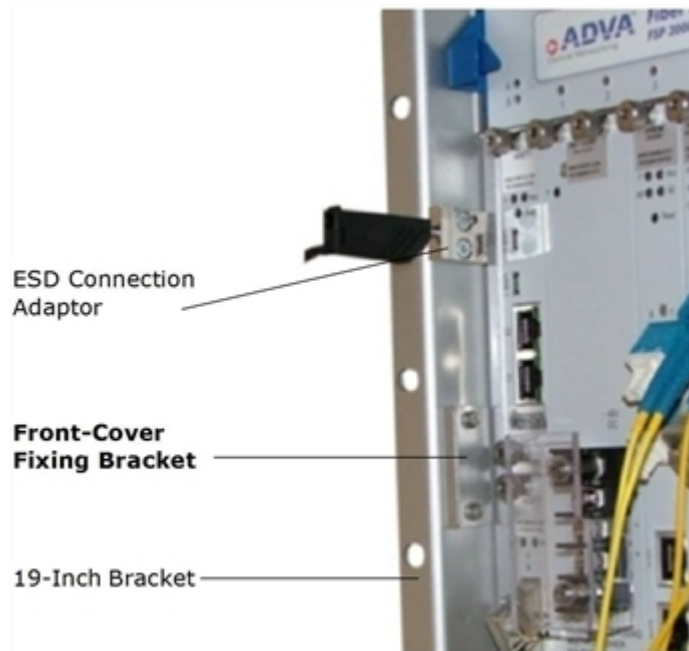
7. Remove the fixing bracket and set it aside:
    a. Use the Torx screwdriver TX10 to turn the two screws of the fixing bracket in the counter-clockwise direction until you completely remove the screws from the threaded holes. Set the screws aside.
    b. Remove the fixing bracket.

8. Reattach the fixing bracket to the ETSI or NEBS bracket:
    a. Align the two threaded holes of the fixing bracket with the holes of the ETSI or NEBS bracket.
    b. Reinsert the two screws into the threaded holes.
    c. Use the Torx TX10 screwdriver to tighten the screws and secure the fixing bracket to the NEBS or ETSI bracket.

9. Fit the ETSI or NEBS bracket to the shelf:
    a. Place the appropriate ETSI or NEBS bracket on the same side of the shelf in the correct position as illustrated in this figure. Align the three threaded holes in the shelf side panel with the bracket holes.
    b. Reinsert the three fixing screws into the threaded holes.
    c. Use the Torx TX20 screwdriver to tighten the screws and secure the bracket to the shelf.

Figure 17:   Fitting the ETSI and NEBS Adopter Brackets to an 7HU Shelf
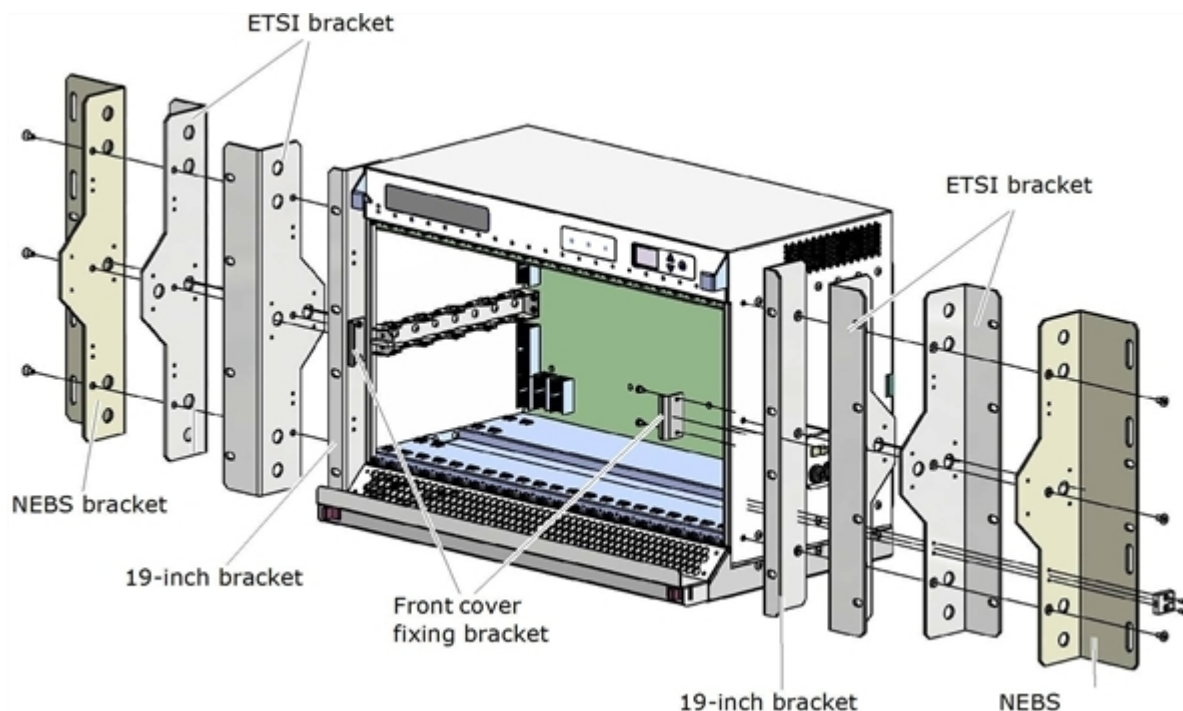
Continue with these steps.

1. Save the 19-inch bracket with the packaging material.

2. Repeat the previous set of steps in this procedure for the opposite side.

3. If you did not already mount the ESD adapter, see Fitting the ESD Connection Adapter to a Shelf Bracket.

4. If you are finished with these steps and do not plan to do other maintenace tasks, reattach the front cover. Press the outer black latches and release them onto the fixing brackets.

Installing the Cover Extension/7HU/9HU on 9HU and 7HU Shelves

Use the COVER EXTENSION/7HU/9HU to increase cabling space between the faceplates of the modules and the front cover of the 9HU shelf or 7HU shelf.

General Considerations

When you mount the COVER EXTENSION/7HU/9HU to the shelf adapter brackets, consider these guidelines:

• Make sure your rack or rack cabinet has enough space to accommodate the offset front cover you plan to install.

- Before you mount the COVER EXTENSION/7HU/9HU, check whether
  - You will meet the specified minimum access clearances for maintenance, servicing, and other operations.
  - The doors of the rack cabinet will close.
  - That you will meet other requirements or appropriate standards.
- Before you install the power supply units or any other system modules, attach the COVER EXTENSION/7HU/9HU to the shelf adapter brackets. Installed modules do not allow sufficient space to mount the COVER EXTENSION/7HU/9HU.
- If the shelf is already equipped with system modules, remove the cabling from the power supplies and the adjacent modules on the left and right side. This step creates sufficient space to mount the COVER EXTENSION/7HU/9HU.
- Ensure that the cables are correctly labeled to make it easier to reinstall them. Then pull the relevant modules from the shelf slots, as far as you need to in order to mount the COVER EXTENSION/7HU/9HU.
- When you remove and re-install the modules, the possibility that you can break fiber-optic cables or bend pins on the backplane increases. Use caution when you remove system modules and fiber-optic cables. Use caution and properly align and re-install the modules.
- Before you handle any modules, ground yourself to the ESD jack on the front of the shelf using a wrist strap, if the shelf is already mounted to the rack.

	ELECTROSTATIC CAUTION
	Ensure that you are grounded with a wrist strap or the equivalent while mounting the COVER EXTENSION/7HU/9HU to a shelf.

We assume that you are familiar with the ESD-prevention precautions you must take to avoid ESD damage to the equipment.

Required Tools and Equipment

- 2 cover adapter base plates
- 2 cover adapter slide plates
- 8 screws M3X4 CSK TORX-T10 A2
- Torx screwdriver TX10
- Grounded surface or an antistatic mat to place the shelf if the shelf is not yet mounted into a rack
- ESD-preventive wrist strap or other personal grounding devices

The mechanical cover adapter kit contents are shown in Figure 18 and Figure 19.

Figure 18: Cover Adapter Base Plates
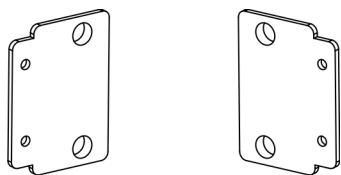
Figure 19: Cover Adapter Slide Plates
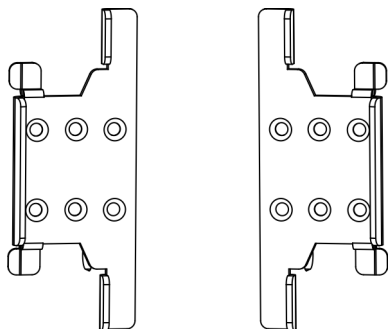
Both adapter base plates and adapter side plates are quite similar in appearance. You can mount a plate on either side of the shelf. Each cover adapter slide plate has three clearance hole pairs to adjust to the cabling space required. Depending on the hole pairs that you use, the adjustable depths measured from the position of the dismounted front-cover fixing brackets are:

- 10 mm (0.39 in.)
- 20 mm (0.78 in.)
- 30 mm (1.18 in.)

Table 25 lists the possible distances between the faceplates of the system modules and the shelf front cover, depending on the specific mounting position of the adapter slide plates.

Table 25: Front Cover Distances

Adjustable Depths	Front Cover Distances
10 mm (0.39 in.)	72 mm (2.84 in.)
20 mm (0.78 in.)	82 mm (3.23 in.)
30 mm (1.18 in.)	92 mm (3.62 in.)

	See also Figure 20 to Figure 23 for more information.

Procedure

1. Remove the front-cover fixing bracket from the shelf adapter bracket on one side of the shelf. See .

   a. Use the Torx screwdriver TX10 to remove the two half-round head screws that attach the front-cover fixing bracket to the shelf adapter bracket. Set the screws aside.

   b. Remove the front-cover fixing bracket and set it aside.

Shelf adapter bracket

Half-round head screws M3

Front cover fixing bracket
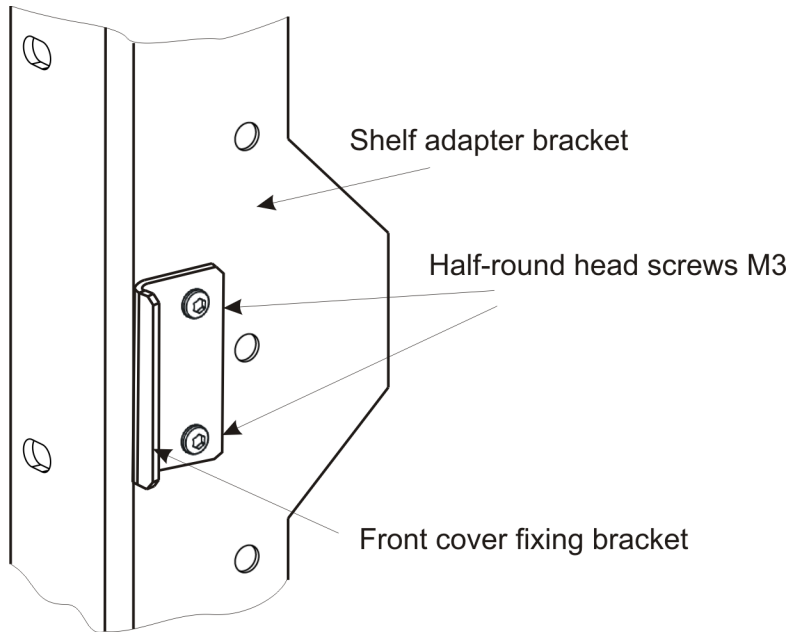
To attach the appropriate cover adapter base to the shelf adapter bracket, complete these steps.

1. Place the cover adapter base on the shelf adapter bracket as shown in the .

2. Align the two threaded holes of the shelf adapter bracket and the clearance holes of the cover adapter base.

3. Insert two flat head M3x4 screws through the adapter base holes and into the threaded holes of the shelf adapter bracket.

4. Use the Torx TX10 screwdriver to tighten the screws and secure the cover adapter base

to the shelf adapter bracket.
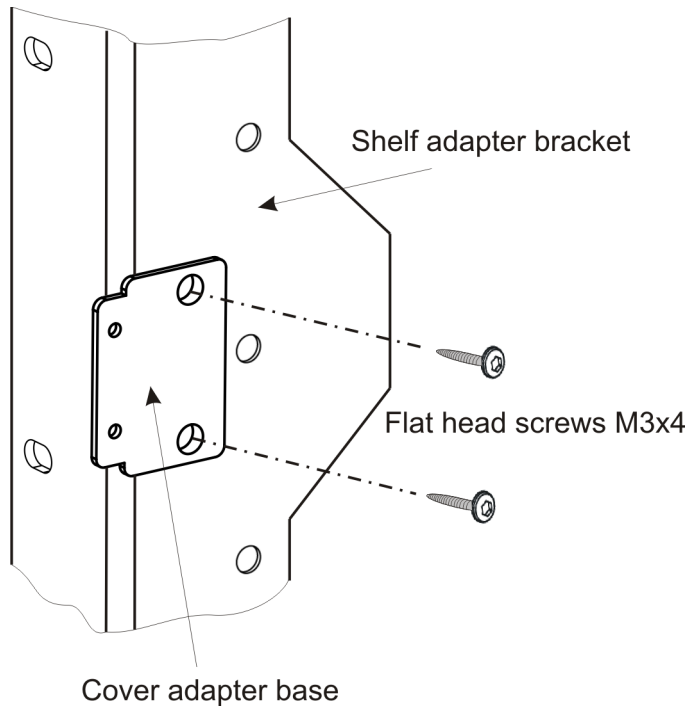
To attach the appropriate cover adapter slide to the cover adapter base, complete these steps.

1. Place the cover adapter slide on the adapter base, as shown in .
   Position the adapter slide based on the required distance between the front cover and the front side of the shelf.
2. Select the adapter slide hole pair based on the required front cover distance. See Figure 20 to Figure 23.
3. Align the selected hole pair of the cover adapter slide and the threaded hole pair of the cover adapter base.
4. Insert two flat head M3x4 screws through the selected adapter slide clearance holes and into the threaded holes of the adapter base.
5. Use the Torx screwdriver TX10 to secure the cover adapter slide to the cover adapter base.
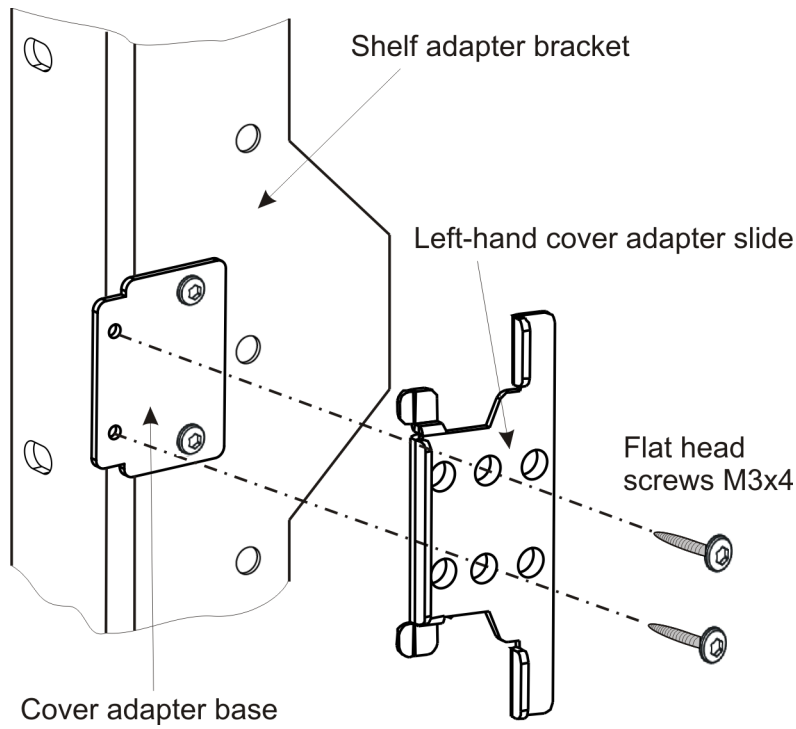
The mounting position of the adapter slide illustrated in the preceding figure accommodates a front cover distance of 82 mm.

Figure 20:   Example of Adapter Slide Mounting Using the Middle Hole Pair
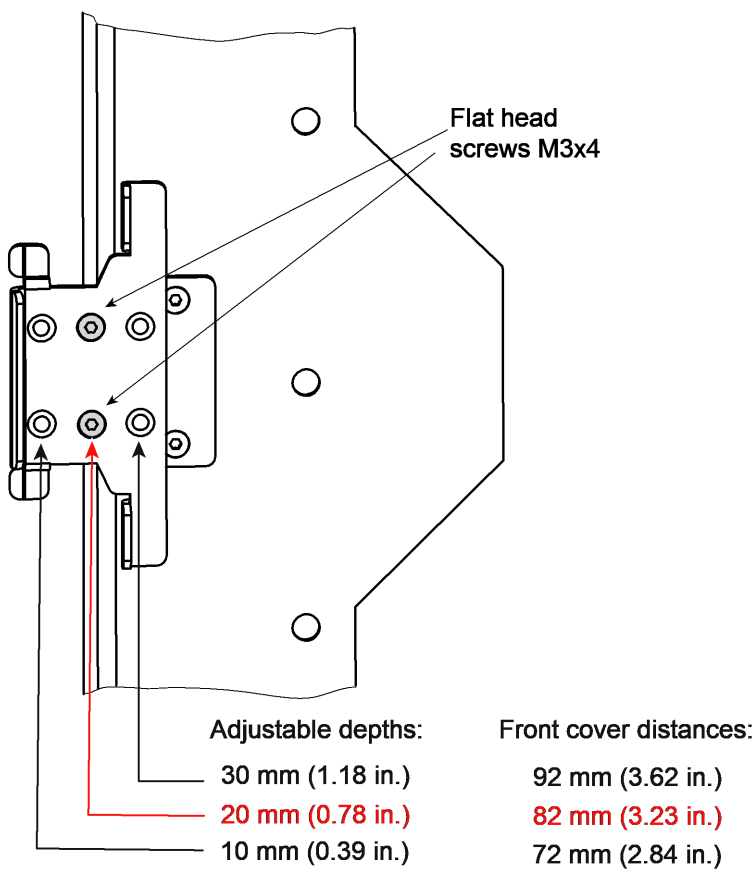
These figures show the possible installation situations.

Figure 21:   Front Cover Distance of 72 mm
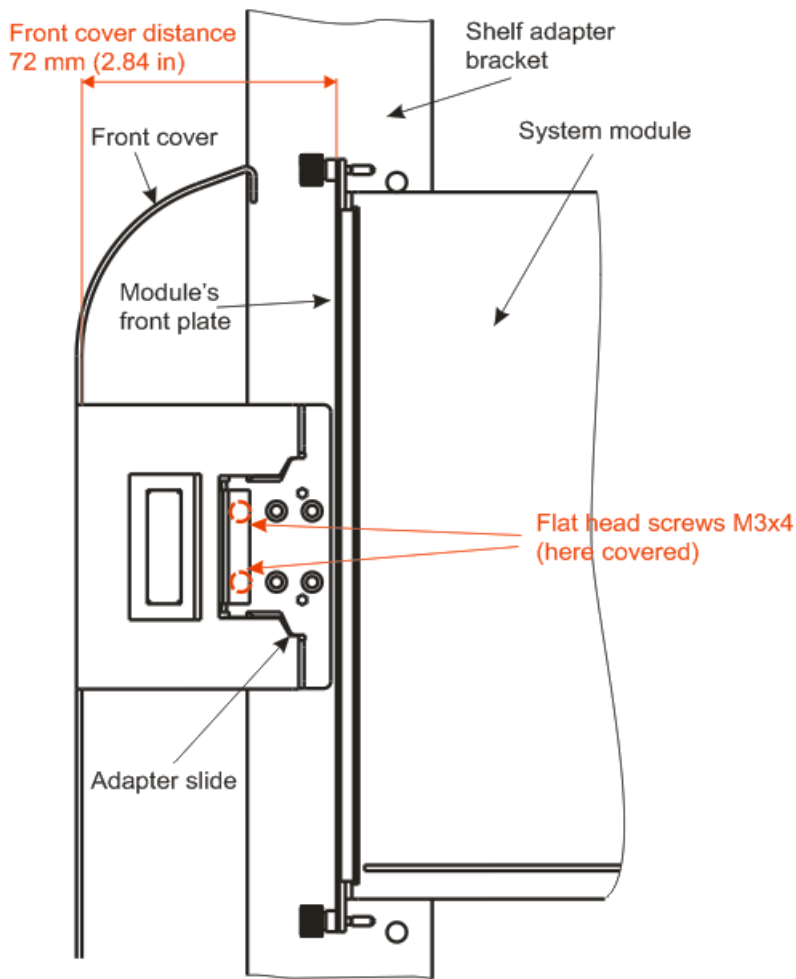
Figure 22:   Front Cover Distance of 82 mm
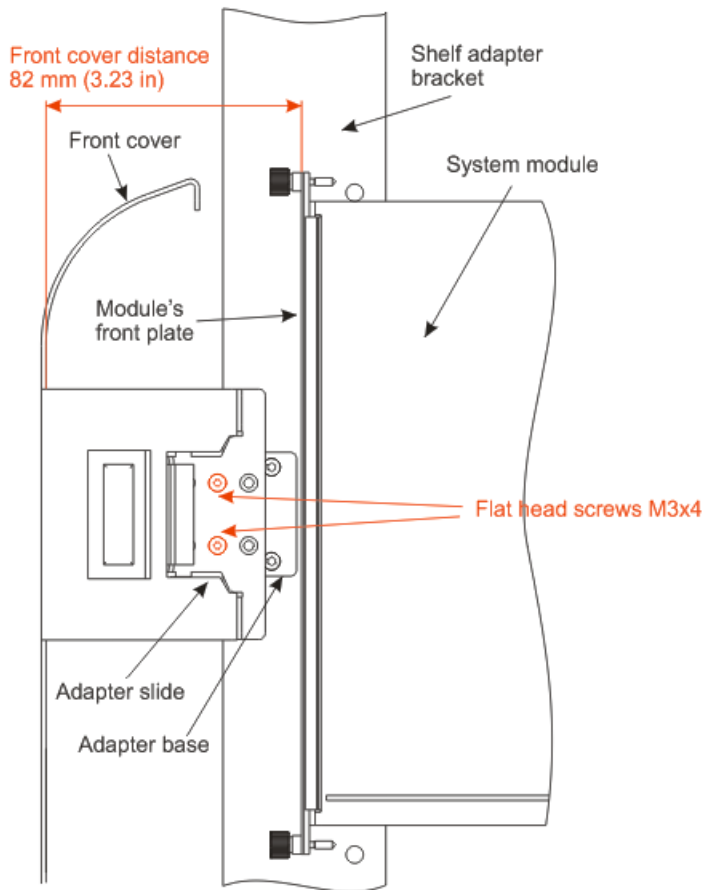
Figure 23:   Front Cover Distance of 92 mm
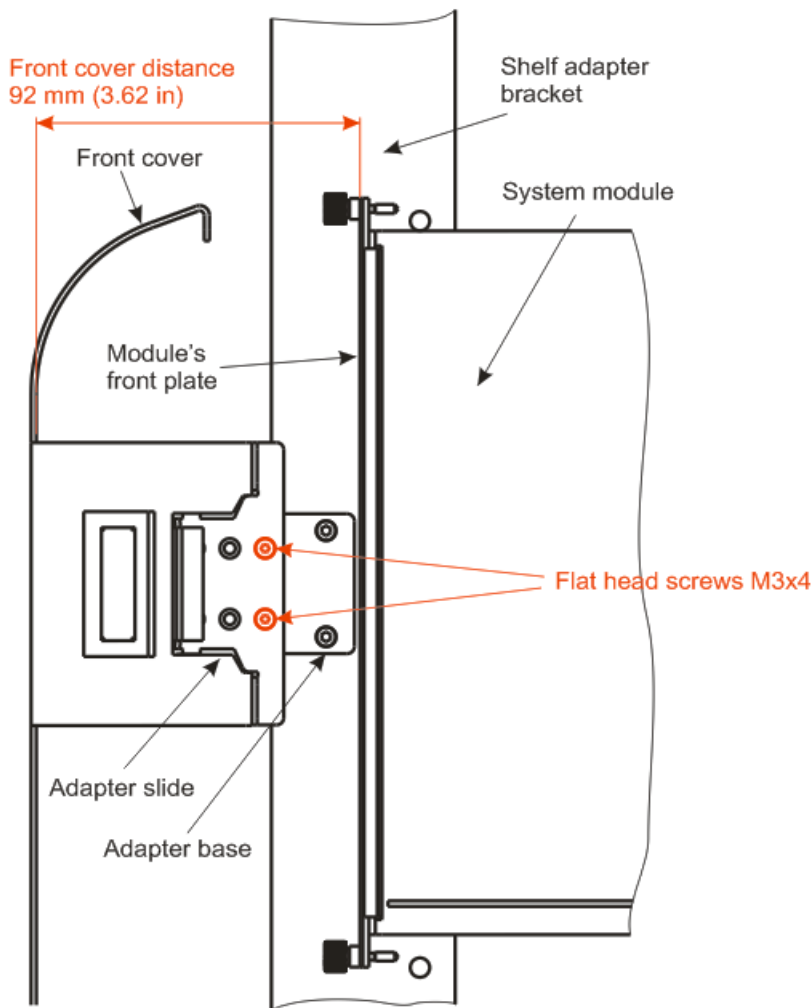
6. Repeat this entire procedure for the opposite side.

7. Save the cover fixing bracket pair and the four half-round screws with the packaging material.

Mounting the Cover Extension-Upgrade 110 to 9HU and 7HU Shelves

The COVER EXTENSION/UPGRADE 110 (1013700010-01) is a mechanical upgrade kit that enlarges the cabling space for 7HU and 9HU shelves. Use this kit to increase the horizontal distance between a module faceplate and the front cover to approximately 110 mm. Use the upgrade kit for configurations with modules that have non-angled optical feeds with non-ADVA optical cables. You can also use the kit for existing installations.

	ELECTROSTATIC CAUTION
⚠️	Ensure that you are grounded with a wrist strap or the equivalent while mounting the COVER EXTENSION/UPGRADE 110 to a shelf.

We assume that you are familiar with the ESD-prevention precautions you must take to avoid ESD damage to the equipment.

Required Tools and Equipment

- Mechanical Upgrade Kit COVER EXTENSION/UPGRADE 110: consists of two front-cover adapter bases, as shown in Figure 24.
- Torque-controlled screwdriver, metric hex bit 1.5 mm.
- Grounded surface or an antistatic mat to place the shelf, if not yet mounted into a rack.
- ESD-preventive wrist strap or other personal grounding devices.

Figure 24:   Parts of the Upgrade Kit COVER EXTENSION/UPGRADE 110

FRONT COVER ADAPTER BASE 110L
Left base plate

FRONT COVER ADAPTER BASE 110R
Right base plate

2x Allen setscrew metric M3X6

2x Allen setscrew metric M3X6
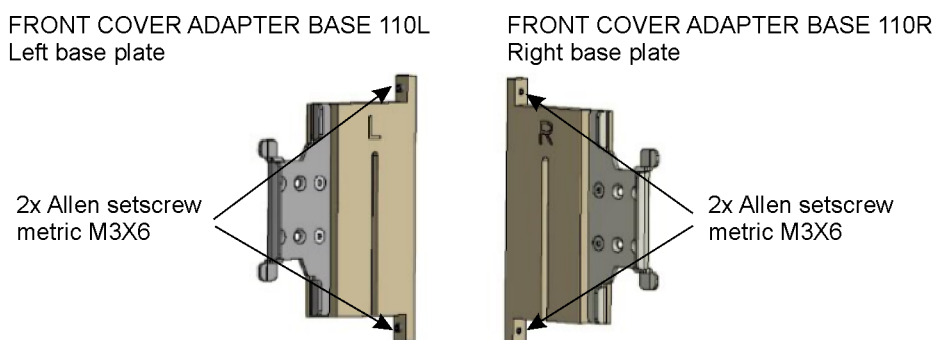
The front cover adapter base plates are durably marked with an L to fit to the left side or an R to fit to the right side of the shelf, as shown in the preceding figure. Each front cover adapter base plate ships with two Allen setscrews, M3x6, inserted into the thread holes.

Procedure

	Mount the front cover adapter base 110R in exactly the same way that you mount the front cover adapter base 110L.
📝	

1. Gently turn the two Allen setscrews of the front cover adapter base 110L counterclockwise. Carefully turn the screws until they no longer protrude past the abutting face of the adapter base plate. Do not completely remove the screws.

Allen setscrew M3x6 turned back
(must not protude beyond the abutting face)

Abutting face

Allen setscrew M3x6 turned back
(must not protude beyond the abutting face)
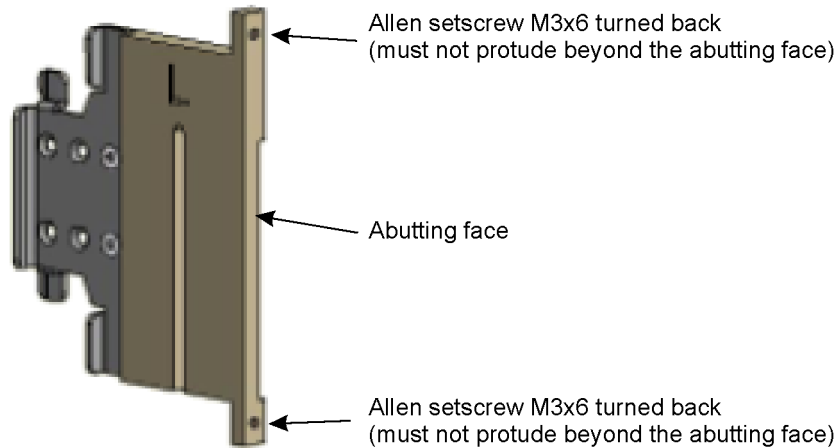
2. Place the front cover adapter base 110L so that it aligns with the front-cover fixing-bracket already mounted on the left side of the shelf.

FRONT COVER ADAPTER BASE 110L

Allen setscrews

Adapter bracket mounted
on the left side of the shelf

Front cover
fixing bracket
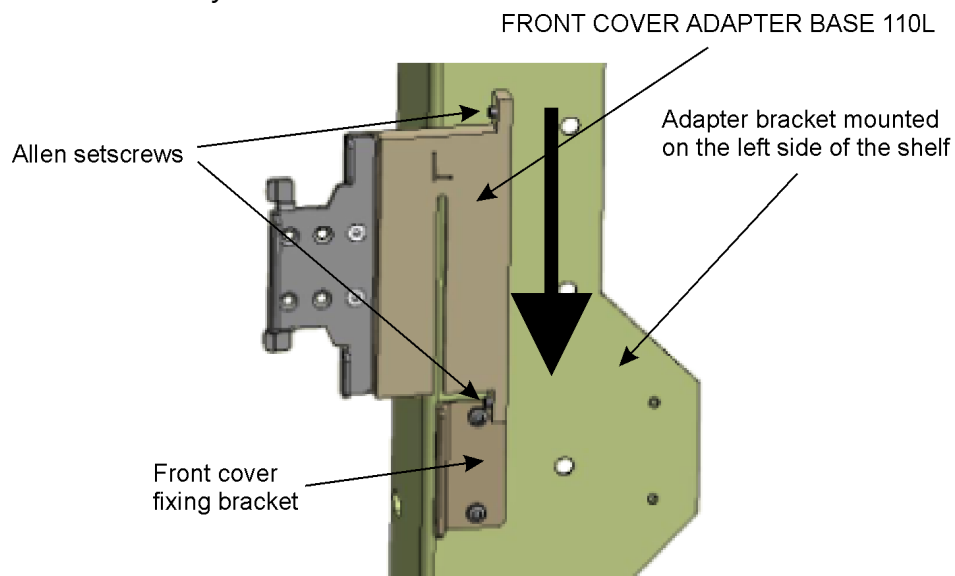
3. Use a torque-controlled screwdriver with an hex bit 1.5 mm to turn the Allen set screws and attach the front cover adapter base 110L on the shelf. Tighten each Allen screw to a torque of 0.25 Nm.

Torque-controlled
screwdriver,
hex bit 1.5 mm   Shelf
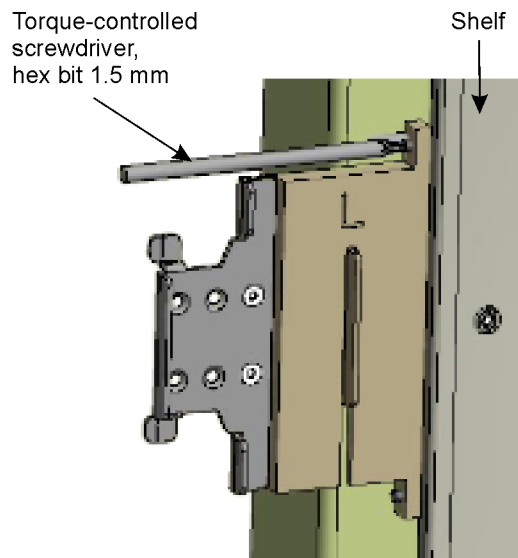
4. Repeat this procedure to attach a bracket to the opposite side. This figure illustrates the
    front cover adapter base 110L mounted to the shelf front cover.
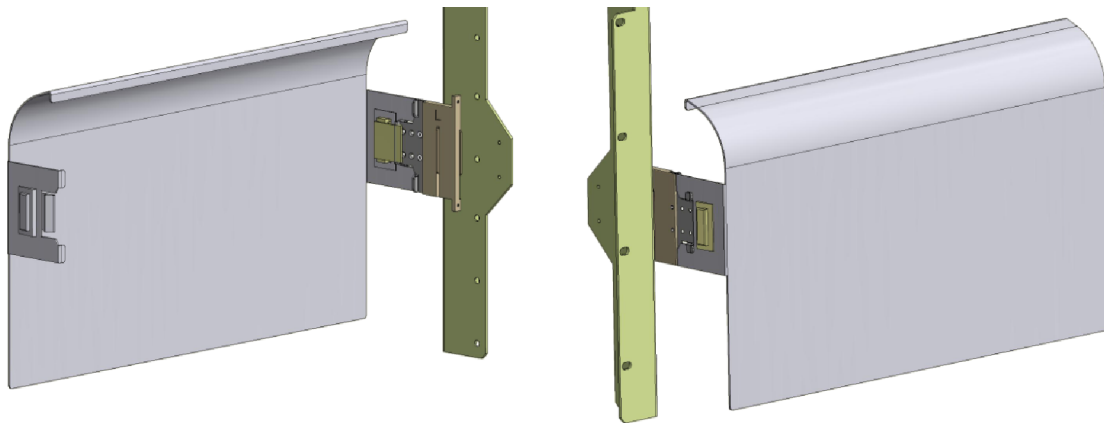
Fitting the 1HU Equipment Shelves with ETSI or NEBS Brackets

Bracket requirements:

- ETSI brackets to adapt the SH1HU-F/2DC, SH1HU-HP/2DC, and SH1HU-R (referred to as *1HU equipment shelf*) to the ETSI standard rack dimensions.
- NEBS brackets to adapt the 1HU equipment shelves to the NEBS standard rack dimensions.

	ELECTROSTATIC CAUTION
⚠	To avoid possible ESD damages to sensitive circuit boards, only remove the shelf from anti-static packaging when you are ready to begin fitting it with the appropriate brackets. Observe standard precautions for handling shelves that contain ESD-sensitive devices.

We assume that you are familiar with the ESD-prevention precautions you must take to avoid ESD damage to the equipment.

Required Tools and Equipment

- 1 ETSI bracket pair or 1 NEBS bracket pair
- Torx screwdriver TX20 for M5x10 screws
- Appropriate grounded surface or an antistatic mat to place the shelf

The ETSI and NEBS bracket pairs shown in Figure 25 are included in the shipping box.

Figure 25:   ETSI and NEBS Adapter Brackets for a 1HU Shelf
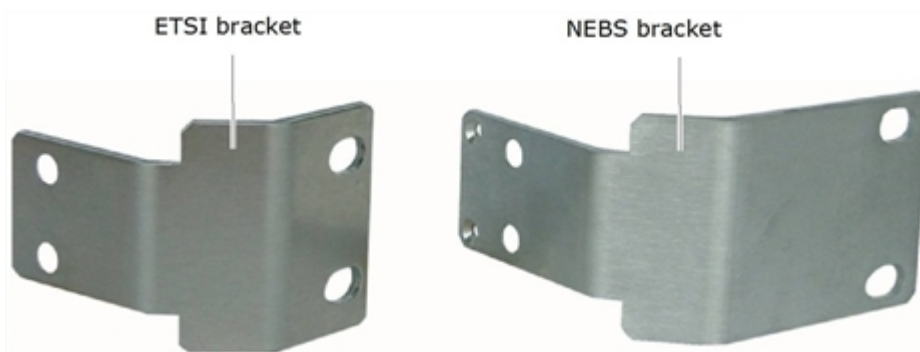
Procedure

1. Remove the 1HU equipment shelf from its shipping box and place the shelf on a grounded surface or an antistatic mat.
2. Remove the ESD protective bag from the shelf and set the shelf aside.
3. Remove the ETSI or NEBS brackets from the plastic bags supplied in the rack-mount kit.
4. Remove the 19-inch bracket on one side panel of the shelf:
   a. Use a Torx screwdriver TX20 to turn the two screws that affix the 19-inch bracket in counter-clockwise direction until you completely remove them from thread holes. Set the screws aside.
   b. Remove the bracket and set it aside.
5. Fit the appropriate ETSI or NEBS bracket to the shelf:
   a. Place the appropriate bracket on the same side of the shelf in the correct position as illustrated in Figure 26 and Figure 27. Align the two threaded holes in the shelf side panel with the bracket holes.
   b. Reinsert the two fixing screws M5x10 into the threaded holes.
   c. Use a Torx screwdriver TX20 to tighten the screws and secure the bracket to the shelf.

Figure 26:   Fitting a 1HU Shelf with an ETSI Bracket

ETSI bracket

M5x10 screws
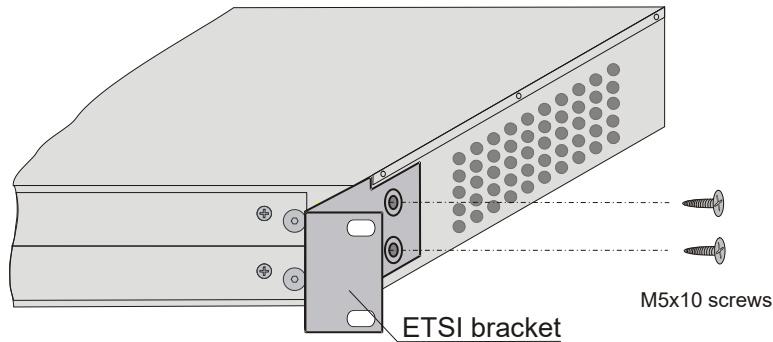
Figure 27:   Fitting a 1HU Shelf with a NEBS Bracket

NEBS bracket

M5x10 screws
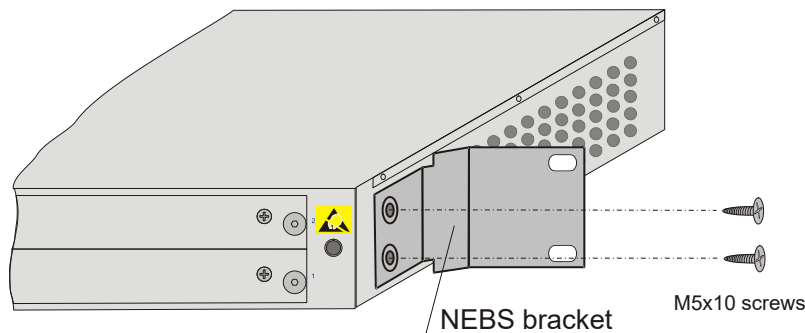
6. Save the 19-inch bracket with the packaging material.

7. Repeat the applicable steps for the opposite side.

Fitting the SH1HU-R/PF with ETSI or NEBS Brackets

The SH1HU-R/PF is pre-installed with 19-inch brackets. To mount the shelf in an ETSI or 23-inch NEBS rack, you need to replace 19-inch brackets with the required adapter brackets.

- ETSI brackets to adapt the SH1HU-R/PF to the ETSI standard rack dimensions.
- NEBS brackets to adapt the SH1HU-R/PF to the NEBS standard rack dimensions. You can front-mount or rear-mount the SH1HU-R/PF shelf in the NEBS Level 3 compliant rack.

ELECTROSTATIC CAUTION

To avoid possible ESD damages to sensitive circuit boards, do not remove the shelf from anti-static packaging until you are ready to commence fitting it with the appropriate brackets.

Observe standard precautions for handling shelves containing ESD-sensitive devices.

We assume that you are familiar with the ESD-prevention precautions you must take to avoid ESD damage to the equipment.

Required Tools and Equipment

- 1 ETSI bracket pair to front-mount the shelf in an ETSI-compliant rack
- 1 front NEBS bracket pair with a steel stiffener to front-mount the shelf in a NEBS-compliant rack, or
- Torx screwdriver TX25 for M5x8 and M5x6 screws
- Appropriate grounded surface or an antistatic mat to place the shelf

shows the bracket kit included in the shipping box. Each front NEBS bracket has a steel stiffener for added stability. Always use both the front NEBS bracket pair and the steel stiffener to front-mount the shelf in a two-post rack. See Figure 28

Figure 28:   ETSI and NEBS Adapter Brackets for an SH1HU-R/PF
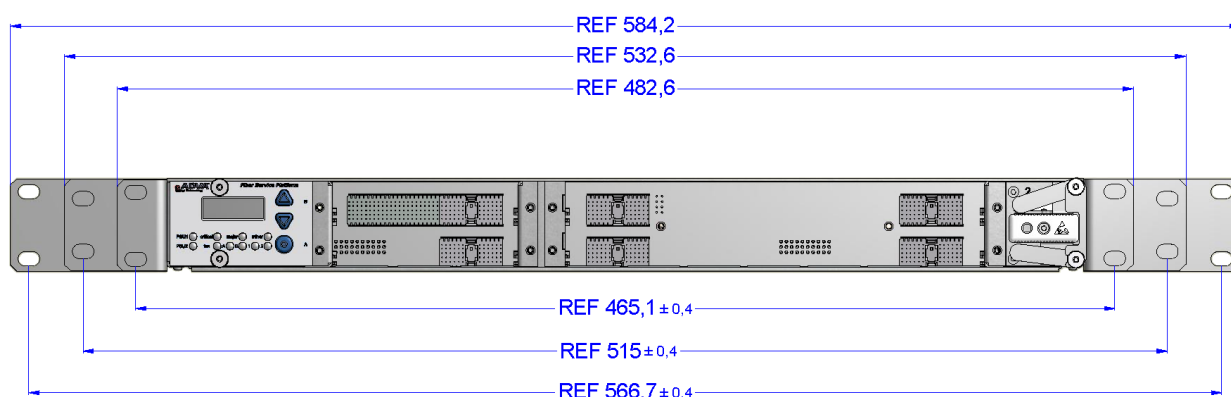
Procedure

1. Remove the SH1HU-R/PF shelf from its shipping box and place it on a grounded flat surface or an antistatic mat.
2. Remove the ESD protective bag from the shelf and set the shelf aside.
3. Remove the ETSI brackets or the appropriate NEBS brackets and steel stiffener supplied in the rack-mount kit from the plastic bags.
4. Remove the 19-inch bracket on one side panel of the shelf:
    a. Use a Torx screwdriver TX25 to turn the three screws that affix the 19-inch bracket in counter-clockwise direction until you completely remove them from the thread holes. Set the screws aside.
    b. Remove the bracket and set it aside.

Fit the appropriate ETSI or NEBS bracket to the shelf .

1. Place the appropriate bracket on the same side of the shelf in the correct position as illustrated in Figure 28. Align the three threaded holes in the shelf side panel with the bracket holes.

2. Reinsert fixing screws M5x8 and M5x6 into the corresponding threaded holes.

3. Use a Torx TX20 screwdriver to turn the screws and secure the bracket to the shelf. Be sure to attach the steel stiffeners when you fit the front NEBS brackets. Use the ADVA-supplied M5x6 screws.

4. If you attach a front NEBS bracket, mount the appropriate steel stiffener as shown in . Use a Torx screwdriver TX25 to turn the M5x6 screw and to secure the steel stiffener to the shelf.

5. Save the 19-inch bracket with the packaging material.

Repeat the applicable steps on the opposite side.

Earth-Grounding a Shelf

> 📝 This document uses the term earth-ground, which is sometimes referred to as earthing or grounding.

The 7HU shelf types and 1HU shelf types require earth-grounding for correct operation and to gain a high electromagnetic interference (EMI) immunity. The 9HU shelf (SH9HU) and 1HU shelf high power (SH1HU-HP/2DC) are designed in accordance with protection class 1. You must only operate these shelves with a protective earth-ground connection.

The term *shelf* refers to all FSP 3000R7 shelf types that you need to earth-gound. To meet safety and EMI requirements, you must individually connect each FSP 3000R7 shelf to the rack or cabinet earth-ground point. For this purpose, each shelf provides one earth-grounding terminal located on either a side panel or the back panel of the shelf and two earth-ground screws.

Before you rack-mount the shelf, attach the protective earth-grounding conductor to the shelf. Do this first because after you mount the shelf in the rack, space to complete the installation is minimized.

The length of the earth-grounding conductor depends on the location of the shelf within the rack and its proximity to the earth-ground point location of the rack. Individually build the earth-grounding conductors with appropriate connectors on both ends.

This section contains these topics:

Required Expertise

Only trained electricians who understand the related national earth-grounding systems should earth-ground a shelf. They must be familiar with the standard electrical safety, electrical wiring, and connection practices for electrical equipment installation.

Personnel must possess the skills and experience for this purpose and must have knowledge of at least these electrical codes and standards:

- IEC/EN 60950-1
- IEC: 62368-1: 2014
- EN 50110-1-2
- ETSI EN 300132-2
- ETSI EN 300253
- EN 50310

Building an Earthing Conductor

⚠	**ELECTRIC VOLTAGE WARNING** In some countries, local regulations might apply. Also check and follow local codes and requirements. Ensure that all strands of a stranded wire enter the terminal connection.

Required Tools and Equipment

Tools and Equipment	Description

Earth-grounding conductor	• Minimum cross sectional area of
	  ◦ 5.26 mm² (10 AWG) for the 9HU shelf
	  ◦ 3.31 mm² (12 AWG) for the 7HU shelf SH7HU
	  ◦ 3.31 mm² (12 AWG) for the and 1HU shelf
	• Solid or stranded copper conductor
	• Yellow or green-yellow insulating wire

Tools and Equipment	Description
Appropriate terminal connector on one side of the earth-grounding conductor to attach to the shelf earth-ground contacts	Use one of these: • Ring lug terminal for bolt size M4, with a hole diameter of 4 mm to 6 mm. • Two-hole lug with 0.25 inch holes on 0.625 centers, for example, Thomas&Betts54205. You must use this type of lug to meet the requirements of the GR 1089. • 6.3 mm Faston wire receptacle, female type.
Appropriate terminal connector	Use for the rack earth-ground point that matches the terminal connector on the earth-grounding conductor
Miscellaneous	• Self-retracting pocket tape measure • Wire cutter • Wire stripper • Wire crimper

Procedure

1. Measure the conductor length required for the shelf.
2. Use the wire cutter to cut the corresponding conductor length from the wire coil.
3. Use the wire stripper to remove sufficient insulation from the conductor end that connects to the earth-ground terminal of the shelf.
4. Insert the stripped end of the earth-ground conductor into the open end of the terminal connector: ring lug for bolt size M4 two-hole lug (0.25 inch holes on 0.625 centers) or 6.3 mm Faston wire receptacle.
5. Use the wire crimper to securely crimp the earth-grounding conductor to the appropriate terminal connector.
6. Use the wire stripper to remove sufficient insulation from the other wire end.
7. Insert the stripped end of the earth-ground conductor into the open end of the appropriate terminal connector. For example, insert the conductor into a ring lug that connects to the earth-ground point connector of the rack.
8. Use the wire crimper to securely crimp the earth-grounding conductor to the appropriate terminal connector.
9. If required, repeat this procedure to build other earth-grounding conductors.

Connecting a Shelf to Earth Ground

Earth-grounding procedures apply to 9HU, 7HU (SH7HU, and 1HU equipment shelves, referred to as the *shelf*). You must complete one of the earth-grounding procedures before you connect power to or power-on the shelf.

	ELECTROSTATIC CAUTION
	Follow national installation codes and regulations when making earth connections.
	Check the earth connections after assembly.
	Ensure that the equipment rack or cabinet is connected to earth ground during normal use.
	Ensure that each shelf is reliably and permanently connected to the earth point of the rack during normal use.

	An earth-gounding conductor with ring lug terminals on either end is available and included in the earth-grounding kit that ships with the equipment. See the *FSP 3000R7 Hardware Description*.
	If you do not use the provided earth-grounding kit, you must provide the appropriate earth-grounding conductor. See Building an Earthing Conductor.

Attach the earth-grounding conductor to the shelf earth-ground terminals. Use one of these:

- A ring lug terminal.
- A two-hole lug terminal that meets the requirements of the GR 1089.
- A Faston wire receptacle.

To perform these tasks, ADVA assumes that you are

- Knowledgeable about standard electrical wiring and connection practices.
- Familiar with power supplies.
- Aware of the precautions you must take to avoid personal injury and equipment damage.

Required Tools and Equipment

- One earth-grounding conductor of the appropriate length and cross-sectional area of the specific shelf. Assemble the conductor with the appropriate lugs on both ends.
- Wrench or box spanner, wrench size of 7 mm or 0.276 in.

- Appropriate screwdriver or wrench to attach the earthing-grounding conductor to the rack.

Procedure

1. Locate the earth-ground terminal on the applicable shelf.
2. Select the appropriate conductor.
3. Connect the earth-grounding conductor to the corresponding terminal of the shelf. If you connect an earth-grounding conductor with a ring lug terminal or a two-hole lug terminal:
   a. Remove one or both nuts, the washers, and the first of the two lock washers from one or both earth-grounding bolts.
   b. Attach these to one or both earth-grounding bolts:
      - the ring lug terminal or the two-hole lug terminal of the conductor
      - the removed lock washers
      - the removed washers
   c. Install and fasten the nuts.
   d. Use the required wrench to tighten the nuts.

   Figure 29 and Figure 30.

Figure 29: Example of Using a Ring Lug to Connect a Functional Earth-Grounding Conductor to a 7HU Shelf
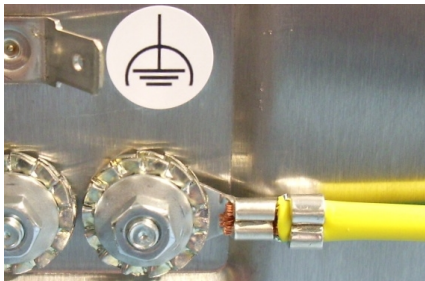
Figure 30: Example of Using a Two Hole Lug Terminal to Connect a Functional Earth-Grounding Conductor to a 7HU Shelf
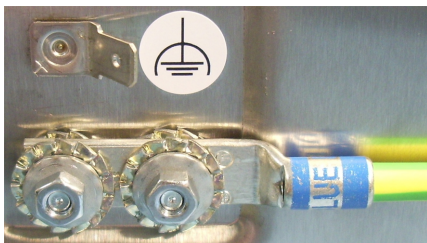
If you connect an earth-grounding conductor with a Faston wire receptacle, carefully slide the wire onto the blade connector as shown in Figure 31.

Figure 31:   Example of Using Faston Wire Receptacle to Connect a Functional Earth-Grounding Conductor to a 7HU Shelf

4. Repeat this procedure for each applicable shelf. After you attach the earth-grounding conductor to the shelf, complete the steps in Mounting an FSP 3000R7 Shelf into a Rack or Cabinet .

Sealing the Shelves

A FIPS-certified operation requires that you close and seal the shelves and FIPS-certified encryption modules. This section describes how to seal the 9HU, 7HU, and 1HU shelves that contain FIPS-certified encryption modules. To seal the encryption modules, see Sealing of FIPS-Certified Encryption Modules.

> Use this seal label type: 1013700030-01 SEAL/FIPS-GENERAL
> — red material with black printing and white tamper evidence.

This seal is equipped with tamper-evidence functionality. After the seal is applied, any attempt to remove the seal causes visible damage of the seal.

Each seal is serialized. The serial number is available on the seal as text and as a 2D code (DataMatrix). You can use most smartphone apps and bar code scanners to read the 2D code. Each seal comes with a counterfoil, or stub, for documentation purposes.

The SEAL/FIPS-GENERAL seals are not included in the ADVA equipment shipment. You must order the appropriate quantity of seals for your configuration.

FIPS Seal Use

You will apply the seal labels (SEAL/FIPS-GENERAL) on your installed devices as one of the last steps in installation, setup, and provisioning. This section contains these topics:

NOTICE	Do not use the equipment if the security seal is broken or damaged in any way.

Sealing the 9HU Shelf — SH9HU

	For seal labels (SEAL/FIPS-GENERAL): • Clean product surfaces from dust, grease, and residue before you apply the new seal labels. • Do not touch the adhesive side of the seal labels while you apply them. • Apply the seal labels in one movement. Any re-seating of a seal label can cause tamper evidence.

For a FIPS-certified operation, use four seal labels (SEAL/FIPS-GENERAL) to seal the 9HU shelf. Place the seals on the rear cover and on the top of the 9HU shelf.

Seal locations for the SH9HU rear:

- One seal label at the left edge, 2/3 of the height of removable rear cover (1).
- One seal label at the right edge, 2/3 of the height of removable rear cover (2).

Figure 32:   SH9HU Rear View — Seal Locations
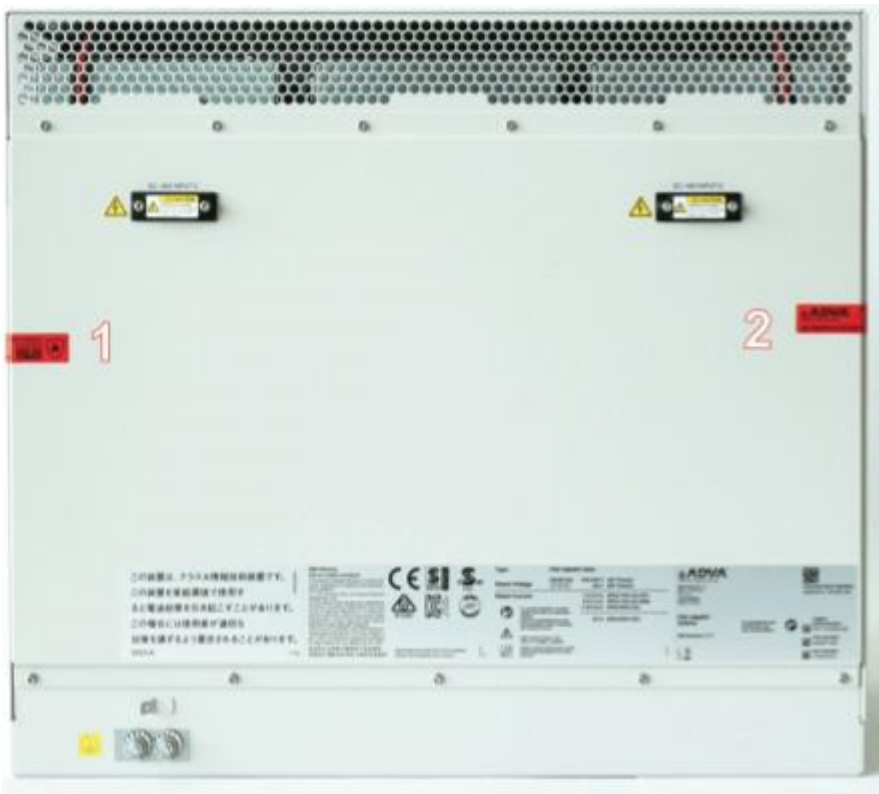
Seal locations for the SH9HU top:

- One seal label at the rear edge of the shelf top and covering the second screw, counted from left side edge (1).
- One seal label at the rear edge of shelf top and covering the second screw, counted from right side edge (2).

Figure 33:   SH9HU Top View — Seal Locations

After you apply a seal label, place the counterfoil/stub in your crypto officer's registration documentation of the serial numbers of the applied seals. During the crytpo officer's audit of the FIPS-certified operation mode, he or she can use the documented registered serial numbers of the seal labels to verify and identify seals on the products.

Sealing of 7HU Shelf — SH7HU(-R)

	For seal labels (SEAL/FIPS-GENERAL): • Clean product surfaces from dust, grease, and residue before you apply new seal labels. • Do not touch the adhesive side of seal labels during the application. • Apply the seal labels in one movement. Any re-seating of a seal label can cause tamper evidence.

For a FIPS-certified operation, use one seal label (SEAL/FIPS-GENERAL) to seal the SH7HU shelf. Place the seal on the 7HU shelf rear cover.

Place one seal label to the left of the screw of the removable rear cover that bridges the top plate and the rear-side cover lid (1).

Figure 34:   SH7HU(-R) Rear View — Seal Locations

After you apply a seal label, place the counterfoil/stub in your crypto officer's registration documentation of the serial numbers of the applied seals. During the crytpo officer's audit of the FIPS-certified operation mode, he or she can use the documented registered serial numbers of the seal labels to verify and identify seals on the products.

Sealing of SH1HU-HP/2DC and SH1HU-HP/E-TEMP/2DC

	For seal labels (SEAL/FIPS-GENERAL):
📝	• Clean product surfaces from dust, grease, and residue before you apply new seal labels. • Do not touch the adhesive side of the seal labels during application. • Apply the seal labels in one movement. Any re-seating of a seal label can cause tamper evidence.

For FIPS-certified operation, use three seal labels (SEAL/FIPS-GENERAL) to seal the SH1HU-HP/2DC and SH1HU-HP/E-TEMP/2DC shelves. Use the information below to place the seals on these shelves. The illustrations that follow show only the seal positions.

Seal locations for the SH1HU-HP/2DC and SH1HU-HP/E-TEMP/2DC shelves:

- One seal label on the left upper edge that bridges the top plate to the faceplate (1).
- One seal label on the top cover and covering the screw of module slot separation and the Guarantee void label (2).

- One seal label on the right upper edge 2/5 in. from rear side that bridges the top plate to the side plate. Avoid the left side air outlet (3)

Figure 35:   SH1HU-HP/2DC and SH1HU-HP/E-TEMP/2DC — Seal Locations

Figure 36:   SH1HU-HP/2DC and SH1HU-HP/E-TEMP/2DC Left Side — Seal Locations

Figure 37:   SH1HU-HP/2DC and SH1HU-HP/E-TEMP/2DC Top Front Side — Seal Locations

Figure 38:   SH1HU-HP/2DC and SH1HU-HP/E-TEMP/2DC Right Side — Seal Locations

After you apply a seal label, place the counterfoil/stub in your crypto officer's registration documentation of the serial numbers of the applied seals. During the crytpo officer's audit

of the FIPS-certified operation mode, he or she can use the documented registered serial numbers of the seal labels to verify and identify seals on the products.

Sealing of SH1HU-R/PF

	For seal labels (SEAL/FIPS-GENERAL): • Clean product surfaces from dust, grease, and residue before you apply new seal labels. • Do not touch the adhesive side of seal labels during application. • Apply seal labels in one movement. Any re-seating of a seal label can cause tamper evidence.

For a FIPS-certified operation, use five seal labels (SEAL/FIPS-GENERAL) to seal the SH1HU-R/PF shelf.

Seal locations for the SH1HU-R/PF:

- One seal label at left upper edge 2.5 in. from the rear side bridging and from the top plate to the side plate. Avoid the left side air outlet (1).
- One seal label at top cover next to front 2.5 in. from the left and covering the screw of module slot separation and the 'WARRANTY VOID' label orthogonally (2)
- One seal label at the right upper edge 2.5 in. from the rear side bridging and from the top plate to side plate. Avoid the left side air outlet (3).
- One seal label at the right lower edge 2.5 in. from the rear side bridging and from the bottom plate to the side plate. Avoid the left side air outlet (4).
- One seal label at the left lower edge 2.5 in. from the rear side bridging and from the bottom plate to the side plate. Avoid the left side air outlet (5).

Figure 39:   SH1HU-R/PF Front-Top View — Seal Locations

Figure 40:   SH1HU-R/PF Front-Bottom View — Seal Locations

Figure 41:   SH1HU-R/PF Viewed From Left Side — Seal Locations

Figure 42:   SH1HU-R/PF Viewed From Right Side — Seal Locations

Figure 43:   Seal Location on the SH1HU-R/PF Top Cover

After you apply a seal label, place the counterfoil/stub in your crypto officer's registration documentation of the serial numbers of the applied seals. During the crytpo officer's audit

of the FIPS-certified operation mode, he or she can use the documented registered serial numbers of the seal labels to verify and identify seals on the products.

Mounting an FSP 3000R7 Shelf into a Rack or Cabinet

Complete the steps in this section to mount the 9HU shelf, 7HU shelf, and 1HU shelf types to a rack or cabinet, both referred to as a *rack*.

Use the mounting brackets to secure the shelf to the rack. The mounting brackets for the 9HU shelf and 7HU shelf have four holes, and the mounting brackets for the 1HU shelf types have two holes.

General Considerations

Consider these guidelines when you prepare to rack-mount a shelf: 9HU shelf, 7HU shelf, and all 1HU shelf types.

- Mount the shelf according to your installation plan.
- After you fit the adapter brackets, immediately rack-mount the shelf.
- Start the rack-mounting tasks at the bottom of the rack, including in a rack that you will only partially fill.
- If possible, first rack-mount the heaviest shelf at the bottom of rack.
- Space requirements in the rack:
    - The 9HU shelf: 9HU (400.05 mm = 15.75 in.)
    - The 7HU shelf: 7HU (311.15 mm = 12.25 in.)
    - The 1HU shelf: 1HU (44.45 mm = 1.75 in.)
- When you rack-mount multiple shelves, avoid uneven mechanical loading to the rack.
- The uppermost shelf in the rack should be the master shelf that holds the NCU. This shelf must have shelf ID 01. The master shelf can be in any position in the rack but having it at the top is recommended by ADVA.
- You can extend a network element from a single rack to a multi-rack system that has 26 shelves or fewer.
- Avoid mounting shelves in an overly-congested rack.
- The shelves are heavy. Two people should lift and move a shelf to avoid personal injury and damage to equipment.
- To ensure adequate cooling of the modules in the shelf, ensure that your installation space is unobstructed. Provide approximately 5 cm (2.0 in.) around the ventilation openings of each shelf. Blocked ventilation openings cause considerable fire risk.

- For cabinet mounting: always mount the deeper DCF1HU-P shelf in the lowest position of a cabinet to facilitate air flow in the cabinet.
- If the earth-grounding terminal on a shelf will be inaccessible after mounted into the rack, attach the earth-grouning conductor first.
- Ensure that the shelves reliably and permanently connect to the rack earth-ground point.
- For information about how to install the shelves in a customer cabinet, see the cabinet manufacturer's instructions.

This figure shows an example of a six 7HU shelf system.
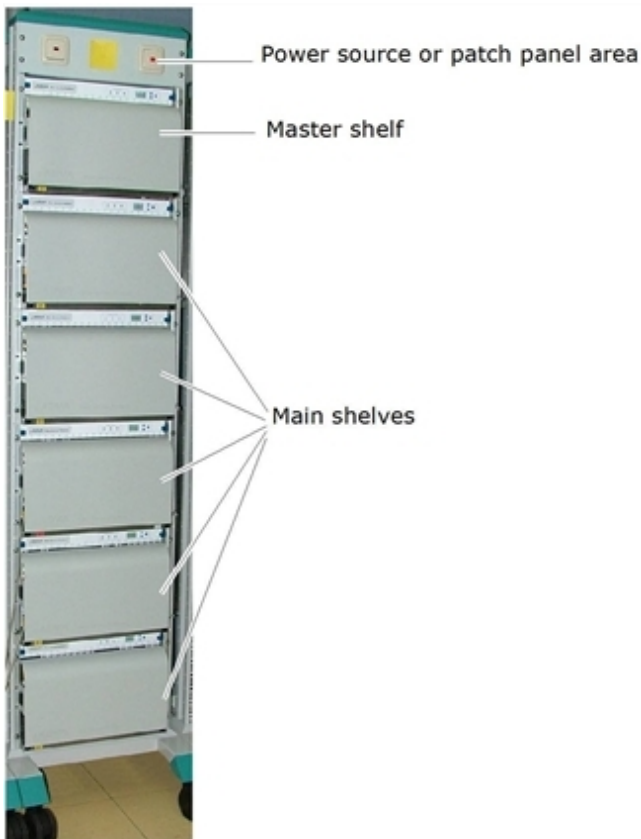
⚠	**CAUTION** Only service personnel are allowed to perform this procedure.

⚠	**ELECTROSTATIC CAUTION** To avoid possible ESD damages to sensitive circuit boards, only remove the shelf from anti-static packaging when you are ready to begin the mounting task. Observe standard precautions for handling shelves that contain ESD-sensitive devices.

We assume that you are familiar with the ESD-prevention precautions you must take to avoid ESD damage to the equipment.

Required Tools and Equipment

- Use screws that fit the threaded holes in your rack. You must supply the screws.
  - 8 rack screws and washers for 9HU shelf and 7HU shelf (SH7HU)
  - 4 rack screws and washers for 1HU shelf types
- 1 cage nut in conjunction with a Pozidriv screw, which are both included in the earth-grounding kit, to attach the earth-grounding conductor to the rack.
- Appropriate screwdriver.

Procedure

⚠️	**LIFTING HAZARD CAUTION** A fully populated 9HU shelf or 7HU shelf is heavy. To avoid personal injury and damage to the shelf, two persons should move, lift, and hold a shelf in position while a third person secures the shelf in the rack.

1. Read the installation plan or the cabling plan to get information about:
   - The shelf to be mounted
   - The rack that will hold this shelf
   - The position of this shelf in the rack

2. On the rack mounting rails, locate and mark the mounting holes where you will affix the shelf. No space should exist below or above the shelf.

3. If required, install two or four cage nuts in the corresponding holes on both sides of the rack.

4. If a terminal connector for the earth-ground point is pre-installed in your rack, skip this step and proceed with Step . Otherwise, locate and clip the cage nut to the right mounting rail on the back side of the rack where you will attach the earth-grounding conductor.

5. Mount the shelf to the rack:
   a. With a person on each side, lift the shelf to the bay. Position the shelf with the attached brackets in the rack so that the bracket holes on each side align with the rack mounting holes or the cage nuts.
   b. Use the correct washers to insert the corresponding rack screws.
   c. Use the applicable screwdriver to tighten the rack screws.

> 📝 While positioning the shelf into the rack, hold on to the earth-grounding conductor, which is attached on the shelf right side or reverse side. You want to avoid inadvertently jamming the conductor.
>
> When you mount the SH1HU-R/PF in a NEBS-compliant rack, make sure that the steel stiffeners are fitted on the side panels of the shelf. Use the same rack screws to secure both the front NEBS brackets and the steel stiffeners.

6. Attach the other end of the earth-grounding conductor to the cage nut affixed in Step 5 or to the pre-installed terminal connector used for the earth-ground point on the rack. This step ensures adequate earth-grounding for the shelf.

7. Insert the Pozidriv screw with the correct washers when you use a cage nut, or use an appropriate screw for the pre-installed terminal connector on the rack.
    For more information, see the earth-grounding instruction sheet in the earth-grounding kit package, that ships with the product.

8. Use the appropriate screwdriver to tighten the screw.

9. Test the earth-grounding connection.
    Use a multimeter to check the continuity between the shelf and the rack earth-ground point. The resistance should measure zero Ohms.

> ⚠️ **ELECTRIC VOLTAGE WARNING**
>
> Only service personnel or a qualified or licensed electrician should test and verify the earth-ground connection.

10. Repeat this procedure to install the other shelves in the approrpiate positions in the rack. Figure 44 shows an example of a 7HU shelf mounted to a rack.

Figure 44:   Example of 7HU Shelves Mounted in a 19-inch Open Rack
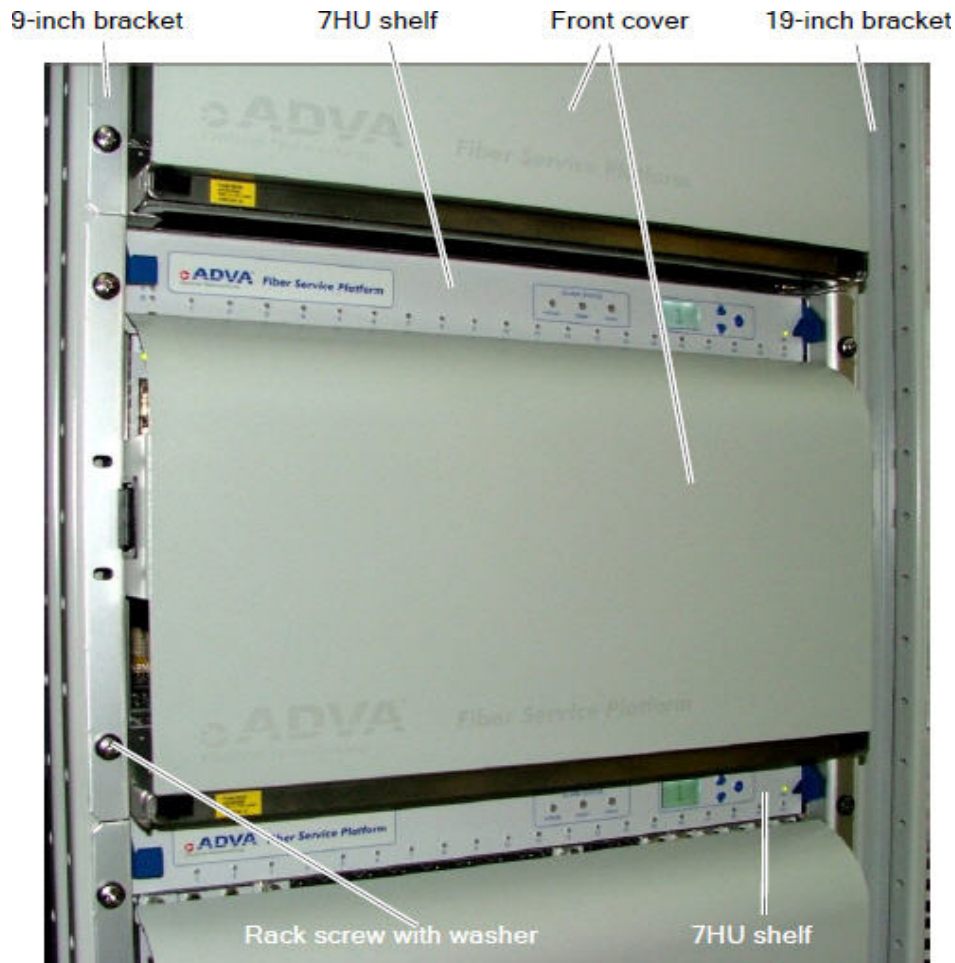
Normally, shelves stack in the rack directly on top of each other with no space in between them. The DCF1HU-P shelf is an exception. Leave a minimum of 1HU of space between the bottom of a 9HU shelf or 7HU shelf and the top of a DCM shelf.

⚠	**CAUTION** **Risk of Fire and Risk of Damage to Equipment Because of Overheating** When you mount a DCF1HU-P shelf beneath a 9HU shelf or 7HU shelf, leave a minimum of 1HU of space between the bottom of a 9HU shelf or 7HU shelf and the top of a DCM shelf. This precaution is necessary to allow free air flow to the shelf above. Failure to do so can cause overheating conditions and can result in incorrect operation, damage to system components, or fire.

Connecting the Power

You can use an AC or DC power source to power the FSP 3000R7. This section lists prerequisites and important safety guidelines, and procedures to follow when you connect electrical power to the FSP 3000R7 system.

This section contains these topics:

Required Expertise

Personnel who connect power to a shelf must be trained electricians. They must be trained in and aware of standard electrical safety, electrical wiring, and connection practices for the installation of electrical equipment.

These personnel must possess the skills and experience in power cabling and have knowledge related to the electrical equipment required for an FSP 3000R7 installation, for example DC power. We assume that personnel who connect and set up power for the product completed applicable safety training about hazards involved in these tasks. Personnel must be knowledgeable of at least these electrical standards:

- IEC/EN 60950-1, IEC: 62368-1: 2014, EN 50110-1-2, ETSI EN 300132-2, ETSI EN 300253, and EN 50310.
- NFPA 70 or CSA C22.1, or IEC 60364, Part 1 through Part 7.
- Other relevant local and national electrical codes.

This knowledge is mandatory for personnel who work with voltage levels that can cause injury.

Connecting DC Power

This section includes these topics:

DC Power Considerations

A DC-powered shelf nominally operates at –48 VDC, which means that the positive conductor of the power source is earth-grounded. For redundancy, the shelf requires two power inputs designated as Power A and Power B, or Power 1 and Power 2. One power input must connect to Power A, the primary power supply, and the other input must connect to Power B, the backup power supply. If only one power source is in use and fails, the shelves cease to operate.

> To connect to AC power, see Connecting AC Power Cables to SH7HU and SH1HU-R Shelves.

DC-powered shelves have no separate power ON-OFF switch. Do not connect these shelves directly to a centralized DC-power system. You must first implement dedicated circuit breakers or fuses in the building or system and use these to switch each DC-powered shelf on or off.

In 48 VDC systems (<60 VDC) for locations that are 2000 m above sea level or below, you can use a 2-core power cable or a 3-core power cable to connect the 7HU shelf. If the site is located at an altitude higher than 2000 m, you must use a 3-core power cable. In 60 V systems, you can use a 3-core power cable.

The DC power supply for 1HU shelf types has two separate inputs that you can use to dual-feed power from independent power supplies. The power connectors of the shelves are front-accessible. The 9HU shelf and the 7HU shelf variants provide both front and rear power access. We recommend that you use power cables provided by ADVA. For information about DC power cables, see the *FSP 3000R7 Hardware Description* and Prerequisites for Installation.

Prerequisites for Connection

Verify or perform these prerequisites before you connect the power:

- The site wiring systems must be installed in accordance with your national and local electrical safety standards.
- The DC-powered shelves require a battery-based power supply or rectifier.
- Site wiring must include a protective earth-ground connection to the –48 VDC power source.
- A properly-rated and dedicated circuit breaker or fuse is required between each DC power source and each power supply unit of the shelf for over-current and short-circuit protection. See the DC Power Requirements. You must incorporate the circuit

breaker or fuse into the site wiring system. The circuit breaker or fuse also serves as a disconnect device and must be readily accessible at all times.

- Ensure that you use a separate power source for each PSU of the shelf or for each power feed. The use of independent power source connections maintains power redundancy.

- When you connect dual DC power sources, verify that both sources have the same polarity.

- The system requires one customer-supplied power distribution unit (PDU) per rack. Before you complete power connections, install the PDU at the top of the rack. Office battery power and return cables connect to the PDU.

- The PDU must nominally provide power at –48 VDC to each shelf. See DC Power Requirements. Customers are responsible for supplying and wiring the PDU to the shelf power connections.

- Ensure that each shelf has a proper earth-ground to the earth-ground point fastener of the rack by using one of these:
    - A separate protective earth-grounding conductor: a shelf with a protective earth-ground terminal.
    - A separate green/yellow functional earth-grounding conductor: a shelf with a functional earth-ground terminal.

- Ensure that you earth-ground the equipment rack and the PDU by the use of a safety earth-ground wire in accordance with local procedures.

- The DC power cables must
    - Meet applicable standards for safety and performance.
    - Have wires of the proper size and length.

- Appropriately prepare the supply end of each cable. For cable specification, see DC Power Cable Requirements.

- Make sure that vertical cable management brackets are mounted on the front sides of the rack. These brackets provide space for secure and orderly cable storage and protect the cables.

Safety Guidelines

Before you complete any power-connection procedure, review the safety guidelines in this section to avoid injury or damage to the equipment.

	Read and understand the *FSP 3000R7 Safety Guide*, which contains useful information that you need to know before you connect power to the system.

Only service personnel or a qualified/licensed electrician is allowed to connect DC power cables.

ELECTRIC VOLTAGE WARNING

Risk of fire

Use only approved and properly rated power cables.

Do not use damaged power cables or cables with damaged power plugs or wire terminals. Immediately replace damaged plugs or wire terminals.

ADVAdoes not allow you to connect a 3-conductor 16 AWG DC power cable to the PSU/7HU-DC-HP or PSU/7HU-R-DC-HP. To connect the PSU/7HU-DC-HP or PSU/7HU-R-DC-HP, you must use a 14 AWG DC power cable as a minimum.

ELECTRIC VOLTAGE WARNING

Risk of electric shock

Ensure that the rack and the external power source are earth-grounded in accordance with national and local regulations. Contact the appropriate electrical inspection authority or a qualified/licensed electrician, if you are uncertain that suitable earth-grounding is available. Incorrect earth-grounding can result in personal injury or damage to equipment.

Follow local procedures for working with electrical power. High voltage might be present in this procedure. Use properly insulated tools when you work with power connections. Do not allow any metal objects to connect across power terminals.

Before you connect a power cable, ensure that you remove power from the associated DC supply circuit. If you ignore this precaution, unacceptable operation, damage to electrical components, or personal injury can result.

Unused power input connectors on the 9HU shelf are live if the shelf connects to a power source. If you touching the open pins, you can get an electric shock. Before you connect the power cable, ensure that the associated power input connector on the opposite side of the shelf is provided with a protective cover.

	ELECTRIC VOLTAGE WARNING
⚠️	**Electrical earthing hazard**
	The DC-powered shelf is designed to permit the earth-grounded conductor of the DC supply circuit to connect to the equipment earth-grounding conductor.

Continue with these guidelines.

NOTICE	Observe the tightening torque values for DC terminal screws on the DC power supply to ensure a tight and reliable electrical connection. For the appropriate tightening torque, see the power supply module specification or 1HU shelf specification in the *FSP 3000R7 Module and System Specification*.
	Use a torque-controlled screwdriver to tighten screws of the DC power supply terminals.

📝	You must ensure that power connections maintain the proper polarity. The power source cables might be labeled + (positive) and − (negative) to indicate their polarity. DC power cables have no international standard for color coding. The color coding that your site uses for the external DC power source determines the color coding for the conductors of the power cables. The cables connect to the terminals on each power supply. See the *FSP 3000R7 Hardware Description* for details about the color codes of the DC power cables.

📝	Carefully pay attention to the polarity of any power connection. If you apply the supply voltage with the incorrect polarity, reverse polarity protection will ensure that no current flows in this invalid direction. Therefore, no power will be available at the PSU output.

Shortening and Assembling DC Power Cables

⚠️	Only service personnel or a qualified/licensed electrician is allowed to perform this procedure.

The DC power cables that ship with your product have a length of 3.0 m (9.84 ft). One end of the cable has no terminal connectors. Because of safety and cable routing, ADVA recommends that you cut the cables to the correct lengths and terminate the ends with appropriate connectors.

> 📝 Termination of power cables that you plan to attach to the external power source is your responsibility.
>
> You must construct your own DC power cables. See DC Power Cable Requirements for applicable cable specifications.

Two power cables of the same length and with the same connectors constitute a cable pair that belongs to a specific shelf. ADVA recommends that you label each DC power cable for easy identification. At a minimum, the label should include this information on each end of the cable:

- Designation of the shelf — that you will connect the cable to
- Cable number
- Power source and power supply (to and from) connection information
- Power A or Power B
- Polarity of the wires

Required Tools and Equipment

- Two DC power cables, one each for Power A and Power B
- Appropriate terminal connectors that match the connectors on the external power source
- Self-retracting pocket tape measure
- Wire cutting pliers
- Wire strippers
- Crimping tool

Procedure

1. Determine the cable length required for the shelf, for example, cable for Power A.
2. Measure the power cable length.
3. Use the wire cutters to cut any excess cable from the end that connects to the power source, which is the end without terminal connectors.
4. Remove enough of the sheath from the end of the cable to expose the wire ends. Be careful not to damage the insulation of the stranded wires.
5. Use the wire stripper to strip approximately 5 mm (0.2 in.) of insulation from the wire ends. Be careful to avoid any damage to the small-gauge wires.
6. Use the wire crimper to crimp the appropriate terminal connectors to the wire ends.
7. Complete and attach an identification label.
8. Repeat this procedure for Power B cable.

Connecting the DC Power Cables to a 9HU Shelf

	Only service personnel or a qualified/licensed electrician is allowed to perform this procedure.

	See Safety Guidelines before you connect a DC power supply cable. ADVA assumes that the person who performs this task: knows standard electrical wiring and connection practices, is familiar with power supplies, and is aware of the precautions to take in order to avoid personal injury and damage to equipment.

You can connect the power cables to the power supply input connectors located either on the front side or on the rear side of the 9HU shelf. This next procedure describes how to connect power cables to the front side connectors and also applies to connecting a rear-access power-feed.

See Figure 45 and Figure 46 for –48 VDC power input connector location and pin assignment information.

Figure 45:   –48 VDC Power Supply Input Connector Locations on the Front Side and D-Sub Connector Pin Assignments
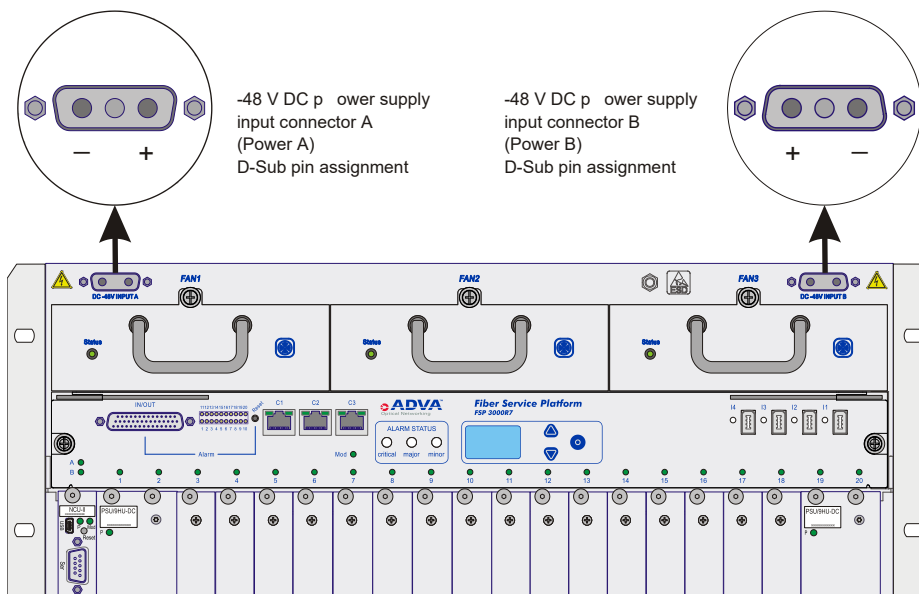
Figure 46:   –48 VDC Power Supply Input Connector Locations on the Rear Side and D-Sub Connector Pin Assignments

-48 V DC p   ower supply
input connector C
(Power C)
D-Sub pin assignment

-48 V DC p   ower supply
input connector D
(Power D)
D-Sub pin assignment

DC -48V INPUT C

DC -48V INPUT D
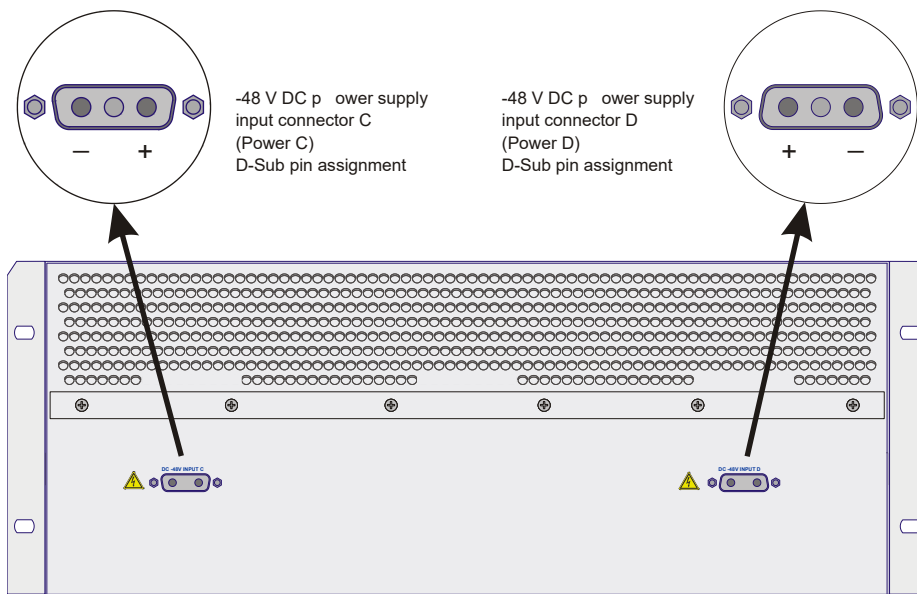
> The –48 VDC power supply D-Sub connector locations on the front side and rear side panel are rotated 180° in relation to each other.

Each power supply input connector has a plastic protective cover.

Required Tools and Equipment

- Two power cables of the proper length (CBL/DC/300/2AWG10/SUB-D), which belong to the specific shelf: one for Power A and one for Power B, or one for Power C and one for Power D.
  ADVA provides two cables per shelf. You must order these separately from your main product order. You must use these cables for your power cable installation.

- A torx screwdriver TX10 to affix the protective cover screws of the power input connectors.

- A size 1 Phillips screwdriver to tighten the locking bolts of the D-Sub power connector plug.

- An appropriate screwdriver or spanner for the terminal screws of the DC power source, for example, a PDU.

Procedure

1. Verify that the DC power supply where you plan to install the FSP 3000R7 can deliver the correct operating voltage to the (–36/–72 VDC nominal).
   Verify that the correct fuse or circuit breaker is installed at the power supply source and that power is off. For recommended external circuit breaker, see the *FSP 3000R7*

Module and System Specification.

2. Locate the 9HU shelf that you plan to connect to the external power source.

3. Depending on the power access requirement, either front or rear power access, decide which input power connectors you want to use.

4. Determine which input power connector you need to connect first, for example, Power A on the front side.

5. Select a cable from the appropriate cable set, and verify that:

   - The cable is the correct length to connect the power source to the shelf.

   - The wires on the other end of this cable are assembled with the proper terminals.

   - The terminals are in good working order and securely fixed to the wire ends.

6. Immediately replace any wire terminals that are damaged or inadequately fixed.

7. Remove the protective cover from the corresponding power input connector on the front side of the shelf, for example, Power A:

   a. Use a Torx screwdriver TX10 to remove the two screws that attach the protective cover. Set them aside for later re-use.

   b. Remove the protective cover and set it aside.

	Take care of the fixing screws because you will need to re-use them later. When you remove the protective cover, the fixing screws can fall off and become lost.
	The D-Sub connector plug fits in only one way. Make sure that you correctly orient the plug based on the power supply input connector locations. See Figure 45 and Figure 46. Orientation of the plug for power A and power C is correct when the cable runs to the left, as you view the plugs from the front of the shelf. Orientation of the plug for power B and power D is correct when the cable runs to the right, when you view the plug from the rear of the shelf.

8. Connect the D-sub plug of the DC cable to the power input connector on the shelf, for example, Power A:

   a. As you hold the plug body, match the D-shaped metal shield on the plug with the D-shaped shell of the power input connector on the shelf. The power A cable runs to the left.

   b. Push the plug straight in.

   c. Using a size 1 Phillips screwdriver to turn and secure the locking bolt on each side of the plug. Do not overtighten the bolts.

CBL/DC/300/2AWG10/SUB-D

9. Route the power cable securely through the vertical cable bracket on the left side (Power A) of the rack to the corresponding high-current connectors of the DC power source, for example, PDU.

> **ELECTRIC VOLTAGE WARNING**
>
> **Risk of burn and fire**
>
> Do not connect or disconnect the CBL/DC/300/2AWG10/SUB-D power cable, if voltage is applied. Before connecting or disconnecting this cable, ensure that the associated power source circuit breaker is in the OFF position and that the corresponding fuse has been removed from the power source. Failure to follow this instruction results in burns and damage of the plug/socket combination by causing electrical arcing.

10. Using a voltmeter, measure the voltages at the source power supply terminals. Verify that no voltage is applied to the power source output (for example, to the PDU) to the shelf to be connected or disconnected. If voltage is applied, take one of these actions:
    - Switch the associated power source circuit breaker to the OFF position.
    - Remove the corresponding fuse from the power source, if required, and store the fuse in a safe place for later re-use in the power connection phase.

11. Attach the other end of the power cable to the corresponding high-current connectors of the power source, for example, the PDU, according to local site practice. See the terminal end specifications described in the *FSP 3000R7 Hardware Description*.

> Ensure that you observe the proper polarity of the DC power. The DC PSU detects polarity reversal and does not power up if the polarity is reversed.

Continue with these steps.

1. Tighten the terminal screws of the power source to the specified torque, which you can find in the power source specification.

2. Save the protective cover with its fixing screws for later use.

3. Repeat this procedure to connect the second power supply unit, for example, Power B, if applicable.

4. Repeat this procedure for each 9HU shelf mounted in the rack.

Connecting the DC Power Cable to the SH1HU-HP/2DC or SH1HU-HP/E-TEMP/2DC Shelf

⚠	Only service personnel or a qualified/licensed electrician is allowed to perform this procedure.

📖	See Safety Guidelines before you connect a DC power supply cable. ADVA assumes that the person who performs this task: knows standard electrical wiring and connection practices, is familiar with power supplies, and is aware of the precautions to take in order to avoid personal injury and damage to equipment.

Required Tools and Equipment

- For the SH1HU-HP/2DC shelf: 1 power cable CBL/DC/300/2AWG16/1HU-HP.

- For the SH1HU-HP/E-TEMP/2DC shelf, you need one of these:
    - 1 power cable CBL/DC300/2AWG16/1HU-HP/R-/B+
    - 1 power cable CBL/DC300/2AWG16/1HU-HP/BL-BK
    - 1 power cable CBL/DC300/2AWG16/1HU-HP/GR-BL

- A flat-blade 0,8 mm x 4 mm screwdriver to affix the power plug screws.

- An appropriate screwdriver or spanner to use for the terminal screws of the DC power source, for example, a PDU.

You can connect the power cables that are assembled with a 4-pole power plug to the power input connector located on the front of the SH1HU-HP/2DC or SH1HU-HP/E-TEMP/2DC shelf.

Procedure

1. Locate the SH1HU-HP/2DC or SH1HU-HP/E-TEMP/2DC shelf in the rack that you plan to connect to the external power source.

2. Select the appropriate cable and verify that:
    - The cable is the correct length to connect the power source to the shelf.
    - The wires on the other end of this cable are assembled with the proper terminals.

- The terminals are in good working order and securely fixed to the wire ends.

3. If necessary, immediately replace any damaged or inadequately fixed wire terminals.

4. Connect the 4-pole plug of the cable to the dual power feed input connector on the shelf. Tighten the two fixing screws on the plug to secure it.

	Only one 4-pole power plug is needed for the two power feeds, Power 1 and Power 2.
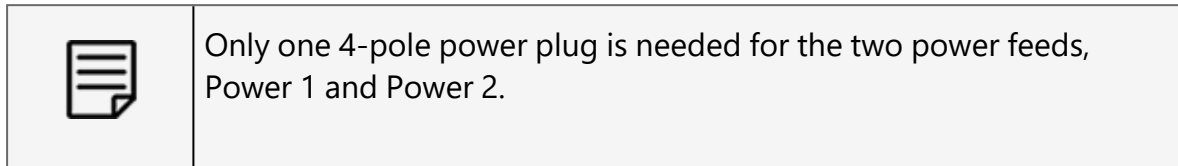
Figure 47:   Example of Connecting the Power Cable to the SH1HU-HP/2DC

NOTICE	**Risk of electrical damage** Do not use the cable to remove the power plug. Always use the strain relief clamp on the plug to remove the plug.
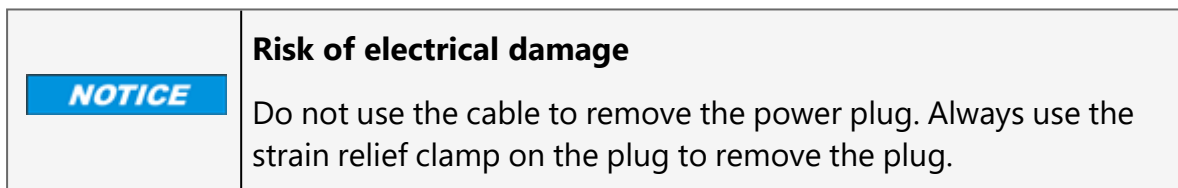
5. Securely route the power cables, Power 1 and Power 2, through the vertical cable bracket to the high-current connectors of the DC power source, for example, the PDU. The bracket is located on the left side of the rack.

	ELECTRIC VOLTAGE WARNING **Risk of burn and fire** Do not connect the power cable, if voltage is applied. Before connecting this cable, ensure that the associated power source circuit breaker is in the OFF position and that the corresponding fuse has been removed from the power source. Failure to follow this instruction results in burns and damage of the plug/socket combination by causing electrical arcing.

6. Use a voltmeter to verify that the power source, such as a PDU, that you plan to connect to the shelf has no voltage applied to it. If voltage is applied, take one of these actions:

a. Switch the associated power source circuit breaker to the OFF position.

b. Remove the corresponding fuse from the power source, if required, and store the fuse in a safe place to re-use later in the power connection phase.

7. Attach the other end of the power cable to the corresponding high-current connectors of the power source, such as a PDU, according to local site practice. Pay attention to the polarity.

Conductor	Shrink Tubing Color	Voltage	Connectors
Wire labeled with 1	Red	0 V (return)	to positive (+) terminal
Wire labeled with 2	Black	−48 V	to negative (−) terminal

8. Tighten the power source terminal screws to the specified torque, which you can find in the power source specification.

9. Repeat this procedure for each SH1HU-HP/2DC or SH1HU-HP/E-TEMP/2DC shelf mounted in the rack.

Connecting the DC Power Cables to SH7HU and SH1HU-F/2DC Shelves

⚠	Only service personnel or a qualified/licensed electrician is allowed to perform this procedure.

📖	See Safety Guidelines before you connect a DC power supply cable.ADVA assumes that the person who performs this task: knows standard electrical wiring and connection practices, is familiar with power supplies, and is aware of the precautions to take in order to avoid personal injury and damage to equipment.

Required Tools and Equipment

*   Two power cables of the correct type and length for the specific shelf, one for Power A and one for Power B. ADVA ships these cables with your product:
    *   One pair of 16 AWG DC power cables (CBL/DC/300/2AWG16/TB) to connect to the SH1HU-F/2DC.
    *   One pair of 14 AWG DC power cables (CBL/DC/300/3AWG14/TB or CBL/DC/300/3AWG14/FLT/R-/B+) to connect to the PSU/7HU-DC and PSU/7HU-DC-HP — Including three tab connectors with a CBL/DC/300/3AWG14/FLT/R-/B+ shipment.

- One pair of 14 AWG DC power cables (PC300/3WIRE/RED/BLACK/14AWG) to connect to the PSU/7HU-DC and PSU/7HU-DC-HP.

- A size 1 Phillips screwdriver to attach the protective cover to the terminal block
- A size 2 torque-controlled Phillips screwdriver for the terminal screws

Procedures

1. Locate the shelf that you plan to connect to the external power source.
2. Determine which power supply unit (PSU) to connect first, for example, Power A or Power 1.
3. Select a power cable from the appropriate cable pair, and verify that:
   - The cable is the correct length to connect the power source to the PSU.
   - The wires on the other end of this cable are assembled with the proper terminals.
   - The terminals are in good working order and securely fixed to the wire ends.
4. If necessary, immediately replace any damaged or inadequately fixed wire terminals.
5. Remove the protective cover from the terminal block, for example, Power A:
   a. Use the size 1 screwdriver to remove the two fixing screws.
   b. Remove the cover and set it aside with the screws to use later.

	Not all protective covers have captive screws. Make sure that you retain the screws. The fixing screws, shown in can fall off and become lost when you mount or remove the protective cover.

6. Use the size 2 Phillips screwdriver to remove the three terminal screws from the terminal block. Set these screws aside for later use.
7. Inspect the terminal block for damage. Do not proceed if one or more terminal screws are damaged. If necessary, replace any damaged terminal screws.

	Do not replace a damaged terminal block in the field. Return the damaged PSU or the entire 1HU shelf to ADVA for repair.

Continue with these steps to connect the equipment end of the CBL/DC/300/2AWG16/TB, CBL/DC/300/3AWG14/TB or PC300/3WIRE/RED/BLACK/14AWG cable (pre-assembled with ring lugs) to the terminal block of the PSU.

1. Connect the earth-ground wire to the protective earth-ground terminal, and then use one of the previously removed terminal screws to secure the wire.
2. Connect the return wire to the positive terminal labeled + and use one of the previously removed terminal screws to secure the wire.

3. Connect the –48 VDC supply wire to the negative terminal labeled –, and use one of the previously removed terminal screws to secure the wire.

4. Use a size 2 torque-controlled Phillips screwdriver to tighten each terminal screw on the PSU-DC(-HP) to a torque of 1.4 Nm (12.4 lbf-in).

5. Use a size 2 torque-controlled Phillips screwdriver to tighten each terminal screw on the power supply of the SH1HU-F/2DC shelf to a torque of 0.8 Nm (7.08 lbf-in).

Continue with these steps to connect the equipment end of the CBL/DC/300/3AWG14/FLT/R-/B+ cable (pre-assembled with flag terminals) to the terminal block of the PSU.

1. Mount the tab connectors to the terminal blocks. Secure the tab connectors with the terminal screws you previously removed.

2. Use a size 2 torque-controlled Phillips screwdriver to tighten each terminal screw on the PSU to a torque of 1.4 Nm (12.4 lbf-in) .

3. Attach the terminal flags of the cable to the corresponding tab connectors, as shown in .

4. Connect the yellow-green earth-ground wire to the protective earth-ground terminal.

5. Connect the black wire (DC positive conductor) to the positive terminal labeled +.

6. Connect the red wire (DC negative conductor) to the negative terminal labeled –.

> Ensure that each power cable lug seats flush against the surface of the terminal block as you tighten the screws. Ensure that each screw is properly threaded into the terminal. If you apply installation torque to a screw that is improperly threaded, damage to the terminal can occur.

Continue with these steps.

1. Pass the power cable through the space between two fiber fingers (7HU shelf) and bend the cable about 90 degrees to the left (for example, Power A) or right (for example, Power B). The direction depends on which side of the rack you need to guide the power cable.

2. Reattach the protective cover over the terminal block:
   a. Replace the protective cover onto the terminal block.
   b. Insert the fixing screws you previously removed.
   c. Use a size 1 Phillips screwdriver to tighten the screws.

3. Route the power cable through the vertical cable brackets on the left side (Power A) or right side (Power B) of the rack to the high-current connectors DC power source, for example the PDU.

> **ELECTRIC VOLTAGE WARNING**
>
> **Risk of electric shock**
>
> Before you connect this cable, ensure that the associated power source circuit breaker is in the OFF position. Also verify that the corresponding fuse is removed from the power source. Failure to follow this instruction will result in personal injury, damage to electrical components, or adverse system operation.

4. On the shelf you plan to connect, use a voltmeter to verify that no voltage is applied to the power source output, for example PDU. If voltage is applied, take one of these actions:

     a. Switch the associated power source circuit breaker to the OFF position.

     b. Remove the corresponding fuse from the power source, and then store the fuse in a safe place to use during the power-connection phase.

5. Attach the other end of the power cable to the corresponding high-current connectors of the power source, for example PDU, according to local site practice. Pay attention to the polarity. See the terminal end specifications described in the *FSP 3000R7 Hardware Description*.

6. Tighten the terminal screws of the power source to the specified torque, which can you can find in the power source specification.

7. Repeat this procedure to connect the second power supply unit — for example, Power B or Power 2.

8. Repeat this procedure for each DC-powered shelf mounted in the rack.

Testing the Earth and Power Connection

After you complete the power and earth-ground connections, test them to ensure correct functionality.

> Only service personnel or a qualified/licensed electrician is allowed to perform this procedure.

> **ELECTRIC VOLTAGE WARNING**
>
> This procedure involves hazardous voltages that can cause personal injury. Take extreme care to avoid bodily contact with electrical terminals.

Required Tools and Equipment

Multimeter to check the voltage level

Procedure

1. Verify that:
   - The polarity of each DC power cable connection is correct and all wires are correctly fixed to their connectors.
   - The earth-ground complies with local procedures.

2. Use a multimeter to verify that a voltage level of –48 VDC is available at the PDU.

3. Reinstall all fuses into the PDU.

4. Turn the PDU Power A or Power 1 circuit breaker to the ON position.

5. Confirm that the PDU has power. The green power indicator should be lit. Immediately after power on, the NCU starts the boot process, indicated by the slot LEDs all blinking yellow.

   The power supply unit (Power A) LED in each 7HU shelf or the power LED labeled pwr1 in each 1HU shelf should light solid green to indicate that the unit is functioning properly.

   The three fans should start operating in turn, and the fan status LED should light solid green. This green LED indicates that the fan unit is functioning properly. In addition, the power LEDs of all modules installed in the shelf should light solid green.
   After approximately 3 minutes, the slot LEDs of the provisioned modules should also light solid green. The green LEDs indicate that the FSP 3000R7 has completed the boot process and is ready for normal operation.

   > 📝 If the LED of the power supply unit is off, no AC voltage is supplied to the unit. If an error occurs, the power LED lights solid red. For troubleshooting information, see the *FSP 3000R7 Maintenance and Troubleshooting Manual* or contact ADVA for technical assistance.

6. Turn the PDU Power A or Power 1 circuit breaker to the Off position. All power LEDs of the shelves, modules, and fans should turn off, and the fans should stop operating.

7. Turn the PDU Power B or Power 2 circuit breaker to the On position, and check the power LEDs.

   Immediately after power on, the NCU starts the boot process, indicated by the slot LEDs all blinking yellow.

   The power supply unit (Power B) power LED in each 7HU shelf or the power LED labeled pwr2 in each 1HU shelf should light solid green to indicate that the unit is functioning properly.

   The three fans should start operating in turn, and the fan status LED should light solid

green. A green LED indicates that the fan unit is functioning properly. In addition, the power LEDs of all modules installed in the shelf should light solid green.

After approximately 3 minutes, the slot LEDs of the provisioned modules should also light solid green. The green LED indicates that the FSP 3000R7 shelf completed the boot proces and is ready for normal operation.

> 📝 If the LED of the power supply unit is off, no voltage is supplied to the unit. If an error occures, the power LED lights solid red. For troubleshooting information, see the *FSP 3000R7 Maintenance and Troubleshooting Manual* or contact ADVA for technical assistance.

8. Turn the PDU Power B or Power 2 circuit breaker to the Off position. All power LEDs of the shelves, modules, and fans should turn off, and the fans should stop operation.

Connecting the AC Power

This section includes these topics:

AC Power Considerations

The AC- powered shelves operate nominally at either 110 V/60 Hz or 230 V/50 Hz. The AC power supply units automatically detect the input voltage and no further adjustment is necessary. The AC power supply unit operates with power systems that have a grounded neutral conductor. For redundancy, the shelf requires two power inputs, (designated as Power A and Power B or Power 1 and Power 2). One power input should be connected to Power A (primary power supply) and the other one should be connected to Power B (backup power supply). If only one power source is used and that source fails, the shelves cease to operate. To apply AC power to the FSP 3000R7 shelves, the appropriate power cables must be connected from the line power, for example power source outlets, to the PSUs located in the shelf. The Power A unit and the Power B unit must be connected from the line power, for example AC power source outlets, to the PSUs located in the shelf. To support power connections in a variety of countries, different AC power cables are provided by ADVA.

Connect one power input to Power A, the primary power supply, and the other input to Power B, the backup power supply. If you use only one power source and it fails, the shelves cease to operate. To apply AC power to the FSP 3000R7 shelves, connect the appropriate power cables from the line power, for example power source outlets, to the shelf PSUs. We

provide a selection of AC power cables to support power connections in a variety of countries.

7HU shelf variants provide front power access. Power connections for the SH1HU-R are located at the back panel.

	For operation in various countries, you can order country- specific AC power cables and have them delivered with your equipment. For proper operation of the system, use the appropriate AC power cables. For more information, see the *FSP 3000R7 Hardware Description* as well as Prerequisites for Installation.

The AC power cable-attachment power plug (attachment plug) of the AC power cable serves as the main disconnection device. Therefore, the dedicated AC power outlet must remain accessible so as to be readily operable for use.

Prerequisites for Connection

Verify or perform these prerequisites before you connect the power.

Prerequisite	Description
Site wiring systems	• Install in accordance with your national and local safety standards. • Ensure that the wiring includes a protective earth-ground connection to the AC power source.
Supply circuits	Ensure you have a regular earth-grounded outlet and use a properly rated double-pole circuit breaker or fuse to limit the current. See AC Power Source Requirements for more information.
PSU	Make sure this is the only appliance in the supply circuit.
AC power source outlet	Use a separate, independent outlet for each PSU on the shelf to maintain redundancy.
Location of power source outlets	Ensure that the power source is • Close enough to the PSUs of the shelves. The supplied AC power cables are approximately 2.5 m (8.203 ft) long. • Easily accessible.
Line voltage and frequency	Use the same line voltage and frequency as those indicated on the shelf supply values label. This label is located on the rear panel of the SH7HU or on the top of the SH1HU-R.
Earth-ground	Earth-ground the rack and all shelves according to national regulations.

Prerequisite	Description
AC power cables	Ensure that the cables meet applicable standards for safety and performance. Make sure that the correct (national) power plug is fitted. For cable specifications, see AC Power Cable Requirements.
Cable brackets	Mount the vertical cable management brackets on the front sides of the rack to provide the necessary space for secure and tidy cable storage and protection.

Safety Guidelines

Before you perform any connection procedure, review the safety guidelines in this section to avoid injury or damage to the equipment.

	Read and understand the *FSP 3000R7 Safety Guide* for information you need to know before you connect power to the system.

	ELECTRIC VOLTAGE WARNING **Risk of electric shock, fire or burns** Use only 3-wired earth-grounded type power outlets that comply with relevant national electrical safety regulations. Do not defeat the safety purpose of the earth-grounded type plug. Do not overload a branch circuit, which can cause a fire hazard or a shock hazard under certain conditions. Unplug the AC power cables when the system is not in use.

	ELECTRIC VOLTAGE WARNING All AC power supply units must be powered by an alternating current (AC) source directly provided from the mains supply. Do not power AC PSUs by using AC derived from a direct current (DC) source.

	ELECTRIC VOLTAGE WARNING Before you perform this procedure, ensure that power is removed from the dedicated AC supply circuit.

> **ELECTROSTATIC CAUTION**
>
> Ensure that you are earth-grounded with a wrist strap or equivalent while you mount the brackets to a shelf that contains ESD-sensitive devices.
>
> Follow ESD-prevention precautions to avoid ESD damage to the other equipment.

Connecting AC Power Cables to SH7HU and SH1HU-R Shelves

Two independent, hot-swappable AC PSUs power the SH1HU-R. The AC inputs are on the rear side and use male connectors (IEC 320-C14). Each PSU must be equipped with a power-cable locking clamp to secure the cable, which are included in the accessory box that ships with the shelf.

We assume that you are familiar with the ESD-prevention precautions you must take to avoid ESD damage to the equipment.

Required Tools and Equipment

- Two AC power cables of the appropriate type for each shelf
- Two power-cable locking clamps to connect the power cables to an SH1HU-R shelf

Procedure

1. Locate the shelf in the rack where you plan to connect to the line power.
2. Determine which power supply unit you want to connect first — for example, Power A or Power 1.
3. Ensure that the PSUs are firmly seated in the shelf slot.
4. If you plan to connect the power cable to a SH1HU-R shelf PSU, you must assemble a power-cable locking clamp.
   a. Retrieve the power-cable locking clamp from its bag in the shelf accessory box.
   b. Grasp the locking clamp on its two long sides and squeeze them together.
   c. Snap the squeezed clamp into the guide intended for this clamp, as shown in Figure 48. Assemble the guide directly above the power supply connector.

Figure 48:   Assembling the Power-Cable Locking Clamp to the AC Power Supply

Inserting the squeezed clamp
into the guide

Assembled power cord
locking clamp
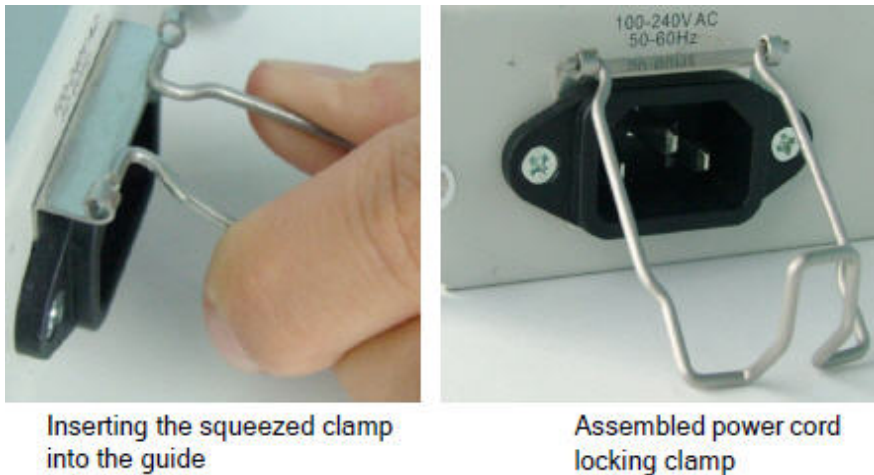
5. Locate the AC power cable that ships with the equipment. Assemble the power cable with:

    • A C13 type device plug according to the IEC 60320 standard at the female end.

    • A country-specific, three-conductor grounding type attachment plug at the male end.

6. Insert the device plug into the appliance coupler on the PSU faceplate, for example, Power A. Secure the power cable with the attached locking clamp. See Figure 49.

Figure 49:   Example of Connecting the AC Power Cable to the SH7HU or SH1HU-R Shelf PSUs
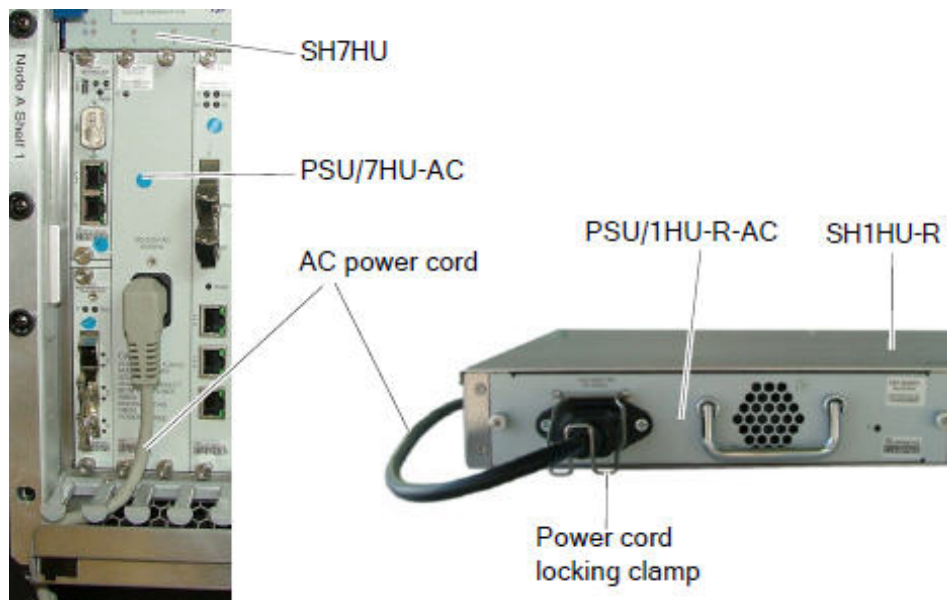
7. Pass the power cable through the space between two fiber fingers (7HU shelf) and bend the cable about 90 degrees to the left or right in the fiber tray (7HU shelf). The

direction depends on which side of the rack you need to guide the power cable. See
[Figure 49](#).

8. Route the cable through the vertical cable brackets on the left or right side of the rack to the line power, which can be any AC source outlet.

9. If the dedicated AC power source outlet has a power switch, set it to the OFF (0) position.

10. Insert the attachment plug into the dedicated AC power source outlet. The system is now ready to operate. Complete the next steps to verify power.

Continue with these steps.

1. If the dedicated AC power source outlet has a power switch, set it to the ON (|) position to power on the system for the first time.

2. Check the power LEDs.
    Immediately after you apply the voltage, the PSU power LED lights green to indicate that the unit is functioning properly. All installed module power LEDs also turn green. The NCU begins the bootup process, as indicated by the slot status LEDs all blinking yellow. After approximately 3 minutes, the slot LEDs turn off to indicate that the optical modules are not yet provided in the management system. The fans begin to operate in turn, and the fan status LEDs turn green. Green fan LEDs indicate that the fans are functioning properly.

    > If the PSU LED is off, the unit is receiving no AC voltage. The power LED turns red if an error occurs. For troubleshooting information, see the *FSP 3000R7 Maintenance and Troubleshooting Manual* or contact technical assistance.

3. If you need to power off the system, set the power switch of the dedicated AC power source outlet to the OFF (0) position or unplug the power cable from the outlet.
    The power LEDs and the slot status LEDs turn off, and the fans stop working.

4. Perform the previous applicable steps to connect the second PSU, for example, Power B or Power 2.

5. Repeat this procedure for each AC-powered shelf mounted in the rack.

Torque Values for Shelves, Earth-Grounding, and Power Connections

This table lists typical torque value guidelines for metric screws and nuts. Use these guidelines to ensure that you properly tighten all shelves, earth-grounding screws, and power connection screws. Depending on the material, torque values differ. These values are also included in the applicable installation instructions in this guide.

Table 26: Torque Value Guidelines

Thread	Torque (cNm)
M2	20
M2.5	50
M3	50
M4	160

Installing a 40CSM/2HU Shelf

Complete the procedures in this section to rack-mount 40CSM/2HU shelf types. Unless otherwise specified, the term *40CSM/2HU shelf* always refers to these shelf types:

- 40CSM/2HU-#D02-#D32
- 40CSM/2HU-#D34-#D64
- 40CSM/2HU-#19590-#19200
- 40CSM-FL/2HU-#19590-#19200
- 40CSM/2HU-#19595-#19205
- 40CSM-C80/2HU-#19590-#19200
- 40CSM-C80/2HU-#19595-#19205
- 40CSM/P-2HU-#19590-#19200-DM

These section contains these topics:

General Information

You can mount the 40CSM/2HU shelf to open racks or customer cabinets of the specified standard widths: 19 inch, 21 inch, and 23 inch. These shelves also fit into a 300-mm (0.984 ft) deep ETSI rack.

Before you mount the shelf to the rack or cabinet, referred to as *rack*, you must fit the appropriate adapter bracket pair. The adapter brackets secure the 40CSM/2HU shelf to the rack. These adapter brackets ship with the shelf:

- 1 — 19-inch bracket pair
- 1 NEBS bracket pair
- 1 ETSI bracket pair

Bracket guidelines:

- To mount the shelf to a 19-inch rack, you must use the 19-inch bracket pair.
- To mount the shelf to a standard 23-inch rack, use the NEBS brackets.
- For an ETSI-compliant rack installation, you need ETSI brackets.

Adapter brackets are fitted on the outside of the left and right side walls of the rack. The 40CSM/2HU shelf also includes fixing screws (M5x10). To mount each shelf, bolt its bracket pair to the rack mounting rails. You must provide the rack screws.

Optionally, to install the shelf in a 21-inch rack, use a provided fiber finger set. Two types of the fiber finger sets are available: FIBER FINGER/2HU and FIBER FINGER/2HU LEFT. Each fiber finger set consists of four fingers with spaces between the fingers. Use these spaces to route and retain the optical fiber jumpers that you plan to connect to the corresponding module. The FIBER FINGER/2HU is fitted on the right side of any 40CSM/2HU shelf type except for the 40CSM-FL/2HU-#19590-#19200. The FIBER FINGER/2HU LEFT is only fitted on the left side of the 40CSM-FL/2HU-#19590-#19200 shelf.

	To monitor, control, and power the 40CSM/2HU shelf, you must connect the shelf management interface to a management controller. Use the supplied IEEE 1394 interface cable. See Connecting the 40CSM/2HU Shelf to an FSP 3000R7 Shelf See Installing System Modules for instructions to mount and remove the front cover to and from a 40CSM/2HU Shelf. For more information about the 40CSM/2HU shelf types, see the *FSP 3000R7 Hardware Description*.

Fitting the 40CSM/2HU Shelf with the FIBER FINGER/2HU or FIBER FINGER/2HU LEFT

	CAUTION Only service personnel are qualified to perform this procedure.

	ELECTROSTATIC CAUTION
	Ensure that you are earth-grounded with a wrist strap or equivalent while you fit the FIBER FINGER/2HU or FIBER FINGER/2HU LEFT to the appropriate 40CSM/2HU shelf.

|	You cannot use a FIBER FINGER/2HU or FIBER FINGER/2HU LEFT to mount a 19-inch bracket.

We assume that you are familiar with the ESD-prevention precautions you must take to avoid ESD damage to the equipment.

Required Tools and Equipment

- Fiber finger set: You must order one of these sets with your equipment:
  - 1 x FIBER FINGER/2HU to use with the 40CSM/2HU shelf.
  - 1 x FIBER FINGER/2HU LEFT to use with the 40CSM-FL/2HU-#19590-#19200 shelf.
- Brackets
  - 1 x right side ETSI or NEBS bracket for any 40CSM/2HU shelf — ships with the shelf rack-mount kit.
  - 1 x left side ETSI or NEBS bracket for the 40CSM-FL/2HU-#19590-#19200 shelf — ships with the shelf rack-mount kit.
- 2 x M5x10 screws to attach the FIBER FINGER/2HU or FIBER FINGER/2HU LEFT with the appropriate bracket to the shelf side panel — ships with the shelf rack-mount kit.
- Torx screwdriver TX25 — for M5x10 screws.
- ESD-preventive wrist strap or other personal earth-grounding device.
- Suitable grounded surface or an antistatic mat to place the shelf.

Procedure

1. Remove the 40CSM/2HU shelf from its shipping box and place the shelf on a grounded surface or an antistatic mat.
2. Remove the right side ETSI or NEBS bracket from the plastic bags.
   For the 40CSM-FL/2HU-#19590-#19200 shelf: Remove the left side ETSI or NEBS bracket from the plastic bags.
3. Position the bracket on the right side of the 40CSM/2HU shelf.
   For the 40CSM-FL/2HU-#19590-#19200 shelf: Position the bracket on the left side of the shelf.
   Align the two threaded holes in the shelf side panel and the mounting holes of the bracket.

4. Remove the FIBER FINGER/2HU or FIBER FINGER/2HU LEFT. Align the mounting holes and place the fiber finger set on the bracket. The open slots must face toward the front as illustrated in Figure 50 and Figure 51.

5. Use the fixing screws to attach the FIBER FINGER/2HU or FIBER FINGER/2HU LEFT with the appropriate bracket to the shelf:

   a. Insert a M5x10 screw through a mounting hole in the bracket, and then into the threaded hole in the shelf side panel.

   b. Insert a second M5x10 screw through the remaining mounting hole in the bracket, and then into the threaded hole in the shelf side panel.

   c. Use a TX25 Torx screwdriver to tighten the screws.

Figure 50:   Example of Attaching the FIBER FINGER/2HU to a 40CSM/2HU Shelf
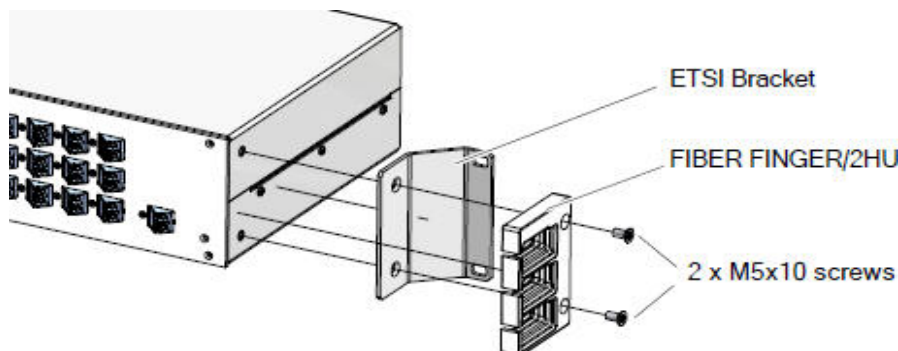
Figure 51:   Example of Attaching the FIBER FINGER/2HU LEFT to the 40CSM-FL/2HU-#19590-#19200 Shelf
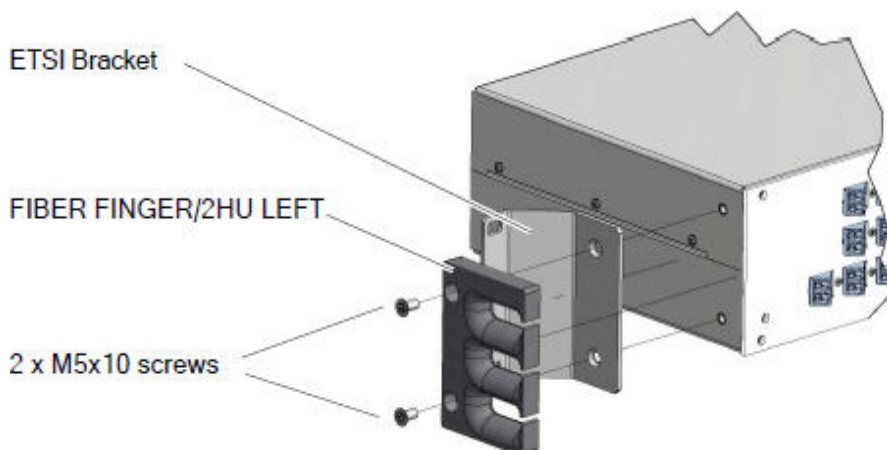
> - You can mount the left side ETSI or NEBS bracket to any 40CSM/2HU shelf type — except for the 40CSM-FL/2HU-#19590-#19200 — without using the FIBER FINGER/2HU.
> - You can mount the right side ETSI or NEBS bracket to the 40CSM-FL/2HU-#19590-#19200 shelf without using the FIBER FINGER/2HU LEFT.

Fitting the 40CSM/2HU Shelf with 19-inch Brackets

Complete these steps to fit the 40CSM/2HU shelf with 19-inch brackets. You must use 19-inch brackets to adapt the 40CSM/2HU shelf to the 19-inch standard rack dimensions.

⚠	**CAUTION**
	Only service personnel are qualified to perform this procedure.

⚠	**ELECTROSTATIC CAUTION**
	Ensure that you are earth-grounded with a wrist strap or equivalent while you mount the brackets to a shelf that contains ESD-sensitive devices.
	Follow ESD-prevention precautions to avoid ESD damage to the other equipment.

We assume that you are familiar with the ESD-prevention precautions you must take to avoid ESD damage to the equipment.

Required Tools and Equipment

- 1 — 19-inch bracket pair
- 4 M5x10 screws to affix the 19-inch brackets
- Torx screwdriver TX25 for the M5x10 screws
- ESD-preventive wrist strap or other personal earth-grounding device
- Suitable grounded surface or an antistatic mat to place the shelf

Figure 52 shows a 19-inch bracket.

Figure 52:   19-inch Bracket for a 40CSM/2HU Shelf

Procedure

1. Remove the 40CSM/2HU shelf from its shipping box and place the shelf on a grounded surface or antistatic mat.

2. Remove the 19-inch brackets and the four screws from the plastic bags in the rack-mount kit.

3. Place the appropriate 19-inch bracket on one side of the shelf in the correct position as illustrated in Figure 53. Ensure that you align the two threaded holes in the shelf side panel and the mounting holes of the bracket.

4. Use the provided fixing screws to fit the appropriate 19-inch bracket:

   a. Insert an M5x10 screw through a mounting hole in the bracket, and then into the threaded hole in the shelf side panel.

   b. Insert a second M5x10 screw through the remaining mounting hole in the bracket, and then into the threaded hole in the shelf side panel.

   c. Use a Torx screwdriver TX25 to tighten the screws.

Figure 53:   19-Inch Bracket Fitted to the 40CSM/2HU-#D02-#D32 Shelf

5. Repeat the applicable steps for the opposite side.

Fitting the 40CSM/2HU Shelf with ETSI Brackets

You must use ETSI brackets to adapt the 40CSM/2HU shelf to the ETSI standard rack dimensions.

⚠	**CAUTION**
	Only service personnel are qualified to perform this procedure.

ELECTROSTATIC CAUTION

Ensure that you are earth-grounded with a wrist strap or equivalent while you mount the brackets to a shelf that contains ESD-sensitive devices.

Follow ESD-prevention precautions to avoid ESD damage to the other equipment.

We assume that you are familiar with the ESD-prevention precautions you must take to avoid ESD damage to the equipment.

Required Tools and Equipment

- 1 ETSI bracket pair
- 4 M5x10 screws to fix the ETSI brackets
- Torx screwdriver TX25 for the M5x10 screws
- ESD-preventive wrist strap or other personal earth-grounding device
- Suitable grounded surface or an antistatic mat to place the shelf

Figure 54 shows an ETSI bracket.

Figure 54:   ETSI Bracket for a 40CSM/2HU Shelf

Procedure

1. Remove the 40CSM/2HU shelf from its shipping box and place the shelf on a grounded surface or an antistatic mat.
2. Remove the ETSI brackets and the four screws from the rack-mount kit.
3. Place the appropriate ETSI bracket on one side of the shelf in the correct position as illustrated in Figure 55. Align the two threaded holes in the shelf side panel and the bracket mounting holes.
4. Use the provided fixing screws to fit the appropriate ETSI bracket:
   a. Insert a screw through a mounting hole in the bracket, and then into the threaded hole in the shelf side panel.

  b. Insert a second screw through the remaining mounting hole in the bracket, and then into the threaded hole in the shelf side panel.

  c. Use a a Torx screwdriver TX25 to tighten the screws.

Figure 55: ETSI Bracket Fitted to the 40CSM/2HU-#D02-#D32 Shelf

5. Repeat the applicable steps of this procedure for the opposite side.

Fitting the 40CSM/2HU Shelf with NEBS Brackets

You must use NEBS brackets to adapt the 40CSM/2HU shelf to the NEBS standard rack dimensions.

⚠️	**CAUTION**
	Only service personnel are qualified to perform this procedure.

	ELECTROSTATIC CAUTION
	Ensure that you are earth-grounded with a wrist strap or equivalent while you mount the brackets to a shelf that contains ESD-sensitive devices.
	Follow ESD-prevention precautions to avoid ESD damage to the other equipment.

We assume that you are familiar with the ESD-prevention precautions you must take to avoid ESD damage to the equipment.

Required Tools and Equipment

- 1 NEBS bracket pair
- 4 M5x10 screws to fix the NEBS brackets

- Torx screwdriver TX25 for the M5x10 screws
- ESD-preventive wrist strap or other personal earth-grounding device
- Suitable grounded surface or an antistatic mat to place the shelf

Figure 56 shows a NEBS bracket.

Figure 56: NEBS Bracket for a 40CSM/2HU Shelf
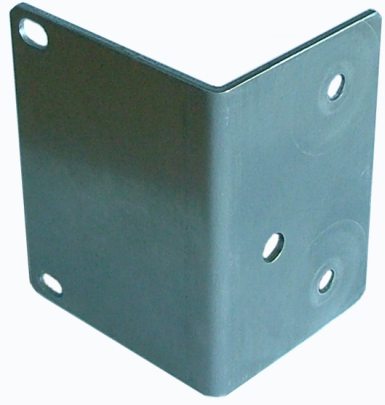
Procedure

1. Remove the 40CSM/2HU shelf from its shipping box and place it on a grounded surface or an antistatic mat.
2. Remove the NEBS brackets and the four screws from the rack-mount kit.
3. Place the appropriate NEBS bracket on one side of the shelf in the correct position as illustrated in Figure 57. Align the two threaded holes in the shelf side panel with the mounting holes of the bracket.
4. Use the provided fixing screws to fit the appropriate NEBS bracket:
   a. Insert an M5x10 screw through a mounting hole in the bracket, and then into the threaded hole in the shelf side panel.
   b. Insert a second M5x10 screw through the remaining mounting hole in the bracket, and then into the threaded hole in the shelf side panel.
   c. Use a Torx screwdriver TX25 to tighten the screws.

Figure 57:   NEBS Bracket Fitted to the 40CSM/2HU-#D02-#D32 Shelf

5. Repeat the applicable steps of this procedure for the opposite side.

Mounting the 40CSM/2HU Shelf into a Rack

Consider these guidelines when you prepare to mount the 40CSM/2HU shelf to a rack:

- For information about how to mount the 40CSM/2HU shelf to your rack, see the rack manufacturer's instructions.
- Separately mount each shelf in turn immediately after you fit the adapter brackets for that shelf. Do not place any other shelf on top of the 40CSM/2HU shelf until after you fit that shelf with adapter brackets and mount it in an appropriate rack position
- Avoid mounting the 40CSM/2HU shelf in an overly congested rack.
- You can mount the 1HU passive shelf below or above 1HU, 7HU, or 9HU equipment that the shelf connects to. The shelf numbering does not change; that is, it does not have a shelf number. This shelf is passive and unmanaged.
- The 40CSM/2HU shelf requires 2HU (44.5 mm = 1.75 in.) of rack space.

⚠	**CAUTION**
	Only service personnel are qualified to perform this procedure.

⚠	**ELECTROSTATIC CAUTION**
	Ensure that you are earth-grounded with a wrist strap or equivalent while you mount the brackets to a shelf that contains ESD-sensitive devices.Follow ESD-prevention precautions to avoid ESD damage to the other equipment.
	Follow ESD-prevention precautions to avoid ESD damage to the other equipment.

We assume that you are familiar with the ESD-prevention precautions you must take to avoid ESD damage to the equipment.

Required Tools and Equipment

- 4 appropriate rack screws and washers that you must provide. Use screws that fit the threaded holes in your rack.
- Appropriate screwdriver

Procedure

1. Determine the location where you plan to mount the 40CSM/2HU shelf. Read the installation plan or the cabling plan to get information about:
   - The shelf that you plan to mount
   - The rack where you plan to place this shelf
   - The position of this shelf within the rack

2. On the rack mounting rails, locate and mark the mounting holes where you plan to affix the shelf. Ensure no space exists between the 40CSM/2HU shelf and the shelf below or above.

3. If required, install two cage nuts in the corresponding holes on both sides of the rack.

📝	To complete the next steps, we recommend that you have another person hold the shelf in place while you secure it to the bay.

4. Lift the shelf to the bay and position it with the attached brackets in the rack so that the bracket holes on each side align with the rack-mounting holes.
5. Insert two rack screws that have washers on each side of the shelf into the holes.
6. Use an appropriate screwdriver to tighten the rack screws.

Rack-Mounting the 1HU Passive Shelf

The FSP 3000R7 1HU passive shelf is available:

- With a fiber management tray: the SH1HU/PASSIVE/FTshelf
- Without a fiber management tray: the SH1HU/PASSIVE shelf.

The term *1HU passive shelf* refers to both SH1HU/PASSIVE/FT and SH1HU/PASSIVE.

You can mount the 1HU passive shelf into open equipment racks or customer cabinets of these standard widths: 19 inch, 21 inch, and 23 inch. The 1 HU passive shelves also fit into a 600-mm (0.984 ft) ETSI-compliant rack. You must use adapter brackets to adapt the 1HU passive shelf to the 19-inch, ETSI, and NEBS standard rack dimensions and to secure the

shelf to the rack. You must separately order adapter brackets for the 1HU passive shelf; none are pre-installed. Before you mount the shelf into the rack or cabinet (referred to as *rack*) you must fit the appropriate adapter bracket pair.

This section contains these topics:

Fitting the 1HU Passive Shelf with Adapter Brackets

⚠	**CAUTION**
	Only service personnel are qualified to perform this procedure.

Depending on your installation needs, you need to attach adapter bracket pairs to the 1HU passive shelf for either a front or rear mount. Mounting bracket pairs are available for installation in a 19-inch rack (19-inch bracket pair), a standard 23-inch rack (NEBS brackets), or ETSI-compliant rack (ETSI brackets). Use the screws provided in the rack mounting kits to fit the adapter brackets on the outside of the left and right side walls. Figure 58 and Figure 59 show the available adapter bracket pairs and how they attach to the shelf.

Figure 58:   Adapter Bracket Installation — Front Mounted
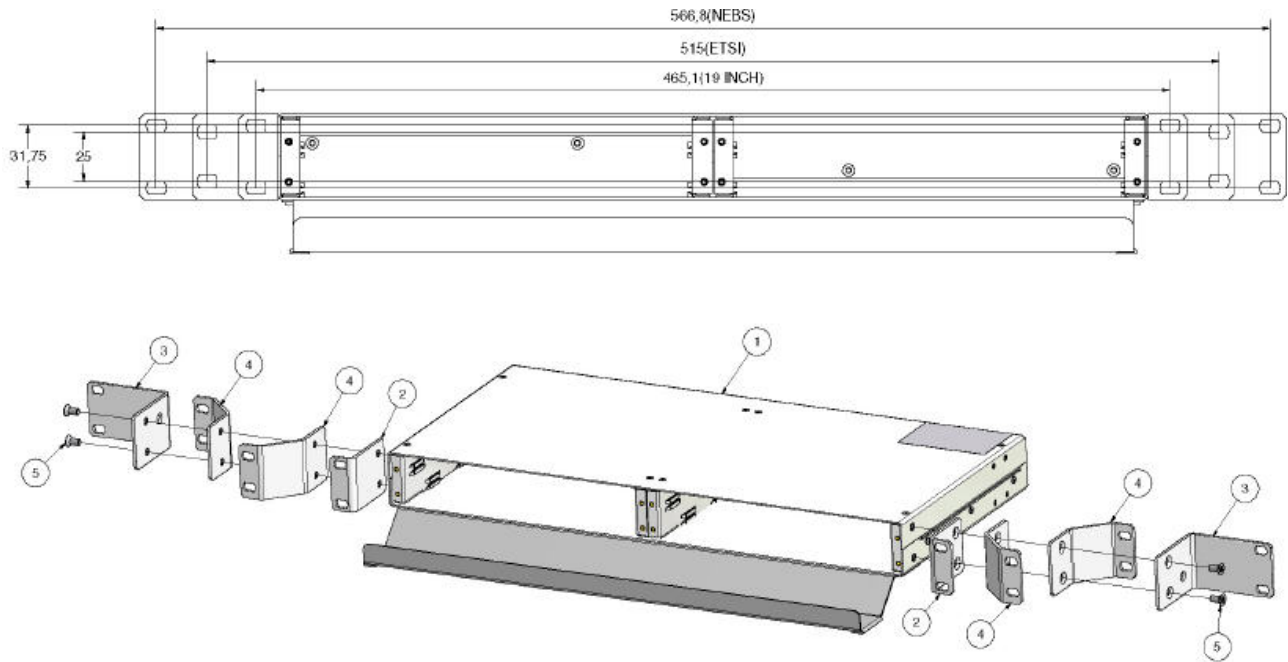
BOM		
Item	Pcs.	Designation
1	1	1HU Passive Shelf
2	2	19-inch adaptor bracket
3	2	NEBS adaptor bracket
4	2	ETSI adaptor bracket
5	4	Screw M5x10 CSK TORX-T25 A2

Figure 59:   Adapter Bracket Installation — Rear Mounted
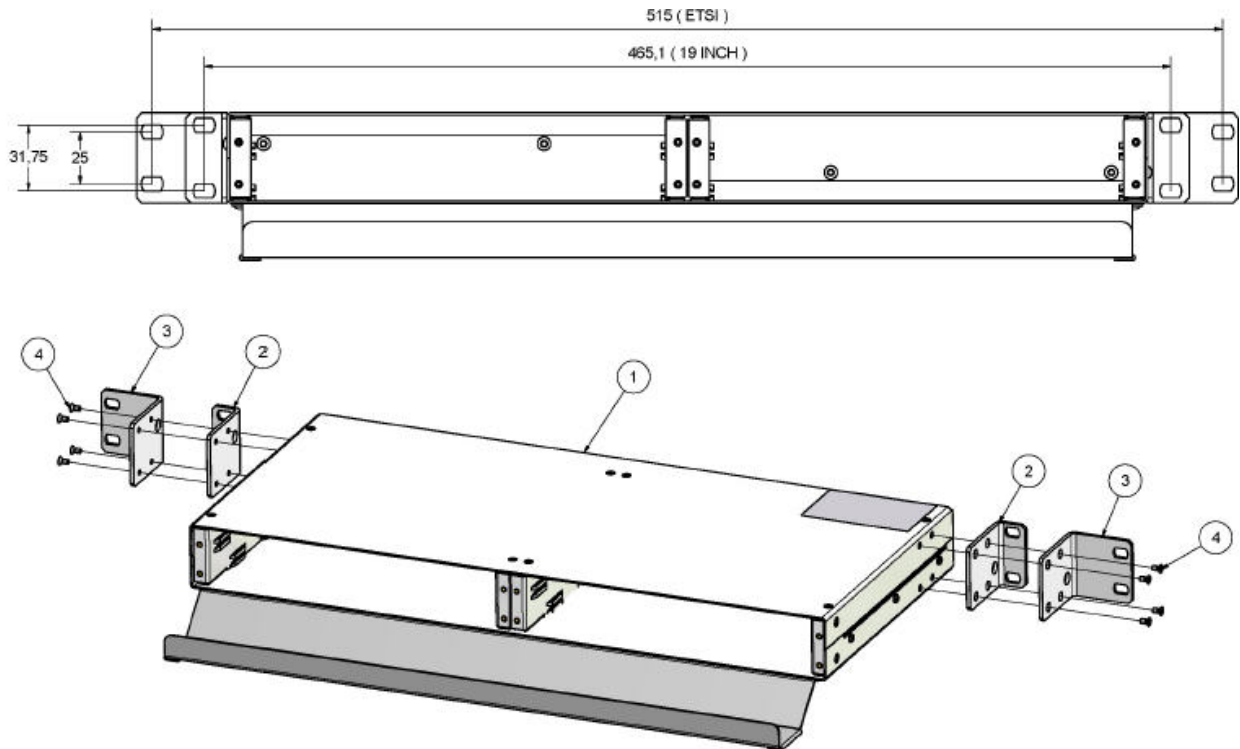
BOM		
Item	Pcs.	Designation
1	1	1HU Passive Shelf
2	2	19-inch Adaptor bracket - rear
3	2	ETSI Adaptor bracket - rear
4	8	Screw M3,0x6 CSK TORX

Required Tools and Equipment

Tools and Equipment	Description
Front panel rack mounting kit. Ships with the shelf and is included in the shipping box.	• 1 x 19-inch rack-mount bracket pair • 1 ETSI bracket pair • 1 NEBS bracket pair • 4 x screws M5x10 CSK TORX-T25 A2
Rear panel rack mounting kit. This kit is compatible only with hardware revision 2.02. You must order this kit separately; it does not ship with the shelf.	• 1 x 19-inch rackmount bracket pair - rear • 1 ETSI bracket pair -rear • 8 screws M3.0x6 CSK TORX A2 to attach brackets to the shelf
Screwdrivers	• TORX screwdriver TX 25 — for screws M5x10 • TORX screwdriver TX 10 — for screws M3x6

Procedure

1. Remove the 1HU passive shelf from its shipping box and place the shelf on a stable and level surface.

2. Remove the required adapter brackets and screws from the plastic bag supplied in the rack-mount kit.

3. Attach the adapter bracket on one side of the shelf in the position shown in Figure 58 and Figure 59. Align the threaded holes in the shelf side panel and the mounting holes of the bracket.

4. Use the provided fixing screws to fit the appropriate bracket:

   a. To attaching a bracket for front mounting, insert an M5x10 fixing screw through a mounting hole in the bracket and into the threaded hole in the shelf side panel.

   b. To attach a bracket for rear mounting, insert an M3x6 fixing screw through a mounting hole in the bracket and into the threaded hole in the shelf side panel.

   c. Insert the appropriate screw into each of the remaining threaded holes in the shelf side panel to secure the bracket.

   d. Use the appropriate TORX screwdriver to completely tighten all screws.

These figures show examples of 19-inch, ETSI, and NEBS bracket attachment on the left side of the shelf for front mounting. The right bracket of a pair attaches to the opposite side of the shelf.

Figure 60:   Example of 19-Inch Bracket Attachment — Front Mounted (Left)

Figure 61:   Example of ETSI Bracket Attachment — Front Mounted (Left)
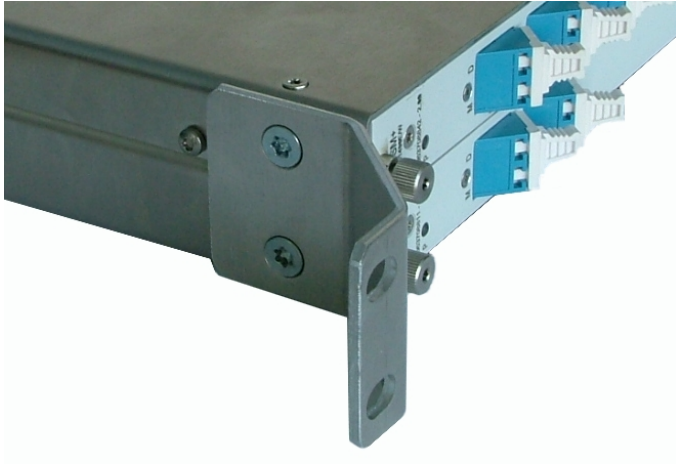
Figure 62:   Example of NEBS Bracket Attachment — Front Mounted (Left)

5. Repeat the applicable steps of this procedure for the opposite side.

Mounting the 1HU Passive Shelf into a Rack or Cabinet

Consider these guidelines when you prepare to mount your 1HU passive shelf to a rack:

*   For information about how to mount the 1HU passive shelf to your rack, see the rack manufacturer's instructions.

*   Separately mount each shelf in turn immediately after you fit the adapter brackets for that shelf. Do not place any other shelf on top of the 1HU shelf until after you fit that shelf with adapter brackets and mount it in an appropriate rack position.

*   Avoid mounting the 1HU passive shelf in an overly congested rack.

*   You can mount the 1HU passive shelf below or above 1HU, 7HU, or 9HU equipment that the shelf connects to. The shelf numbering does not change; that is, it does not have a shelf number. This shelf is passive and unmanaged.

*   The 1HU passive shelf requires 1HU (44.45 mm = 1.75 in) of rack space.

- Provide your own rack-mounting screws to install the shelf in the rack. Use two screws on each side.

⚠	**CAUTION** Only service personnel are qualified to perform this procedure.

⚠	**ELECTROSTATIC CAUTION** Ensure that you are earth-grounded with a wrist strap or equivalent while you mount the brackets to a shelf that contains ESD-sensitive devices. Follow ESD-prevention precautions to avoid ESD damage to the other equipment. Follow ESD-prevention precautions to avoid ESD damage to the other equipment.

Required Tools and Equipment

- 4 appropriate screws and washers to attach the shelf to the rack. You must supply these screws. Use screws that fit the threaded holes in your rack or the cage nuts installed in the holes of the rack rails.
- Appropriate screwdriver.
- ESD-preventive wrist strap or other personal earth-grounding device.

Procedure

1. Determine the location in the rack where you plan to mount the 1HU passive shelf. Read the installation or cabling plan to fully understand:
   - The shelf that you plan to mount
   - The rack where you will mount this shelf
   - The position of this shelf in the rack

2. On the rack mounting rails, locate and mark the mounting holes where you will affix the shelf. Ensure that no space exists between the 1HU passive shelf and the shelf below or above it.

3. If required, install two cage nuts in the corresponding holes on both sides of the rack.

📄	To complete the next steps, we recommend that you have another person hold the shelf in place while you secure it to the bay.

4. The support person should grasp the shelf underneath the lower edge and lift with both hands. The shelf should be positioned so the attached brackets in the rack align with the bracket holes on each side of the rack.

5. Insert two rack screws that have washers on each side of the shelf into the holes.

6. Use an appropriate screwdriver to completely tighten the rack screws.

Rack-Mounting the DCF1HU-P Shelf

You can mount the FSP 3000R7 DCF1HU-P shelf into open equipment racks or customer cabinets of these standard widths: 19 inch, 21 inch, and 23 inch. The shelf also fits into a 300-mm (0.984 ft) deep ETSI rack.

Each DCF1HU-P shelf is pre-installed with 19-inch brackets. If you plan to mount a DCF1HU-P shelf into an ETSI or NEBS compliant rack, you must remove the 19-inch brackets and fit the appropriate adapter bracket pair. The ETSI and NEBS brackets are fitted on the outside of the left and right side walls. The adapter bracket pairs ship with the equipment.

This section contains these topics:

Fitting the DCF1HU-P Shelf with 19-inch, NEBS, or ETSI Brackets

Complete these steps to fit the DCF1HU-P shelf with 19-inch, NEBS, or ETSI brackets.

Required adapter brackets:

- 19-inch brackets to adapt the DCF1HU-P shelf to the 19-inch standard rack dimensions.
- NEBS brackets to adapt the DCF1HU-P shelf to the NEBS standard rack dimensions.
- ETSI brackets to adapt the shelf to the ETSI standard rack dimensions.

⚠	**CAUTION** Only service personnel are qualified to perform this procedure.

> **ELECTROSTATIC CAUTION**
>
> Ensure that you are earth-grounded with a wrist strap or equivalent while you mount the brackets to a shelf that contains ESD-sensitive devices.
>
> Follow ESD-prevention precautions to avoid ESD damage to the other equipment.

We assume that you are familiar with the ESD-prevention precautions you must take to avoid ESD damage to the equipment.

Required Tools and Equipment

- Appropriate bracket pair:
    - 1 — 19-inch bracket pair
    - 1 — 23-inch bracket pair
    - 1 ETSI bracket pair
    - 1 customized ETSI bracket pair
- 8 screws to affix the brackets
- Torx screwdriver TX 10
- ESD-preventive wrist strap or other personal earth-grounding device
- Suitable grounded surface or an antistatic mat to place the shelf

Figure 63 shows a 19-inch bracket.

Figure 63:   19-inch, NEBS, and ETSI Brackets for a DCF1HU-P Shelf
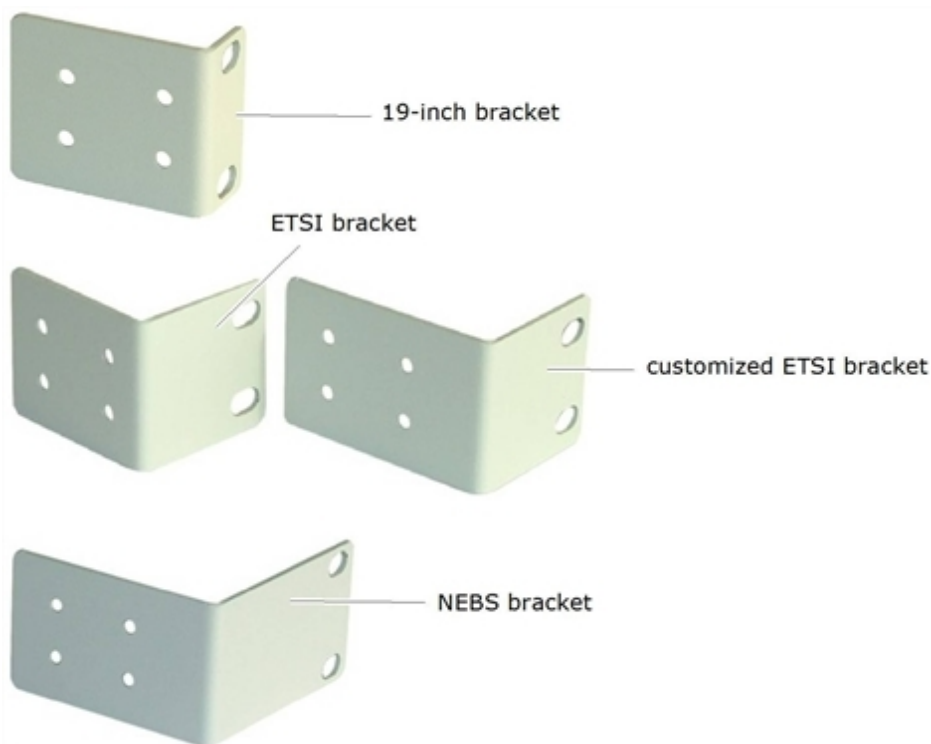
Procedure

1. Place the appropriate 19-inch, NEBS, or ETSI bracket on one side of the shelf in the appropriate position:
   - Mount the 19-inch bracket directly in the threaded holes at the front edge of the shelf.
   - Mount the ETSI bracket into threaded holes with a recess of 25 mm (0.984 in.) from the front of the shelf.
   - Position the NEBS or ETSI customized bracket in threaded holes with a recess of approximately 110 mm (4.331 in.) from the front of the shelf.

   The correct position for each bracket is shown in Figure 64, Figure 65, and Figure 66.

2. Use the fixing screws provided with the brackets to fit the appropriate 19-inch, NEBS, or ETSI bracket:
   a. Insert a screw through a mounting hole in the bracket into the threaded hole in the shelf side panel.
   b. Insert a second screw through the remaining mounting hole in the bracket into the threaded hole in the shelf side panel.
   c. Repeat the prevoius step to insert the third and fourth screw through the appropriate mounting holes.
   d. Use a TX10 Torx screwdriver to tighten the screws.

Figure 64:　19-Inch Bracket Fitted to the DCF1HU-P Shelf

Figure 65:   NEBS Bracket Fitted to the DCF1HU-P Shelf
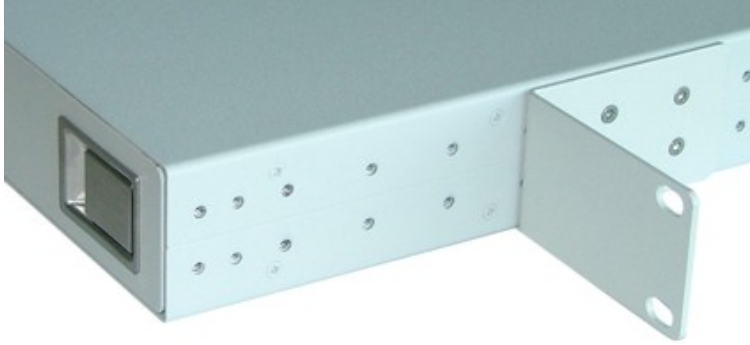
Figure 66:   Customized ETSI Bracket Fitted to the DCF1HU-P Shelf

Figure 67:   ETSI Bracket Fitted to the DCF1HU-P Shelf

3. Repeat this procedure for the opposite side.

Mounting the DCF1HU-P to an Rack or Cabinet

General Considerations

Consider these guidelines when you prepare to mount your DCF1HU-P shelf to a rack:

- For information about how to mount the DCF1HU-P shelf to your rack, see the rack manufacturer's instructions.

- Separately mount each shelf in turn immediately after you fit the adapter brackets to each shelf. Do not place any other shelf on top of the DCF1HU-P shelf before you mount that shelf to the rack.

- Avoid mounting the DCF1HU-P shelf in an overly congested rack.

- You can mount the DCF1HU-P shelf below a 1HU or 7HU equipment shelf that it is connected to. The shelf numbering does not change; that is, the DCF1HU-P shelf does not have a shelf number. It is unmanaged.

- Because of its larger depth, always mount the DCF1HU-P shelf in the lowest position of a cabinet to allow air flow through the cabinet. In most configurations, shelves are stacked in the rack with each shelf directly on top of another and no space in between. The DCF1HU-P shelf is an exception.

- The DCF1HU-P shelf requires 1HU (44.45 mm = 1.75 in.) of space in the rack.

⚠	**CAUTION** Only service personnel are qualified to perform this procedure.

⚠	**ELECTROSTATIC CAUTION** We assume that you are familiar with the ESD-prevention precautions you must take to avoid ESD damage to the equipment.

⚠	**CAUTION** **Risk of Fire and Risk of Damage to Equipment because of Overheating** When you mount a DCF1HU-P shelf beneath a 7HU shelf, allow a minimum of space equal to a DCF1HU-P shelf between the bottom of a 7HU shelf and the top of a DCF1HU-P shelf. This spacing allows a free flow of air to the 7HU shelf above. Failure to do so can cause overheating conditions and result in incorrect operation, damage to system components, or fire.

We assume that you are familiar with the ESD-prevention precautions you must take to avoid ESD damage to the equipment.

Required Tools and Equipment

- 4 appropriate rack screws and washers that you must provide. Use screws that fit the threaded holes in your rack

- An appropriate screwdriver

Procedure

1. Determine where you plan to mount the DCF1HU-P shelf. Read the installation or cabling plan to get information about:
   - The shelf that you plan to mount
   - The rack where you will install the shelf

2. On the rack-mounting rails, locate and mark the mounting holes where you will fix the shelf. Ensure a space of 1HU exists between the DCF1HU-P shelf and the shelf above it.

3. If required, install two cage nuts in the corresponding holes on both sides of the rack.

🗒	To complete the next steps, we recommend that you have another person hold the shelf in place while you secure it to the bay.

4. Lift the shelf to the bay and position it with the attached brackets in the rack so that the bracket holes on each side align with the rack mounting holes.

5. Insert two rack screws with washers on each side of the shelf into the holes.

6. Use an appropriate screwdriver to tighten the rack screws .

Rack-Mounting the FMT/1HU Shelf

Mount the 1HU high fiber management shelf FMT/1HU shelf into open equipment racks or customer cabinets of these standard widths: 19 inch, 21 inch, and 23 inch. This shelf also fits into a 300-mm (0.984 ft) deep ETSI rack.

The FMT/1HU shelf comes pre-installed with 19-inch brackets.

Adapter brackets you need to fit on the outside of the left and right side walls:

- To install the shelf into an ETSI-complaint rack or cabinet, you must remove the 19-inch brackets and mount ETSI brackets.
- To install the shelf into a NEBS-complaint rack or cabinet, you must remove the 19-inch brackets and mount NEBS brackets.

This section contains these topics:

Fitting the FMT/1HU with 19-Inch Brackets

Complete the steps in this section to fit the fiber management shelf (FMT/1HU) with ETSI brackets for 19-inch rack-mounting. You can use the same steps to fit the shelf with NEBS brackets for 19-inch rack-mounting .

⚠	**CAUTION**
	Only service personnel are qualified to perform this procedure.

Required Tools and Equipment

Phillips screwdriver PH 2

Figure 68 shows an ETSI bracket.

Figure 68:   Example of an ETSI Bracket for a Fiber Management Shelf
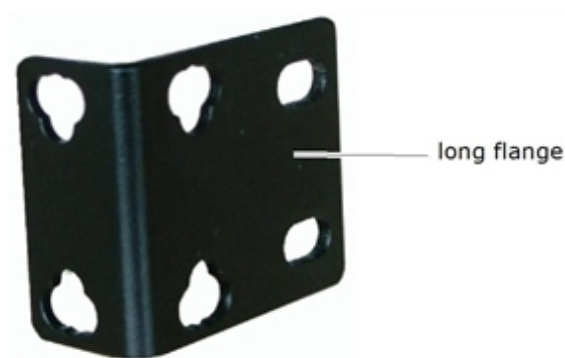
long flange

Procedure

1. Use a PH 2 Phillips screwdriver to remove the ETSI bracket on one side of the shelf. Keep the removed washers and screws available.

2. On the same side of the shelf, place the long flange of the ETSI bracket so that you can affix the screws in the top threaded holes. This position has a recess of about 40 mm (1.575 in.) from the front of the shelf. You can also fit the ETSI bracket for 19-inch mounting to the shelf with a recess of 127 mm (5 in.).

3. Reinsert the fixing washers and screws into the threaded holes.

4. Use a PH 2 Phillips screwdriver to tighten the screws and secure the bracket to the shelf. Figure 69 shows an ETSI bracket (19-inch) mounted to a shelf with a recess of 40 mm (1.575 in.).

Figure 69:   Example of a ETSI Bracket Mounted for 19-inch to the Shelf
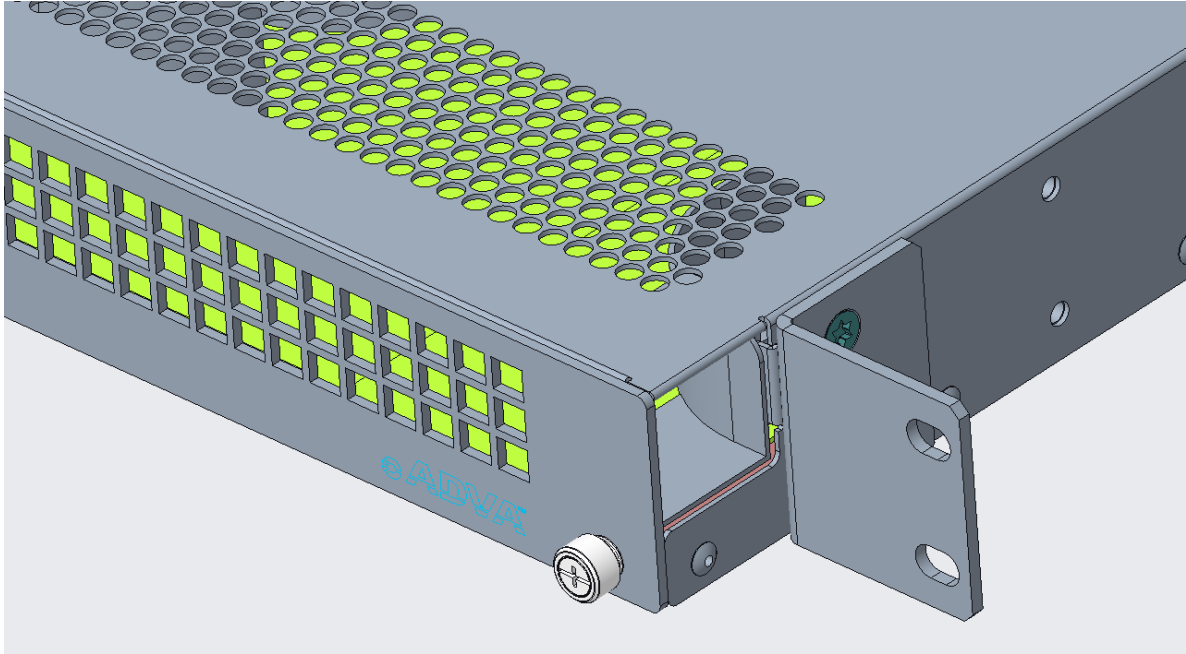
5. Repeat this procedure for the opposite side.

Fitting the FMT/1HU with NEBS Brackets

⚠	**CAUTION** Only service personnel are qualified to perform this procedure.

Required Tools and Equipment

- Phillips screwdriver PH 2
- 1 NEBS bracket pair

Figure 70 shows a NEBS bracket.

Figure 70:   Example of One NEBS Bracket for a Fiber Management Shelf

narrow flange

Procedure

1. Use a PH 2 Phillips screwdriver to remove the ETSI bracket on one side of the shelf. Keep the removed washers and screws available.
2. On the same side of the shelf, place the narrow flange of the NEBS bracket so that you can affix the screws in the holes with a recess of approximately 127 mm (5-in.) from the front of the shelf.
3. Reinsert the fixing washers and screws into the threaded holes.
4. Use a PH 2 Phillips screwdriver to tighten the screws and secure the bracket to the shelf. Figure 71 shows a NEBS bracket mounted to a 19-inch shelf with a recess of 127 mm (5 in.).

Figure 71:   Example of a NEBS Bracket Mounted to a 19-Inch Shelf
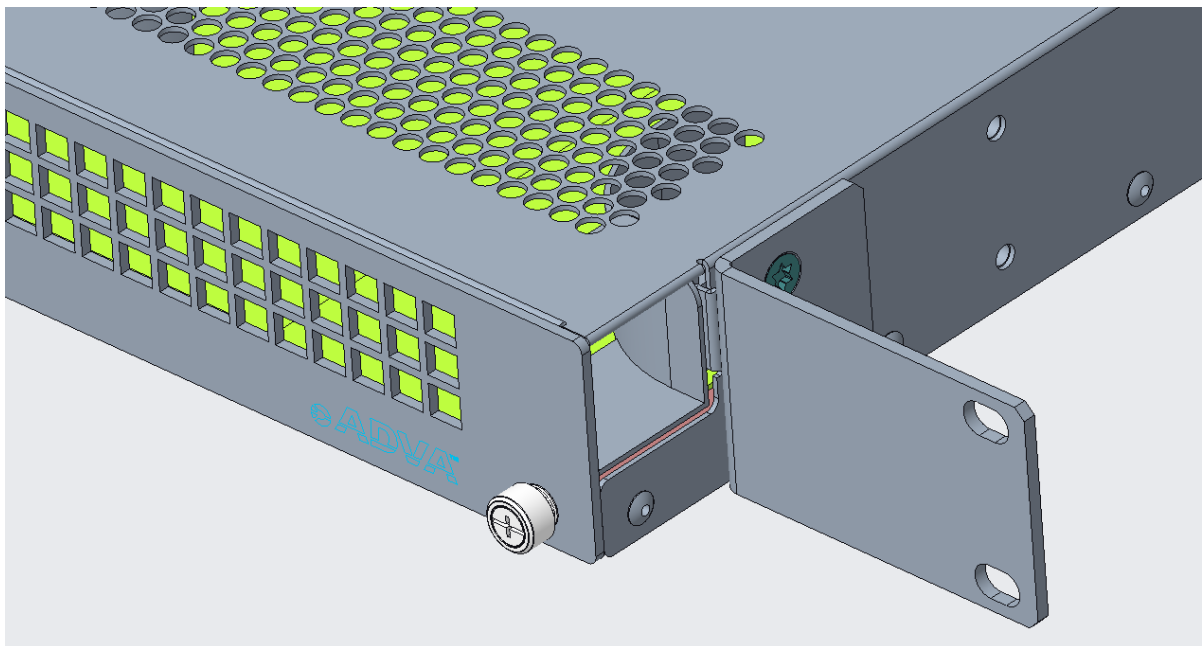
Figure 72:   Example of a NEBS Bracket Mounted to a 19-Inch Shelf
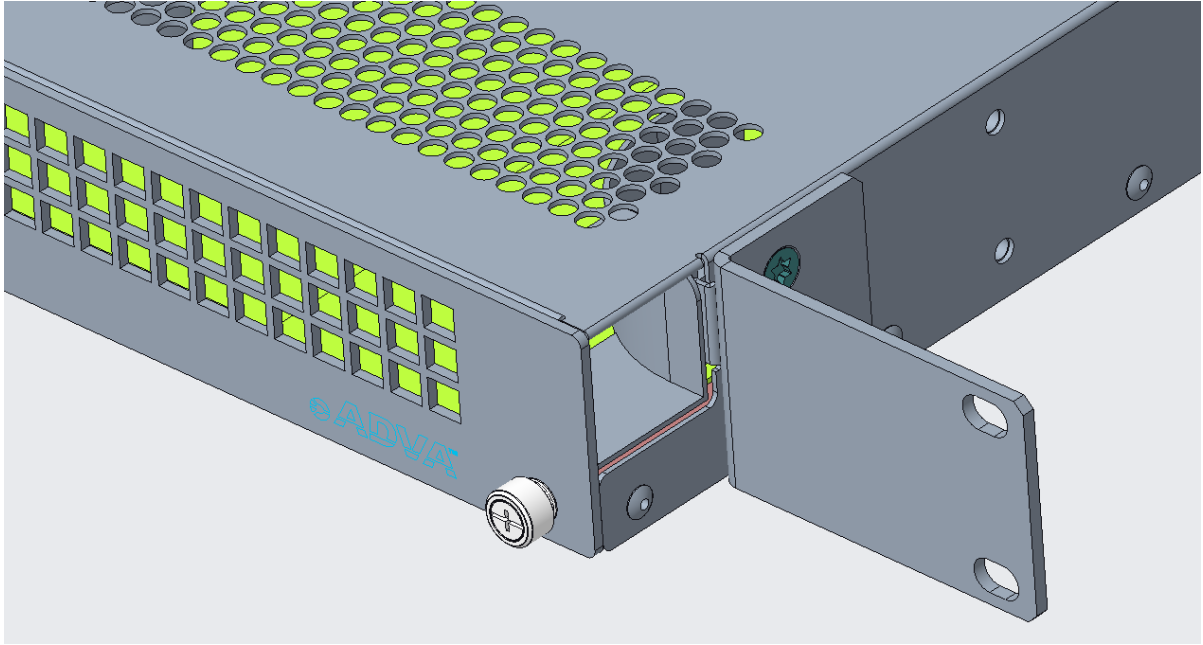
5. Repeat this procedure for the opposite side.

Fitting the FMT/1HU with ETSI Brackets

Use ETSI brackets to adapt the FMT/1HU shelf to the ETSI-standard rack dimensions.

⚠	**CAUTION**
	Only service personnel are qualified to perform this procedure.

Required Tools and Equipment

- 1 ETSI bracket pair — included in the shipping box and shown in Figure 73.
- Torx screwdriver TX20

Figure 73:   ETSI Adapter Brackets for a FMT/1HU
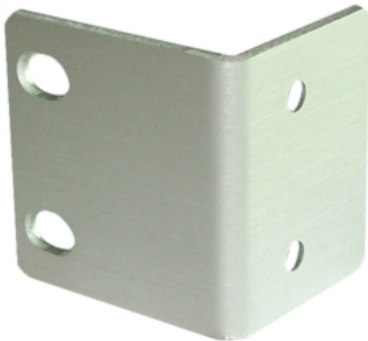
Procedure

1. Remove the 19-inch bracket on one side panel of the shelf:
   a. Use a TX20 Torx screwdriver to turn the two screws that affix the 19-inch bracket in a counter-clockwise direction until you completely remove them from the thread holes. Keep the removed screws available.
   b. Remove the bracket and set it aside.
2. Fit the appropriate ETSI bracket to the shelf.
3. Place the appropriate bracket on the same side of the shelf in the correct position as illustrated in Figure 74.
   The two threaded holes in the shelf side panel and the holes of the bracket should align.

   This mounting position has a recess of about 40 mm (1.575 in.) from the screw at the front of the shelf.
   a. Reinsert two fixing screws that you removed from the 19-inch bracket into the threaded holes.
   b. Use a TX20 Torx screwdriver to tigthen the screws and secure the bracket to the shelf.
      Figure 74 shows an ETSI bracket mounted to the shelf.

Figure 74:
Fitting an FMT/1HU with an ETSI Bracket

4. Save the 19-inch bracket with the packaging material.

5. Repeat this procedure for the opposite side.

Mounting the FMT/1HU into a Rack or Cabinet

⚠	**CAUTION**
	Only service personnel are qualified to perform this procedure.

The mounting brackets secure the FMT/1HU to the rack. These mounting brackets ship with the shelf:

- ETSI brackets that you can also use as 19-inch mounting brackets. The shelf is pre-installed with ETSI brackets.

- NEBS brackets that you can also use as 19-inch mouting brackets.

Each 19-inch and ETSI bracket of the FMT/1HU shelf has two holes for rack-mounting.

General Considerations

Consider these guidelins when you mount the shelf into a rack or cabinet:

- The FMT/1HU shelf requires 1HU (44.45 mm = 1.75 in.) of space in the rack.

- Mount the FMT/1HU shelf below or above a 1HU, 7HU, or 9HU shelf to store the fibers of this shelf.

- When you plan the rack layout, ensure that third-party equipment does not interfere with the ADVA fiber management shelf.

We provide fiber optic cables with a dimension of 2 mm (0.079 in.). If the dimensions of a cable is 2 mm (0.079 in.), you can store 25 cables with a length 3.4 m (133.858 in.) each in

the FMT/1HU shelf. See the *FSP 3000R7 Hardware Description* for the shelf capacities of 1.7 mm (0.067 in.) and 3 mm (0.118 in.) cable dimensions.

- Do not put any other shelf on the fiber management shelf in the rack. You must mount every shelf directly to the rack.
- Avoid mounting shelves in an overly congested rack.
- For information about how to install shelves in a customer cabinet, see the cabinet manufacturer's instructions.

Required Tools and Equipment

- 4 appropriate rack screws for 19-inch rack-mounting, or
- 8 x appropriate rack screws for ETSI rack-mounting and washers. You must provide your own screws. Use screws that fit the threaded holes in your rack.
- Appropriate screwdriver

Procedure

1. On the rack-mounting rails, locate and mark the mounting holes where you will affix the shelf.

> We recommend that one person holds the shelf in position while another service person secures the shelf to the rack.

2. Lift the shelf and position the shelf with the attached brackets into the rack so that the bracket holes on each side align with the rack-mounting holes.
3. Insert the rack screws with the washers to the rack holes.
4. Use the screwdriver to tighten the rack screws. Figure 75 shows a FMT/1HU shelf.

Figure 75:   Fiber Management Shelf
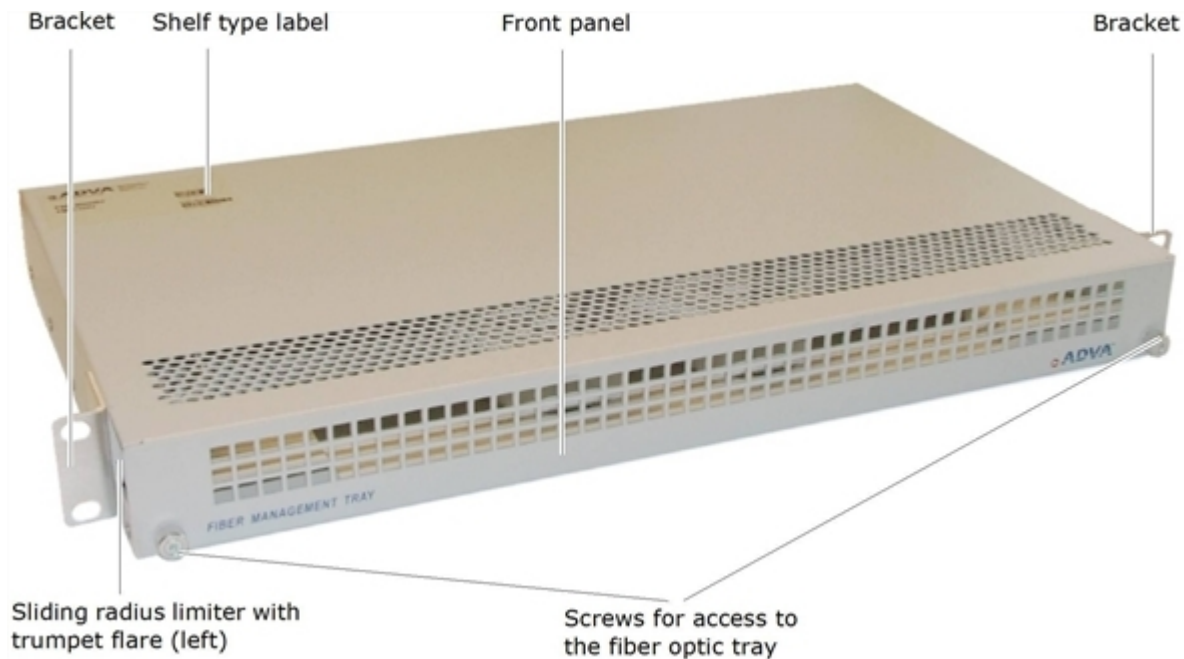
Installing Fiber Optic Cables in the FMT/1HU

⚠	**CAUTION** Only service personnel are qualified to perform this procedure.

The FMT/1HU shelf provides fiber management for the fiber-optic cables and patch cables that originate from an FSP 3000R7 shelf. Route the fiber-optic cables through two sliding-radius limiters with trumpet flares into the fiber-optic tray of the fiber management shelf. One sliding-radius limiter with a trumpet flare is located on the left and one on the right side of the fiber management shelf.

Cables are properly installed in the fiber management shelf when slack loops are formed within the shelf. The slack loops form by the movement of the sliding radius limiter with trumpet flare when the shelf is closed.

☀	**LASER RADIATION WARNING** Infrared radiation is invisible. Radiation can cause damage to the eye. Do not look into the end of any open optical fiber connection.

NOTICE	Dirt particles can enter the optical fiber connector. Place a protective cap over any open optical fiber connector.

NOTICE	If you place a load in excess of 9 kg (19.841 lbs) onto an open tray, the tray becomes misaligned or damaged.

Required Tools and Equipment

Kurly locks — use to locate and bundle fiber optic cables in an FMT/1HU

Procedure

1. To access the fiber optic tray, loosen the screws to open the FMT/1HU tray.
2. Completely remove the tray.
3. Route the cables to the open tray. Route the cables from shelves that are rack-mounted above or below the fiber management shelf, which is located to the left or right side of the fiber optic tray.
4. Route the cables through the sliding-radius limiter into the tray. Whether you route the cables through the left or right sliding-radius limiter depends on the configuration of the shelf that the cables originate from.
5. Place the cables:
   - Place cables that enter through the right-sliding radius limiter around the right set of storage radius limiters.
   - Place cables that enter through the left sliding-radius limiter around the left set of storage radius limiters.

This figure shows a configuration of optical cables installed in an FMT/1HU.
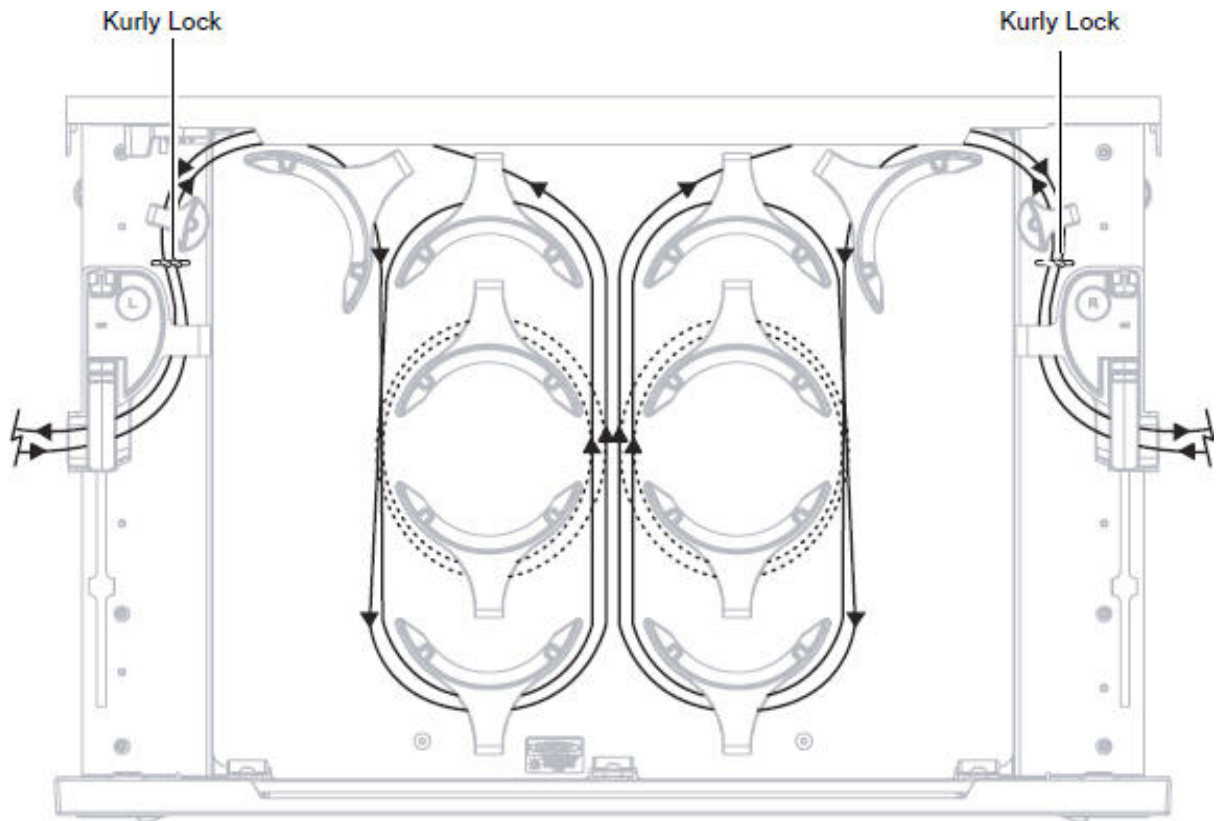
6. Use the kurly locks to bundle cables together between the sliding-radius limiter and the rear-radius limiter, as shown in .

7. If you installed cables in a fiber management shelf, close the tray:

   a. Make sure that all cables are properly secured and located below the top surface of the tray.

   b. Slowly insert the tray.

NOTICE	While the fiber optic tray is closed, be attentive that no cable is bent. Do not proceed if a cable bends. Immediately open the tray and place the cable in the correct position.

Rack Mounting the SH1HU-F/E+TEMP/PF Shelf

You can mount the SH1HU-F/E+TEMP/PF shelf into open equipment racks or customer cabinets that have these standard widths: 19 inch, 21 inch, and 23 inch. The shelf also fits into a 300-mm (0.984 ft) deep ETSI rack.

Each SH1HU-F/E+TEMP/PF shelf is pre-installed with 19-inch brackets. If you plan to mount the shelf into an ETSI or NEBS compliant rack, first remove the 19-inch brackets and fit the

appropriate adapter bracket pair. Fit the ETSI and NEBS brackets on the outside of the left and right side walls. The adapter bracket pairs ship with the equipment.

This section contains these topics:

Fitting the SH1HU-F/E+TEMP/PF Shelf with Adapter Brackets

The SH1HU-F/E+TEMP/PF shelf ships with pre-installed 19-inch brackets. This section describes how to fit the SH1HU-F/E+TEMP/PF shelf with 19-inch, NEBS wind tunnel, or ETSI brackets.

- To adapt the shelf to NEBS-standard rack dimensions and direct airflow from the front-right entry to left-rear exit, you need to install two NEBS wind-tunnel brackets.
- To adapt the shelf to the ETSI-standard rack dimensions, you need to install ETSI brackets.

⚠	**CAUTION**
	Only service personnel are qualified to perform this procedure.

	ELECTROSTATIC CAUTION
⚠	Ensure that you are earth-grounded with a wrist strap or equivalent while you mount the brackets to a shelf that contains ESD-sensitive devices.
	Follow ESD-prevention precautions to avoid ESD damage to the other equipment.

Required Tools and Equipment

- Bracket pair
  - 1 — 19-inch bracket pair, ships pre-installed
  - 1 NEBS wind-tunnel bracket pair
  - 1 ETSI bracket pair, or
  - 1 customized ETSI bracket pair
- 8 screws to affix the brackets

- Torx screwdriver TX 10
- ESD-preventive wrist strap or other personal earth-grounding device
- Suitable grounded surface or an antistatic mat to place the shelf

These figures show the different bracket mountings.

Figure 76:   19-inch Brackets Mounted on a SH1HU-F/E+TEMP/PF Shelf
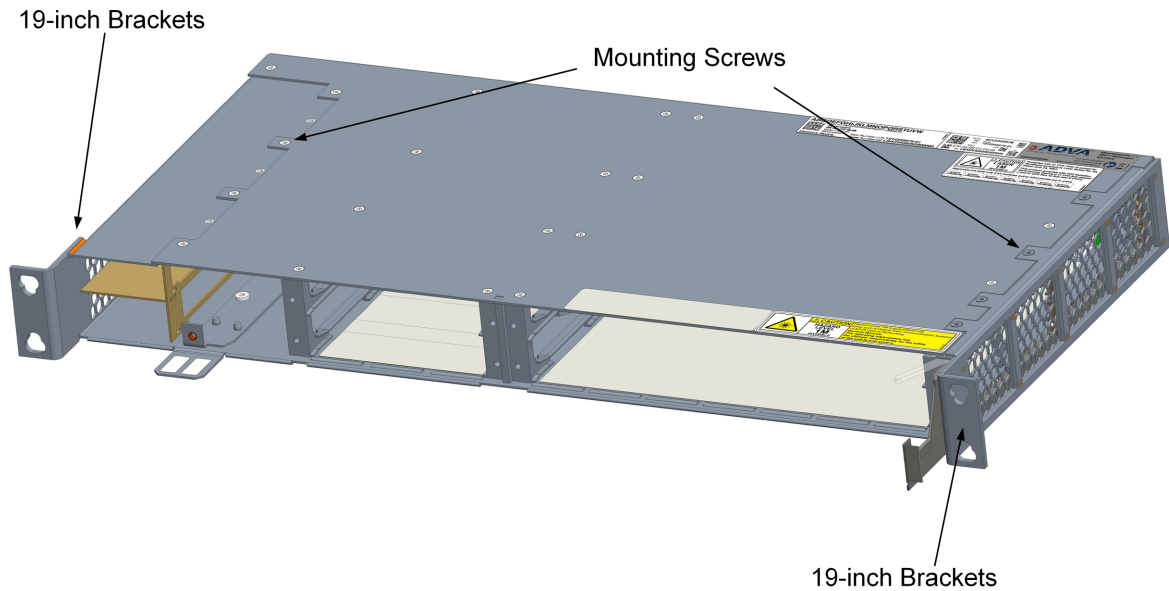
Figure 77:   ETSI Brackets for a SH1HU-F/E+TEMP/PF Shelf
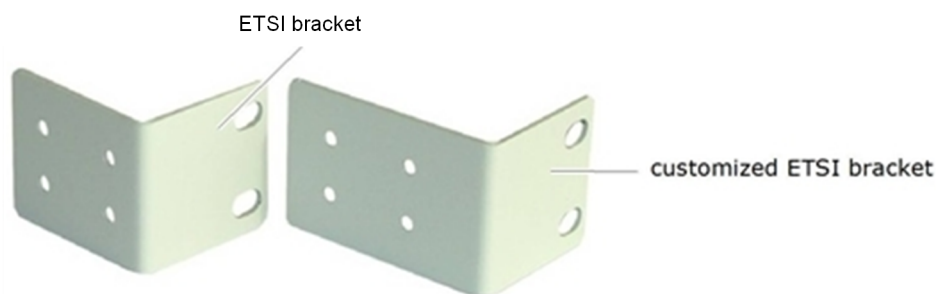
Figure 78: NEBS Wind-Tunnel Brackets for a SH1HU-F/E+TEMP/PF Shelf

NEBS Wind Tunnel
Bracket. Air exits here.

NEBS Wind Tunnel
Bracket. Air enters here.
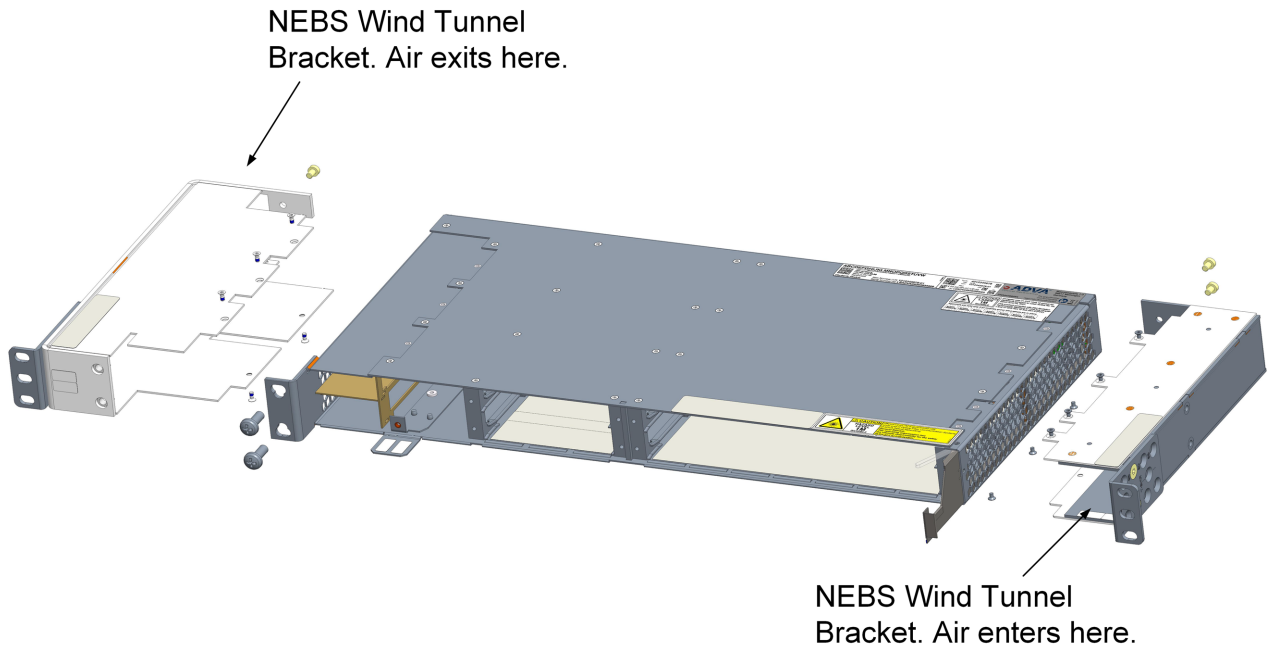
Procedure

1. Place the shelf on a flat work surface.
    - For 19-inch brackets: these ship pre-installed to the right and left side of the shelf.
    - For ETSI brackets: use the threaded holes with a recess of 25 mm (0.984 in.) from the front of the shelf. Mount the brackets on each side of the shelf.
    - For ETSI customized brackets: position the brackets in the threaded holes with a recess of approximately 110 mm (4.331 in.) from the front of the shelf.
    - For NEBS wind-tunnel brackets: use the threaded holes and mounting screws to mount the brackets on each side of the shelf.

2. Use the screws provided with the brackets to fit the appropriate NEBS wind tunnel or ETSI bracket:
    a. Insert the screws through the mounting holes in the bracket, and then into the threaded holes in the shelf side panel. NEBS wind-tunnel brackets fit only one way — with the air inlet on the right-front and air exit located at the shelf left-rear.
    b. Use a Torx screwdriver TX10 to tighten the screws .

    These figures show the correct position of the different brackets.

Figure 79:   NEBS Wind-Tunnel Brackets Fitted to a SH1HU-F/E+TEMP/PF Shelf

NEBS Wind Tunnel
Bracket. Air exits here.

NEBS Wind Tunnel
Bracket. Air enters here.
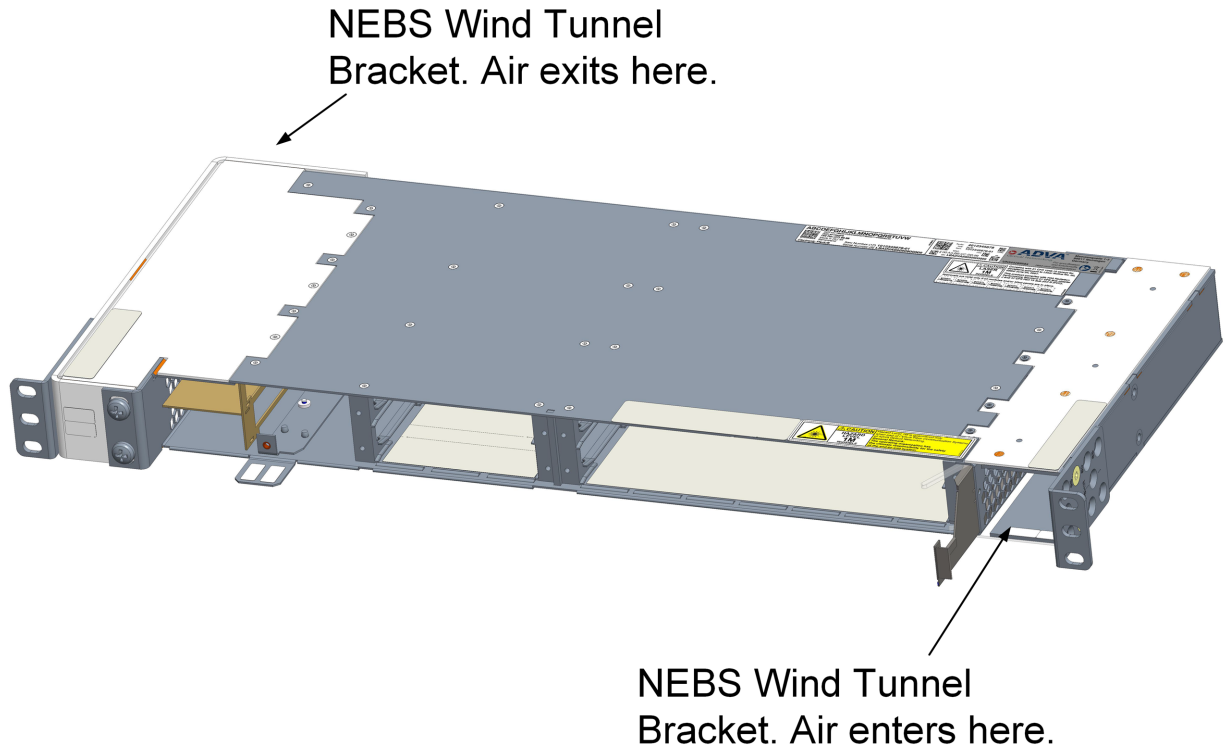
Figure 80:   Customized ETSI Bracket Fitted to a 1HU Shelf

Figure 81:   ETSI Bracket Fitted to a 1HU Shelf

3. Repeat this procedure for the opposite side.

Mounting the SH1HU-F/E+TEMP/PF Shelf into a Rack or Cabinet

General Considerations

Consider these guidelines when you mount the SH1HU-F/E+TEMP/PF shelf to a rack or cabinet, referred to as *rack*:

- For information about how to mount the shelf to the rack, see the rack manufacturer's instructions.
- Immediately mount each shelf after you fit the adapter brackets.
- Avoid mounting the shelf in an overly congested rack. You can mount the shelf below or above a 1HU, 7HU, or 9HU equipment shelf.
- The shelf requires 1HU (44.45 mm = 1.75 in.) of rack space.
- Use your own rack-mounting screws to install the shelf in the rack. Use two screws on each side.

⚠	**CAUTION**
	Only service personnel are qualified to perform this procedure.

	ELECTROSTATIC CAUTION Ensure that you are earth-grounded with a wrist strap or equivalent while you mount the brackets to a shelf that contains ESD-sensitive devices. Follow ESD-prevention precautions to avoid ESD damage to the other equipment.

Required Tools and Equipment

- 4 appropriate rack screws and washers that you must provide. Use screws that fit the threaded holes in your rack.
- Appropriate screwdriver

Procedure

1. Determine where you plan to mount the shelf. Read the installation or cabling plan to get information about:
   - The shelf that you plan to mount.
   - The rack that will house this shelf.
2. On the rack mounting rails, locate and mark the mounting holes where you plan to affix the shelf. A SH1HU-F/E+TEMP/PF can be directly mounted below or above another shelf without any space in between.
3. If required, install two cage nuts in the corresponding holes on both sides of the rack.

	To complete the next steps, we recommend that you have another person hold the shelf in place while you secure it to the bay.

4. Lift the shelf to the bay and position it with the attached brackets in the rack so that the bracket holes on each side align with the rack-mounting holes.
5. Use two rack screws and washers on each side of the shelf to attach the shelf.
6. Use an appropriate screwdriver to tighten the rack screws.

Installing the PSU/1HU-F-xx into a SH1HU-F/E+TEMP/PF Shelf

	Review the Safety Guidelines before you begin.

Required Tools and Equipment

- No. 2 Phillips or slot screwdriver to loosen the screws.
- ESD-preventive wrist strap or other personal earth-grounding device.
- Suitable earth-grounded surface or an antistatic mat to place the PSU.
- PSUs packaged in the cardboard shipping box.

Procedure

1. Attach a wrist strap to your bare wrist and fasten the earth-grounding wire onto the ESD grounding point on the shelf, if available, or to a bare metal surface on the rack.
2. Ensure that you first connect the SH1HU-F/E+TEMP/PF to the rack or cabinet earth-ground point.
3. Locate the empty power supply slot (bay) on the shelf.
4. Remove the power supply from the cardboard shipping box and from the static-protective package. Immediately place the power supply unit on an earth-grounded surface or antistatic mat.

Check and prepare the power supply:

1. Make sure that the PSU is the correct one you want to install (type, specifications). See the faceplate markings and the labels on the board cover for this information.
2. Visually inspect the power supply for any damage or impurities. If necessary, use canned, dry, oil-free compressed air to blow away any impurities.
   - Carefully check the plug-in board connector of the power supply for dirt, any deformation in the shape of the pin holes, or damage on the outside.
   - Check the EMI shielding gasket on the faceplate edges of the unit for damage.

Continue with these steps:

1. On the inside of the shelf, verify that:
   - No foreign bodies are present between the backplane connector pins.
   - No backplane connectors pins are bent or broken.

   If either condition is evident, do not install the power supply.

	Risk of electromagnetic disturbances
NOTICE	Be careful not to damage the EMI shielding gasket on the faceplate edges of the power supply when you insert the unit into the slot. For EMC compliance, no damage can exist to the shielding gasket.

2. Insert the power supply into the specified slot (bay):

    a. Because the DC power cable is not earth-grounded, ensure that the D-SUB connector does not connect to the power supply before you install it.

    b. The SH1HU-F/E+TEMP/PF shelf has two slots. Slide the power supply into an empty slot until the power supply handle clicks to the right. The click signals that the power supply is locked in position. If you use a second PSU for redundancy, repeat this step.

Figure 82:　SH1HU-F/E+TEMP/PF Shelf with PSU/1HU-F-DC PSU

3. For a PSU/1HU-F-DC, connect the D-SUB power cable to the power supply and tighten the two connector screws.

4. The PSU/1HU-F-AC has a C5 power connector. Insert the C5 connector into place on the front panel. You do not need to tighten any screws.

5. To remove the PSU, remove the DC or AC power cable from the PSU front panel. The PSU unlocks from the shelf only after you remove the power cable.

6. Push the PSU handle to the left, pull out the PSU, and place it onto a grounded surface or antistatic mat.

7. Reverse your ESD precaution steps:

    a. Detach the wrist strap from your wrist.

    b. Disconnect the earth-grounding cable from the ESD earth-grounding point on the shelf, if available, or the rack.

    c. Set the earth-grounding cable aside.

8. Store the cardboard box in a safe place for later use, including the static-protective package.

For help with this procedure, contact ADVA Technical Services.

Installing the FAN/1HU-F into a SH1HU-F/E+TEMP/PF Shelf

	Review the Safety Guidelines before you begin.

Required Tools and Equipment

- Torx screwdriver TX 10
- ESD-preventive wrist strap or other personal earth-grounding device
- Suitable grounded surface or antistatic mat to place the FAN/1HU-F
- FAN/1HU-F packaged in the cardboard shipping box

Procedure

1. Attach a wrist strap to your bare wrist and fasten the grounding wire onto the ESD earth-grounding point on the shelf, if available, or to a bare metal surface onto the rack.
2. Ensure that the SH1HU-F/E+TEMP/PF shelf connects to the rack or cabinet earth-ground point.
3. Locate the empty FAN/1HU-F slot (bay) on the shelf adjacent to the PSUs.
4. Remove the FAN/1HU-F from the cardboard shipping box and from the static-protective package. Immediately place the fan on a grounded surface or antistatic mat.
5. Check and prepare the FAN/1HU-F:
   a. Make sure that the unit is the correct one you want to install (type, specifications). See the faceplate markings and labels on the board cover.
   b. Visually inspect the unit for any damage and impurities. If necessary, use canned, dry, oil-free compressed air to blow away any impurities.
      - Carefully check the plug-in board connector of the FAN/1HU-F for dirt, any deformation in the shape of the pin holes, and damage on the outside.
      - Check the EMI shielding gasket on the faceplate edges of the unit for damage.

   If any of these conditions exist, do not install the unit. Return the unit for examination and repair if:
   - You drop the FAN/1HU-F onto a hard surface. The fan's ball bearing is sensitive against a hard drop, mechanic shock, and pressure on the rotor wings.
   - The fan is damaged in any way.
   - The cover is missing.

6. Inside the shelf, verify that:

    • No foreign bodies are present between the pins on the backplane connectors.

    • No pins on the backplane connectors are bent or broken.

    If you find evidence of these conditions, do not install the FAN/1HU-F.

NOTICE	**Risk of electromagnetic disturbances**
	Be careful not to damage the EMI shielding gasket on the faceplate edges of the FAN/1HU-F when you insert the unit into the slot. For EMC compliance, no damage can exist to the shielding gasket.

7. Hold the FAN/1HU-F handle and insert it into the specified slot (bay).

    Figure 83:   Fan Insertion into a SH1HU-F/E+TEMP/PF Shelf

Handle

4 Fans
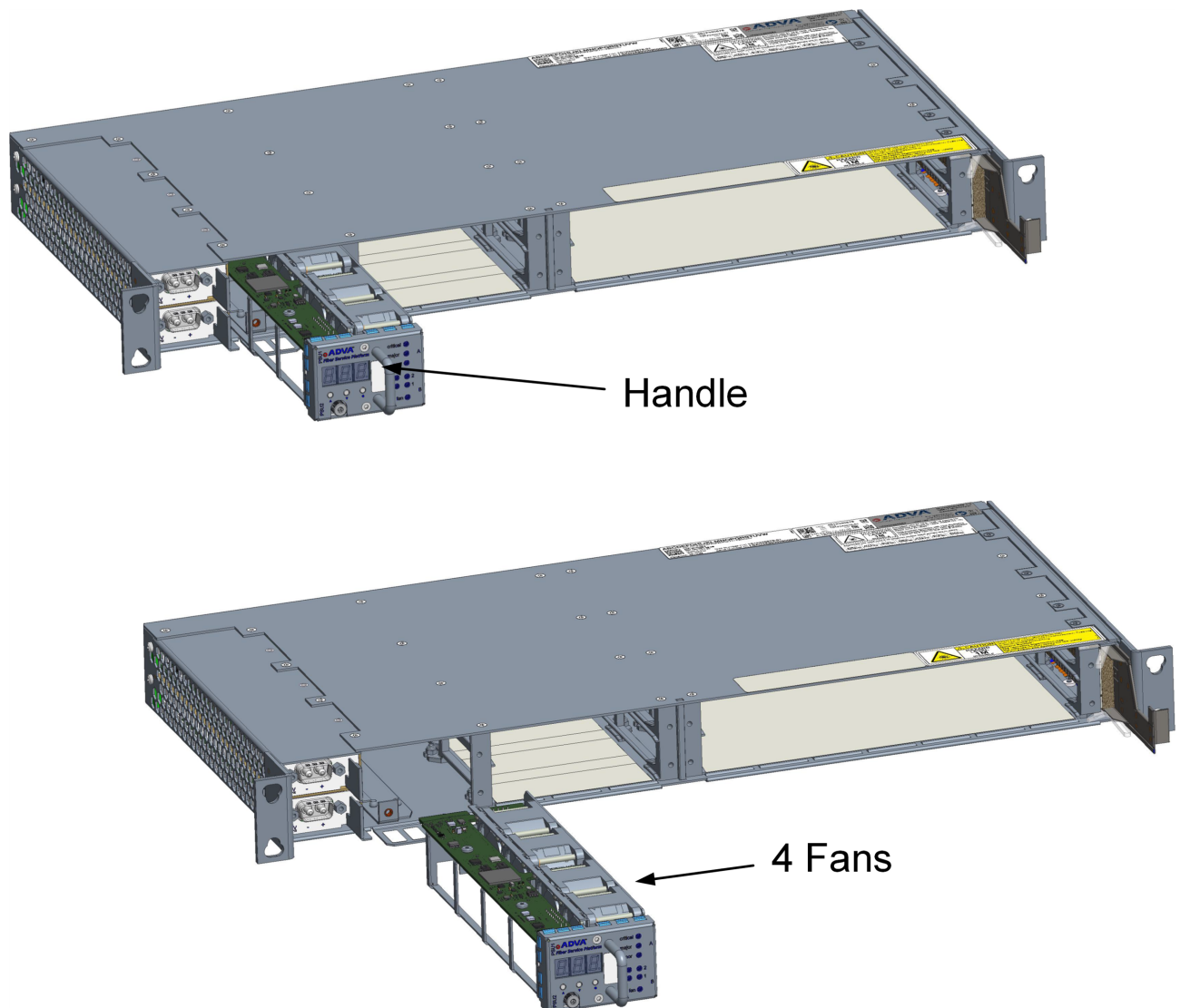
8. Tighten the knurled screw located on the module front panel. The fan LED lights green for normal operation. LED processing can take up to 2 minutes.

Figure 84:   FAN/1HU-F Mounted in a SH1HU-F/E+TEMP/PF

9. To remove the FAN/1HU-F, unscrew the knurled screw on the front panel, then grasp the module handle and pull it out. You do not need to turn off shelf power. You must replace the FAN/1HU-F within one minute to prevent the other modules from overheating.

10. Detach the wrist strap from your wrist, disconnect the earthing cable from the ESD grounding point on the shelf (if available) or the rack and set the earth-grounding cable aside.

11. Store the cardboard box in a safe place for later use, including the static-protective package.

If you need help with this procedure, contact ADVA Technical Services.

Replacing the SH1HU-F/E+TEMP/PF Shelf Air Filter

	Review the Safety Guidelines before you begin.

Required Tools and Equipment

1 air filter

Procedure

1. Ensure that the SH1HU-F/E+TEMP/PF shelf is installed in a rack or connects to the rack or cabinet earth-grounding point.

2. Locate the air filter on the right-side of the shelf.

Figure 85:   Air Filter Installed in a SH1HU-F/E+TEMP/PF Shelf
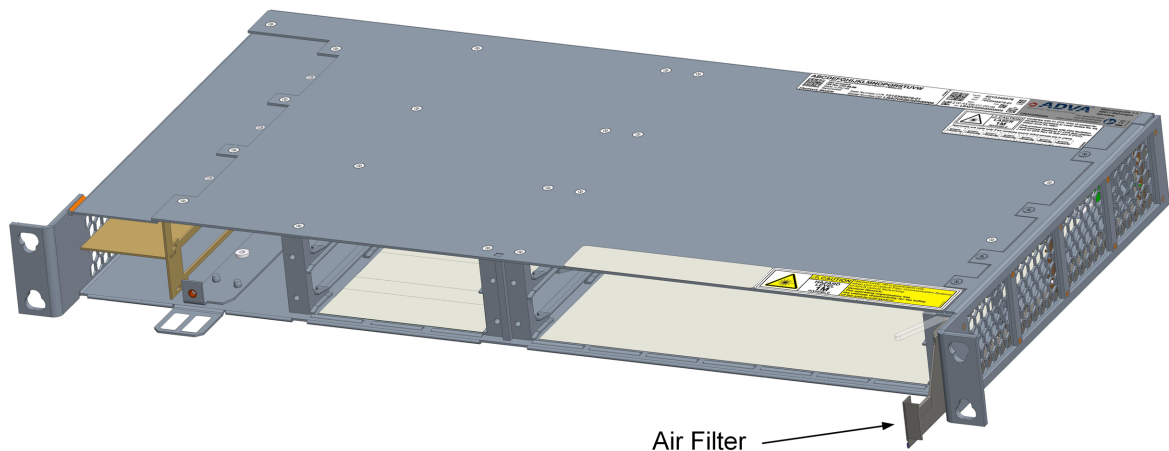
Air Filter

3. Lift the optical fibers from the air filter's fiber holder so they are clear of the Air Filter before it is pulled out.
4. Grasp the tab at the front of the air filter and pull it out of the slot.
5. Insert the new air filter and guide it firmly into the slot.
6. Secure the optical fibers on the air filter's fiber holder.

Installing the OTDR Apparatus

The OTDR apparatus consists of two rack-mountable units:

- Test head controller (OTDR/THC/2HU/AC) unit, or THC.
- Optical test head (OTDR/8-OTH/1HU/AC) unit, or OTH.

Both units form a unified and complete 3HU-high unit with integrated AC power supplies, referred to as OTDR.

General Considerations

When you install the OTDR, consider these guidelines:

- Use the appropriate adapter brackets to install the OTDR in a 19-inch, ETSI-, or NEBS-compliant rack.
- For information about how to mount the OTDR to your rack, see the rack manufacturer's instructions.
- The OTDR apparatus requires 3HU (133.35 mm = 5.25 in) of rack space.

- You can mount the OTDR anywhere in the rack. However, we recommend that you install the OTDR directly below or above the master shelf.

- When you mount the OTDR in a rack, we recommend that two people hold the THC and OTH units in place while another service person secures the unit to the rack.

- Position the OTDR so that air can freely circulate around it.

- The OTDR uses international safety standard three-wire power cables. These cables serve as an earth-ground when you connect them to an appropriate AC power outlet. Only use power cables supplied by ADVA.

⚠	**CAUTION** Only service personnel are qualified to perform this procedure.

⚡	You must earth-ground the OTDR. Ensure that both the THC and OTH units connect to earth ground during normal use.

⚡	**ELECTRIC VOLTAGE WARNING** Insert the power cable plug into a power outlet that has a protective earth-ground contact. Only use an extension cord that has a protective conductor. Any interruption of the protective earth-grounding is a potential shock hazard and can cause personal injury. If the earth-ground protection becomes impaired, do not use the unit. Secure the unit against any accidental operation. Do not tamper with the protective earth-ground terminal.

⚡	**ELECTRIC VOLTAGE WARNING** To ensure that the THC and OTH units are completely turned off, disconnect the power cables.

☀	**LASER RADIATION WARNING** Do not install or terminate fibers while a light source is active. Never look directly into a live fiber. Ensure that your eyes are protected at all times.

> **ELECTROSTATIC CAUTION**
>
> Ensure that you are earth-grounded with a wrist strap or equivalent while you mount the brackets to a shelf that contains ESD-sensitive devices.
>
> Follow ESD-prevention precautions to avoid ESD damage to the other equipment.

> We recommend the you use an uninterruptible power supply (UPS) when you operate this product.

We assume that you are familiar with the ESD-prevention precautions you must take to avoid ESD damage to the equipment.

Procedure

1. Attach the adapter brackets and the handles to the THC.
2. Attach the adapter brackets to the OTH.
3. Mount the THC and OTH units in a rack.
4. Use the SCSI bus cable to connect the OTH unit to the THC unit.
5. Prepare the earth-grounding wires and earth-ground on both the THC and OTH units.
6. Connect the OTH unit and the THC unit each to its own separate AC power source.
7. Connect the THC unit to an NCU.
8. On the OTH unit, connect an alarm device.
9. Connect the OTH optical ports.
10. Power on the OTH and THC units.

> For more details about how to install the OTDR apparatus, see the *OTDR Installation Manual*.

Verifying the Basic Installation

Checklist for basic installation of a multi-shelf system. Ensure that you completed these tasks:

- Mounted all shelves in their predetermined positions in the rack, including the optional OTDR unit.
- Followed the proper sequence to mount all of the shelves.

- Properly secured all shelves to the rack, including the PDU if one is installed on the top of the rack.

- Installed all required ancillary equipment, particularly the vertical cable ducts.

- Correctly earth-grounded all shelves, the PDU, and the rack. Ensure that you properly tightened all of their earth-grounding screws.

Chapter 6

Installing System Modules

This section contains these topics:

Introduction

Install the FSP 3000R7 system modules in a 9HU shelf (SH9HU), 7HU shelf (SH7HU), and 1HU equipment shelves.

Based on your purchase order, system modules can ship pre-installed in the shelf according to your system configuration, or they can ship separately. We recommend that you order the 9HU and 7HU shelves unequipped, because of their weight, and then install the single system modules.

> First mount the COVER EXTENSION/7HU/9HU on the shelf adapter brackets, if applicable. Then install PSUs or any other system modules. If you install the modules first, you will not have sufficient space to mount the COVER EXTENSION/7HU/9HU.

Shelf slots 1 to 20 accommodate the complete set of 5HU FSP 3000R7 system modules, including the PSUs. Use the half-size height slots labeled A and B for the NCU and SCU.

Each FSP 3000R7 shelf has industry-standard connectors on its backplane. Any excessive mechanical force on the backplane connector pins can bend them and cause misalignment. Mechanical force can be, for example, a result of inappropriate use of mechanical tools or improper handling during transport or installation.

Backplane connectors issues can occur in these ways:

- You have to force a module to insert it.
- A new module fails to correctly seat into its respective slot position.
- A module fails to power on correctly, or you are unable to access the module through the management tools.
- In extreme cases, overheating or burned module damage and related odors can occur.

	If a pin is misaligned or broken, do not install a module into that slot: Replace the damaged backplane connector. Contact your regional Technical Services and follow your standard RMA procedure. See Equipment Return and Repair.

The most efficient way to install the modules is to fill the slots from left to right, starting with slot 1. Before you power on the system, ensure that every slot is closed and that every module seats properly in the slot.

	Never operate the FSP 3000R7 shelves with empty slots. To conform to EMI emissions requirements and enable proper airflow across the modules, you must fill all unused slots with dummy modules.

You must equip each unused 5HU module slot with a DM/5HU dummy module and each unused 2.5HU module slot with a DM/2HU5 dummy module. If you plan to add more modules at a later time, store the dummy modules in a safe place to use later.

Verify that the installed modules quickly power on and that no failures arise during the power-on test. If you notice any visible signs of overheating or related odors after power-on, immediately disconnect the power and remove the module. Re-inspect the backplane connector and the connector of the plug-in module for any damage. Contact ADVA Technical Services for advice if necessary.

> In descriptions of a position relative to a unit or module, the reference point is that of facing the front side of the unit or module. Any exception is stated clearly.
>
> The illustrations in these procedures are for reference only and based on the latest hardware revision available at the time of guide creation. The equipment you receive might differ from the pictures or graphics shown in this guide.

The installation procedures in this section do not include connecting the cables. See Connecting the Power and Connecting Optical Cables.

You must provision all system modules and register them in the NE database after you insert them into the shelf. See the *Network Element Director (NED) Online Help* for information about how to assign equipment to the NE database and how to configure the equipment.

If the installed system module does not respond, remove it from the slot. Install another module of the same type or reinsert the appropriate dummy module into the empty slot.

Return a damaged or malfunctioning system module to ADVA for examination and repair. See Equipment Return and Repair.

Audience

This section is for service personnel, field service technicians, and personnel who install hardware. Additionally, these procedures are for qualified and authorized personnel who need to install plug-in modules in a FSP 3000R7 equipment shelf and perform cabling tasks.

Personnel are considered to be qualified if they:

- Have the necessary knowledge and practical experience of mechanics, electrical engineering, and fiber-optic cabling systems.
- Understand the various hazards that can arise when they work on a shelf.
- Know to take reasonable precautions to prevent personal injury and equipment damage.
- Are familiar with the management software available on the system.

Associated Documentation

These documentation resources provide instructions to install plug-in modules in a FSP 3000R7 equipment shelf:

- Installation plan, including information about placement of shelves within the network element and location of the optical modules within an equipment shelf
- Optical cabling plan
- Optical jumper list

Installing Power Supply Units

This section contains these topics:

General Information

The FSP 3000R7 equipment shelves can operate with one AC or DC power supply unit (PSU). However, in a redundant power supply configuration, the second PSU provides hot-swappable, load-sharing redundant power. In this case, both PSUs must be of the same type and receive power from separate circuits.

The 7HU shelf front power access (SH7HU) and 7HU shelf rear power access can optionally be powered by AC or DC power supply units. See Table 27.

Table 27: Power Supply Installation Notes

Shelf Types	AC PSUs	DC PSUs	Combinations of AC and DC PSUs
SH9HU	2 x PSU/9HU-AC 2 x PSU/7HU-AC-800	2 x PSU/9HU-DC 2 x PSU/7HU-DC-800	Supports a combination of AC and DC PSUs in the same SH9HU shelf.
SH7HU	2 x PSU/7HU-AC	2 x PSU/7HU-DC	Supports a combination of AC and DC PSUs in the same SH7HU shelf.
	2 x PSU/7HU-AC-HP 2 x PSU/7HU-AC-800	2 x PSU/7HU-DC-HP 2 x PSU/7HU-DC-800	

Table 27: Power Supply Installation Notes

Shelf Types	AC PSUs	DC PSUs	Combinations of AC and DC PSUs
SH1HU-R/PF	2 x PSU/1HU-R-AC-200	2x PSU/1HU-R-DC-200	Supports a combination of AC and DC power supply units in the same SH1HU-R/PF shelf.

Always use the correct PSU in each FSP 3000R7 shelf. ADVA is not responsible for any damage that results from misuse of the PSUs.

The PSUs for the 9HU shelf and the 7HU shelf types are 8-HP wide and occupy two regular shelf slots. Insert these units only in slots 1+2 and 19+20 of the SH9HU, SH7HU. 1HU equipment shelves with rear power access such as the SH1HU-R/PF require that you use the rear access to insert the PSUs.

PSUs listed in Table 27 are referred to as *PSU*. Keep these guidelines in mind:

Guideline for	Description
Connectors	The PSU plug-in board connectors and the appropriate backplane connectors of the shelf must mate precisely to avoid connector damage and malfunction.
Connector integrity	Always verify connector integrity before you install a PSU. Attempts to install a PSU with a damaged plug-in board connector or the use of excessive force when you insert the PSU into the slot can bend the backplane connector pin. If you force a PSU into a backplane connector with bent pins, further damage will occur to the pins and damage the PSU plug-in board connector.
Connector alignment	Make sure that the connectors properly align when you insert the PSU into the slot. Gently push the unit for the last centimeter so that the plug-in board connectors properly enter the backplane connectors.
Bent pins	Bent pins on a backplane connector can raise communication issues with the PSU. In extreme cases, bent pins can result in a short circuit between the power and ground rails. A short circuit condition can cause excessive current flow and potential heat damage to the slot position. In the worst case, a fire hazard can occur within the PSU shelf.
Module installation	Improper module installation or installing modules with damaged plug-in board connectors can bend connector pins and void the shelf and PSU warranties.

Guideline for	Description
Power connectors	The power connectors for the PSU/9HU-DC, PSU/7HU-R-DC, and PSU/7HU-R-DC-HP are located at the back panel of the SH9HU. The power connector of the PSU/7HU-AC-HPpower connector is located on the faceplate of the PSU for front power access.
PSU mounting	Depending on the type, a PSU has two or four captive mounting screws (knurled screws) on the faceplate that holds the unit in place. The handles on the power supply faceplate provide grip points you can use to pull the unit out of the shelf slot.
PUS removal	If you remove a PSU from the shelf, the management system detects this removal and generates a corresponding alarm (RMVD alarm). This alarm is listed in the Event Log and Fault Management tables. To avoid raising an RMVD alarm after you completely reinsert the same PSU, comply with the this rule that follows.

	Do not remove and then quickly reinsert a PSU. Wait at least 30 seconds between removal and reseating the same unit.

	For specific information about the power supply units, see the *FSP 3000R7 Hardware Description* and *FSP 3000R7 Module and System Specification*.

Safety Guidelines

Before you perform any installation procedure, review the safety guidelines in this section to avoid injury or damage to the equipment.

	CAUTION Only service personnel are qualified to perform this procedure.

	ELECTRIC VOLTAGE WARNING **Risk of hazardous voltage** Be aware that you might touch live contacts when the PCB cover is damaged or missing, and you later apply voltage . Do not install the power supply unit if it is damaged or if the covers are missing.

ELECTRIC VOLTAGE WARNING

Risk of electric shock

Ensure that you reliably and permanently connect the shelf to the rack earth-ground point before you install the PSU.

ELECTRIC VOLTAGE WARNING

Risk of short circuit.

If a backplane connector of a shelf has bent or broken pins, do not slide the PSU into that shelf slot.

If the plug-in board connector of the PSU is damaged, do not install this unit.

Damaged connectors can cause a short circuit or malfunction.

ELECTRIC VOLTAGE WARNING

Disconnect power immediately if you notice visible signs of the PSU overheating or related odors after you power on the PSU.

ELECTROSTATIC CAUTION

Ensure that you are earth-grounded with a wrist strap or equivalent while you mount the brackets to a shelf that contains ESD-sensitive devices.

Follow ESD-prevention precautions to avoid ESD damage to the other equipment.

Risk of electromagnetic disturbances

Make sure that the EMI gasket is undamaged before you install the PSU. Damage to the EMI gasket results in electromagnetic disturbances that degrade the performance of your system. Relevant EMC requirements are therefore not met.

	Risk of electromagnetic disturbances
NOTICE	To maintain agency compliance requirements for the 9HU and 7HU shelves with a single power supply unit, ensure that you fulfill one of these actions: • Fill the unused power supply slots with the appropriate dummy modules. • Keep any existing dummy modules already installed in the unused power supply slots in place. Only remove these dummy modules from the shelf if you intend to install a redundant PSU. The 1HU shelves must always be equipped with **two** AC power supplies. No plates cover the slots.

	Risk of backplane connector damage
NOTICE	Never force a PSU into the dedicated shelf slot if you feel any resistance. Apply firm, even pressure on the PSU to seat it properly. Forcing a PSU into its backplane connectors can bend the pins of the backplane connectors, damage the plug-in board connectors, and cause damage to the tracks in the slot. Avoid any misdirected mechanical force on the backplane connectors.

📝	Store the original package of the PSU in a safe place for to use later if needed.

We assume that you are familiar with power supplies and aware of the electrical safety precautions you must take to avoid personal injury and damage to the equipment.

Installing a PSU in a 9HU or 7HU Shelf

👁	See the section Safety Guidelines before you begin.

The term *PSU* refers to all AC and DC power supply units that you can install in a 9HU shelf (SH9HU) and a 7HU shelf (SH7HU).

You install and mount PSUs in both theSH9HU andSH7HU shelves in the same way. Except for the PSU/1HU-R-AC(–200), this installation procedure applies to all PSUs listed in Table 27.

Required Tools and Equipment

- Torx screwdriver TX10 to tighten the knurled screws
- ESD-preventive wrist strap or other personal earth-grounding device
- Suitable grounded surface or an antistatic mat to place the power supply unit
- Appropriate PSU packaged in the cardboard box

Procedure

> 📝 You can install the PSUs only into slots 1+2 and 19+20.

1. Read the installation plan to get information about:
   - The PSU type that you plan to install.
   - The shelf that you plan to equip with this PSU.
2. Attach a wrist strap to your bare wrist. Fasten the earth-grounding wire onto the ESD earth-grounding point on the shelf, if available, or to a bare metal surface onto the rack.
3. Locate the corresponding shelf within the rack or cabinet.
4. Ensure that the shelf connects to the earth-ground point of the rack or cabinet.
5. Remove the PSU from the cardboard shipping box. Then remove the PSU from the static-protective package. Immediately place the PSU on an earth-grounded surface or an antistatic mat.

Check and prepare the PSU:

1. Ensure that the PSU is the correct one you want to install (type, specifications). See the faceplate markings and labels on the board cover.
2. Visually inspect the PSU for any damage and impurities. If necessary, use canned, dry, oil-free compressed air to blow away any impurities.
   - Carefully check the plug-in board connector of the PSU for dirt, any deformation in the shape of the pin holes, and for damage on the outside of the unit.
   - Check the EMI shielding gasket on the faceplate edges of the PSU for damage.

If the power supply unit looks like it was dropped on a hard surface, damaged in any way, or if its cover is missing, do not install the unit. Return it to ADVA for examination and repair.

Continue with these steps.

1. Check inside the shelf to ensure that:
   - No foreign bodies are present between the backplane connector pins.
   - No backplane connector pins are bent or broken.
   - No backplane connector of the shelf has any damage.

   If such a condition is evident, do not install the PSU.

	Risk of electromagnetic disturbances
NOTICE	Be careful not to damage the EMI shielding gasket on the faceplate edges of the power supply when you insert the unit into the slots. Any gasket damage voids EMC compliance.

2. Insert the PSU into the specified slots:
   a. Position the PSU in front of the dedicated slots and align the upper and lower edges of the unit with the upper and lower tracks.

   b. After the unit is in the correct position, carefully slide the PSU into the slots a few millimeters as you guide the upper and lower edges of the unit in the tracks. You can place the PSU only into slots 1+2 and 19+20.

   c. Use your thumbs and moderate force to gently push the faceplate until the unit connectors mate properly with the backplane connectors.

	For correct insertion, the edges of the PSU must glide smoothly in the tracks. If the edges do not, stop immediately and remove the unit. Position the unit again, and then reinsert it.

	Risk of damage to connectors
NOTICE	To avoid damage to the backplane connectors, do not use excessive force when you insert the PSU into the slots. If you need to use a force greater than 90 Newton (20.2 lbf) to push the unit, stop immediately. Inspect the unit and the electrical connectors. If the unit and the connectors have no damage, repeat Step 2.

3. Ensure that you completely insert the PSU into the slots. The unit faceplate must be flush with the faceplates of the adjacent modules and the shelf panels.

4. After you completely insert the PSU, secure it tightly in the slots:
   a. Use one hand to hold the unit in place. Use the thumb and forefinger of your other hand to simultaneously turn the two diagonally-arranged knurled screws clockwise into the threaded holes.

   b. Turn the remaining knurled screws in the same way into the threaded holes.

   c. Use the Torx screwdriver TX10 to gently tighten the four knurled screws. Do not overtighten.

5. Detach the wrist strap from your wrist, disconnect the earth-grounding cable from the ESD grounding point on the shelf (if available) or the rack, and set the earth-grounding cable aside.

6. Store the cardboard box in a safe place for later use, including the static-protective package.

7. Repeat this procedure for each AC or DC power supply unit that you need to install.

For any issues with this procedure, contact ADVA Technical Services.

Installing a PSU in a 1HU Shelf

	See the section Safety Guidelines before you begin.

Use the same procedure to mount and install these power supplies in the SH1HU-R/PF shelf:

- PSU/1HU-R-AC-200.
- PSU/1HU-R-DC-200.
- All PSU/1HU-F-DC PSU types.

The term *PSU/1HU-R-AC(-200)* refers to the PSU/1HU-R-AC-200.

Required Tools and Equipment

- No. 2 Phillips screwdriver to loosen the knurled screws
- ESD-preventive wrist strap or other personal earth-grounding device
- Suitable grounded surface or an antistatic mat to place the PSU
- Appropriate PSU packaged in the cardboard box

Procedure

1. Read the installation plan to get information about:
   - The PSU type that you plan to install.
   - The shelf where you plan to install this PSU.

2. Attach a wrist strap to your bare wrist. Fasten the earth-grounding wire onto the ESD earth-grounding point on the shelf, if available, or to a bare metal surface onto the rack.

3. Locate the corresponding shelf in the rack or cabinet.

4. Ensure that the shelf connects to the rack or cabinet earth-ground point.

5. Locate the empty power supply slot (bay) on the shelf back panel.

6. Remove the PSU/1HU-R-AC(-200) from the cardboard box and then from the static-protective package. Immediately place the PSU onto a grounded surface or antistatic mat.

Check and prepare the PSU/1HU-R-AC(-200):

1. Make sure that the PSU is the correct one to install (type, specifications). See the faceplate markings and labels on the board cover.

2. Visually inspect the PSU/1HU-R-AC(-200) for any damage or impurities. If necessary, use canned, dry, oil-free compressed air to blow away any impurities.
   - Carefully check the PSU/1HU-R-AC(-200) plug-in board connector for dirt, any deformation in the shape of the pin holes, and damage on the outside of the board.
   - Check for damage on the EMI shielding gasket that is located on the faceplate edges of the unit.

   If the PSU/1HU-R-AC(-200) looks like it was dropped on a hard surface, damaged in any way, or its cover is missing, do not install the unit. Return it to ADVA for examination and repair.

3. Check inside the shelf to ensure that—
   - No foreign bodies are present between the backplane connectors pins.
   - No backplane connectors pins are bent or broken.
   - No backplane connector of the shelf is damaged in any way.

   If such a condition is evident, do not install the PSU/1HU-R-AC(-200).

NOTICE	**Risk of electromagnetic disturbances** Be careful not to damage the EMI shielding gasket on the faceplate edges of the power supply when you insert the unit into the slot. Any gasket damage voids EMC compliance.

4. Insert the PSU/1HU-R-AC(-200) into the specified slot (bay):
   a. With the AC appliance coupler on the left, align the PSU/1HU-R-AC(-200) to the open power supply bay on the rear of the 1HU shelf.
   b. Use moderate force to slide the PSU/1HU-R-AC(-200) all the way into the power supply bay until the unit connector mates properly with the backplane connector.

📝	You can only insert the PSU/1HU-R-AC(-200) with the AC appliance coupler on the left.

NOTICE	Risk of connector damage
	Do not use unnecessary force when you insert the PSU/1HU-R-AC(-200) into the power supply bay. You can cause damage to the connectors if you force the unit into the bay.

5. Ensure that the PSU/1HU-R-AC(-200) is completely inserted into the power supply bay. For the PSU/1HU-R-AC(-200) to be completely inserted, verify these conditions: The unit faceplate is flush with the shelf rear panel. The two knurled screws on the faceplate align with their threaded holes in the shelf.

	To ensure that the PSU/1HU-R-AC(-200) is securely seated in the power supply bay, tighten the knurled screws on the bay faceplate.

6. After you completely insert the PSU/1HU-R-AC(-200), secure it tightly in the bay:

   a. Use one hand to hold the unit in place. Use the thumb and forefinger of your other hand to simultaneously turn the two knurled screws on the faceplate clockwise into the threaded holes.

   b. Use the No. 2 Phillips screwdriver to gently tighten the two knurled screws. Do not overtighten.

7. Detach the wrist strap from your wrist, disconnect the earth-grounding cable from the ESD grounding point on the shelf (if available) or the rack, and set the earth-grounding cable aside.

8. Store the cardboard box and the static-protective package in a safe place.

9. Repeat this procedure for each PSU/1HU-R-AC(-200) that you need to install.

For any issues with this procedure, contact ADVA Technical Services.

Installing Optical Modules

Complete the steps in this section to install an optical module in any FSP 3000R7 shelf. Unless otherwise specified, the term *optical module* refers to all types of:

- channel modules
- optical filter modules
- optical protection switch modules
- OSC modules
- reconfigurable optical layer devices
- optical amplifiers and dispersion compensation modules

If instructions apply only to a specific module type, for example, a channel module, that term is specified.

You use the same steps to mount a channel module, a filter module, an amplifier module, and so forth.

General Information

Item	Description
Compatibility	All optical modules are compatible with any FSP 3000R7 shelf. A particular optical module has no slot restrictions. Double-width modules occupy two slots. The preferred configuration of these modules is to start at an odd slot number such as 1, 2; 3, 4; 5, 6; and so forth. You do not need to place channel modules that interoperate in a channel module protection group in neighboring slots. Slot positions 1+2 and 19+20 of the 9HU shelf are reserved for PSUs.
Board connectors	The plug-in board connectors of the optical module and the appropriate backplane connectors of the shelf must mate precisely to avoid connector damage and malfunction. Always check connector integrity before you install an optical module.
	You can bend the backplane connector pins if you try to install an optical module with a damaged plug-in board connector or use excessive force when you insert the module into the slot. If you force an optical module into a backplane connector with bent pins you can further damage the pins and the plug-in board connector on this module. Make sure that the connectors properly align when you insert the optical module into the slot. Gently push the module on the last centimeter into the slot so that the plug-in board connectors enter the backplane connectors properly.
Backplane connector pins	Bent pins on a backplane connector can raise communication issues with the optical module. In extreme cases, bent pins can result in a short circuit between the power and ground rails. A short circuit condition can cause excessive current flow with potential heat damage to the slot position, and, in the worst case, a fire hazard on the optical module within the shelf.
	Bent connector pins caused by improper module installation or by modules with damaged plug-in board connectors can void the warranty for the shelf and the optical modules.
Tools	No tools are required to insert each optical module into any 5HU shelf slot. All optical modules use captive mounting screws (knurled screws) on their faceplates to secure the device in the shelf slots.

Item	Description
C1 port	If you plan to equip the C1 port with an SFP electrical transceiver, installation of the 10TCC-PCTN-4GUS+10G or 10TCC-PCTN-4GU+10G channel module is limited. Because of the physical format of an SFP electrical transceiver, you cannot insert the module C1 port if you mount the fiber tray on the shelf. In this case, first insert the SFP electrical transceiver into the C1 port before you install this channel module in the shelf.
Module inventory access	You can access the module inventory data stored in the EEPROM is accessible from the management system. If you enable auto-provisioning, the optical module will enter the NE database with default parameters.

	For specific information about the optical modules, see the *FSP 3000R7 Hardware Description* and *FSP 3000R7 Module and System Specification*.

Required Tools and Equipment

- Optical module that you plan to install
- ESD-preventive wrist strap or other personal earth-grounding device
- Suitable grounded surface or an antistatic mat to place the optical module

Procedure

	CAUTION
	Only service personnel are qualified to perform this procedure.

	ELECTROSTATIC CAUTION
	Ensure that you are earth-grounded with a wrist strap or equivalent while you mount the brackets to a shelf that contains ESD-sensitive devices. Follow ESD-prevention precautions to avoid ESD damage to the other equipment.

	We assume that you are familiar with how to handle optical modules and aware of the precautions needed to avoid damage to the equipment. The *FSP 3000R7 Maintenance and Troubleshooting Manual* provides a summary of how to handle optical modules.

1. Read the installation plan to get information about:
    - The module type that you plan to install.
    - The shelf where you plan to install this module.
    - The slot where you plan to insert this module.

2. Attach a wrist strap to your bare wrist and fasten the earth-grounding cable onto the ESD grounding point on the shelf (if available) or to a bare metal surface onto the rack.

3. Locate the shelf within the network element where you need to install the module.

4. Locate the slot where the you plan to insert optical module.

5. If a dummy module is installed, remove it to make space to insert the optical module. See Removing a Dummy Module

NOTICE	Never reach into a vacant shelf slot. Contact with the adjacent optical modules or the connectors on the backplane can result in damage to the equipment.

6. Remove the optical module from the cardboard box and then from the static-protective package. Immediately place the module onto an earth-grounded surface or antistatic mat.

Check and prepare the optical module:

1. Make sure that the module is the correct one you want to install (type, specifications). See the faceplate markings and the labels on the board cover.

2. Visually inspect the optical module for any damage and impurities. If necessary, use canned, dry, oil-free compressed air to blow away any impurities.
    - Carefully check the plug-in board connector of the optical module for dirt, any deformation in the shape of the pin holes, and damage on the outside of the module.
    - Check the EMI shielding gasket on the module faceplate edges for damage.

If the optical module looks like it was dropped on a hard surface or damaged in any way, do not install it. Return the module to ADVA for examination and repair.

3. Check inside the shelf to ensure that
    - No foreign bodies are present between the backplane connectors pins.
    - No backplane connectors pins are bent or broken.
    - No backplane connector of the shelf has any damage.

    If such a condition is evident, do not install the optical module.

	ELECTRIC VOLTAGE WARNING
	Risk of short circuit.
	If a the pins on a shelf backplane connector are bent or broken, do not slide the optical module into that shelf slot.
	If the plug-in board connector of the optical module is damaged, do not install this module.
	Damaged connectors can cause a short circuit or malfunction.

	ELECTRIC VOLTAGE WARNING
	Risk of fire
	Immediately power off the shelf and remove the optical module if you notice visible signs of module overheating or related odors after you powering on the shelf.

	Risk of electromagnetic disturbances
NOTICE	Be careful not to damage the EMI shielding gasket on the faceplate edges of the optical module when you insert it into the slot. Damage to the gasket voids EMC compliance.

Continue with these steps to insert the appropriate module into the empty slot:

1. To insert an optical module into an SH7HU or SH9HU shelf, hold the module by both screws or by the faceplate.
2. To insert an optical module into an SH1HU shelf, hold the module by both screws as shown in or by the faceplate.
3. Align the upper and lower edges of the module with the upper and lower tracks in the slot. After the module is in the correct position, carefully slide the module into the slot a few millimeters as you guide the upper and lower edges of the module in the tracks.
4. Use moderate force to gently push the module unitl the connectors mate properly with the backplane connectors.

5. Ensure that the module is completely inserted into the slot as follows:
   - The faceplate is flush with the faceplates of the adjacent modules and the shelf panels.
   - The shelf is reciving power.

- If power is applied to the shelf, the power LED lights solid green as soon as the module is in contact with the backplane.

> 📝 The management software automatically detects the insertion of an optical module. The internal network management system receives a trap message each time an optical module is inserted into a shelf slot.

6. Check the module LED indicators — P, Mod, O/E, Err, and the corresponding shelf slot LED (1 to 20).

> 📝 The module LEDs indicate reliable information for only 5 to 10 seconds after you insert the module. Wait at least 5 minutes after you power on the module before you check the LEDs. The LED colors can change within this time span.

When you install a module for the first time, the LEDs indicate status.

LED Name	LED Color	Meaning
P	Solid green	If the shelf is connector to power, a green LED indicates that the module has power.
Mod	Off	The module admin state is unassigned, which means that the module is not available in the management system.
Slot 1 to 20	Off	

For a detailed description of the status LED indicators, see the *FSP 3000R7 Maintenance and Troubleshooting Manual*.

If the module does not respond, remove it from the slot. Reinsert the dummy module into the empty slot as described in Inserting a Dummy Module.

7. After the inserted module responds, secure it tightly in the slot:
   a. Hold the module in place with one hand. Use the thumb and forefinger of your other hand to simultaneously turn the two knurled screws clockwise into the threaded holes.
   b. Gently tighten the two knurled screws by hand. Do not overtighten

8. Detach the wrist strap from your wrist, disconnect the earth-grounding cable from the ESD earth-grounding point on the shelf (if available) or the rack, and set the earth-grounding cable aside.

9. Store the cardboard box in a safe place for later use, including the static-protective package.

10. Repeat this procedure for each optical module that you need to install.

For any issues with this procedure, contact ADVA Technical Services.

Installing Encryption Modules

Unless otherwise specified, the term *encryption module* refers to all types of FSP 3000R7 system encryption modules.

	For specific information about each encryption module type, see the *FSP 3000R7 Hardware Description*.

This section contains these topics:

Adding an Encryption Module to a Shelf

Complete the steps in this section to add an encryption module to a shelf. For specific information about each encryption module type, see the *FSP 3000R7 Hardware Description*.

	CAUTION Only service personnel are qualified to perform this procedure. Service personnel entrusted with adding governmental security-approved modules to a shelf must have the appropriate level of security clearance. See the hardware description of the module type to identify governmental security-approved modules in the *FSP 3000R7 Hardware Description*.
	You must operate FIPS-certified encryption modules in FIPS-approved mode. After you physically install the modules, equip them with the appropriate NE software encryption firmware package.
	Before you connect fiber optic cables, first install the encryption module and pluggable transceivers to the FSP 3000R7 system.

Additional Information

Encryption modules are plug-in modules that are compatible with many FSP 3000R7 shelves.

- You must install Federal Information Processing Standards (FIPS) certified encryption modules only in the appropriate FSP 3000R7 shelves.
- You must seal FIPS-certified encryption modules after you install them.

Adding an encryption module has no impact on the operation of currently installed modules in the shelf. The shelf contains no fixed or dedicated slot positions for specific encryption modules. You can insert encryption modules into a shelf slot without the use of tools. See the *FSP 3000R7 Network Element Director (NED) Online Help*.

Encryption modules are provisioned with two independent sets of configuration parameters: optical and crypto, described as follows:

- The NCU database controls the optical parameters. The software automatically provisions the parameters when you insert the replacement encryption module. Use management software to confirm these settings. If the settings differ from your network requirements, reconfigure the module.

- When you remove an encryption module from a shelf, the system automatically erases any stored passwords and other sensitive information. When you install the new encryption module, all crypto-related variables are set to their default values.

To enable encryption functionality, you must provision the security parameters on the module. This procedure is described in the *FSP 3000R7 Network Element Director (NED) Online Help*.

	The term *NCU* refers to the NCU-3, NCU-II, NCU-II-P, and NCU-S modules.

You can use the management system to access the module inventory data stored in the EEPROM. When auto-provisioning is enabled, the encryption module enters the NE database with set default parameters. See the *Network Element Director (NED) Online Help* for information about how to assign equipment to the NE database and configure equipment.

If you add an encryption module at a later time, the optical budget can change. Use the FSP Network Planner to calculate the changes or contact ADVA Technical Services.

	Risk of power supply failure
	If you add modules that consume a relatively high amount of power to an already operating node, the overload can cause a power failure.
NOTICE	Ensure that the total power consumption of a fully equipped shelf does not exceed the specified value. Calculate the total power consumption or contact ADVA Technical Services before you insert the module.

Required Tools and Equipment

- Encryption module that you plan to add, packaged in the shipping box.
- Required number of security seal labels and a security twist wire seal to install a FIPS-certified encryption module
- The initial crypto officer password and authentication password for the module that you are adding, other than -G and -F modules.
  For a FIPS-certified encryption module, you need the crypto officer password and pairing token (static DH key).
- The initial crypto officer password and authentication password for the module you are adding, other than -G and -F modules.
  For a FIPS-certified encryption module, you need the crypto officer password and pairing token (static DH key).
- A Torx screwdriver TX10 to help loosen the knurled screws.
- An ESD-preventive wrist strap or other personal earth-grounding device.
- A suitable earth-grounded surface or an antistatic mat to place the encryption module.
- Make sure that the shelf that will house the encryption module to be added is created in software.

	The crypto officer must have a valid admin, provision, or crypto account on the NCU and may use either a web browser or SSH client to log in to the NCU.

	ELECTROSTATIC CAUTION Ensure that you are earth-grounded with a wrist strap or equivalent while you mount the brackets to a shelf that contains ESD-sensitive devices. Follow ESD-prevention precautions to avoid ESD damage to the other equipment.

Procedure

Complete these steps to insert the appropriate module into the empty slot:

1. For an SH7HU or SH9HU shelf, hold the module vertically by both screws or by the faceplate to insert the module.
2. For an SH1HU shelf, hold the module horizontally by both screws or by the faceplate to insert the module.
3. Align the upper and lower edges of the module with the upper and lower tracks in the slot. After the module is in the correct position, carefully slide the module into the slot a few millimeters as you guide the upper and lower edges of the module in the tracks.

4. Use moderate force to gently push the module into the slot until the module connectors mate properly with the backplane connectors.

	Risk of module damage
NOTICE	Very carefully insert the encryption module into the slot to avoid damage to the PCB assembly components.

	Risk of module damage
NOTICE	If you need to use a force greater than 90 Newton (20.2 lbf) to push in the module, stop immediately. Inspect the module and the electrical connectors. If the module and the connectors are not damaged, repeat this procedure.

5. To ensure that the module is properly and completely inserted into the slot, confirm that:

    -   The faceplate is flush with the face plates of the adjacent modules and the shelf panels.
    -   The module receives power. If power is applied to the shelf, the module Power LED lights green as soon as the module establishes contact with the backplane.

	The management software automatically detects the insertion of an encryption module. After you insert the module into the shelf slot, the module boots up.

	After power-on, the encryption module executes self-tests. The module LED Mod lights red. After you provision the module, re-start the self-test. See the *Network Element Director (NED) Online Help* for details.
	Do not use a module that fails a self-test.

	For a FIPS-certified encryption module, automatic power-on self-tests execute with no operator actions after the device powers on. If this test fails, the module enters the Error State and disables cryptographic functions with CSPs. Only status information is available. In error state, the module LED illuminates red.

6. See the installation plan for details about:

    -   The module type that you plan to add.
    -   The shelf and corresponding slot where you plan to install this module.

7. Attach a wrist strap to your bare wrist, connect the earth-grounding wire to the ESD jack on the shelf, and then secure the other end of the grounding wire to your wrist strap.

8. Locate the shelf within the NE where you plan to install the module.

9. If the front cover is mounted, remove it, as described in Removing the SH7HU or SH9HU Front Cover.

10. Locate the slot where you plan to insert the encryption module.

11. Check the operating status of the equipment and the current hazard level. A module in the system that operates in Forced On mode can raise the hazard level of the NE.
Note: Proceed only if you have laser safety training.

12. Remove the corresponding dummy module from the slot as described in Removing a Dummy Module.

NOTICE	Never reach into a vacant shelf slot. Human contact with the adjacent optical modules or backplane connectors can damage the equipment.

Continue with these steps.

1. Unpack and inspect the encryption module as described in Unpacking and Inspecting Optical Modules.
Do NOT install an encryption module that

   - Shows evidence of tampering.

   - Was dropped on a hard surface.

   - Exhibits loose or torn EMI shielding.

   Return a damaged module to ADVA for examination and repair. See Equipment Return and Repair for details.

2. Check inside the shelf to ensure that:

   - No foreign conductive bodies are present between the backplane connectors pins.

   - No backplane connectors pins are bent or broken.

   Do NOT install the module if a backplane connector of the shelf is damaged in any way.

⚡	**ELECTRIC VOLTAGE WARNING** **Risk of short circuit** If a backplane connector of a shelf has bent or broken pins, do not slide the encryption module into that shelf slot. If the plug-in board connector of the encryption module is damaged, do not install this module. Damaged connectors can cause a short circuit or malfunction.

	Risk of electromagnetic disturbances
NOTICE	Before you insert the module, ensure that the EMC contact strips are not damaged, which voids EMC compliance.

3. Check the module LED indicators (P, Mod, O/E, Err) and the corresponding shelf slot LED (1 to 20).

	The module LEDs indicate that it has power within 5 to 10 seconds after you insert the module. After power on, wait at least five minutes before you read the LED status. The LED colors can change within this time-span.

If you are installing the module for the first time, the LEDs indicate status.

LED Name	LED Color	Meaning
P	Solid green	For shelves that are connected to power, solid green shows that the module has power.
Mod	Off	The module admin state is unassigned, which means that the module is not available through the management interface.
Slot 1 to 20	Off	

For a detailed description of the status LED indicators, see the *FSP 3000R7 Maintenance and Troubleshooting Manual.*

If the module does not respond, remove it from the slot. Reinsert the dummy module into the empty slot as described in Inserting a Dummy Module.

4. After you verify that the inserted module operates properly, secure it tightly in the slot:
   a. Use one hand to hold the module in place. Use the thumb and forefinger of your other hand to simultaneously turn the two attached knurled screws clockwise into the threaded holes.
   b. Tighten the screws.

5. Insert the pluggable transceivers into the module interface cages as specified in the installation plan. Follow the appropriate procedures described in Installing Pluggable Transceivers.

	If any interface cage remains unequipped, immediately insert the appropriate dust plugs into the empty interface cage. This precaution ensures proper air flow within the shelf and prevents dust and dirt particles from entering the module.

6. If auto-provisioning is disabled, create the new module and all applicable equipment such as plugs and channels associated with this module. See the *FSP 3000R7 Network Element Director (NED) Online Help*.

   If auto-provisioning is enabled, the encryption module enters into the NE database with its default parameters set and you do not have to provision the encryption module.

7. If the module is not equipped with the encryption firmware package associated with the NE software, update the encryption module. See Installing the Encryption Module Firmware.

8. For a FIPS-certified encryption module, add security seals:
   a. Add the security twist-wire seal to the module front-panel screws as described in Sealing of FIPS-Certified Encryption Modules
   b. Add the security CFP seal to CFP on the front panel as described in Sealing of FIPS-Certified Encryption Modules
   c. Add security seals to the shelf as described in Sealing the Shelves, if needed.

Complete these steps to provision these security parameters on the module. The crypto officer completes the initial steps.

1. The crypto officer must set his or her password to the initial default password CHANGEME.1. See the *FSP 3000R7 Network Element Director (NED) Online Help* for details.

2. The crypto officer must set the authentication password for the communication link. See the *FSP 3000R7 Network Element Director (NED) Online Help* for details.
   After you configure the far-end module in the same way, the key-exchange process starts. After the process generates the first key, encryption of user data begins. This process does not apply to -F and -G modules.
   For -F and -G modules: After the crypto officer sets the password, you must complete further provisioning to start encrypted data transport. See the *FSP 3000R7 Network Element Director (NED) Online Help*.

3. For a FIPS-certified encryption module, the crypto officer must begin the pairing process on the near-end and far-end modules. During pairing, both modules generate unique local authentications keys. After the crypto officer accepts the fingerprints on both sides, the modules are paired and encrypted communications begin.

4. After you configure the non-security-related settings of the module, the module is prepared to establish encrypted optical communication.

> 🗒 When the crypto officer initially changes his or her password from CHANGEME.1, all other crypto-related values automatically set to their default values.

Continue with these steps:

1. Connect the module optical ports as specified in the installation plan.
   For -F modules only: Perform FIPS-certified sealing of the module. See Sealing of FIPS-Certified Encryption Modules in this document.

2. Repeat this procedure for each encryption module that you add to a shelf.

3. If available, mount the front cover to the shelf as described in Mounting the SH7HU or SH9HU Front Cover

4. Detach the wrist strap from your wrist. Disconnect the earth-grounding wire from the ESD jack on the shelf.

For any issues with this procedure, contact ADVA Technical Services.

Installing the Encryption Module Firmware

⚠	**CAUTION** Only service personnel are allowed to perform this procedure. Service personnel entrusted with installing the encryption firmware packages to the encryption modules must have the appropriate level of security clearance.

🗒	The term *NCU* refers to the NCU-3, NCU-II, NCU-II-P, and NCU-S modules.

Additional Information

All FSP 3000R7 encryption modules allow firmware updates. The module firmware contains several FPGA images and executable code for the micro controller. Since firmware influences the security of the encryption modules, firmware updates must be allowed by the Crypto Officer.

An NCU software load contains all firmware packages of all approved modules. Because of export restrictions, the NCU software load does not contain firmware packages of encryption modules. Instead dummy packages are included, which show the user, that new firmware for the encryption modules is available for this new NCU load. The user must separately download new firmware packages for encryption modules from the ADVA Customer Portal at http://www.adva.com/. Downloads are tracked for export control issues. The user must verify that the image has not been modified during transport.

The firmware installation for encryption modules requires two users: The Crypto Officer, who must allow a firmware installation on his modules and must specify the target firmware version. Another user, either ADMIN or PROVISION can copy the firmware package to the NCU and install the firmware on the module after the Crypto Officer has allowed installing

of the same exact version. An encryption module allows installing a firmware package only, if the Crypto Officer password has been set. Then the module has to check if the version number is the expected one. Before jumping to the new image, the micro controller images of the encryption module are checked for their checksum. The new firmware can only be executed if the micro controller checksum is correct. ADVA publishes the MD5 and SHA-256 checksum of every firmware image to verify the integrity.

To load a new firmware into an Fips-certified encryption module, a firmware load test according to FIPS 140-2 is performed. This requires the verification of a digital signature of the firmware package (RSA-3072 signature verification). A SHA-256 hash value is included in the version information for unambiguous identification of the firmware of the Fips-certified encryption modules. If the firmware update has not been accepted (signature or version number), booting into this image is prevented. After a new firmware has been copied, only the Crypto Officer is allowed to activate the new firmware.

For the 10TCE-PCN-16GU+AES100G-BSI module, the SHA-256 hash over of internal checksums is published by the German Federal Office for Information Security (BSI). The micro controller calculates the checksum of each sub image and the user compares it with the value provided. The firmware is executed if the calculated firmware checksum matches the expected checksum.

General Requirements

- The network element (NE) containing encryption modules has to run a software release of 10.3 or higher. For guidance in installing the master shelf and its NCU module, refer to this manual.
- The NCU-II, NCU-II-P, and NCU-3 support all AES modules offered by ADVA.
- The NCU-S supports all AES modules except the 9TCE-PCN-10GU+AES10G.
- If appropriate, update the NE as described in the *FSP 3000R7 Maintenance and Troubleshooting Manual*, section "Updating the NE Software Release".
- Before an encryption module is provisioned, the shelf which will contain it must be provisioned. See the *FSP 3000R7 Network Element Director (NED) Online Help* for details.
- To successfully log on the NE carrying the relevant encryption module, use either of these emulation programs or browsers:
    - To enter the Craft Console
        - Use a terminal emulation program supporting secure shell (SSH), for example, PuTTY.
        - Use a serial connection.
    - To enter the Network Element Director (NED)
        - Use a web browser supporting a secure HTTPS connection.

- Both far-end and near-end encryption modules are physically inserted into the shelf and completely provisioned the same:
    - All module entities are created and available.
    - All optical parameters are set.
- Initial Crypto Officer password of the encryption module to be updated

Procedure

1. Download the appropriate firmware package from the Customer Portal to a safe storage location that is addressable by the NE on which the relevant encryption module resides. This can be your management PC or an FTP/SCP server.
2. Log on the NE where the relevant encryption module resides. You must be logged on with an ADMIN or PROVISION level user account.
3. Select the relevant encryption module from the Craft Console submenus **(Service Management > SHELF > MOD)**.
4. Select **CRYPTO** from the module submenu.
5. Select **[Change Settings]** in the 'Module' tab.
6. Select **Yes** in the 'Allow FWP Update' field to enable firmware package installation.
   For all encryption enabled modules, select **Enable** in the 'FWP Encryption Update' field to enable firmware package installation.
7. Type the firmware release version in the 'Firmware Release' field and select **[Apply]** to save your settings.
   For all encryption enabled modules, type the firmware release version in the 'FWP Encryption Release' field and select **[Apply]** to save your settings.
8. Type the Crypto Officer password into the editable field and select **[Apply]** to confirm the setting.
9. To check whether your settings were affective, select **[Cancel]** and note the 'Allow FWP Update" field and 'Firmware Release' field on the 'Module' tab displaying your entries.
   For all encryption enabled modules, select **[Cancel]** and note the 'FWP Encryption Update' field and 'FWP Encryption Release' field on the 'Module' tab displaying your entries.
10. Return to the Craft Console main menu and select **System Management > Software & Database Control > FWP Update** tab.
    For all encryption enabled modules, return to the Craft Console main menu and select **System Management > Firmware Control > 2 ACT program** tab
11. Select **[Install Crypto FWP from EXTERN]** on the FWP Update tab. Type the appropriate information into the editable fields and select **[Apply]**. The encryption firmware package downloads to the NE. For information about the window fields, see the *FSP 3000R7 Maintenance and Troubleshooting Manual*, "Installing NE Software".
    A finished window indicates the successful copying of the firmware package to the NCU standby area (STBY).

12. Navigate to the appropriate encryption module you wish to update using the list on the FWP Update tab.

13. Ensure that the correct firmware revisions of the relevant encryption modules are displayed:

    - The current FWP revision of the encryption module
    - The revision of FWP on NCU that becomes active on the module when updated

14. Ensure that the correct firmware revisions of the encryption enabled modules are displayed:

    - The current FWP version of the encryption module
    - The revision of FWP on NCU 'FWP active' that becomes active on the module when updated

15. Press ENTER.

16. Check whether the displayed information in this window is correct and then select **[Update]**.
    For all encryption enabled modules:
    select **[Transfer + Activate].**
    For Fips-certified encryption modules: select **[Transfer].**
    The update process can take up to three minutes. A status bar continuously shows the progress of the update. The update is completed when an informational window is displayed.
    The update was successful when the 'FWP Rev. column' in the list on the FWP Update tab now shows the revision of the activated and thus current firmware package. In case of Fips-certified encryption modules: Firmware package (FWP) standby shows the target FWP.
    For all encryption enabled modules: the state column shows 'Activate Compl'.
    For Fips-certified encryption modules: in addition, the state column shows 'Transfer Completed'.

17. For Fips-certified encryption modules: Activate the FWP by performing an encryption restart:

    a. Select **CRYPTO** from the module submenu.
    b. Select **[Change Settings]** in the 'Module' tab.
    c. Carry out an encryption restart ("Cold with Standby FWP")

18. Verify the authenticity of the firmware package that was being installed on the encryption module using the hash function.
    The check sum algorithm starts running automatically as soon as the firmware is installed. After some minutes retrieve the calculated hash (checksum) for the firmware package using the management software. If the computed hash for the encryption firmware package matches the hash of the original file you are sure that the firmware you have is identical and has not been altered or corrupted.
    The check sum algorithm starts running automatically as soon as the firmware is

installed. After some minutes retrieve the calculated hash (checksum) for the firmware package using the management software. If the computed hash for the encryption firmware package matches the hash of the original file you are sure that the firmware you have is identical and has not been altered or corrupted.

The result of the hash check is also reported to the crypto log file. These items are displayed:

FWP hash check - pass (hash check was successful)

FWP hash check - fail (hash check was not successful)

19. Repeat this procedure for each encryption module to be added to a shelf.

If you experience any problems that result in a deviation from this procedure, contact ADVA Technical Services.

Sealing of FIPS-Certified Encryption Modules

Fips-certified operations requires closing and sealing of shelves and FIPS-certified encryption modules.

	For sealing the FSP 3000R7 shelves containing FIPS-certified encryption modules, see Sealing the Shelves.

For sealing the FIPS-certified encryption modules, use these seal types:

- 1013700031-01 SEAL/FIPS-CFP seal label — red material with black printing and white tamper evidence
- 1013700032-01 SEAL/FIPS-WIRE plastic wire coil-in seal — transparent seal body with black "printing" and white back side label, metal wire

These seals are equipped with a tamper-evidence functionality. The plastic wire coil-in seal consists of a plastic seal body and a metal wire. Attached to the seal body is a white label with a counterfoil/stub. After applying the seals, any attempt to remove the seal causes visible damage of the seal.

Each seal is serialized. The serial number is available on the seal as text and as 2D code (DataMatrix). The 2D code is readable with most contemporary bar code scanners and by use of Smartphone apps. Each seal comes with a counterfoil (or stub) for documentation purpose.

To make the use of the encryption modules as safe as possible, these seals are delivered with the equipment in appropriate numbers. If you need additional seals at a later date, they can be ordered from ADVA.

FIPS Seals Use

FIPS seals have to be applied on installed FIPS-certified encryption modules as one of the last steps in installation, setup and provisioning of FSP 3000R7. This section contains these topics:

Procedure for Plastic Wire Coil-In Seal

1. Remove the unattached part of the white label including the counterfoil/stub, leaving the white label on the flag of seal body.

2. Feed the wire through all necessary holes on the product.

3. Feed both ends of wire through the both parallel holes in the seal body until approximately 1 cm (1/2 in.) of the wire left the other side of the holes.

4. Twist the seal body handle gently clockwise until the wire is tightly coiled into the seal body.

5. Break away the seal handle.

6. After applying a seal, place the counterfoil/stub in your Crypto Officer's documentation for registration of the serial numbers of the applied seals. The registered serial numbers of the seals in Crypto Officer's documentation can be used for checking and identifying seals on the products during regular Crypto Officer's audit of products in Fips-certified mode of operation.

Sealing of the 10TCE-PCN-16GU+AES100G-F

	For seal labels (SEAL/FIPS-CFP):
	• Clean product surfaces from dust, grease and residuals before applying new seal labels.
	• Don't touch adhesive side of seal labels during application.
	• Apply seal labels in one move. Any re-seating of a seal label can cause tamper evidence.

For Fips-certified operation, the 10TCE-PCN-16GU+AES100G-F module has to be sealed with these seal types:

- 1013700031-01 SEAL/FIPS-CFP seal label
- 1013700032-01 SEAL/FIPS-WIRE plastic wire coil-in seal

Figure 86:   10TCE-PCN-16GU+AES100G-F — Seal Locations

Placement:

- T the plastic wire coil-in seal fixing the two upper module screws (1) and
- The seal label bridging the gaps of lower part of CFP fixing the CFP into the module (2).

Sealing of the 9TCE-PCN-10GU+AES10G-F

For Fips-certified operation, the 9TCE-PCN-10GU+AES10G-F module has to be sealed with this seal type: 1013700032-01 SEAL/FIPS-WIRE plastic wire coil-in seal.

Figure 87:   9TCE-PCN-10GU+AES10G-F — Seal Locations

Place the plastic wire coil-in seal fixing the upper module screw to stub.

Sealing of the WCC-PCN-AES100G-F

📝	For seal labels (SEAL/FIPS-CFP): • Clean product surfaces from dust, grease and residuals before applying new seal labels. • Don't touch adhesive side of seal labels during application. • Apply seal labels in one move. Any re-seating of a seal label can cause tamper evidence.

For Fips-certified operation, the WCC-PCN-AES100G-F module has to be sealed with these seal types:

- 1013700031-01 SEAL/FIPS-CFP seal label
- 1013700032-01 SEAL/FIPS-WIRE plastic wire coil-in seal

Figure 88:   SEAL/FIPS-WIRE Seal on the WCC-PCN-AES100G-F — Seal Location

Figure 89:   SEAL/FIPS-CFP Seal Label on the WCC-PCN-AES100G-F — Seal Location

Placement:

- The plastic wire coil-in seal fixing the two upper module screws (1) and
- T the seal label bridging the gaps of lower part of CFP fixing the CFP into the module (2).

	WCC-PCN-AES100G is shipped with two seal label of type 1013700030-01 SEAL/FIPS-GENERAL on the side plate of the module.

Installing Pluggable Transceivers

This section contains these topics:

General Information

Modules with interchangeable interfaces use pluggable transceivers. The FSP 3000R7 system uses these types of pluggable transceivers:

- SFP
- SFP+
- XFP
- QSFP
- CFP fiber-optic transceiver modules
- Fiber optic SFP dual transmitter and receiver modules
- Electrical SFP transceiver modules

Unless otherwise specified, the term *pluggable transceivers* refers to SFP transceivers, SFP+ transceivers, XFP transceivers, and CFP transceivers.

Pluggable transceivers are field-replaceable, hot-swappable input/output devices that plug into the corresponding channel module or management module interface cages. These transceivers physically fit into these modules:

- SFP transceivers, SFP+ transceivers, and QSFP transceivers: any cage of an SFP/QSFP-based channel module.
- XFP transceivers: any cage of an XFP-based channel module.
- CFP transceivers: any cage of a CFP-based channel module.

You can use finger pressure only, no tools needed, to easily insert or remove pluggable transceivers into or from the appropriate channel module interface cages. You do not need to de-activate the channel module when you install or remove a pluggable transceiver. Depending on the transceiver manufacturer, your pluggable transceivers can use different types of latching mechanisms to secure and detach the transceiver into or from the channel module interface cage. Most of the ADVA pluggable transceivers use a bale-clasp latch. CFP transceivers use two captive mounting screws (knurled screws) on their faceplates to secure the device in the interface cage.

The system runs a transceiver check immediately after you insert a pluggable transceiver into the interface cage of a previously provisioned channel module. Only ADVA- approved pluggable transceiver modules can pass this verification step. The FSP 3000R7 does not support third-party transceiver modules . All ADVA-approved pluggable transceiver modules are equipped with a Class 1 Laser device, which emits invisible radiation.

Pluggable transceivers are static- and dust-sensitive. Protect the transceiver modules from static discharge and physical shock. Always plug the dust covers in the transceiver optical port until you are ready to make a connection.

You can use any combination of the approved pluggable transceiver types that the corresponding channel module supports.

	Restrictions: • Each port must match the wavelength specifications on the other end of the optical fiber. • This fiber must be of the right type and not exceed the specified fiber length for reliable communications.

If the fiber tray is mounted on the shelf, you cannot insert an SFP electrical transceiver into the C1 port of a 10TCC-PCTN-4GU+10G or 10TCC-PCTN-4GUS+10G module . This constrint is becuase of the physical format of the SFP electrical transceivers.

	Insert the SFP electrical transceiver into the C1 port of a 10TCC-PCTN-4GU+10G or 10TCC-PCTN-4GUS+10G before you install this channel module in the shelf.

	For specific information about each pluggable transceiver, see the *FSP 3000R7 Hardware Description* and the *Fiber Service Platform Pluggable Transceiver Module Specification*.

Safety Guidelines

	LASER RADIATION WARNING Use of controls, adjustments, or performance of procedures other than those specified in the user documentation can result in hazardous radiation exposure.

	CAUTION Only service personnel are qualified to perform this procedure.

	CAUTION
	The ADVA fiber-optic pluggable transceiver modules are Class 1 laser products per IEC 60825-1 and/or 21 CFR1040.10 and 1040.11.

	LASER RADIATION WARNING
	When the laser is powered on and no fiber is connected, the aperture of the transmit connector (Tx) can emit invisible laser radiation. To prevent exposure to hazardous radiation:
• Do not look into an open aperture of the transceiver port or an unterminated fiber-optic connector.
• Do not use optical instruments to directly view the open aperture of a transceiver port or an unterminated fiber-optic connector.
• Make sure that the relevant laser sources are disabled before you inspect, clean, and connect fiber optic connectors.
Looking directly at a laser beam can cause permanent eye damage.

	CAUTION
	We strongly recommend that you use only pluggable transceivers provided and approved by ADVA on all FSP 3000R7 modules. This precaution is to ensure your safety, the warranty, and the reliability and compatibility of your FSP 3000R7 system.

	CAUTION
	The use of pluggable transceivers other than those approved and released by ADVA results in the loss of laser safety approval for the respective module and entire FSP 3000R7 system. Only approved pluggable transceivers guarantee the specified behavior of the module.

	Approved pluggable transceivers have an ADVA transceiver type label.

	ELECTRIC VOLTAGE WARNING
	Pluggable electrical transceivers must not directly connect to metallic tip and ring outside-plant conductors. Use these transceivers only for inside-plant conductors.

	ELECTROSTATIC CAUTION
	Risk of electrostatic discharge.
	To prevent damage from electrostatic discharge (ESD)
	Ensure that you are earth-grounded with a wrist strap or equivalent while you mount the brackets to a shelf that contains ESD-sensitive devices.
	Follow ESD-prevention precautions to avoid ESD damage to the other equipment.

Take these precautions when you work with pluggable transceiver modules, take these precautions:

- Do not use a damaged or malfunctioning pluggable transceiver.
- Replace a damaged pluggable transceiver with a new one of the same type.
- If a pluggable transceiver malfunctions or fails, contact ADVA for a replacement.
- To guarantee EMC compliance, use only grounded, shielded, twisted-pair Category 5 or 6 cabling or Belden 1694A coaxial cables. Use 75 Ω to connect copper pluggable transceivers.

NOTICE	To prevent permanent damage to a fiber-optic pluggable transceiver and other equipment: always check the optical input power of the receiver before you insert the fiber cable. See the *FSP 3000R7Module and System Specification* for the receiver maximum optical input power.

NOTICE	Be sure that you do not install a pluggable transceiver module with the optical fiber pair attached to it. Doing so can damage the optical fibers, the optical fiber connectors, or the optical port of the transceiver module.

We assume that you are familiar with pluggable transceivers and aware of the precautions you must take to avoid damage to the equipment. The *FSP 3000R7 Maintenance and Troubleshooting Manual* provides a summary of how to handle pluggable transceivers.

Installing an SFP or XFP Pluggable Transceiver

	See the Safety Guidelines before you begin.

Required Tools and Equipment

- Pluggable transceiver module that you plan to install
- ESD-preventive wrist strap or other personal grounding device
- Suitable grounded surface or an antistatic mat to place the pluggable transceiver on

Procedure

1. Read the installation plan to get information about:
   - The transceiver type that you plan to install.
   - The channel module that will house this transceiver.
   - The cage where you plan to insert this transceiver if the channel module has two or more interface cages.

2. Check the operating status of the equipment and the present hazard level. Keep in mind that when you operate any module in Forced On mode, this mode affects the laser hazard level of the network element. Do not proceed unless you are familiar with laser safety, and you are protected accordingly.

3. Attach a wrist strap to your bare wrist and fasten the earth-grounding cable onto shelf ESD earth-grounding point, if available, or to a bare metal surface onto the rack.

4. If the shelf front cover is mounted, remove it, as described in Removing the SH7HU or SH9HU Front Cover.

5. Physically locate the channel module that will house the pluggable transceiver.

6. Remove the pluggable transceiver from its static-protective packaging and immediately place the transceiver on a grounded surface or antistatic mat.

	Do not remove the optical port dust cover until directed to do so later in the procedure.

Check and prepare the pluggable transceiver module:

1. Verify that the pluggable transceiver is the correct one for your network configuration (type, specifications). See the ADVA label on the top of the transceiver module.

2. Visually inspect the transceiver for damage and impurities. If necessary, use canned, dry, oil-free compressed air to blow away any impurities. Do not install a damaged transceiver.

3. Make sure that the optical port of the transceiver module is equipped with a dust cover. If not, install one.

4. Identify the interface cage (port) on the channel module where you plan to install the replacement transceiver.

5. If a dust plug is installed, remove it from the corresponding interface cage of the channel module and store in a resealable container to use at a later time.

	Pluggable transceivers are keyed to prevent incorrect insertion.
	Make sure that the pluggable transceiver module has the correct orientation. The bale clasp is oriented either to the left or to the right depending on the channel module type.
	Ensure that the bale clasp is in the lock-in position before you insert the transceiver into the interface cage.
	If the pluggable transceiver resists pressure, the orientation might be incorrect. Do not force the module. Pull it out of the interface cage.

Continue with these steps to insert the appropriate pluggable transceiver into the empty cage:

1. If the pluggable transceiver has a bale clasp, grip the transceiver on the narrow sides between your thumb and forefinger.

2. Remove the dust cover from the optical port.

3. Move the bale clasp toward the optical port until it touches the port, and before you insert the transceiver.

4. Reinstall the dust cover.

5. Hold the pluggable transceiver between your thumb and forefinger and orient the transceiver so that the optical port is toward you, and the bale clasp is on the right. See .

6. Align the pluggable transceiver and the cage opening, as shown in . Gently insert the transceiver into the empty cage.

7. Apply light pressure to the pluggable transceiver until it snaps into place. A click indicates that the transceiver is completely inserted and securely seated in the cage.

8. Provision the pluggable transceiver to be present in the NE database. See the *Network Element Director (NED) Online Help* as described in the *FSP 3000R7 Provisioning and Operations Manual*.

Complete the procedure:

1. After you complete your work, mount the front cover to the shelf as described in Mounting the SH7HU or SH9HU Front Cover.

2. Detach the wrist strap from your wrist, disconnect the earth-grounding cable from the ESD earth-grounding point on the shelf, if available, or the rack. Set the earth-grounding cable aside.

3. Store the pluggable transceiver and the resealable containers in a safe place for later use, including the dust plugs, dust covers, and protective caps.

4. Repeat this procedure for each SFP, SFP+, or XFP transceiver that you need to install.

For any issues with this procedure, contact ADVA Technical Services.

Installing a QSFP Pluggable Transceiver

	See the Safety Guidelines before you begin.

Required Tools and Equipment

- QSFP transceiver module that you plan to install
- ESD-preventive wrist strap or other personal earth-grounding device
- Suitable grounded surface or an antistatic mat to place the pluggable transceiver

Procedure

1. Use your installation plan to verify this information about the QSFP transceiver you are installing
   - The type of QSFP transceiver you are installing
   - Which channel module houses this QSFP transceiver
   - Which module port houses this QSFP transceiver

2. Verify the operating status of the equipment and the present hazard level. Keep in mind that if you operate any module in Forced On mode, this mode influences the laser hazard level of the network element. Do not proceed unless you are familiar with the laser safety and protected accordingly.

3. Attach an anti-static wrist strap to your bare wrist and fasten the earth-grounding cable onto the earth-grounded ESD jack on the shelf, if available, or to a bare metal surface onto the rack. Alternatively use ESD heel straps.

4. If the front cover is mounted, remove it from the shelf, as described in Removing the SH7HU or SH9HU Front Cover.

5. Identify the channel module port where you will install the QSFP transceiver.

6. If the dust plug is installed, remove it from the corresponding interface cage of the channel module. Store the dust plug in a resealable container for later use.

7. Remove the QSFP transceiver module from the shipping box. Remove the module from the antistatic bag and immediately place the module onto a grounded surface or antistatic mat.

	Do not remove the optical port dust cover.

8. Check and prepare the QSFP transceiver module:
   a. Verify that the QSFP transceiver is the correct one for your network configuration (type, specifications). See the ADVA label on the top of the transceiver module.
   b. Visually inspect the transceiver for damage and impurities. If necessary, use canned, dry, oil-free compressed air to blow away any impurities. Do not install a damaed transceiver.
   c. Make sure that the optical port of the transceiver module is equipped with a dust cover. If not, install one.

9. Remove the dust plug from the identified module port (interface cage) and store it in a resealable container for later use.

NOTICE	Do not install a pluggable transceiver with the optical fiber pair attached. You can damage the optical fibers, the optical fiber connectors, or the optical port of the module.

Continue with these steps.

1. To insert the QSFP transceiver into the empty interface cage:
   a. Use your thumb and forefinger to hold the pluggable transceiver and orient it so that the label is on the left.
   b. Align the pluggable transceiver with the cage opening, and then gently insert the transceiver into the empty cage.
   c. Apply light pressure to the pluggable transceiver until it snaps into place. A click indicates that the transceiver is completely inserted and securely seated in the cage.

If you feel resistance, remove the transceiver, realign it so that the bale clasp faces the other direction, and then re-insert the transceiver.

NOTICE	Do not remove the dust cover from the QSFP transceiver at this time. You will remove it when you connect the optical cables.

🗎	The management software automatically detects when a pluggable transceiver is inserted. The internal network management system receives a trap message each time someone inserts a transciver into the channel-module interface cage. When you apply power to the equipment later in these steps, the software automatically provisions the equipment.

2. Check the corresponding the channel module port LED.
   For information about the channel module port LEDs, see the *FSP 3000R7 Maintenance and Troubleshooting Manual*.
   If the system does not accept the pluggable transceiver or does not respond, removethe transceiver from the cage. Install a new transceiver of the correct type or reinsert the dust plug into the empty cage.

3. Repeat this procedure for each QSFP transceiver that you need to install.
   For any issues with this procedure, contact ADVA Technical Services.

4. After you complete your work, mount the front cover to the shelf, as described in Mounting the SH7HU or SH9HU Front Cover.

5. Detach the anti-static wrist strap from your wrist, disconnect the earth-grounding cable from the ESD jack on the shelf, if available, or the rack. Set the grounding cable aside.

6. Store the pluggable transceiver and the resealable containers in a safe place for later use, including the dust plugs, dust covers, and the protective caps.

Installing a CFP Pluggable Transceiver

	See the section Safety Guidelines before you begin.

Required Tools and Equipment

- CFP transceiver module that you plan to install
- ESD-preventive wrist strap or other personal earth-grounding device
- Suitable grounded surface or an antistatic mat to place the CFP transceiver on

Procedure

Check and prepare the CFP transceiver:

1. Verify that the CFP transceiver is the correct one for your network configuration (type, specifications). See the ADVA label on the board cover of the transceiver module.
2. Visually inspect the CFP transceiver for damage and impurities. If necessary, use canned, dry, oil-free compressed air to blow away any impurities. Do not install a damaged CFP transceiver.
3. Make sure that the optical port of the CFP transceiver module is equipped with a dust cover. If not, install one.

	Risk of electromagnetic disturbances.
NOTICE	Make sure that the EMI gasket flange is not damaged before you insert the module, which voids EMC compliance.

Continue with these steps:

To continue, insert the appropriate CFP transceiver into the empty cage:

1. Grasp the CFP transceiver so that the optical port is toward you, and the label on the board cover with the host connector faces to the right.
2. Align the CFP transceiver into the empty interface cage. Carefully slide the transceiver in until its EMI gasket flange makes contact with the bezel on the channel module faceplate. See .
3. Use your thumbs or fingers to firmly press on the front of the CFP transceiver and fully seat it in the cage.
   The CFP transceiver is completely inserted when its faceplate is flush with the bezel on the channel module faceplate.
4. Gently tighten the two knurled screws on the CFP transceiver to secure it in the cage.

	CFP transceivers are keyed so they can only be inserted in one orientation.
📝	If you install a CFP transceiver into a WCC-PCTN-100G module, the label on the board cover and the host connector must face to the left.
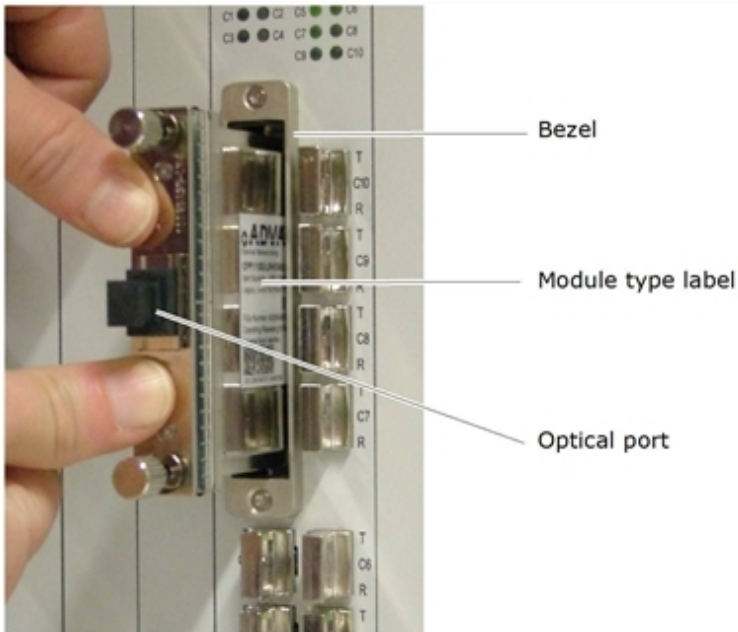
5. Identify the interface cage (port) on the channel module where you want to install the CFP transceiver.

6. If a dust plug is installed, remove it from the corresponding interface cage of the channel module and store it for later use in a resealable container.

Continue with these steps.

1. Read the installation plan to get information about:
   - The CFP transceiver type that you plan to install.
   - The channel module that will house this transceiver.
   - The cage where you plan to insert this transceiver, if the channel module has two interface cages.

2. Check the operating status of the equipment and the present hazard level. If you set any module to operate in Forced On mode, this mode affects the laser hazard level of the network element. Proceed only if you are familiar with the laser safety and protected accordingly.

3. Attach a wrist strap to your bare wrist and fasten the earth-grounding cable to the ESD earth-grounding point on the shelf, if available, or to a bare metal surface onto the rack.

4. If the front cover is mounted, remove it from the shelf, as described in Removing the SH7HU or SH9HU Front Cover.

5. Physically locate the channel module that will house the CFP transceiver.

6. Remove the CFP transceiver module from the shipping box. Remove the module from the antistatic bag and immediately set it on an earth-grounded surface or antistatic mat.

> Do not remove the optical port dust cover until directed to do so later in the procedure.

> The management software automatically detects insertion of a CFP transceiver. Each time a transceiver is inserted into a channel module cage, the internal network management system receives a trap message.

7. Provision the CFP transceiver to be present in the NE database. If you are installing the transceiver for the first time, see the NED User Manual.

- Check the corresponding channel module port LED.
  If this LED is off, use the management software to assign the inserted CFP transceiver. This situation applies only when you install the transceiver the first time.

- A solid yellow LED indicates that the port is equipped again, the inserted transceiver module is already assigned, but no traffic is passing. This situation occurs only when you replace a transceiver.

- If the LED blinks red, the inserted CFP transceiver is not the correct type, or it is not approved by ADVA and not accepted by the system.
  For more information about the channel module port LEDs, see the *FSP 3000R7 Maintenance and Troubleshooting Manual.*

- If the system does not accept the CFP transceiver or does not respond, remove it again from the cage. Install a new one of the correct type or reinsert the dust plug into the empty cage.

- A solid yellow LED indicates that the port is equipped again, the inserted transceiver module is already assigned, but no traffic is passing. This situation occurs only when you replace a transceiver.
  If the LED blinks red, the inserted CFP transceiver is the incorrect type, or it is not approved by ADVAand not accepted by the system.
  For more information about the channel module port LEDs, see the *FSP 3000R7 Maintenance and Troubleshooting Manual.*

- If the system does not accept the CFP transceiver or does not respond, remove it again from the cage. Install a new one of the correct type or reinsert the dust plug into the empty cage.

8. After you complete your work, mount the front cover to the shelf, as described in Mounting the SH7HU or SH9HU Front Cover.

9. Detach the wrist strap from your wrist, disconnect the earth-grounding cable from the ESD earth-grounding point on the shelf, if available, or the rack. Set the earth-grounding cable aside.

10. Store the original shipping box of the CFP transceiver in a safe place for later use, including the static-protective package and the resealable containers with the dust plugs, dust covers, and the protective caps.

11. Repeat this procedure for each CFP transceiver that you need to install.
    For any issues with this procedure, contact ADVA Technical Services.

Connecting an NCU to an OSCM

This section describes how to use an Ethernet cable to connect an NCU to an OSCM-PN, referred to as *OSCM*. This procedure applies to all NCUs and OSCM module types.

Be aware that the OSCM and the NCU must have no backplane interconnection if you want use the Ethernet cable connection method for a single OSC module.

⚠	**CAUTION**
	Only service personnel are qualified to perform this procedure.

⚡	**ELECTRIC VOLTAGE WARNING**
	Do not connect or disconnect the Ethernet cable during periods of lightning activity.

⚠	**ELECTROSTATIC CAUTION**
	Ensure that you are earth-grounded with a wrist strap or equivalent while you mount the brackets to a shelf that contains ESD-sensitive devices.
	Follow ESD-prevention precautions to avoid ESD damage to the other equipment.

We assume that you are familiar with Ethernet and LAN practices and aware of the necessary precautions to avoid damage to the equipment.

Required Tools and Equipment

- Cat 5e Ethernet straight-through cable of the proper length, and with male RJ45 plugs on both ends
- ESD-preventive wrist strap or other personal earth-grounding device

Procedure

Read the installation or the cabling plan or contact the system administrator for any relevant information you need to perform this task.

> 📝 The RJ45 plug fits into the Ethernet ports — RJ45 receptacles — only one way and clicks into place when properly inserted.
>
> First press the plug release tab before you pull the plug out.

1. Connect one end of the appropriate Ethernet cable into one of the Ethernet ports on the NCU, labeled C1, or C2 if available. Ensure that the RJ45 plug clicks into place.
2. Direct the cable through the space between two fiber fingers. Then route the cable in the fiber tray to the OSCM and direct the cable upward through the space between two fiber fingers. See Figure 90.

Figure 90:   Example of NCU-to-OSCM Cable Connection
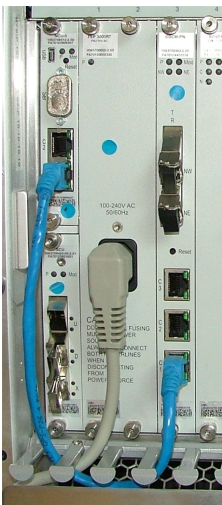
3. Connect the other end of the Ethernet cable to one of the Ethernet client ports on the OSCM, labeled C1, C2, and C3. Ensure that the RJ45 plug clicks into place.
4. Check the LAN port status LED indicators. See the *FSP 3000R7 Maintenance and Troubleshooting Manual* for details.

For any issues with this procedure, contact ADVA Technical Services.

> 📘 For information about how to enable transport of OSCM traffic to the local NE through an Ethernet cable, see the *Network Element Director (NED) Online Help*.

Removing and Inserting a Dummy Module

The section contains these topics:

General Information

You must populate all 9HU, 7HU, and 1HU empty or unused shelves with the appropriate dummy modules. Depending on the slot sizes, the FSP 3000R7 provides two types of dummy modules:

- The DM/5HU to populate an 5HU slot.
- The DM/2HU5 to populate a 2.5HU slot.

Unless otherwise specified, the term *dummy module* refers to both DM/5HU and DM/2HU5.

You do not need a tool to remove or insert a dummy module from or into the appropriate shelf slot. Dummy modules use captive mounting screws (knurled screws) on their faceplates to secure the device in the shelf slots.

	For specific information about dummy modules, see the *FSP 3000R7 Hardware Description*.

Inserting a Dummy Module

Required Tools and Equipment

- Appropriate dummy module packaged in the shipping box
- ESD-preventive wrist strap or other personal earth-grounding device

Procedure

	CAUTION Only service personnel are qualified to perform this procedure.

> **ELECTROSTATIC CAUTION**
>
> To prevent ESD damage to adjacent optical modules, when you insert a dummy module:
>
> Ensure that you are earth-grounded with a wrist strap or equivalent while you mount the brackets to a shelf that contains ESD-sensitive devices.
>
> Follow ESD-prevention precautions to avoid ESD damage to the other equipment.

> We assume that you are familiar with optical modules and aware of the necessary precautions to avoid equipment damage.

1. Attach a wrist strap to your bare wrist and fasten the earth-grounding wire onto the ESD earth-grounding point on the shelf, if available, or to a bare metal surface onto the rack.

2. Locate the empty slot within the shelf that you need to populate.

3. Remove the dummy module from the shipping box and visually inspect it for damage. If necessary, use canned, dry, oil-free compressed air to blow away any dust particles.

> **NOTICE**
>
> **Risk of electromagnetic disturbances**
>
> Make sure that the EMI gasket is undamaged before you insert the dummy module, which will void EMC compliance.

4. Insert the dummy module into the empty slot:
   a. Hold the module by both screws as shown in Figure 91 or by the faceplate.
   b. Align the upper and lower edges of the module with the upper and lower tracks in the slot. When the module is in the correct position, carefully slide it into the slot as you guide the upper and lower edges of the module into the tracks.
   c. Ensure that the module is completely inserted into the slot. The module is properly and completely inserted when its faceplate is flush with the faceplates of the adjacent modules and the shelf panels.

Figure 91:   Example of Inserting a Dummy Module (DM/2HU5) into a Shelf Slot
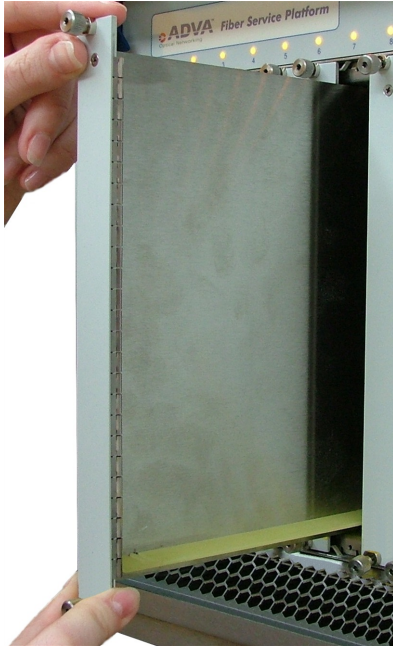
5. Secure the module in place:

    a. Use one hand to hold the module in place. Use the thumb and forefinger of your other hand to turn the two attached knurled screws clockwise into the threaded holes.

    b. Tighten the screws.

6. Detach the wrist strap from your wrist, disconnect the grounding wire from the ESD earth-grounding point on the shelf, if available, or the rack. Set the grounding wire aside.

7. Store the empty shipping box in a safe place for later use.

Removing a Dummy Module

Required Tools and Equipment

- Torx screwdriver TX10 to loosen the knurled screws
- ESD-preventive wrist strap or other personal earth-grounding device
- Original cardboard box or an equivalent container to store the removed dummy module

Procedure

⚠	**CAUTION**
	Only service personnel are qualified to perform this procedure.

> **ELECTROSTATIC CAUTION**
>
> Ensure that you are earth-grounded with a wrist strap or equivalent while you mount the brackets to a shelf that contains ESD-sensitive devices.
>
> Follow ESD-prevention precautions to avoid ESD damage to the other equipment.

> We assume that you are familiar with optical modules and aware of the precautions that you must take to avoid damage to the equipment.

1. Attach a wrist strap to your bare wrist and fasten the earth-grounding wire onto the ESD earth-grounding point on the shelf, if available, or to a bare metal surface onto the rack.
2. Physically locate the respective dummy module within the shelf.
3. Use your fingers or a Torx screwdriver TX10 to turn the two knurled screws in a counter-clockwise direction until you completely remove them from the threaded holes.
4. Firmly pull on the screws as shown in Figure 92. Leave the screws loosely in place. As you use the screws to hold the module, carefully slide the module straight out of the slot.

Figure 92:   Example of Removing a Dummy Module (DM/2HU5) from a Shelf Slot

	Never reach into a vacant shelf slot. Contact with the adjacent optical modules or the connectors on the backplane can result in damage to the equipment.
NOTICE	

5. Place the dummy module in the shipping box.

6. Insert an optical module as described in the section Installing Optical Modules.

7. Detach the wrist strap from your wrist, disconnect the earth-grounding wire from the shelf ESD earth-grounding point, if available. or the rack. Set the grounding wire aside.

8. Store the dummy module in its box or container in a safe place for later use.

Mounting and Removing Front Covers

This section contains these topics:

Mounting the SH7HU or SH9HU Front Cover

	ELECTROSTATIC CAUTION Ensure that you are earth-grounded with a wrist strap or equivalent while you mount the brackets to a shelf that contains ESD-sensitive devices. Follow ESD-prevention precautions to avoid ESD damage to the other equipment.

Procedure

1. Attach a wrist strap to your bare wrist and fasten the earth-grounding wire onto the shelf ESD grounding point, if available, or to a bare metal surface onto the rack.

2. Use both hands to hold the shorter sides of the front cover with its curvature upward.

	Pay attention to the optical cables when you position the front cover. Ensure that no optical cables are layered or enclosed between the cover and the front of the shelf. Failure to do so can result in damage to the fiber.
NOTICE	

3. Position the cover on the front of the shelf so that the latches and fixing brackets on either side align.
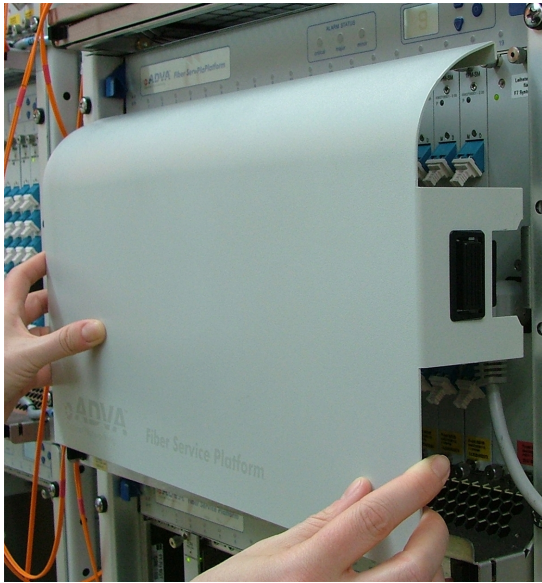
4. Push the cover toward the shelf. Be careful not to pinch any fibers. Make sure the latches snap into place.

5. Detach the wrist strap from your wrist, disconnect the earth-grounding wire from the shelf ESD earth-grounding point, if available, or the rack. Set the earth-grounding wire aside.

Removing the SH7HU or SH9HU Front Cover

	ELECTROSTATIC CAUTION
⚠	Ensure that you are earth-grounded with a wrist strap or equivalent while you mount the brackets to a shelf that contains ESD-sensitive devices.
	Follow ESD-prevention precautions to avoid ESD damage to the other equipment.

Required Tools and Equipment

An ESD-preventive wrist strap or other personal earth-grounding device

Procedure

1. Attach a wrist strap to your wrist and fasten the grounding wire onto the ESD earth-grounding point on the shelf, if available, or to a bare metal surface onto the rack.

2. Use your forefingers to simultaneously push in the latches on both sides of the front cover (see Figure 93) as you pull the cover toward you.

Figure 93:   Removing the Front Cover
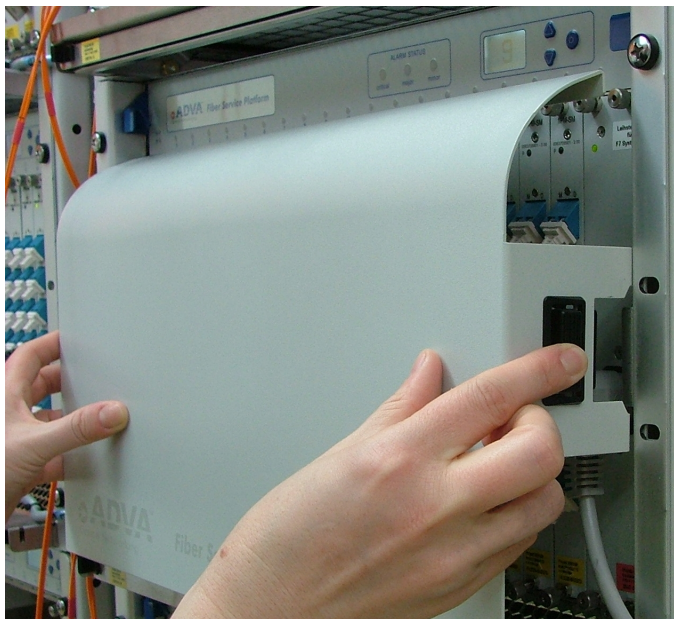
3. Remove the cover and set it aside.

4. Detach the wrist strap from your wrist, disconnect the earth-grounding wire from the ESD earth-grounding point on the shelf, if available, or the rack. Set the grounding wire aside.

Mounting the 40CSM/2HU Front Cover

The 40CSM/2HU shelf ships with a front cover installed. This precaution protects the fiber optic connectors from external influences and prevents anyone from inadvertently pulling out the fibers. If not enclosed in the shelf delivery, you must order the front cover separately.

	ELECTROSTATIC CAUTION
⚠️	Ensure that you are earth-grounded with a wrist strap or equivalent while you mount the brackets to a shelf that contains ESD-sensitive devices.
	Follow ESD-prevention precautions to avoid ESD damage to the other equipment.

Required Tools and Equipment

- ESD-preventive wrist strap or other personal earth-grounding device
- Relevant 40CSM/2HU shelf
- Appropriate front cover for a 40CSM/2HU shelf

- If the shelf front panel has no bolts mounted to it, these tools are required:
  - Torx screwdriver TX8 to remove the left and right screws located on the far sides of the front panel
  - 4 hexagon head bolts, included in the accessory box
  - 7 mm hexagonal wrench to tighten the bolts

Procedure

1. Attach a wrist strap to your wrist. Fasten the earth-grounding wire onto the ESD earth-grounding point or to a bare metal surface onto the rack.
2. Check whether your shelf is equipped with bolts on the farthest left and right front panel sides. If it is not, continue with Step 3. If your shelf is equipped with bolts go to Step 4.
3. If no bolts are mounted to the shelf:
   a. Find the two screws located on the far right and left sides of the front panel. Use a Torx screwdriver TX8 to remove then and set them aside.
   b. Remove the bolts from the accessory box and insert them into the holes. Use a wrench to tighten the bolts.
4. Hold the front cover by its shorter sides to remove it.

NOTICE	Pay attention to the optical cables when you position the front cover. Ensure that no optical cables are layered or enclosed between the cover and the front of the shelf, which can result in damage to the fiber.

5. Position the front cover of the shelf so that the magnet pins align with the bolts.
   The magnet pins use strong magnets to help hold the front cover in place.

Magnet Pins   Hexagon head bolts
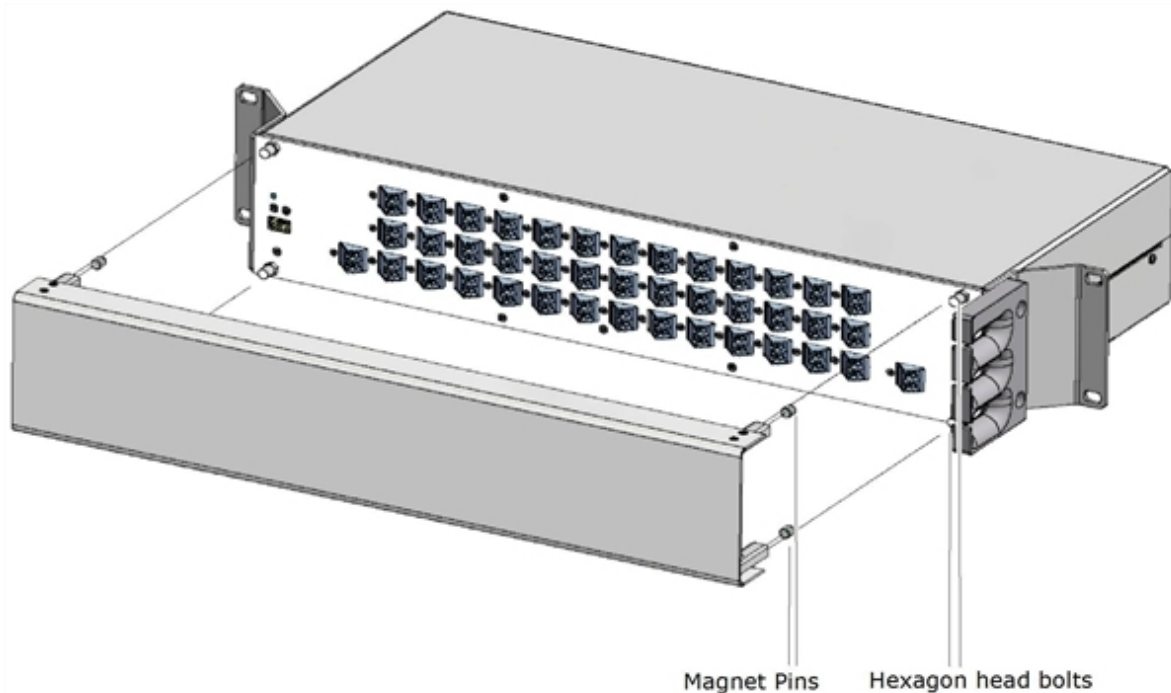
6. Detach the wrist strap from your wrist, disconnect the earth-grounding wire from the
   ESD grounding point on the rack, and set the earth-grounding wire aside.

Removing the 40CSM/2HU Front Cover

	ELECTROSTATIC CAUTION
⚠	Ensure that you are earth-grounded with a wrist strap or equivalent while you mount the brackets to a shelf that contains ESD-sensitive devices.
	Follow ESD-prevention precautions to avoid ESD damage to the other equipment.

Required Tools and Equipment

- Relevant 40CSM/2HU shelf with a mounted front cover
- ESD-preventive wrist strap or other personal earth-grounding device

Procedure

1. Attach a wrist strap to your wrist. Fasten the earth-grounding wire onto the ESD earth-grounding point or to a bare metal surface onto the rack.
2. Hold the shorter sides of the front cover to pull it toward you.
3. Remove the cover and set it aside.

4. Detach the wrist strap from your wrist, disconnect the earth-grounding wire from the ESD earth-grounding point on the rack. Set the earth-grounding wire aside.

Chapter 7

Interconnecting Shelves

This section briefly discusses the system that provides communication between FSP 3000R7 shelves and ROADM-C40/40/OPM-3HU/2DCs in a multi-shelf network element. Additionally, this section includes procedures to interconnect shelves with the various shelf control units (SCUs) and install management cables, both fiber patch cables and electrical cables.

This section contains these topics:

Introduction

After you mount FSP 3000R7 shelves and ROADMs to the rack and connect them to the power, you must set up Ethernet connections. To establish management connections between the individual shelves in an FSP 3000R7 network element (NE), use these management modules:

- Network Control Unit (NCU)
- Shelf Control Units (SCUs)

	The term *NCU* refers to these modules:
	- NCU-3
	- NCU-II
	- NCU-II-P
	- NCU-S

The NCU and SCUs provide the management and configuration capabilities for the entire FSP 3000R7 system. The NCU uses management tools and SNMP to deliver FSP 3000R7 management information to the LAN or data communications network (DCN) and the connected management systems.

To achieve inter-shelf communication in the NE, you need to interconnect only the SCU modules in a series, one after another, with the appropriate management cables. The connection from shelf to the shelf is through optical Ethernet at 1250 Mbps or Fast Ethernet at 100 Mbps data rates.

You can order the SCU modules already installed in the shelves. If the modules are ordered not installed, you can install them now. For details about how to install the modules, see the *Network Element Director (NED) Online Help*.

Audience

This section is for service personnel and qualified and trained equipment installers who need to perform cabling tasks. Personnel are considered to be qualified if they have the necessary knowledge and practical experience of electrical engineering to understand the various hazards that can occur when they work on a shelf. These personnel know to take reasonable precautions to prevent personal injury and equipment damage.

Associated Documentation

- Installation plan
- Parts list

Personal Safety and Equipment Precautions

This section contains these topics:

Personal Safety

> ⚠️ **CAUTION**
>
> Only service personnel are qualified to perform this procedure.

	CAUTION
	Risk of bodily injury:
	• Only service personnel are qualified to interconnect shelf control units (SCUs).
	• Use of controls or adjustments or performance of procedures other than those specified in this manual might result in hazardous radiation exposure.

	LASER RADIATION WARNING
	Risk of eye injury
	• Do not power on the SCU until you connect the laser to the optical patch cable and place the cover in position. Laser outputs emit infrared laser light at this point.
	• Disconnected or broken patch cables can emit invisible laser radiation. Never look into the end of an optical patch cable or directly view a patch cable with optical instruments.
	• Disconnect fiber optic cables at both ends before you view use optical instruments to view the cables.
	• Associated optical-test sets emit invisible infrared lightwaves into optical fibers.

	LASER RADIATION WARNING
	The pluggable transceivers that the SCU management ports use meet the specifications for a Class 1 laser product.

	LASER RADIATION WARNING
	Use only pluggable transceivers of the type SFP/HS/850I/MM/LC. These must be approved by ADVA. The use of pluggable transceivers other than those approved by ADVA results in loss of safety approval for the FSP 3000R7.

Equipment Precautions

	ELECTROSTATIC CAUTION
	Risk of damage because of electrostatic discharge Each FSP 3000R7 shelf contains modules that are sensitive to electrostatic discharge (ESD). To avoid possible ESD damage to sensitive circuit boards, implement and maintain ESD damage prevention measures when you interconnect shelves. Ensure that you are earth-grounded with a wrist strap or equivalent while you mount the brackets to a shelf that contains ESD-sensitive devices. Follow ESD-prevention precautions to avoid ESD damage to the other equipment.

When you connect optical patch cables to the SCUs, always follow ESD prevention practices:

- Ensure that the FSP 3000R7 shelves and the ROADMs are electrically connected to an earth-ground through the protective earth-grounding conductor.
- Wear an ESD-preventive wrist strap and make sure that the strap makes proper skin contact.
- Fasten the earth-grounding cable of the wrist strap onto the ESD grounding point on the shelf, if available, or to a bare metal surface onto the rack.

NOTICE	• The SFP transceiver cages of the SCU modules ship with dust plugs in place to prevent impurities. Keep the dust plugs in the cages for any unistalled modules in a running system. • Unused pluggable interfaces that you use to connect extension shelves do not need to be equipped with transceivers but must be covered with dust plugs.

Optical patch cables can break if you mishandle them. Handle cables with extreme care.

Interconnecting Shelves

This section provides information about shelf-to-shelf communication and procedures to interconnect the shelf control units (SCUs).

General Information

The 7HU shelf (SH7HU) has only an SCU-II. The 1HU shelf types (SH1HU/2DC and SH1HU-F/2DC are fitted with either an SCU-II or SCU-S.

The placement for shelves is always as follows:

- SCUs are always in slot B of a 7HU shelf or 1HU shelf.
- Each NCU type is always in slot A of a 7HU shelf or 1HU shelf, which makes this shelf the master shelf. This shelf ID number is 01.
- The NCU-II, NCU-3, and NCU-II-P are for use only in the 9HU shelf. You must install the NCU-II and NCU-3 in slot A and insert the NCU-II-P into slots 3 or 18.
- For redundancy, the 9HU shelf can contain two NCU-II-P modules — one each in slots 3 and 18.

A shelf that houses only an SCU-II or SCU-S is known as the main shelf. Within one NE, all SCUs must interconnect so that the NE can control and monitor the shelves. Therefore, the SCU-II or SCU-S in the master shelf connects all the NE main shelves to the NCU.

Additional interconnection information:

- For the main shelf interconnections, SCU interfaces operate at 1000Base-SX optical Ethernet. The connections use multimode patch cables that pass through SFP transceivers, which must be ADVA-approved SFP transceivers.
- The SCU-S uses two RJ45 ports for inter-shelf communications through standard Ethernet crossover Ethernet cables. The management links communicate through the 10/100Base-TX Fast Ethernet.
- You can set up a daisy chain of multiple main shelves through the SCU-II uplink and downlink ports. You cannot set up a daisy-chain with SCU-S modules for multiple shelf communication.
- Both the SCU-II and SCU-S provide redundant inter-shelf communications.

SCU Ports

ADVA provides SCU-Intercom-Kits to interconnect multiple SCUs. For more information, see SCU-Intercom-Kit .

SCU-II Ports

The SCU-II front panel has two Ethernet interfaces. This figure shows the SCU-II and describes the port usage.

Figure 94:   SCU-II Ports
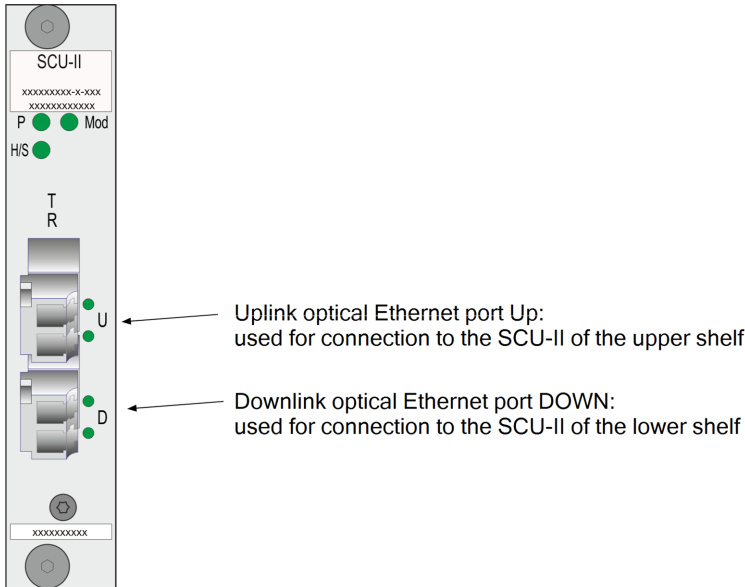
SCU-S Ports

The SCU-S front panel has two Ethernet interfaces. Figure 95 shows the SCU-S and describes the port usage.

Figure 95:   SCU-S Ports
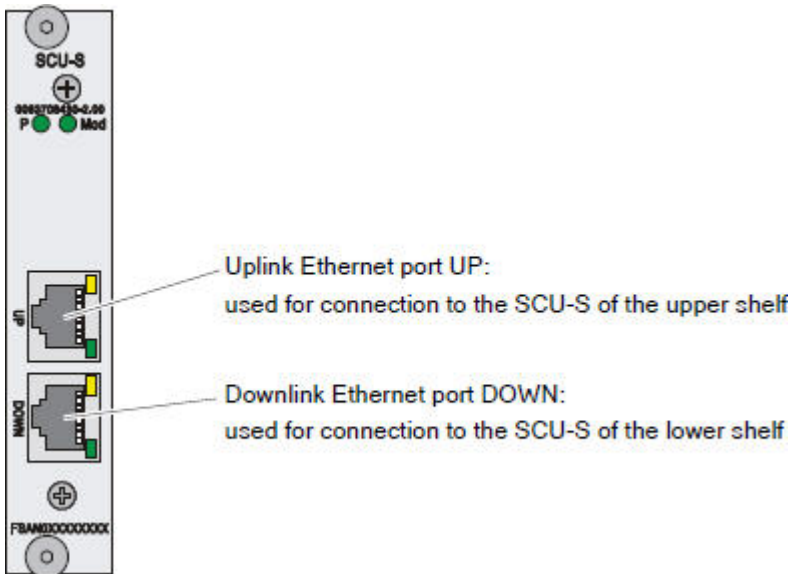
Use standard Ethernet crossover cables or straight-through cables (Cat 5e) to interconnect 1HU shelves equipped with SCU-S modules. The Ethernet cables do not ship with the equipment. If you have to build your own Ethernet crossover cables, follow the appropriate wiring diagram in Table 12 located in the Ethernet Straight-Through Cables and Crossover Cables Requirements topic.

Interconnecting 9HU, 7HU, and 1HU Shelves using SCU-II or SCU-S Modules

> The term *shelf* refers to these shelves:
> - SH9HU
> - SH7HU
> - SH1HU-HP/2DC
> - SH1HU-F/2DC
> - SH1HU-R/PF

The NCU and SCU have these inter-shelf communication conditions:

Table 28: Shelf Support

Controllers	Active Shelves Supported	Passive Shelves Supported	Total
NCU-S + SCU-S	2	2	4
NCU-II + SCU-II	26	30	56
NCU-II-P + SCU-II	26	30	56
NCU-II-P+ SCU-II For redundant configurations	20	30	50
NCU-3 + SCU-II	40	30	70

Rules:

Equipment	Applicable Rules
Shelf 1	- Shelf 1 is the master shelf that you can equip with any type of NCU. - You can equip slot A in this shelf with an NCU-3, NCU-S, or use a NCU-II for non-redundant SCU configurations. - If shelf 1 is an SH9HU, you can equip it with an NCU-II-P. - If shelf 1 is a SH9HU in slot 3 or 18, you can equip this shelf with an NCU-II-P for redundant controller configurations.
ROADMs	Configurations that contain ROADMs support up to 20 shelves.
Single SCU-II	For shelves that have a single SCU-II, you must equip slot B with the SCU-II.

Equipment	Applicable Rules
Two SCUs	For shelves that have two SCUs, you must equip slots A and B with an SCU-II.
Only one SCU	These shelves support only one SCU-II in slot B: • SH1HU-HP/2DC • SH1HU-F/2DC • SH1HU-R/PF
Ring configurations	Shelves that connect • In a ring configuration: must have SCU connections from SCU slot B port D to an SCU slot B port U. • In a protected ring configuration: must have SCU connections from SCU slot B port D to a SCU slot A port U. • In a ring-of-rings configuration to 2 rings: must have SCU connections: 　　○ between shelves SCU slot A port U to an SCU slot B port D for one ring and 　　○ between SCU slot A port D to an SCU slot B port U for the other ring

These figures illustrate shelf-to-shelf interconnections in a multi-shelf NE for single and redundant SCUs. These connections support optical Ethernet.

Figure 96:   Interconnecting Shelves Using Single SCU Modules
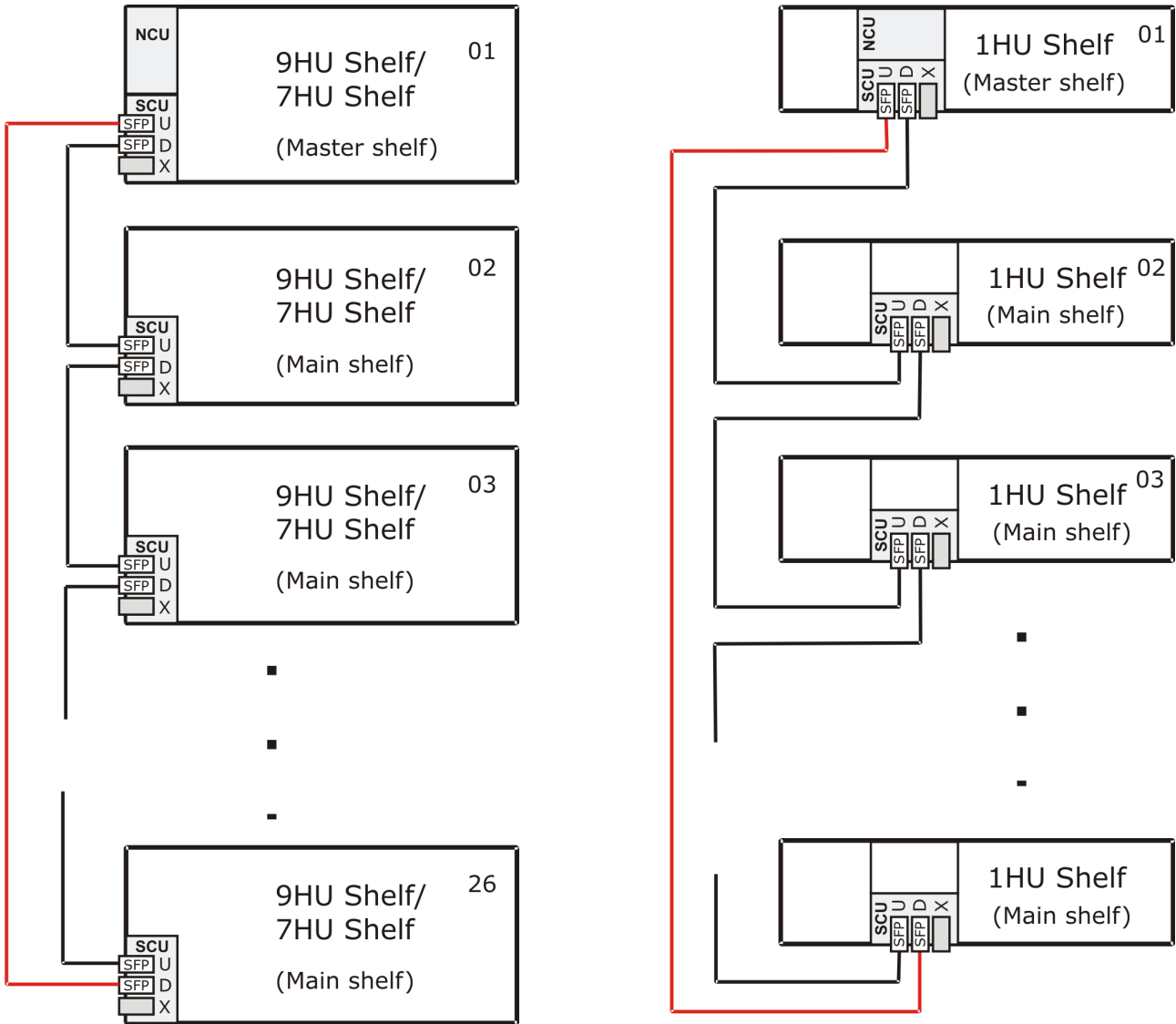
NCU	Network Element Control Unit
SCU	Shelf Control Unit
U	Uplink port
D	Downlink port

SFP	Pluggable transceiver of the SFP/HS/850I/MM/LC type
___	Patch cable, 90 cm (2.95 ft) long J/MM62/LC/DUP/0090/RED
___	Patch cable, 5.0 m (16.4 ft) long J/MM62/LC/DUP/0500/RED

Figure 97:   Interconnecting a 9HU Shelf Using an SCU-II in a Redundant Configuration
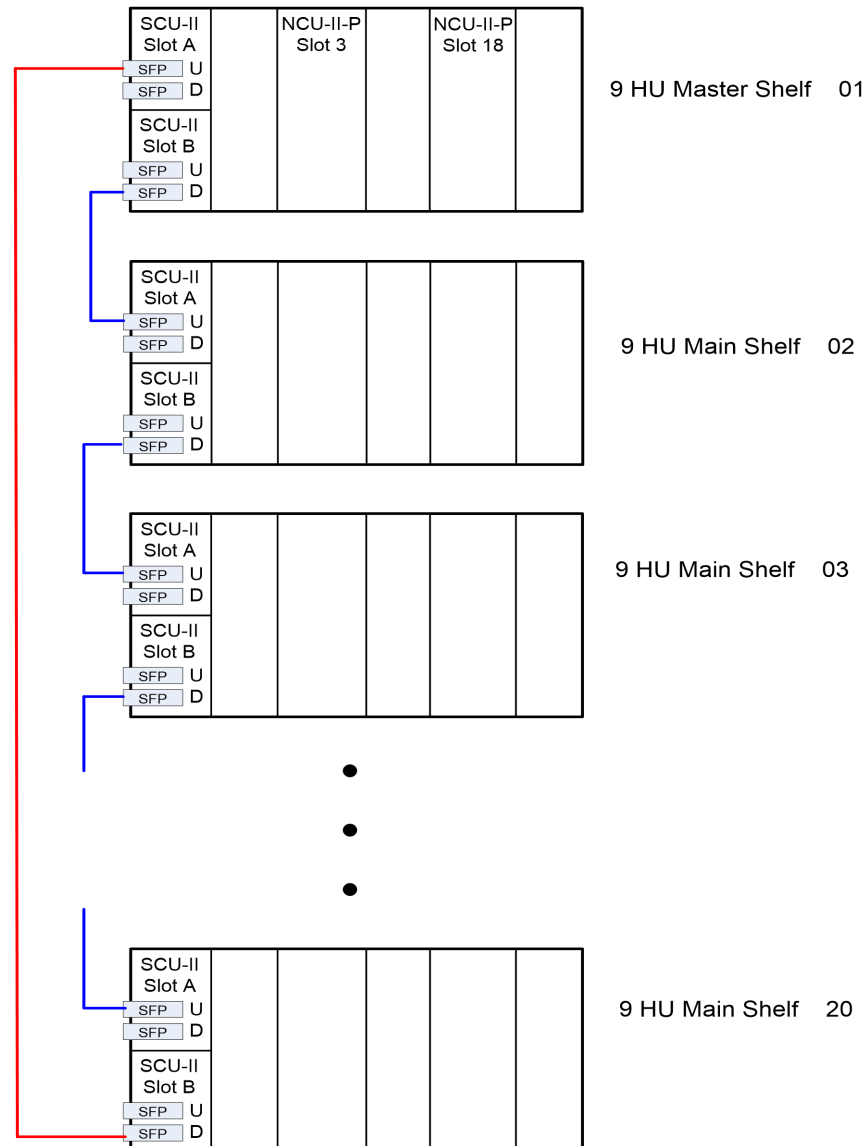
NCU	Network Control Unit	SFP	Pluggable transceiver of the SFP/HC/850I/MM/LC type
SCU	Shelf Control Unit	——	Patch cable, 90 cm (2.95 ft) long J/MM62/LC/DUP/0090/RED
U	Uplink Port	——	Patch cable, 5.0 m (16.4 ft) long J/MM/62/LC/DUP/0500/RED
D	Downlink Port		

Required Tools and Equipment

- Pluggable transceivers — SFPs such as SFP/2G1/850I/MM/LCs.
  The number of required SFPs depends on the number of the shelves that you plan to interconnect. See the installation plan.

- Fibers with duplex LC connectors on both ends, such as J/MM62/LC/DUP/0090/RED, which is 90 cm (2.95 ft) in length. Use these fibers to interconnect SCUs in adjacent shelves.

The required number of fibers depends on the number of shelves that you plan to interconnect. See the installation plan.

- ESD-preventive wrist strap or other personal earth-grounding device.
- Appropriate earth-grounded surface or an antistatic mat.
- Small resealable container for dust plugs, dust covers, and protective end-caps

Procedure — Interconnecting Two SCU Modules (one in each shelf)

	Follow the guidelines in Personal Safety and Equipment Precautions. See Figure 96.

1. Remove two SFPs from the package and place the modules on an earth-grounded surface or antistatic mat.
2. Make sure the SFPs are the ones you intend to install. See the label on top of the SFPs.
3. Inspect both SFPs for damage and make sure the optical connectors are clean. If an SFP is damaged, return it to ADVA.
4. Remove the dust plug from the SCU D port in the shelf and store the plug in a small sealable container.
5. Insert the SFP into the empty D port. See Installing Pluggable Transceivers.

	The management software automatically detects the insertion of an SFP. The system supports only approved SFPs and disables any unsupported interfaces.

6. Pay attention to the corresponding port LED on the SCUs to determine if the system accepts the inserted SFP.
   If the D port is assigned, the D-T LED should be solid green, and the D-R LED should be solid yellow.

	See the module LED indicator descriptions in the *FSP 3000R7Maintenance and Troubleshooting Manual* for more information.

7. Remove the dust plug from the SCU U port in the next shelf and store the plug in the small sealable container.
8. Insert the SFP into the empty U port.
9. Pay attention to the corresponding SCU port LEDs to see whether the system accepts the inserted SFP.
   If the U port is assigned, tThe U-T LED should be solid green, and the U-R LED should be solid yellow. If the shelf, SCU, or U port is unassigned, the LEDs remain off.

> See the module LED indicator descriptions in the *FSP 3000R7 Maintenance and Troubleshooting Manual* for more information.

Continue with these steps to connect the fiber from the SCU port D in the first shelf to the SCU U port in the next shelf. See Figure 96.

1. When you connect multiple shelves, complete two identification tags for each fiber and attach one tag to each end for the fiber.
2. Remove the protective caps from the LC connectors on both ends of the fiber and store them in a small sealable container.
3. Check the fiber connectors on both ends for damage and cleanliness.
4. Remove the dust cover from the SFP installed in the SCU D port in the first shelf. Store the dust cover in a small sealable container.
5. Carefully slide the LC connector on one end of the fiber into the SFP connectors until you hear a click.
6. Route the fiber in the fiber tray and along the vertical cable conduit that is tie-mounted on the left side of the rack. Continue down to the SCU in the next shelf. Use cable ties to secure the fiber to the side of the rack to reduce the risk of fiber pinching.
7. Remove the dust cover from the SFP installed in the SCU U port in the next shelf. Store the cover in the small sealable container.
8. Carefully slide the LC connector on the other end of the fiber into the SFP connectors until you hear a click.

> Unclean optical fiber can impair system performance. Always inspect and clean the connectors before you make a connection. Use a fiberscope to inspect connectors on both ends. Use a cartridge or pocket cleaner to clean any dirty connectors.

> If the fiber is completely connected, the corresponding LEDs on both SCU ports light solid green.

9. Repeat the previous steps until all shelves in the NE interconnect.
10. In the management software, toggle the **SCU Connections** to Ring, to Linear, and then back to Ring. The ring is then fully configured and operational.

For any issues with this procedure, contact ADVA Technical Support.

Procedure — Interconnecting 9HU Shelves Using SCU-II Modules in a Redundant Configuration

	Follow the guidelines in Personal Safety and Equipment Precautions. See Figure 97.

1. Remove two SFPs from the package, such as the SFP/2G1/850I/MM/LC. Place the modules on an earth-grounded surface or antistatic mat.

2. Check and prepare the SFPs:

   a. Make sure the SFPs are the ones you intend to install. See the label on top of the SFPs.

   b. Visually inspect the SFPs for damage and make sure the optical connectors are clean. If an SFP is damaged, return it to ADVA.

3. Remove the dust plug from the SCU-II B module downlink interface — labeled D — that is installed in the master shelf. Store the plug in a small sealable container.

4. Insert the SFP into the empty downlink interface. See Installing Pluggable Transceivers.

	The management software automatically detects the insertion of an SFP. The system supports only approved SFPs and disables any unsupported interfaces.

5. Pay attention to the port LEDs of the SCU-II B module to determine if the system accepts the inserted SFP.
   If the shelf is assigned, the D-T LED should be solid green, and the D-R LED should be solid yellow.

	See the module LED indicator descriptions in the *FSP 3000R7Maintenance and Troubleshooting Manual* for more information.

6. Remove the dust plug from the SCU-II A module uplink interface — labeled U — that is installed in the first main shelf. Store the plug in the small sealable container.

7. Insert the other SFP into the empty uplink interface labeled U.

8. Pay attention to the SCU-II B module port LEDs to determine if the system accepts the inserted SFP.
   If the shelf is assigned, the U-T LED should be solid green, and the U-R LED should be solid yellow. If the shelf is unassigned, the LEDs remain off.

> See the module LED indicator descriptions in the *FSP 3000R7Maintenance and Troubleshooting Manual* for more information.

Continue with the steps that follow to connect the shorter fiber patch cable in the master shelf:

- From the SCU-II B downlink port D, which is the J/MM62/LC/DUP/0090/RED.
- To the SCU-II A uplink port U in the next main shelf.
- See Interconnecting a 9HU Shelf Using an SCU-II in a Redundant Configuration.

1. When you connect multiple shelves, complete two identification tags, one for each patch cable, and attach one tag to each cable end.
2. Remove the protective caps from the duplex LC connectors on both ends of the patch cable and store them in a small sealable container.
3. Check the connectors on both ends for damage and cleanliness.
4. Remove the dust cover from the SFP installed in the downlink interface of the SCU-II B in the master shelf. Store the cover in a small sealable container.
5. Carefully slide the duplex LC connector on one end of the patch cable with the red marker up into the SFP Rx and Tx connectors until you hear a click.
6. Carefully insert or tuck the fiber patch cable in the fiber tray and route the cable along the tie-mounted vertical cable on the left side of the rack. Continue down to the SCU-II A in the lower main shelf. Use cable ties to secure the patch cable to the side of the rack to reduce the risk of fiber pinching.

> Unclean optical fiber can impair system performance. Always inspect and clean the connectors before you make a connection. Use a fiberscope to inspect the connectors on both ends. If a connector is dirty, use a cartridge or pocket cleaner to clean it. Repeat the inspection and cleaning processes, as necessary.

> If the fiber is connected completely, the corresponding LEDs on both SCU ports light solid green.

7. Repeat the previous steps to install the next set of SFPs and short patch cables. Route them
   - from the SCU-II B, downlink port D in the lower main shelf
   - to the SCU-II A, uplink port-U in the next main shelf.

8. Repeat this process until all main shelves in the NE interconnect with the short J/MM62/LC/DUP/0090/RED patch cables. See Figure 97.

To complete the ring connection, complete these steps to connect a long patch cable (J/MM62/LC/DUP/0500/RED) between the master shelf and the last main shelf. See Figure 97.

1. Complete two identification tags for the long patch cable and attach one tag to each cable end.
2. Remove the protective caps from the duplex LC connectors on both ends of the patch cable and store them in a small sealable container.
3. Check the connectors on both ends for damage and cleanliness.
4. Remove the dust cover from the SFP installed in the uplink interface U of SCU-II A and in the master shelf. Store the cover in a small sealable container.
5. Carefully slide the duplex LC connector on one end of the long patch cable with the red marker into the SFP Rx and Tx connectors until you hear a click.
6. Carefully place, or tuck, the patch cables in the fiber tray and route them along the tie-mounted vertical cable on the left side of the rack. Continue to route the cables down to the SCU-II in the last main shelf. Use the cable tie to affix the patch cable to the side of the rack to reduce the risk of fiber pinching.
7. Remove the dust cover from the SFP installed in the last shelf, SCU-II B downlink interface D. Store the cover in a small sealable container.
8. Carefully slide the duplex LC connector on the other end of the patch cables with the red marker up into the Rx and Tx connectors of the SFP until you hear a click.
9. In the management software, toggle the **SCU Connections** to Ring, to Linear, and then back to Ring. The ring is then fully configured and operational.

	Unclean optical fiber can impair system performance. Always inspect and clean the connectors before you make a connection. Use a fiberscope to inspect the connectors on both ends. Use a cartridge or pocket cleaner to clean any dirty connectors

	If the fiber is completely connected, the corresponding LEDs on both SCU ports light solid green.

For any issues with this procedure, contact ADVA Technical Support.

Interconnecting 1HU Shelves with SCU-S Modules

A network element can have a maximum of two 1HU shelves equipped with SCU-S modules. To establish communications between these shelves, connect the SCU-S master-shelf downlink port to the SCU-S main-shelf uplink port. This connection is an unprotected link. Basic inter-shelf communications occur through the SCU-S ring. For this purpose, connect the SCU-S main shelf downlink port to the master shelf SCU-S uplink port. See Figure 98.

Figure 98:   Using SCU-S Modules to Interconnect 1HU Shelves
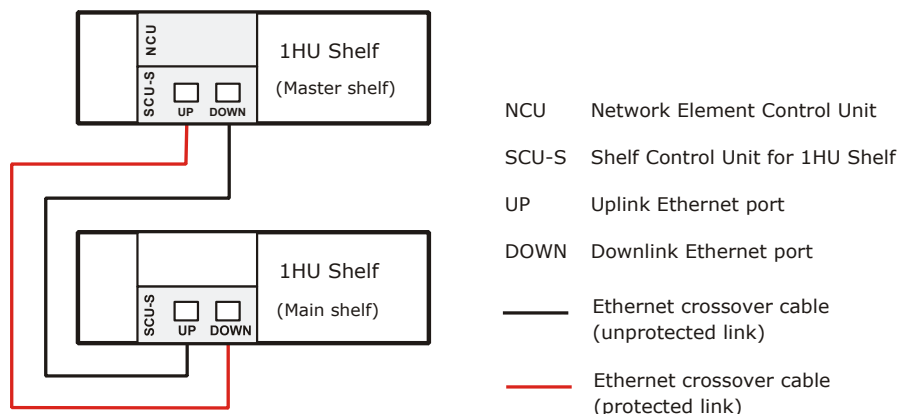
The SCU-S ring provides a high-speed redundant interconnection. The management links are 10/100Base-TX Standard Ethernet that use shielded Cat 5e or Cat 6 cables. If an interruption occurs in the ring at one point, the NCU can continue to reach each shelf of the NE. The involved SCU-S module detects the broken link, and the NCU can reach the shelf through another management path if necessary.

Complete these steps to install the Ethernet cables. Pay attention to the safety notices and additional information in Personal Safety and Equipment Precautions.

We assume that you are familiar with Ethernet and LAN and aware of the needed precautions to avoid damage to the equipment. Connect the shelves in shelf order beginning with the Master.

Required Tools and Equipment

- Two 100BASE-TX Ethernet cables of the appropriate lengths with RJ45 connectors on both ends (Cat 5e)
- ESD-preventive wrist strap or other personal earth-grounding device

Procedure

1. Read the installation or the cabling plan. If needed, contact the system administrator to get the relevant information you need to perform this task.

	The RJ45 plug fits into the Ethernet ports — RJ45 receptacles — only one way and clicks into place when properly inserted. Ensure that you press the release tab on the plug before you pull it out.

2. Attach a wrist strap to your wrist and fasten the earth-grounding cable onto the ESD earth-grounding point on the shelf, if available. Or fasten the cable to a bare metal surface onto the rack.

3. If the shelves:
   - Are close to each other as shown in , use the supplied Ethernet cable.
   - Are farther apart, use your own Ethernet cable of the appropriate length.

4. Hold the appropriate Ethernet cable and carefully connect one end of the cable to the SCU-S master-shelf uplink port. Ensure that the RJ45 plug clicks into place. Pay attention to the corresponding port LEDs.

5. Where necessary, route this cable along the vertical cable brackets mounted on the left side of the rack, and then down toward the SCU-S in the main shelf.

6. Carefully connect the other end of the cable to the SCU-S main-shelf downlink port. Ensure that the RJ45 plug clicks into place. Pay attention to the corresponding port LEDs.

7. If your configuration requires a protected link, hold the other Ethernet cable and carefully connect one end of this cable to the SCU-S master- shelf downlink port. Ensure that the RJ45 plug clicks into place. Pay attention to the corresponding port LEDs.

8. Repeat Step 5.

9. Carefully connect the other end of this cable to the SCU-S main-shelf uplink port, as shown in Figure 98. Ensure that the RJ45 plug clicks into place. Pay attention to the corresponding port LEDs.

10. Detach the wrist strap from your wrist, disconnect the earth-grounding cable from the ESD earth-grounding point on the shelf, if available. Or detach the cable from the rack. Set the earth-grounding cable aside.

For any issues with this procedure, contact ADVA Technical Support.

Interconnecting 9HU and 7HU Shelves for Inter-Shelf CCCP

In the protection scenarios described in this section, you install the active channel module and the standby channel module of a protection group (PG) in different shelves of a multi-shelf node.

To create shelf-to-shelf connections, interconnect the SCU modules in a ring configuration. The ring links transmit protection switching messages and data.

For shelf interconnection, the interfaces of the SCU operate at 1000Base-SX optical Ethernet. SFP transceiver modules connect through single-mode or multimode patch cables. ADVA must approve the SFP transceiver modules that you use. To create a daisy chain of the various main shelves, use the SCU downlink ports (D) and uplink ports (U).

	For information about how to provision inter-shelf Client Channel Card Protection (CCCP), see the *FSP 3000R7 Network Element Director (NED) Online Help*.

Basic Rules and General Considerations

Item	Description
High availability	If your cabling plan includes inter-shelf CCCP, you can operate with only one installed NCU, but ADVA recommends that you use two NCU-II-Ps in a 9HU shelf to achieve high availability. You can implement inter-shelf CCCP with or without SCU redundancy.
Ethernet support	The 9HU and shelf supports 1 Gbps Ethernet on the backplane to the NCU-II-Ps in slots 3 and 18.
For redundancy	You must install • A redundant NCU-II-P in slots 3 and 18 of a 9HU shelf. • Redundant SCU modules in slots A and B of a 9HU shelf.
For non-redundancy	You can install : • A single, non-redundant, NCU-II-P in slot 3 or 18 of a 9HU shelf. • A single, non-redundant, NCU module in slot A of a 9HU shelf or 7HU shelf.

Item	Description
Master shelf and sub-shelves	• You must install an NCU-3, NCU-II, or NCU-II-P module in Shelf 01, the master shelf. • The topmost shelf in the rack should typically be the master shelf, but this placement is not essential. The master shelf can be in any position within a multi-rack system. • You usually mount the sub-shelves, called main shelves, that house the SCU modules below the master shelf. However, where you mount the shelves in the rack within the NE is your decision.
Other shelf requirement	You must install a single SCU module in slot B of a 9HU shelf or 7HU shelf.
Shelf aggregation	A multi-shelf node can aggregate up to 25 sub-shelves. You must co-locate all of these shelves at the same site and at a maximum distance of 500 m (1640.5 ft) from the master shelf.
Interconnecting shelves	To interconnect the shelves through the SCU modules, you can use GbE-SFP transceivers such as SFP/2G1/850I/MM/LCs or SFP/2G5U/1310S/SM/LCs. The type of SFP transceivers that you use depends on your configuration. The number of SFP transceivers depends on the inter-shelf communication configuration that you use, with or without SCU redundancy.
Patch cable requirements	The required patch cables do not ship with the equipment. You can make your own patch cables, either single-mode or multimode. The cable lengths of the cables depend on the position of the shelves that you plan to interconnect within the node. The number of cables depends on the inter-shelf communication configuration that you use — with or without SCU redundancy.

Before You Begin

• Verify that all NCU and SCU modules are installed in the shelves and operating properly. The LED indicators (P, Mod) should light green when you apply power.

• Determine the required amount of patch cables and SFP transceivers based on the specific network configuration in use, that is, the number of SCU modules within the NE. See your company's engineering work order or the ADVA installation or cabling plan.

• Connect the shelves in order beginning at the master shelf. ADVA recommends that before you install the patch cables, label them. To avoid any confusion, specify which

cable end goes to and which comes from the corresponding SCU modules. Use the procedures described as follows to complete the shelf-to-shelf connections. Follow the guidelines in Personal Safety and Equipment Precautions.

- We assume that you are familiar with fiber-optic cables, pluggable transceivers, and Ethernet and LAN protocols and practices. We assume that you are aware of the needed precautions to avoid damage to the equipment. See the *FSP 3000R7 Network Element Director (NED) Online Help* for a summary of how to handle pluggable transceivers and optical fibers.
- For any problems with SFP transceiver operations, see the *FSP 3000R7 Maintenance and Troubleshooting Manual*. If an SFP transceiver does not respond after you insert it, remove it from the cage. Reinsert the dust plug in the empty cage.

Required Tools and Equipment

- Two SFP transceivers such as SFP/2G1/850I/MM/LCs or SFP/2G5U/1310S/SM/LC per shelf, referred to as *GbE SFP transceiver*. The total number of SFPs depends on the number of SCU modules that you plan to interconnect. Also see your installation or cabling plan.
- Patch cables of the proper lengths, single-mode or multimode. Terminate the cables with duplex LC connectors on both ends to interconnect two SCU modules that are installed in different shelves. The total number of patch cables depends on the number of SCU modules you plan to interconnect. Also see your installation or cabling plan.
- One patch cable of the proper length, single-mode or multimode. Terminate the cable with duplex LC connectors on both ends to connect the last sub-shelf to the master shelf for a redundant scenario.
- ESD-preventive wrist strap or other personal earth-grounding device.
- Suitable earth-grounded surface or an antistatic mat.
- Small resealable containers for dust plugs, dust covers, and protective endcaps each.

Cabling Shelves for Inter-Shelf CCCP

For a redundant scenario, internally connect both SCU modules within one 9HU shelf. Connect both SCU modules to two rings and maintain communication in the event of a fiber cut, an SCU failure, or an SFP transceiver failure.

For a non-redundant scenario, connect the two optical-Ethernet ports of the SCU module in each shelf to neighbor shelves in a ring configuration. If a fiber breaks, an SCU module fails, or both SFP transceivers fail, shelves equipped with a single SCU module lose communication to the NCU.

Connect the shelves in shelf order beginning with master shelf 01. Figure 99 illustrates the cabling schemes for the inter-shelf CCCP with and without SCU redundancy.

Figure 99:   Cabling Schemes for Inter-Shelf CCCP with and without SCU Redundancy

Redundant scenario   Non-redundant scenario
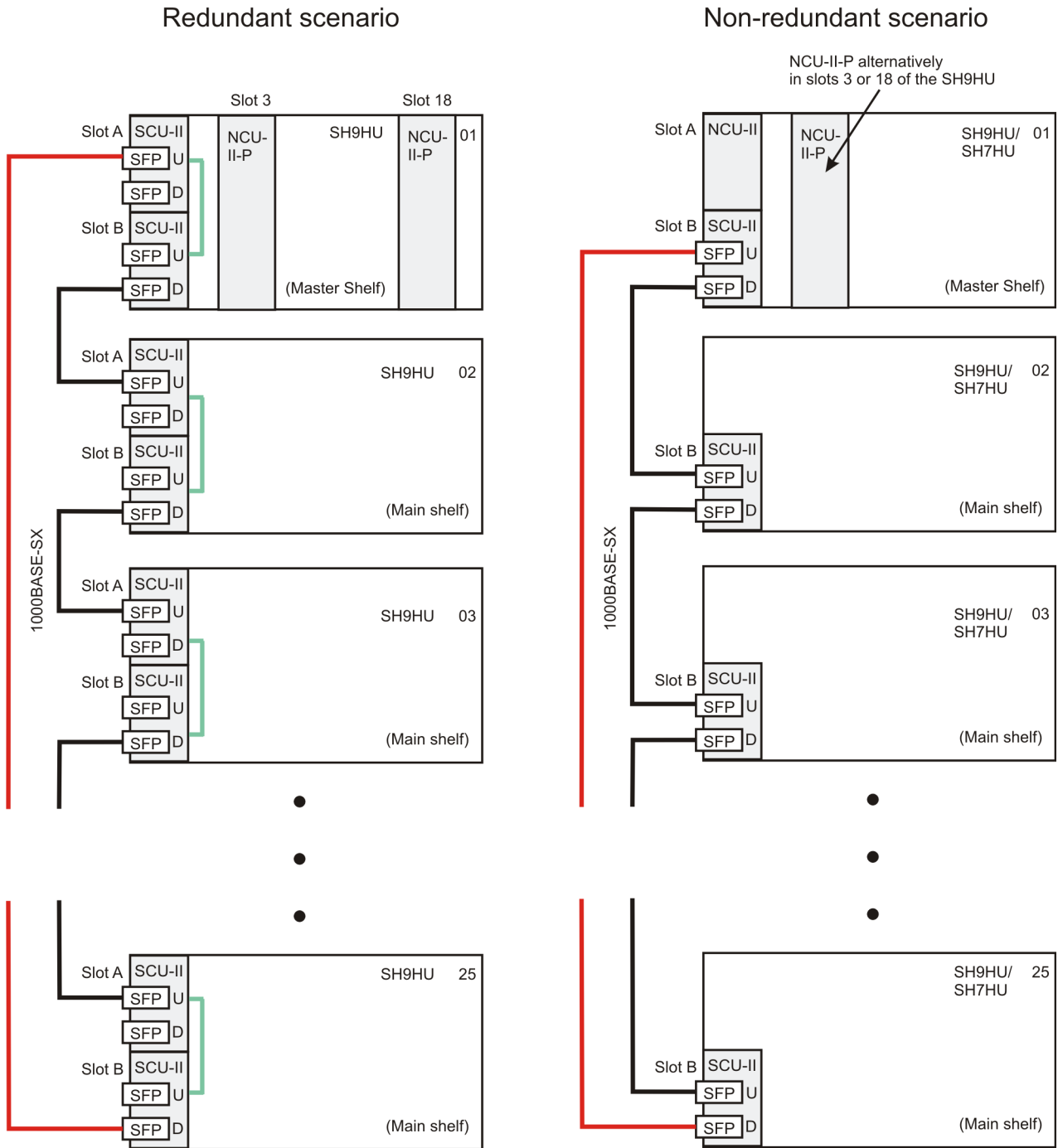
SH7HU	7HU shelf
SH9HU	9HU shelf
SCU-II	Shelf control unit
NCU-II-P/ NCU-II	Network element control unit
U	Uplink port
D	Downlink port
SFP	GbE SFP transceiver

Fiber-optic patch cable
(unprotected link)

Fiber-optic patch cable
(protected link)

Internal 100Base-T

Procedure

1. Remove two appropriate GbE SFP transceiver modules from the package and place them onto an earth-grounded surface or antistatic mat.

2. Make sure the SFP transceivers are the ones you intend to install. See the label on top of the SFP transceivers.

3. Visually inspect the SFP transceivers for damage and make sure the optical connectors are clean. If necessary, use canned, dry, oil-free air to blow away any impurities. If a transceiver is damaged, return it to ADVA.

4. Remove the dust plug from the downlink port D of the slot B SCU module in the first shelf and store it in a small sealable container.

5. Insert the appropriate GbE SFP transceiver into the empty downlink port D. For details about how to install SFP transceivers, see Installing Pluggable Transceivers.

> The management software automatically detects the insertion of an SFP. The system supports only approved SFPs and disables any unsupported interfaces.

6. Pay attention to the corresponding SCU port LEDs to determine if the system accepts the inserted SFP transceiver is accepted.
    If the D port is assigned, the D-T LED should be solid green, and the D-R LED should be solid yellow. If the shelf, SCU or D port are unassigned, the LEDs remain off.

> See the module LED indicator descriptions in the *FSP 3000R7 Maintenance and Troubleshooting Manual* for more information.

7. Remove the dust plug from the uplink port U of the slot A SCU or slot B SCU module in the next shelf and store it in a small sealable container.

8. Insert the appropriate GbE SFP transceiver into the empty uplink port U.

9. Pay attention to the corresponding port LEDs of the SCU to determine if the system accepts the inserted SFP transceiver.
    If the U port is assigned, the U-T LED should be solid green, and the U-R LED should be solid yellow. If the shelf, SCU or U port are unassigned, the LEDs remain off.

> See the module LED indicator descriptions in the *FSP 3000R7 Maintenance and Troubleshooting Manual* for more information.

Continue with these steps to connect the appropriate fiber-optic patch cable. Connect the cable from the slot B SCU D port in the first shelf to the slot A SCU or slot B SCU U port in the next shelf, as shown in Figure 99

1. Before you connect multiple shelves, complete two identification tags for each fiber. Attach one tag to each end of the fiber-optic patch cable.
2. Remove the protective caps from the LC connectors on both ends of the fiber-optic patch cable and store them in a small sealable container.
3. Check the fiber connectors on both ends for damage and cleanliness.
4. Remove the dust cover from the SFP transceiver installed in the first shelf, slot B SCU D port. Store the cover in a small sealable container.
5. Carefully slide the LC connector on one end of the fiber-optic patch cable into the SFP connectors until you can hear a click.
6. Route the fiber-optic patch cable in the fiber tray and along the tie-mounted vertical cable conduit on the left side of the rack. Continue to run the cable down to the SCU slot A or slot B SCU in the next shelf. Use cable ties to secure the fiber-optic cable to the side of the rack to reduce the risk of fiber pinching.
7. Remove the dust cover from the SFP transceiver installed in the slot A or slot B SCU U port in the next shelf. Store the cover in the small sealable container.
8. Carefully slide the LC connector on the other end of the fiber into the SFP connectors until you hear a click.

📝	Unclean optical fibers can impair system performance. Always inspect and clean the connectors before you make a connection. Use a fiber scope to inspect the connectors on both ends. If a connector is dirty, use a cartridge or pocket cleaner to clean it. Repeat the inspection and cleaning processes, as necessary.

📝	If the fiber is completely connected, the corresponding LEDs on both SCU ports will light solid green.

Continue with these steps:

1. Repeat the previous applcable steps until all shelves in the NE interconnect as described.
2. To physically interconnect the last shelf and first shelf — master shelf — remove the two appropriate GbE SFP transceiver modules from the package. Place the modules on an earth-grounded surface or antistatic mat.
3. Make sure the SFP transceivers are the ones you intend to install. See the label on top of the SFP transceivers.

4. Visually inspect the SFP transceivers for damage and make sure the optical connectors are clean. Also see step 3.

5. Remove the dust plug from the SCU module slot B downlink port D in the last shelf and store the plug in a small sealable container.

6. Insert the appropriate GbE SFP transceiver into the SCU module slot B empty downlink port.

7. Pay attention to the corresponding port LEDs of the SCU slot B to verify if the system accepts the inserted SFP transceiver. See also step 6.

8. Remove the dust plug from the SCU module slot A or slot B uplink port U in the first shelf. Store the plug in a small sealable container.

9. Insert the appropriate GbE SFP transceiver into the SCU module slot A or slot B empty uplink port U.

10. Pay attention to the corresponding port LEDs of the SCU slot A or slot B to verify if the system accepts the inserted SFP transceiver. See also step 9.

Continue with these steps to connect the appropriate fiber-optic patch cable from the slot B SCU slot B D port in the last shelf to the SCU slot A or slot B U port in the first shelf. See Figure 99.

1. Complete two identification tags for the fiber-optic patch cable and attach one tag to each end for the fiber.

2. Remove the protective caps from the LC connectors on both ends of the fiber-optic patch cable and store them in a small sealable container.

3. Check the fiber connectors on both ends for damage and cleanliness.

4. Remove the dust cover from the SFP transceiver installed in the SCU slot B D port of the last shelf. Store the cover in a small sealable container.

5. Carefully slide the LC connector on one end of the fiber-optic patch cable into the SFP connectors until you can hear a click.

6. Route the fiber-optic patch cable in the fiber tray and along the tie-mounted vertical cable conduit on the left side of the rack. Continue to run the cable up to the SCU slot A or slot B in the first shelf. Use cable ties to secure the fiber-optic patch cable to the side of the rack to reduce the risk of fiber pinching.

7. Remove the dust cover from the SFP transceiver installed in the SCU slot A or slot B U port in the first shelf. Store the cover in the small sealable container.

	If the fiber is completely connected, the corresponding LEDs on both SCU ports will light solid green.

Finally,

Toggle the SCU Connections setting in the system, in order for the ring to be fully

configured and operational. Set the SCU Connections to Ring, then to Linear, and

back to Ring.

If you encounter any issues, contact ADVA Technical Support. See Call ADVA for details.

Connecting the 40CSM/2HU Shelf to an FSP 3000R7 Shelf

Unless otherwise specified, the term 40CSM/2HU shelf always refers to these shelf types:

- 40CSM/2HU-#D02-#D32
- 40CSM/2HU-#D34-#D64
- 40CSM/2HU-#19590-#19200
- 40CSM-FL/2HU-#19590-#19200
- 40CSM/2HU-#19595-#19205
- 40CSM-C80/2HU-#19590-#19200
- 40CSM-C80/2HU-#19595-#19205

To supply the 40CSM/2HU shelf with power and provide management functionality, first review this information:

- Connect the shelf to a management controller such as the Passive Shelf Control Unit (PSCU) or the Common Equipment Module (CEM/9HU).
- You can install the PSCU in a SH9HU, SH7HU, or SH1HU shelf.
- Only the SH9HU shelf includes the CEM/9HU.
- The shelf management interface indicates only the filter shelf in each of the management tools.

⚠	**CAUTION**
	Only service personnel are qualified to perform this procedure.

⚠	**ELECTROSTATIC CAUTION**
	Ensure that you are earth-grounded with a wrist strap or equivalent while you mount the brackets to a shelf that contains ESD-sensitive devices.
	Follow ESD-prevention precautions to avoid ESD damage to the other equipment.

Required Tools and Equipment

Use only the IEEE 1394 interface cable (IC300/PSCU/IEEE1394) that ships with the 40CSM/2HU shelf. This interface cable is 3 meters (9.84 ft) long and has a 6-pin, male IEEE-1394 connector plug on each end. See Figure 100.

Figure 100: IEEE 1394 Interface Cable Connector Plug

The IEEE-1394 connector plugs fit into the interconnect ports of any 40CSM/2HU shelf and the PSCU or CEM/9HU in only one way.

📝	The use of cables other than those that ADVA ships voids both the warranty and the EMC certificate.

📝	Although the PSCU, CEM/9HU, and 40CSM/2HU shelf can use a FireWire 400 cable to interconnect, the FireWire itself is not supported nor are the protocol or the pinout.

- The interconnect ports on the PSCU are labeled **I1** to **I8**.
- The interconnect ports on the CEM/9HU are labeled **I1** to **I4**.

Procedure

1. Read the installation or cabling plan, or contact the system administrator for information about:
    - The 40CSM/2HU shelf that you plan to connect
    - The shelf that houses the PSCU or the CEM/9HU
    - The rack that holds these shelves
    - The position of these shelves within the rack
    - The IP address of the network element

2. Connect one end of the IEEE 1394 interface cable to an available interconnect port on the PSCU or CEM/9HU. Do not force the plug. If you encounter resistance to inserting the plug, reverse its orientation and try again.

3. Pass the IEEE 1394 interface cable through the space between two fiber fingers. Bend the cable about 90 degrees to the left or right in the fiber tray, depending on which side of the rack you are guiding the interface cable through. Then, route the cable through

the fiber tray. See .

Figure 101:   Routing the IEEE 1394 Interface Cable Inside the Fiber Tray
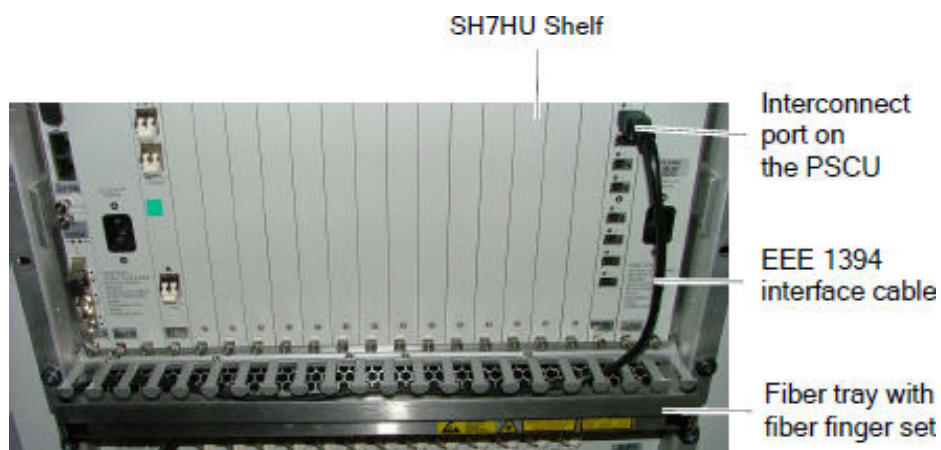
Retention of excess cable

The supplied IEEE 1394 interface cable is 3 meters (9.84 ft) in length. Depending on the location of the SH9HU or SH7HU shelf and the 40CSM/2HU shelf within the rack, the cable might be longer than required. Secure any excess cable to facilitate easy, safe maintenance activities and proper operation. Observe these guidelines:

- Always use cable managers to secure excess cable, if cable managers are available.
- Otherwise, store excess cable in the space or gap between the SH9HU or SH7HU and the 40CSM/2HU shelf. See Figure 102.
- Use cable ties to loop and restrain any excess cable before you store it.
- To ensure proper equipment cooling, ensure that no excess cable impedes airflow.
- Leave an appropriate amount of slack at each cable end.

4. If the shelves are located close to each other as shown in Figure 102, loop any excess cable when you route it. If do not have a cable manager, use the space between the shelves for the excess cable. Loop and restrain the excess cable length and store it in the gap.
    Or, if the shelves are farther apart from each other, route the IEEE 1394 interface cable through the vertical cable brackets on the left or right side of the rack toward the 40CSM/2HU shelf.

Figure 102:   Example of Routing the IEEE 1394 Interface Cable
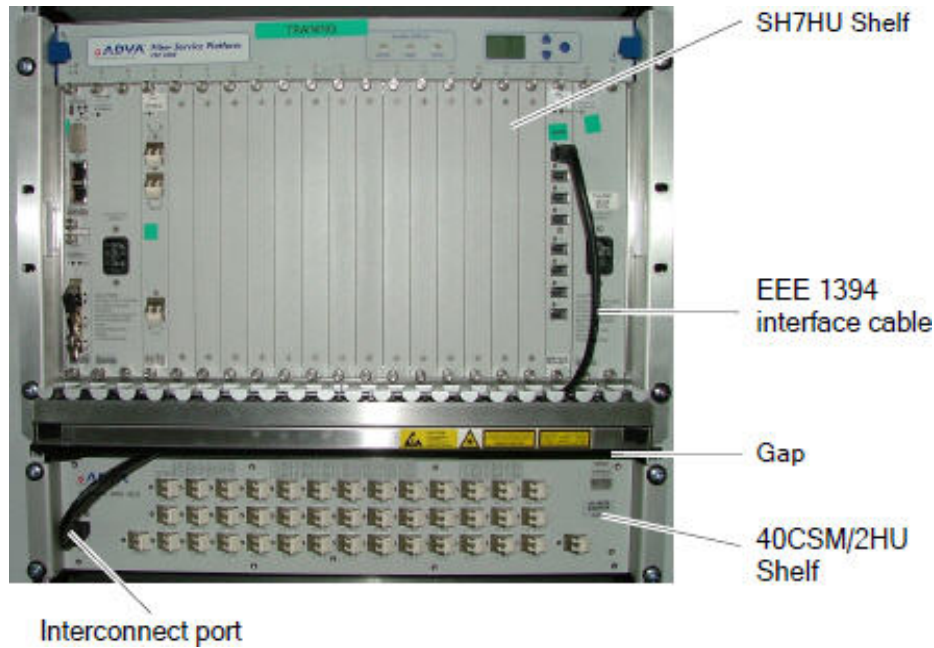
5. Connect the other end of the IEEE 1394 interface cable to the interconnect port labeled with the letter I on the 40CSM/2HU shelf. Do not force the plug. Check for the correct orientation of the plug if it does not fit to the connector.

6. Check the port status LED indicators.

> 📄 The power LED on the shelf and the interconnect port x on the controller illuminate after you connect the cable only if the 40CSM/2HU shelf and the PSCU or CEM/9HU are provisioned.
>
> For information about provisioning, see the *Network Element Director (NED) Online HelpFSP 3000R7*.

The corresponding interconnect port LEDs labeled I1 to I8 on the front panel of the PSCU or CEM/9HU should light solid green. A green light indicates that the PSCU or CEM/9HU and the connected shelf are communicating properly.
The power LED labeled P on the 40CSM/2HU shelf front panel should also be green to indicate that DC power is supplied to the shelf.

7. To troubleshoot any problems, see the module LED indicator descriptions in the *FSP 3000R7 Maintenance and Troubleshooting Manual*.

Interconnecting a ROADM-C40/40/OPM-3HU/2DC Shelf to an FSP 3000R7 Shelf

To establish communication between the FSP 3000R7 and ROADM-C40/40/OPM-3HU/2DC equipment, connect the SCU management monitor and control ports to the FSP 3000R7

shelf management ports. These connections create a ring configuration.

Required Tools and Equipment

You must use an SCU-Intercom-Kit to connect SCU modules to the ROADM-C40/40/OPM-3HU/2DC. The kit includes the fiber patch cables and SFP transceivers for the SCU and this shelf.

Procedure

1. Remove the protective covers and dust plugs from the equipment one at a time. As you make each connection, insert the pluggable SFP transceiver modules. See the *FSP 3000R7 Hardware Description* and Figure 103.

	To accomplish the monitor and control functionality, interconnect the management ports U and D in a ring. For example, connect the SCU port U transmit and receive fibers to the ROADM port D. From the ROADM port U, connect the transmit and receive fibers to port D of the next ROADM. Continue to make these connections until the ring is complete.

Figure 103:   Management Port Connections
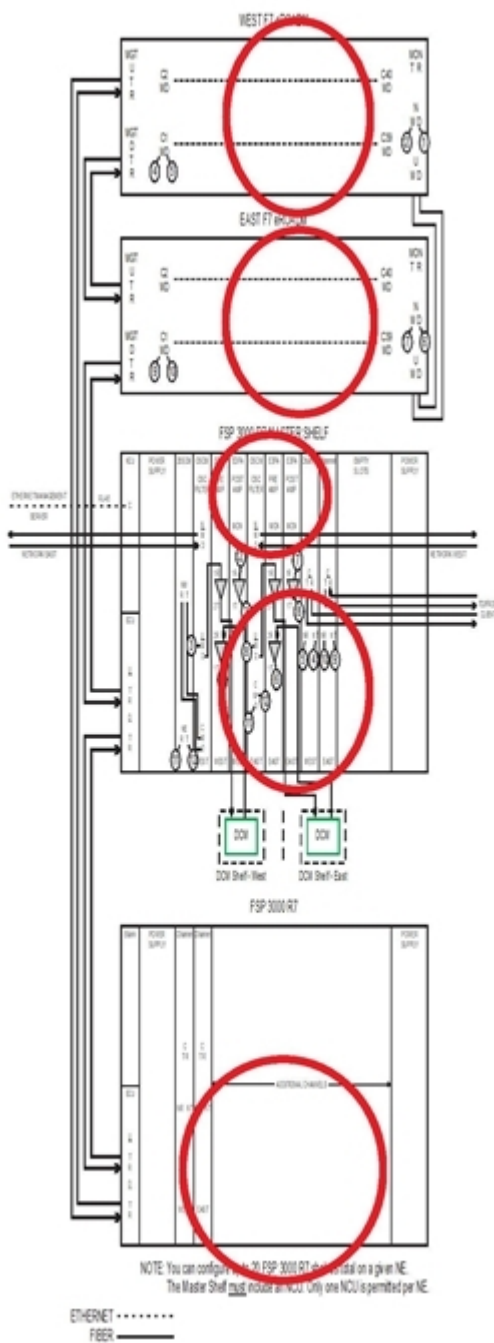
2. On the FSP 3000R7 shelf 2 SCU, connect a fiber jumper

    - from the shelf 2, SCU port, U transmit and receive ports

    - to the FSP 3000R7 SCU, master shelf 1, port D receive and transmit ports

3. After you complete all management port connections, connect the Ethernet cable from the management server to the FSP 3000R7 master shelf NCU, Port C (RJ45) connector.

Chapter 8

Powering On and Off

This section describes how to power the FSP 3000R7 on and off and contains these topics:

Audience

This section is for service personnel and qualified and trained equipment installers who need to rack-mount and earth-ground a shelf and perform power cabling tasks. Personnel are considered to be qualified if they have the necessary knowledge and practical experience of mechanics and electrical engineering to be aware of and understand the various hazards of working on the shelf. These personnel know to take reasonable precautions to prevent personal injury and equipment damage.

Switching Power On

Procedure

Complete these steps to determine whether all components connect to their respective power supplies.

1. Unlock the main power, and then turn on the main power switches.
2. Immediately after power-on, the NCU starts booting. All slot LEDs blink yellow to indicate that the NCU is booting up.
3. For each shelf, check that the PSU power LED is solid green, which indicates that the unit is functioning properly.

> 📝 If the PSU LED is off, no voltage is being supplied to the unit. If an error occurs, the power LED turns red. For troubleshooting, see the *FSP 3000R7Maintenance and Troubleshooting Manual* or contact ADVA for technical assistance.

4. On each shelf, the three fans start working in succession. Check to confirm that the fan status LED lights are green, which also indicates that the fan unit is functioning properly.

5. Check the power LEDs of all modules installed in the shelves, which should all illuminate green.

6. After approximately 3 minutes, check the slot LEDs of the provisioned modules, which should all illuminate green. Green LEDs indicate that the FSP 3000R7 completed booting and is ready for normal operation.

Figure 104:   Fan Front Panel
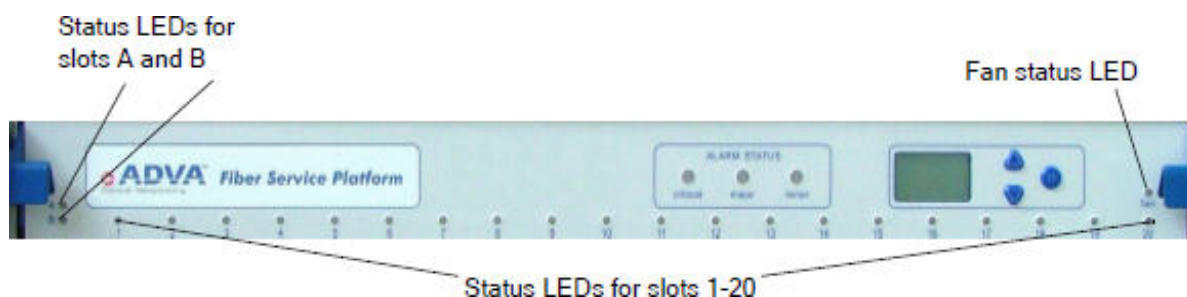
Troubleshooting Power Issues

Indicator	Description
PSU LED off.	No power is available. Attach the power cable and ensure that the correct voltage is applied.

PSU LED yellow.	• Power supply overload.
	  ○ Pull modules out of their back connectors until the LED changes to green. Any module that does not illuminate green is the defective one.
	  ○ If the power supply LED stays yellow after you pull the last module,replace the power supply or the shelf.
	  ○ If you find the error, replace the defective module and seat all modules again.

PSU LED red.	This power supply has no mains input. Only the other power supply provides power to the shelf. Provide power to the power supply.

Indicator	Description
Fan LED red.	Turn off the network element. At least two fans in the fan unit are out of order, which can cause the respective shelf to overheat.
Fan LED: solid yellow.	One fan is out of order. Replace that fan with a new one.
Fan LED blinking yellow.	• The NE is experiencing a communications problem. Check the Ethernet cabling. • The NCU or FCU has an incorrect contact. Reset the NCU or the FCU.

Chapter 9

Connecting Optical Cables

The FSP 3000R7 system supports a large array of hardware configurations. Instructions to cable the optical modules for each unique configuration varies. This section describes how to establish internal and external optical connections and client- and network-side connections at the basic level. This section does not include cabling instructions for all variants. Instructions to interconnect OSCMs and OSFMs in OSC networks are also included.

This section contains these topics:

Introduction

The FSP 3000R7 system provides flexibility for each individual configuration. We recommend that you use FSP Network Planner to help you plan, calculate, and install your specific and custom configuration. See the *FSP Network Planner User Manual*. When you install the network elements (NEs), you will set up fiber optic cabling.

To connect various optical modules in a single FSP 3000R7 equipment shelf and within the NE inter-shelf connections, use pairs of fiber-optic jumpers. The equipment shelves can ship with pre-terminatated fiber optic cabling according to your purchase order. If so, you only need to optically interconnect the completely pre-installed equipment shelves, ROADM shelves, 1HU passive shelves, and fiber management shelves of an NE.

Your specific system configuration determines the interconnection requirements, which are provided in the optical cabling plan. The optical module ports connect in relation to their logical sequence in the network. Establish optical connections from client lines (CPE) through channel modules, various active or passive optical modules, amplifiers, and an optical switch module to the network line. Fiber-optic jumpers form the internal optical signal path of a single NE.

	For more information about the optical connector labels for each module faceplate, see the *FSP 3000R7Hardware Description*.

Each shelf ships with the appropriate pairs of fiber-optic jumpers of different lengths and types, which are color-coded and labeled according to usage.

	You can easily damage fiber-optic jumpers if you improperly handle and install them. Follow all guidelines to properly handle fiber-optic jumpers and follow standard installation practices for field use.

Optical module ports — receptacles — and fiber-optic connectors can become contaminated. To achieve correct connections of the fibers, verify that the fiber-end face and ferrule of the fiber optic connectors are completely clean and smooth. Visually inspect them for scratches or cracks. Microscopic dust particles, fingerprints, or any loose contaminants on the fiber-end faces can cause performance problems in optical networking. You must completely remove any contamination before you first use or mate the connectors. If you mate a dirty fiber-optic connector, the module receptacle can become cross-contaminated and permanently damage both end-faces of the fibers. You would then have to replace the two mated connectors. Always visually inspect, clean, and then re-inspect the fiber optic connectors before you make any fiber optic connection. You must also inspect new and unused fiber-optic connectors and receptacles. See Cleaning and Inspecting Fibers and Ports.

Audience

This section is for service personnel, field service technicians, and qualified and trained equipment installers who perform optical cabling procedures.

Associated Documentation

To make sure your optical cabling process will be complete and accurate, obtain this information from FSP Network Planner:

- Information about the placement of shelves and optical modules
- Generated fiber-optic jumper list
- Generated optical cabling plan

Required Expertise

Personnel who perform optical cabling procedures must have training in laser-based technology and optical fiber communication systems. We assume that personnel are experienced in handling optical fibers and know how to clean optical connectors. These personnel must have the required knowledge of currently relevant laser safety standards such as:

- IEC/EN 60825-1, IEC/EN 60825-2
- ITU-T G.664, ITU-T G.665
- 21CFR1040.10, 21CFR1040.11 and ANSI Z136.1

In addition, personnel must be familiar with handling ESD-preventive equipment.

Safety Guidelines

⚠️	**CAUTION** Only service personnel are qualified to perform this procedure.

☢️	**LASER RADIATION WARNING** **Risk of invisible laser radiation** Disconnected fibers or connectors can emit invisible laser radiation. Do not stare into beams or use optical instruments to view beams directly. The end of an unterminated optical fiber connector or receptacle can emit invisible laser radiation when the aperture interlocks are defeated. Never look directly into an optical fiber connector or unterminated receptacle during service operations by using optical instruments, unless you are absolutely certain that no laser radiation is being emitted from the receptacle or the fiber.

	ELECTROSTATIC CAUTION
	Ensure that you are earth-grounded with a wrist strap or equivalent while you mount the brackets to a shelf that contains ESD-sensitive devices.
	Follow ESD-prevention precautions to avoid ESD damage to the other equipment.

NOTICE	To ensure faultless operation of the FSP 3000R7 system, use only fiber-optic cables released and provided by ADVA. Fiber-optic cables other than ones released and provided by ADVA might be incompatible with FSP 3000R7 modules and interoperability cannot be guaranteed.

	Before you connect fiber-optic cables, install the optical module and pluggable transceivers to the FSP 3000R7 system. After the physical installation, the module boots up. Wait about 1 minute until the boot process, and configuration and initialization time for protection completes. You can then connect the fiber-optic cables to the installed optical module and pluggable transceivers.

	Risk of damage to the network ports of channel modules
NOTICE	To avoid serious damage to the network ports of the channel modules, ensure that the specified maximum optical input power of the channel modules is not exceeded. If input power levels are too high, the resulting damage can only be repaired at the factory and is not covered by the warranty.

	Risk of optical connector damage
	With no power applied, always inspect and clean all fiber-optic connector plugs thoroughly before you plug them into a module. Contamination can degrade optical performance, and in some cases, permanently damage fiber optic connectors. See Cleaning and Inspecting Fibers and Ports.
NOTICE	To prevent contamination, always cover any connector receptacles that are not in use with protective plugs. Keep protective caps on unplugged fiber-optic connector plugs.

Cleaning and Inspecting Fibers and Ports

Perform the procedures in this section to clean and inspect optical cabling and port connections. Before you mate any optical cabling, always inspect and clean them first.

NOTICE	**Risk of equipment damage:** Dirty fiber can impair system performance.

📝	The network fiber and patch panels that you use to connect ADVA equipment to the network fiber must have discrete back reflection level values. As measured with an optical time-domain reflectometer (OTDR), these levels should be less than –27 dB. For spans that use Raman amplifiers, the discrete back reflection levels are required to be <–32 dB. Back reflection levels that are higher than the specified levels can cause BER penalties through in-band crosstalk that multipath interference generates. Use a fiber spool with a length that exceeds the OTDR dead-zone to measure the OTDR. Connect one end of the spool to the OTDR and the other end to the patch panel. This precaution ensures reliable back reflection and loss measurement of the near-end patch panel. Measure OTDR in both directions of a fiber.

Quality connections between fiber-optic equipment require clean fiber-optic components. Cleaning the fiber-optic equipment is one of the most basic and important procedures to maintain fiber-optic systems. Any contamination in the fiber connection can cause failure of the component or failure of the entire system.

Even microscopic dust particles can cause a variety of optical connection issues. A particle that partially or completely blocks the core generates strong back reflections, which can destabilize the laser system. Dust particles trapped between two fiber end-faces can scratch the glass surfaces. A particle on the cladding or on the edge of the end-face can cause an air gap or a misalignment between the fiber cores, which significantly degrades the optical signal. Always remove all foreign materials and debris from the fiber end-face before you mate the connectors.

Common contaminants include:

- Oils — frequently from human hands
- Film residues — condensed from vapors in the air
- Powdery coatings — that remain after water or other solvents evaporate

If you do not remove these common contaminants, they can be more difficult to remove than dust particles are and can also damage the equipment.

NOTICE	**Risk of equipment damage:** When you use a high-powered laser such as a Raman amplifier, any contaminant can burn into the fiber end-face. If the burned-on contaminant blocks the core while the laser is on, this blockage can cause optical surface damage that you cannot clean.

This section contains these topics:

General Reminders and Warnings

Review these reminders and warnings before you inspect and clean your fiber-optic connections.

Always

- Turn off any laser sources before you inspect fiber connectors, optical components, or fiber-optic bulkhead connectors (FOBCs).
- Make sure that you disconnect the cable at both ends or that you remove the module or pluggable transceiver from the the shelf.
- Inspect the connectors or adapters before you clean them.
- Inspect and clean the connectors before you make a connection.
- Use the connector housing to plug or unplug a fiber.
- Keep a protective cap on unplugged fiber connectors to prevent contamination.
- Store unused protective caps in a resealable container to avoid transferring dust to the fibers. Locate the containers near the connectors for easy access.
- Discard used tissues and swabs properly.

LASER RADIATION WARNING

- Always wear appropriate safety glasses as required in your area. They should meet all applicable federal and local regulations and match to the lasers in use within your environment.
- Never look into a fiber while the system lasers are on.
- Never use unfiltered hand-held magnifiers or focusing optics to inspect fiber connectors.
- Never connect a fiber to a fiber scope while the system lasers are on.

NOTICE

- If you use alcohol to wet-clean, always ensure the alcohol does not leave residue on the end-face, which can damage the equipment.
- Clean bulkhead connectors or receptacle devices only if you have a way to inspect them.
- Never touch the end-faces of fiber connectors.
- Never twist or pull forcefully on the fiber cable.
- Never reuse any tissue, swab, or cleaning cassette reel.
- Never touch the clean area of a tissue, swab, or cleaning fabric.
- Never touch any portion of a tissue or swab where alcohol was applied.
- To prevent contamination, never touch the dispensing tip of an alcohol bottle.

ELECTROSTATIC CAUTION

Ensure that you are earth-grounded with a wrist strap or equivalent while you mount the brackets to a shelf that contains ESD-sensitive devices.

Follow ESD-prevention precautions to avoid ESD damage to the other equipment.

Best Practices

Use resealable containers to store all cleaning tools. Store endcaps in a separate container. Keep the inside of these containers extremely clean and the lid tightly closed to avoid contamination of the contents during the fiber connection process.

Never allow cleaning alcohol to evaporate from the ferrule, which can leave residual material on the cladding and fiber core. This residue is extremely difficult to remove without another wet cleaning, which is usually more difficult to remove than the original contaminant. Liquid alcohol can also remain in small crevices or cavities, where it can re-emerge.

Required Tools and Equipment

- Hand-held fiber scope
- 1.25-mm cotton swabs
- Video scope
- CLETOP or clean-room tissues
- Optical-grade isopropyl alcohol and canned, oil-free compressed air
- Lint-free wipes — preferably clean room quality — to use in Using Lint-Free Wipes to Dry-Clean Fiber Connectors

Cleaning Fiber-Optic Connector Plugs

Complete these steps to inspect and clean all optical plugs before you set up the cabling.

📝	Materials that you use to clean fiber-optic connectors should be consistent with the function. Use - Wiping cloths made of lint-free, non-abrasive materials. - Cotton swabs that have a tightly wrapped tip and are talcum-free. - Pure optical-grade isopropyl alcohol (IPA) to clean optical contact surfaces. - Canned, oil-free compressed air to remove dust from connectors.

⚠️	**CAUTION** Only service personnel are qualified to perform this procedure.

NOTICE	Raman amplifiers are high-powered devices. Always disable the network port on a Raman amplifier before you remove an optical cable. Failure to disable the network port can damage the optical connector.

Procedure

1. Review the contents of the *FSP 3000R7 Safety Guide* and observe all caution statements in this section.

⚠️	**LASER RADIATION WARNING** Laser Radiation is present when the equipment is open and the interlocks are defeated. Avoid exposure to the beam.

2. Switch any forced laser back to auto, or off.

3. Disconnect any connected fiber-optic cables. If no fiber-optic cables are connected, remove the protective cover from the plugs.

4. Use an optical power meter to measure the output power of the common output ports.

	Handle the connectors carefully to avoid leaving fingerprints or otherwise contaminating the ferrule end-face.

5. Use canned, oil-free compressed air to blow away any accumulated dust or loose debris from the ferrules.

	Do not use commercial, compressed air because of its oil content, which can contaminate the fiber-optic connectors and receptacles. Always use canned, oil-free compressed air.

6. Use a video scope to inspect the ports and ensure that the port connectors are clean (see Figure 105). See Figure 106 for comparison examples of clean and contaminated fiber end-faces.

	LASER RADIATION WARNING Never use optical instruments to look directly into an optical fiber connector or into an unterminated receptacle during service operations. An example of an optical instrument is a magnifier or video scope. Only look directly into an optical figure connector if you are absolutely certain that no laser radiation is being emitted from the receptacle or the fiber.

Figure 105: Video Scope

Figure 106:   Clean, Damaged, and Dirty Fiber Ends
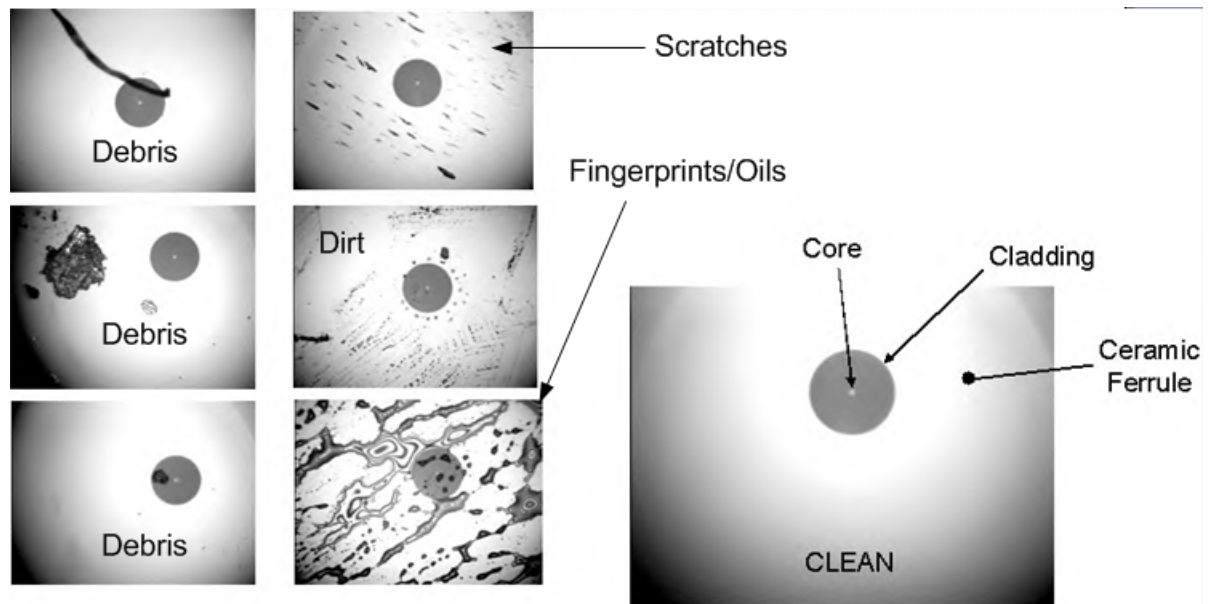
Continue with these steps:

1. If the ports require cleaning, open one or more port connector hinged caps from the circuit packs.

2. Use canned, oil-free compressed air to blow way any accumulated dust or loose debris from the ferrules.

3. Use 1.25 mm cotton swabs to clean the ports.

4. After you clean and inspect a port, immediately close the cap on any port that you do not cable to prevent contamination of the connector.

5. If the connector is still dirty, repeat the dry cleaning technique.

6. Use the video scope to inspect the connector again. If the connector is still dirty after a second dry cleaning, use a wet-cleaning technique to clean it. Immediately follow the wet cleaning with another dry cleaning to ensure that no residue is left on the end-face.

NOTICE	We do not recommend wet cleaning for bulkheads and receptacles, which can damage the equipment.

7. If you need to perform a wet cleaning, use a pad saturated with optical-grade isopropyl alcohol. Gently wipe the ferrules and endface surfaces of the connector plugs. Make sure that the pad makes full contact with the endface surfaces. Use canned, oil-free compressed air to dry the connector surfaces or let them air dry for 5 seconds.

8. Inspect the connector again. If you still unable to remove the contaminant, use a fresh surface on the pad and repeat the cleaning procedure.

📝	Do not touch the connector surfaces after you clean them.
	If the end-face surface of the connector remains dirty after repeated cleaning, replace the plug.

9. Attach the fiber connector plug to the corresponding receptacle. If you do not need to use the cleaned connectors right away, cover them with protective caps or plugs to prevent contamination.

NOTICE	Only use alcohol or wet cleaning if you can ensure that no residue will remain on the endface, which can cause equipment damage.

Cleaning and Inspecting Connector Receptacles

We recommend that you clean the installed fiber-optic connector plugs in the fiber-optic connector receptacles on a non-routine basis. Clean them only if you measure low light levels. The manufacturer cleans and connects the receptacles in the modules, which is normally sufficient.

System operation should be error-free if you — the customer — provides clean connector plugs on the application side.

📝	Only clean the inside of the receptacles if you suspect that contamination is causing reduced light power.

⚠️	**LASER RADIATION WARNING**
	Only authorized personnel are qualified to perform this procedure.

Procedure

If have system alarms or low optical power levels and you find that you need to clean the connector plugs and receptacles, complete these steps.

1. Review the contents of the *FSP 3000R7 Safety Guide*. Observe all caution statements in this section.

2. Check the operating status of the equipment and the current hazard level. A system module that operates in Forced On mode can affect the hazard level of the NE.

⚠	**LASER RADIATION WARNING** Laser radiation is present when the equipment is open and the interlocks are defeated. Avoid exposure to the beam.

3. Clean the fiber-optic connectors, as described in Cleaning Fiber-Optic Connector Plugs, before you plug them into the receptacles.

4. If the optical receptacle is contaminated, carefully insert the extension tube of the compressed air can into the optical receptacle and blow dry, oil-free air into the connector. Avoid touching the adapter receptacle.

5. Carefully reconnect the optical connector plug, and check for proper function. If the performance is deficient, repeat the cleaning procedure.

📝	If problems persist after repeated cleaning, replace the optical module. Send the module that you remove to ADVA Technical Services.

6. If you do not use or plan to reconnect an optical fiber cable soon, cover the connector receptacle with plugs to avoid contamination.

Cleaning and Inspecting Fiber Jumpers

Complete the steps in these procedures to inspect and clean fiber jumpers — fiber patch cables.

Using Cartridge and Pocket-Style Cleaners to Dry-Clean Fiber Jumpers

Procedure

1. Make sure that the lasers are off before you begin the inspection.

> **LASER RADIATION WARNING**
>
> Disconnected fibers or connectors can emit invisible laser radiation. Do not stare into beams or use optical instruments to view beams directly .

2. Remove the fiber caps from one or more jumpers and store them in a small, resealable container.

3. Use a fiber scope to inspect the fiber, as shown in Figure 107). See Figure 106 for examples of clean, damaged, and dirty fiber end-faces.

    Figure 107:   Fiber scope
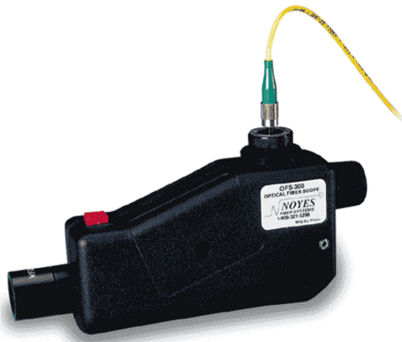
4. If the connector is dirty, use one of these methods to clean it:

    a. To use a cartridge cleaner, press down on the cartridge and hold the thumb lever. The shutter slides back, and exposes a new cleaning area. Proceed to Step 5.

    b. To use a pocket cleaner, peel back the protective film for one cleaning surface. Proceed to Step 5.

    c. To use a manual advance cleaner, pull the cleaning material from the bottom of the device until a new strip appears in the cleaning window. Proceed to Step 5.

5. Hold the fiber tip lightly against the cleaning area.

    a. To clean single, non-APC fiber connectors, rotate the fiber one quarter turn of 90 degrees.

    b. To clean APC connector end-faces, hold the cleaning area at the same angle as the end-face.

6. Pull the fiber tip lightly down from the exposed cleaning area in the direction of the arrow, or pull the tip from top to bottom.

a. To use pocket-style cleaners, go to Step 8.

b. For single fiber connectors with the type A CLETOP, repeat the cleaning process in the second clean slot (Step 5 and Step 6).

NOTICE	Do not scrub the fiber against the fabric or clean over the same surface more than once, which can potentially contaminate or damage your connector.

7. Release the thumb lever to close the cleaning window if you are using cartridge-type cleaners.

8. Use the fiber scope to inspect the fiber again.

9. Repeat the inspection and cleaning processes, as necessary.

	Throw away any used cleaning material such as cards or material cartridges.

Using Lint-Free Wipes to Dry-Clean Fiber Connectors

This section describes how to use lint-free wipes for dry cleaning techniques.

	Review General Reminders and Warnings before you start this procedure.

Procedure

1. Make sure all lasers are off before you begin the inspection.

	LASER RADIATION WARNING Disconnected fibers or connectors can emit invisible laser radiation. Do not stare into beams or use optical instruments to view beams directly.

2. Remove the protective end cap and store it in a small resealable container.

3. Fold the wipe into a square of about four to eight layers thick. See Figure 108.

4. Use a fiber scope to inspect the fiber. See Cleaning Fiber-Optic Connector Plugs. If the fiber is dirty, clean it with a lint-free wipe.

> When you fold the wipe, be careful to avoid contamination from your hands or from a surface to the wipe cleaning surface.

5. If the connector is dirty, use the center of the wipe to lightly wipe the ferrule tip in a *figure 8* motion.

Figure 108:   Cleaning the End of a Jumper with a Clean-Room Tissue
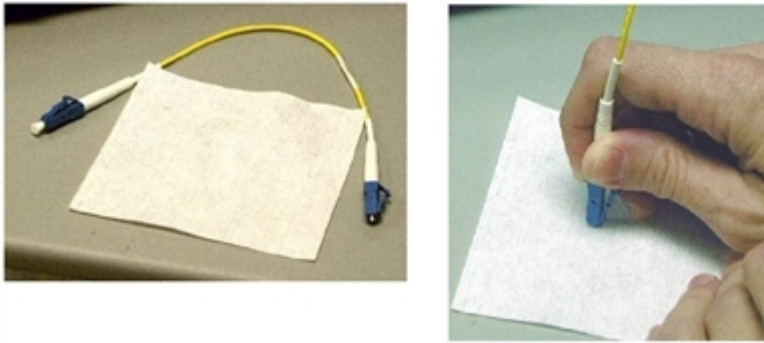
> Do not scrub the fiber against the wipe, which can cause scratches and further contamination.

If the connector is dirty, use the center of the wipe to lightly wipe the ferrule tip using a *figure 8* motion.

Figure 109:   Cleaning the End of a Jumper with a Clean-Room Tissue

> Do not scrub the fiber against the wipe, which can cause scratches and further contamination.

6. Repeat the *figure 8* wiping action on another clean area of the wipe.
7. Properly dispose of the wipe.
8. Use the fiber scope to inspect the connector again.

9. Repeat this process as necessary.

Using Lint-Free Wipes to Wet-Clean the Fiber End-Face

If you cannot remove dirt from the fiber end-face using a dry cleaning procedure, try this wet cleaning method. Be very careful when you use the wet cleaning method because it can leave unwanted residue on the equipment.

NOTICE	• Improper cleaning can damage the equipment. You must completely remove isopropyl alcohol from the connector or adapter. Residual liquid alcohol can act as a transport mechanism for loose dirt on the end-face. If the alcohol slowly evaporates from the ferrule, residual material from the alcohol can remain on the cladding and fiber core. The only way to thoroughly remove this residue is another wet cleaning. This second wet cleaning leaves more residue, which is usually more difficult to remove than the original contaminant. Liquid alcohol can also remain in small crevices or cavities, where it can re-emerge during fiber connection. • On female multi-fiber connectors, ensure that no alcohol seeps into the guide pin holes. The alcohol can emerge from any holes during mating and contaminate your connection. • Before you begin this procedure read the *FSP 3000R7 Safety Guide*. Observe all caution statements in this section.

Procedure

1. Make sure that all lasers are off before you begin the inspection.

⚠	**LASER RADIATION WARNING** Disconnected fibers or connectors can emit invisible laser radiation. Do not stare into beams or use optical instruments to view beams directly.

2. Remove the protective end cap and store it in a small resealable container.

3. Use a fiber scope to inspect the connector. See Cleaning Fiber-Optic Connector Plugs.

4. Fold the wipe into a square of about 4 to 8 layers thick, as shown in Figure 108.

5. Use one drop of 99% alcohol to moisten one section of the wipe. Keep a portion of the wipe dry.

6. Lightly wipe the ferrule tip in the alcohol-moistened portion of the wipe using a *figure 8* motion. Use the dry area of the wipe, and immediately repeat the wiping action to remove any residual alcohol.

NOTICE	Do not scrub the fiber against the wipe, which can scratch the endface.

7. Properly dispose of the wipe. Never reuse a wipe.

8. Use a fiber scope to inspect the connector again.

9. Repeat the process as necessary.

Using Lint-Free Swabs to Dry-Clean the Fiber Connector

NOTICE	• Clean bulkheads or receptacles only if you have a way to inspect them as you clean them. • Read the reminders and warnings before you begin this process.

Procedure

1. Make sure that the lasers are off before you begin the inspection.

⚠	**LASER RADIATION WARNING** Disconnected fibers or connectors can emit invisible laser radiation. Do not stare into beams or use optical instruments to view beams directly.

2. Remove the protective end cap and store it in a small resealable container.
3. Use a fiber scope to inspect the fiber connector in the adapter or bulkhead. See Cleaning Fiber-Optic Connector Plugs.
4. If the adapter is dirty, select the appropriate lint-free swab according to the connector ferrule size.
5. Use a fiber scope probe to inspect the connector in the adapter again.
6. Insert the clean lint-free swab into the adapter.
7. Turn the swab several complete revolutions in the same direction.
8. Properly dispose of the swab. Never reuse a swab.
9. Repeat the cleaning process as necessary.

Using Lint-Free Swabs to Wet-Clean the Fiber

| **NOTICE**	• Improper cleaning can cause damage to the equipment. You must completely remove isopropyl alcohol from the connector or adapter. Residual liquid alcohol can act as a transport mechanism for loose dirt on the endface. If the alcohol slowly evaporates from the ferrule, the alcohol can leave residual material on the cladding and fiber core. The only way to thoroughly remove this residue is another wet cleaning. The second wet cleaning leaves more residue, which is usually more difficult to remove than the original contaminant. Liquid alcohol can also remain in small crevices or cavities, where it can re-emerge during fiber connection. • On female multi-fiber connectors, ensure that no alcohol seeps into the guide pin holes. The alcohol can emerge during mating and contaminate your connection. • Do not wet-clean E-2000 or F-3000 connectors because the connector can trap alcohol and re-contaminate the connector.

Procedure

1. Make sure lasers are off before you begin the inspection.

⚠	**LASER RADIATION WARNING** Disconnected fibers or connectors can emit invisible laser radiation. Do not stare into beams or use optical instruments to view beams directly.

2. Remove the protective end cap and store it in a small resealable container.
3. Use a fiber scope to inspect the connector. See Cleaning Fiber-Optic Connector Plugs.
4. If the dry cleaning procedure does not completely remove the dirt from the fiber end-face, place one drop of 99% alcohol to lightly moisten a new lint-free swab. Do not oversaturate the swab.

🗒	Have a dry lint-free swab available to immediately dry the end-face after you clean it. Make sure that drying swab stays clean.

5. Lightly press and turn the dampened swab to clean the ferrule face.
6. Immediately after cleaning, lightly press and turn the second dry swab to dry any remaining alcohol from the ferrule face.

7. Properly dispose of the wet and dry swabs. Never reuse a swab.

8. Inspect the connector again.

Vendor-Specific Cleaning Techniques

Because of the proprietary nature of many cleaning techniques, contact the supplier for detailed information.

Cleaning MTP Fiber Cable Ends

One of the most important aspects of fiber cabling is to ensure the cleanliness of the cable ends. One speck of dust or a fingerprint can severely compromise cable transmission capability. With MTP cables, this possible hazard is compounded because of multiple fibers and channels per cable.

	• Unclean fiber can result in possible loss of service
	• Before you insert MTP connectors into OADM or breakout panel ports, use this procedure to clean them. Failure to follow this procedure can result in loss of service

Procedure

1. Use a 2.5 mm clean-room swab (See Figure 110) to clean dust and debris from the fiber termination area (See Figure 111) between the MTP alignment pins.

	You can purchase swabs shown in these figures from clean-room and optical-communications equipment suppliers.

Figure 110: Using the Clean-Room Swab

Figure 111: MTP Male Connector Tip Diagram
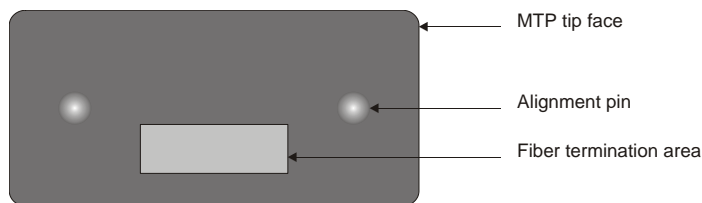
2. Use the tip of a 2.5 mm clean-room swab to clean the fiber termination area on the female MTP connector.

3. Use a fiber scope or videoscope that has an MTP tip to inspect the connectors after you clean them. Contact ADVA to obtain a list of MTP inspection equipment suppliers.

4. Mate the MTP connectors together.

Providing Internal Optical Connections

Verify these items before you interconnect modules within the same shelf, including channel-module-to-filter-module combinations and filter-module-to-filter-module combinations. Check these items before you complete internal optical connections. Ensure that:

- The cable types match your sales order.
- The SFP transceiver types match your sales order.
- If you plan to use a patch panel, you have the correct quantity and type of fiber optic cables and they match the requirements for each module.
- The fiber optic cables have the correct connectors.
- Each network or access port has one pair of fibers.

Providing External Optical Connections

Most traffic through the NE uses optical fibers for these two classes of traffic:

Type of Traffic	Optical Fibers
Client-side traffic terminates within the site.	Most of this traffic uses 850-nm or 1310-nm wavelengths. You can use single-mode fibers (SMFs) or multimode fibers (MMFs) depending on the module type.
Network-side traffic, in most cases, terminates in another ADVA NE at a different site.	For network traffic, use only SMFs.

Providing Client-Side Connections

	Before you connect fiber-optic cables, install the optical module and pluggable transceivers to the FSP 3000R7 system. After the physical installation, the module boots up. Wait about one minute until the boot up, configuration, and initialization time for protection completes. You can then connect the fiber-optic cables to the installed optical module and pluggable transceivers.

	Before you connect the fibers to the client equipment, ensure that the maximum power levels are not exceeded. For details, see the relevant module specification in the *FSP 3000R7 Module and System Specification*. Always measure channel module network port fiber power using an optical power meter before you connect the fiber.
	For each client connection in the NE, connect the client cable.

We assume that you are familiar with the ESD-prevention precautions you must take to avoid ESD damage to the equipment.

Procedure

1. Read the installation plan and identify the first module in the first shelf that has one or more defined client connections. See the individual module description in the *FSP 3000R7Hardware Description* for definitions of the connector markings.
2. Prepare the module:
    a. Remove the blind plugs from the relevant connectors.
    b. Inspect the connectors for damage. If you find any damage, do not use this connector and do not attempt to repair the damage yourself. Contact ADVA Technical Support for assistance.
3. Select a cable pair of the correct type, according to your installation plan.
4. Prepare the cable:
    a. Remove the protective cap from each end.
    b. Inspect the plug for damage. If you find any damage, replace the jumper.
    c. Use a standard cleaning kit to clean the plug. Be careful not to contaminate the surfaces after you clean the plug.
5. Connect the cable pair:
    a. Connect one fiber-optic cable to the client port marked C-T. This cable will carry transmit signals.

   b. Connect one fiber-optic cable to the client port marked C-R. This cable will carry received signals.

Providing Network-Side Connections

	Before you connect fiber-optic cables, install the optical module and pluggable transceivers into the FSP 3000R7 system. After the physical installation, the module boots up. Wait about 1 minute until the boot up, and the configuration and initialization time for protection completes. Then you can connect the fiber-optic cables to the installed optical module and pluggable transceivers.

	Before you connect the fibers to the network equipment, ensure that the maximum power levels are not exceeded. For details, see the relevant module specification in the *FSP 3000R7 Module and System Specification*.
	Complete tests that determine whether you need attentuators. Then connecting the other end of these cables to the network/dark fiber itself.
	We assume that you are familiar with the ESD-prevention precautions you must take to avoid ESD damage to the equipment.

Procedure

1. For each network port in the NE, connect the network cables as described in Procedure, Steps 1 to 5 until you are ready to connect the cables.
2. Connect the cable pair:
    a. Connect one fiber-optic cable to the network port marked N-T. This cable will carry transmitted signals.
    b. Connect one fiber-optic cable to the network port marked N-R. This cable will carry received signals.

Interconnecting OSCM and OSFM Modules

This section contains these topics:

Optical Fiber Connections

Within the network element, the network topology and location of the OSCM and OSFM modules determine the interconnection requirements for optical fiber connections. Independently of the network topology, the OSCM optical Ethernet ports connect:

- West to west (NW to NW)
- East to east (NE to NE)
- East to west (NE to NW)
- West to east (NW to NE)

> To enable Ring Group Switching (RGS) and the Topology Detection Protocol (TDP), always interconnect OSCM modules east-to-west or west-to-east.

Fiber-Optic Cable Jumpers

If fiber jumper cables do not ship with your equipment, you must build your own fiber jumpers. Use single-mode fibers (SM 9/125 µm) according to ITU-T G.652 with LC connector plugs on each end of the cable jumpers. Pay attention to the proper fiber-jumper lengths.

Using Optical Supervisory Channels

Use Optical Supervisory Channels (OSCs) for inter-node communication. The equipment that you use for the degrees determines the OSC support in these configurations:

1. Amplifier
2. Amplifier and OSCM
3. OSFM and OSCM

   The amplifier modules in this table do not require an OSCM.

Table 29: Amplifiers with Full OSC Support

Amplifier	OSC Support
MTP-OSC-C	Full support
MTPB-OSC-C	Full support
MAP-OSC-C	Full support
MAPB-OSC-C	Full support
MALP-OSC-C	Full support
MALPB-OSC-C	Full support

The amplifier modules in this table require that you connect an OSCM to the amplifier C port for OSC support.

Table 30: Amplifiers with OSC Filter and/or Attenuator

Amplifier	OSC Support
EDFA-C-S26-VGC-DM	OSC filter
EDFA-C-S26-VGCB-DM	OSC filter
RAMAN-C10	OSC filter
AMP-S20H-C15	OSC filter and attenuator
AMP-S20L-C15	OSC filter and attenuator
EDFA-S20H	OSC filter and attenuatorr
EDFA-S20L	OSC filter and attenuator

The amplifier modules in this table require an OSFM to separate the OSC signal from the traffic signals. The OSCM must connect to the OSFM C port.

Table 31: Amplifiers with OSC Filter and/or Attenuator

Amplifier	OSC Support
EDFA-C-D20-VGC-DM	None
EDFA-C-D20-VLGC-DM	None

ROADM-C40/40/2-3HU-2DC and FSP 3000R7 Master Shelf Optical Cabling

This section contains these topics:

Network Element Connections

The diagram in the next illustration shows:

- Typical internal NE cabling that uses ROADM-C40/40/2-3HU-2DCs.
- A typical signal flow through the NE when ROADM-C40/40/2-3HU-2DCs connect to the FSP 3000R7 master shelf.

In the diagram, the purpose of the ROADM-C40/40/2-3HU-2DC cabling is to add, drop, and pass signals through channels.

	If your configuration has only an add or drop channel, you do not need the U-D and U-M ports between the ROADM-C40/40/2-3HU-2DCshelves.

Figure 112: Typical NE Signal Flow with ROADM-C40/40/2-3HU-2DCs

⚠️	**ELECTROSTATIC CAUTION** We assume that you are familiar with the ESD-prevention precautions you must take to avoid ESD damage to the equipment.

ROADM-C40/40/2-3HU-2DC to FSP 3000R7 Shelf Connections

The Typical NE Signal Flow Diagram in FSP 3000R7 Module Interconnections shows the basic optical connections that you need to operate the ROADM-C40/40/2-3HU-2DC with the FSP 3000R7 shelf. Actual fiber connections vary based on how you configure each NE. See your cabling plan for instructions.

⚠️	**ELECTRIC VOLTAGE WARNING** Disconnected fibers or connectors can emit invisible laser radiation. Do not stare into beams or use optical instruments to view beams directly.

Procedure

At this location on the ROADM-C40/40/2-3HU-2DC, make these connections in this order:

Location	Connection
The west right side	Connect a fiber jumper from port U-D to port U-M on the east ROADM-C40/40/2-3HU-2DC. D ports are transmit ports, and M ports are receive ports.
The west right side	Connect a fiber jumper from port U-M to port U-D on the east ROADM-C40/40/2-3HU-2DC.
The west right side	Connect a fiber jumper from port N-D to the FSP 3000R7 west pre-amp port 1T.
The west right side	Connect a fiber jumper from port N-M to the FSP 3000R7 west post-amp port 1R.
The east right side	Connect a fiber jumper from port N-D to the FSP 3000R7 east pre-amp port 1T.
At the east right side	Connect a fiber jumper from port N-M to the FSP 3000R7 east post-amp port 1R.
At the west channel 1 port	Connect a fiber jumper from port C1-M to the FSP 3000R7 west channel module port N-T. On channel modules, R is a receive port and T is a transmit port.
At the west channel 1 port	Connect a fiber jumper from port C1-D to the FSP 3000R7 west channel module port N-R.
At the east channel 1 port	Connect a fiber jumper from port C1-M to the FSP 3000R7 east channel module port N-T.
At the east channel 1 port	Connect a fiber jumper from port C1-D to the FSP 3000R7 east channel module port N-R.

FSP 3000R7 Module Interconnections

Complete these steps to connect the individual modules in the FSP 3000R7 shelf to the for an optical supervisory channel (OSC)-based network. See the Typical NE Signal Flow Diagram in FSP 3000R7 Module Interconnections.

Procedure

On the master shelf module, make these connections in this order:

Location	Connection
2OSCM module	Connect a fiber jumper on the OSC filter west from port NW-R to OSC filter west port C-D.
2OSCM module	Connect a fiber jumper on OSC filter west from port NW-T to port C-M.
2OSCM module	Connect a fiber jumper on OSC filter east from port NE-R to port C-D.
2OSCM module	Connect a fiber jumper on OSC fFilter east from port NE-T to port C-M.
OSC filter west	Connect a fiber jumper on post-amp west port U-M to port 1T.
OSC filter west	Connect a fiber jumper on pre-amp west from port U-D to port 1R.
OSC filter east	Connect a fiber jumper on post-amp east from port U-M to port 1T.
OSC filter east	Connect a fiber jumper on pre-amp east from port U-D to port 1R.
Pre-amp west	Connect a fiber jumper from port 2T to the Dispersion Compensation Module (DCM) shelf west receive port. **Note**: If your configuration does not require the DCM shelf, ports 2T and 2R on the east and west pre-amp modules interconnect with a short fiber jumper. See your cabling plan.
Pre-amp west	Connect a fiber jumper from port 2R to the DCM shelf west transmit port.
Pre-amp east	Connect a fiber jumper from port 2T to the DCM shelf east receive port.
Pre-amp east	Connect a fiber jumper from port 2R to the DCM shelf east transmit port.

	If your configuration does not require the DCM shelf, ports 2T and 2R on the east and west pre-amp modules interconnect with a short fiber jumper. See your cabling plan.

Chapter 10

Commissioning the Shelves

This section describes the basic NE commissioning. Configure any required traffic, fault, performance, and security features after you complete the installation procedure. See the *Network Element Director (NED) Online Help* for configuration task instructions.

This section contains these topics:

Audience

This section is for service personnel and other qualified and trained personnel who commission the network element.

Required Expertise

Personnel who commission the system should have experience with the use of computers and computer software. In-depth knowledge of the FSP 3000R7 management software is mandatory. We assume that all personnel are appropriately trained to perform these procedures.

Associated Documentation

The configuration plan that contains the product commissioning information.

Required Tools and Equipment

- Information:
  - IP address
  - Net mask address
  - Default gateway address of the network element
- PC or laptop
- Terminal emulation software

Commissioning the NE

	This section provides a basic overview of the commissioning process, which you can use to remotely access the NE. You will complete the commissioning steps in the sections that follow.

	See the *Network Element Director (NED) Online Help* to complete the commissioning process.

Procedure

1. Consult the installation plan to identify the master shelf.
2. Set the shelf IDs as described in Managing the Shelf ID.
3. Connect to the NE as described in Communicating with the Network Element.
4. Start a terminal emulation program, see Using Terminal Emulation Programs.

5. Log in to the NE using the user account ADMIN with an already set valid password, or use the default password, CHGME.1A. See Logging In to the Network Element. The password is not case sensitive. ADVA recommends that you change all passwords as soon as possible.

6. To configure the basic parameters:

   a. Read the installation plan and identify the IP address, subnet mask, and default gateway specified for this NE.

   b. Enter these parameters as described in Provisioning Management Ports.

   c. Configure the SNMP settings.

   d. Configure the date and time, see Setting Date and Time.

7. Use the serial port to communicate with the NE, see Setting Up Serial Port Settings.

8. Configure Ethernet access to remotely reach the NE. See Creating Ethernet Port Settings for the NCU Ethernet Port.

9. Assign all shelves in the NE to the database maintained on the NE.

10. If an eROADM is installed, commission the eROADM, see ROADM-C40/40/OPM-3HU/2DC Commissioning.

Managing the Shelf ID

This section describes the procedures to configure the ID number for shelves using a LCD display or a 7-segment display and contains these topics:

Usage Guidelines

The FSP 3000R7 system can have one or more shelves, and each shelf in a NE must have a unique ID number. Shelf ID numbers identify specific shelves in a rack numerically and sequentially. You can specify the shelf ID number by using the arrow and Enter buttons on the front panel during initial configuration of the shelf.

- Set the shelf ID before you provision the shelf.

- Use a shelf ID must be unique for each FSP 3000R7 system.

- The shelf that houses the NCU must always be ID 1 or 01. You cannot change this ID because of the master shelf definition.

	Never change the ID number of the master shelf.

- The shelf cabling identifies successive shelves, for example, the shelf 1 SCU D port connects to the shelf 2 SCU U. Shelf 2 is then assigned ID 2 or 02. The shelf 2 SCU D port connects to the shelf 3 SCU U port. Shelf 3 is then set as ID 3 or 03, and so on.

- If you enter an incorrect shelf ID, you must unlock the incorrect ID number before you can correct the mistake. You can make this change in release 9.3 or later.

- A valid shelf ID is 1 or 01 for the master shelf and can be ID 2 or ID 02 to 26 for any other main shelf.

- If you enter an incorrect shelf ID and provision the shelf, you then need to set the shelf to management status before you can change the ID number.

- If you enter an incorrect shelf ID and cannot correct it, press and hold the Enter button for 2 minutes and then enter the correct shelf ID.

	If a shelf is already provisioned, do not change its shelf ID. If you have to change a main shelf ID at a later time, you must provision this shelf again.

Using an LCD Display to Configure Shelf ID Numbers

This section contains these topics:

The procedures in this section apply to these shelf types:

- SH9HU
- SH7HU
- 1HU shelf types with LCD display (prior types)

Figure 113 illustrates an example of the LCD shelf display and the push buttons that you use to configure the shelf ID.

Figure 113:   Example of the LCD Shelf Display
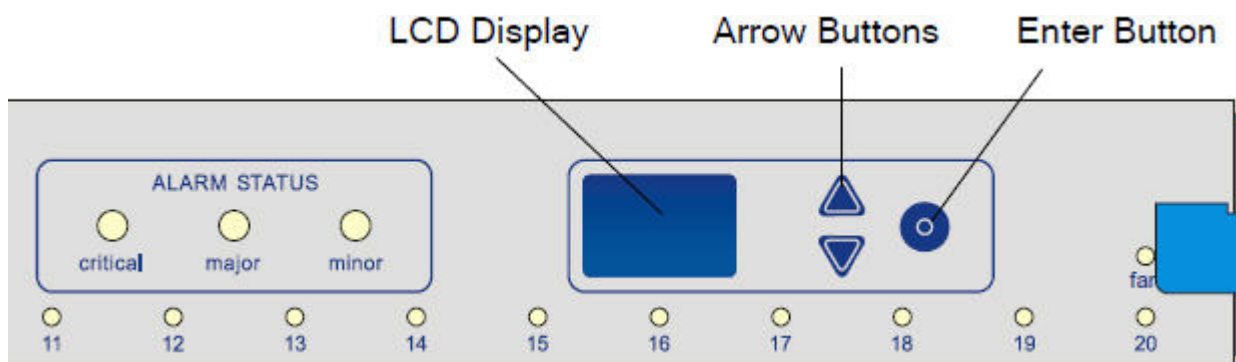
If the shelf serves as a master shelf, keep the shelf ID as 1. If you use a shelf as a main shelf that connects to a master shelf, modify the shelf ID to a number other than 1.

Unlocking the Shelf ID

Procedure

On the LCD display:

1. Press and hold the Enter button for approximately 5 seconds. After 5 seconds the service menu is available on the display.
2. Use the lower arrow button to mark the menu item **Shelf ID**.
3. Press the Enter button to confirm and open the shelf ID submenu.
4. Use the lower arrow button to move to the item **Unlock** , and then press the Enter button to confirm.
5. Use the upper arrow button to navigate to the angled arrow symbol at the top. Press the Enter button to return to the service menu.
6. Press the Enter button again to save the setting and close the service menu. The display indicates the shelf ID number that you set. If the lock symbol no longer shows on the display, the unlocking process was successful.

Setting Up the Shelf ID
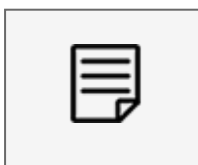
	You must set the shelf ID for each shelf. You can identify the shelf ID on display.

Procedure

On the LCD display:

1. Press the lower or upper arrow buttons until you see the applicable shelf ID number . The ID number starts blinking.
   Press and hold the Enter button for 5 seconds to verify your setting. Otherwise, after 20 seconds the shelf ID returns to its previous setting.

2. After you press and hold the Enter button for 5 seconds to confirm the number, the verification process starts and the display shows **valid** or **not valid**.

   - If the display indicates `valid` for two seconds, the verification was successful and you can see the new shelf ID number on the display.

   - If the display indicates `not valid` for two seconds, the applicable shelf ID number is already assigned to a shelf. The ID number returns to its previous ID number.

Locking the in-Service Shelf ID

	After you set the shelf ID, we recommended that you lock it. Lock the shelf ID for each shelf as you set it to avoid accidentally changing it.

Procedure

To lock the shelf ID on the LCD display:

1. Press and hold the Enter button for approximately 5 seconds. After 5 seconds, the service menu appears.

2. Use the lower arrow button to highlight the menu item **Shelf ID.**

3. Press the Enter button to open the shelf ID submenu.

4. Use the lower arrow button to move to **Lock** and press the Enter button to confirm.

5. Use the upper arrow button to navigate to the angled arrow symbol at the top. Press the Enter button to return to the service menu.

6. Press the Enter button again to save the setting and close the service menu. The display indicates the set shelf ID number.
   If the lock symbol appears at the bottom of the LCD screen, the locking operation was successful.

Using a 7-Segment Display to Configuring Shelf ID Numbers

Complete the steps in this section to unlock, set up, and lock the shelf ID for the SH1HU shelf types using a 7-segment shelf display.

These steps apply to these shelf types:

- SH1HU-HP/2DC
- SH1HU-F/2DC
- SH1HU-R
- SH1HU-R/PF

Figure 114 is an example of the 7-segment shelf display and the push-buttons that you use to configure the shelf ID. The 7-segment shelf display and the push-buttons are located on the front panel.

Figure 114: Example of the 7-Segment Shelf Display
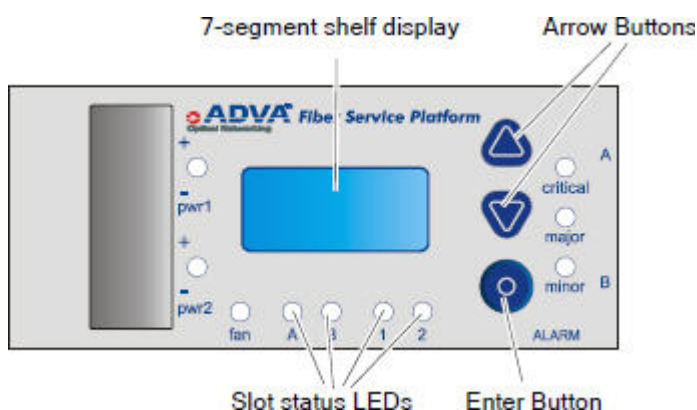
The shelf display indicates the current shelf ID number. If you press one of the arrow buttons, the display shows LOC to indicate that the current shelf ID number is locked.

If the shelf serves as a master shelf, that shelf ID must remain as 01". If the shelf serves as a main shelf that connects to a master shelf, complete these steps to modify the ID number.

Procedure

On the shelf display:

1. Disconnect the Ethernet cable or the optical patch cable from the SCU-S or SCU uplink and downlink ports. The SCU Mod LED and the shelf slot status LEDs blink yellow and then off.
2. Press the Enter button for approximately 5 seconds to unlock the shelf ID. The current shelf ID number starts blinking when it unlocks.
3. Press the lower or upper arrow button until the applicable shelf ID number appears. The applicable shelf ID number blinks.
4. Press the Enter button again for about 5 seconds to confirm and save the setting. After the number stops blinking, you know that the save was successful.

> You must press the Enter button within the next 20 seconds after you set the shelf ID or the number returns to its previous setting.

5. Verify that the setting on the shelf display is correct. The configured shelf ID number automatically changes after a few seconds. You will see the previous shelf ID number on the display at first, and then a few seconds later this number changes to the current shelf ID number that you just set. While the ID numbers are in transition, the SCU Mod LED and the shelf slot status LEDs blink yellow and then turn off.

6. Reconnect the Ethernet cable or the optical patch cable to the SCU-S or SCU uplink downlink ports. As soon as you reconnect the cable, the applicable shelf ID number is automatically locked.

Communicating with the Network Element

This section describes how to connect a management PC to the network element (NE) using either a serial cable with an SUB-D9 RS-232, USB connectors, or an Ethernet cable. This section contains these topics:

Connecting a PC to the Serial Interface

This section describes how to establish a direct serial connection to the FSP 3000R7 NCU.

Required Tools and Equipment

- A management PC or laptop with:
  - Windows or Linux operating system
  - An available RS-232 serial port
- A null modem cable such as Laplink

Procedure

1. Connect one end of the serial null modem cable to an available SUB-D9 RS-232 port on the management PC.

2. Connect the other end of the serial null modem cable to the SUB-D9 port marked Ser on the NCU.

Connecting a PC to the USB Interface

Complete the steps in this section to establish a USB serial connection to the FSP 3000R7 NCU. If you use management computers running Windows, a USB driver is required for both the USB device and the USB bridge.

Required Tools and Equipment

- A management PC or laptop with:
    - Windows or Linux operating system
    - An available USB port
- A USB cable with a standard USB connector on one end and an A plug 5-pin mini USB connector on the other end.
- The FSP 3000R7 USB driver, available on the user documentation CD.

> The first time you use a USB cable to connect this management computer to the NCU, if you are running a windows operating system, you need a USB driver for your computer USB device. If you previously used a USB cable on this management computer, these steps are unnecessary.
>
> The term *NCU* refers to the NCU-3, NCU-II, NCU-II-P, and NCU-S modules.

Procedure

1. To install the USB driver, insert the documentation CD and double-click the USB Driver.zip file.
2. Extract the files for your driver to your management computer. These instructions assume that the driver files are saved to the C:\ directory.
3. Connect one end of the USB cable to an available USB port on the management PC.
4. Connect the other end of the USB cable to the NCU USB port labeled USB1.

A wizard window opens to guide you through the process to install new software on the management computer and install the USB driver for the USB bridge and the USB device.

5. Install the USB driver for the USB device. Select **No, not this time** to inform the wizard to not connect Windows to Windows Update. Then click **Next**.

6. In the next wizard window, select **Install from a list or specific location** and click **Next**.
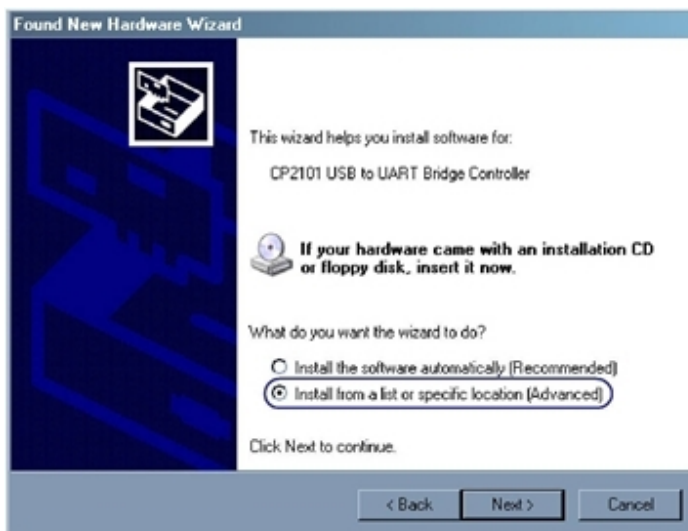
7. After the prompt to choose your search and installation options, select the **Search for the best drivers in these locations**.
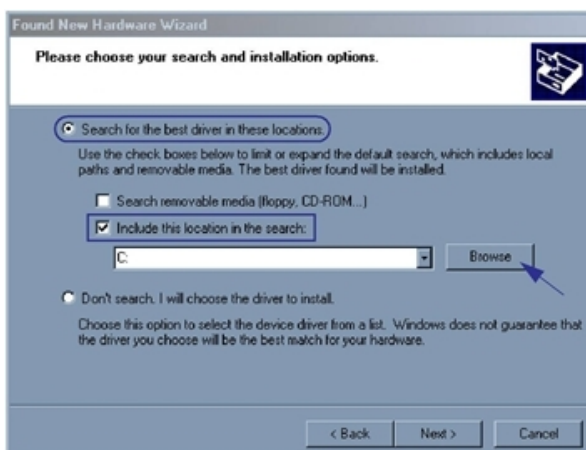
8. In the same window, select **Include this location in the search**. Click **Browse** to open the Browse for Folder window.
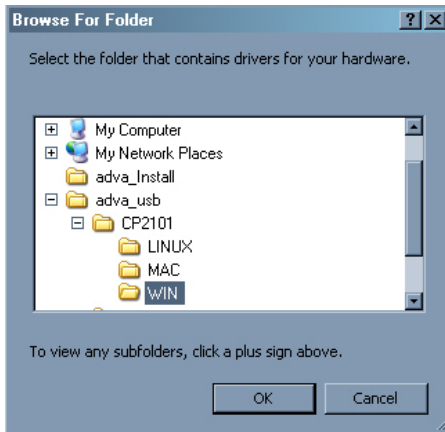
9. Select the C\: directory as specified in Step 2 to access the corresponding folder for the operating system your computer uses: WIN for Windows, MAC for Macintosh or LINUX.

10. Click **OK** to return to the wizard.

11. In the next wizard window click **Next**.

12. Select **Finish** to complete the installation.

Continue with these steps.

1. Verify the availability of the new device as described:
    a. At your PC, select **Start** > **Control Panel** > **System**.
    b. Select the **Hardware** tab.

c. Select the **Device Manager** button and this window opens:
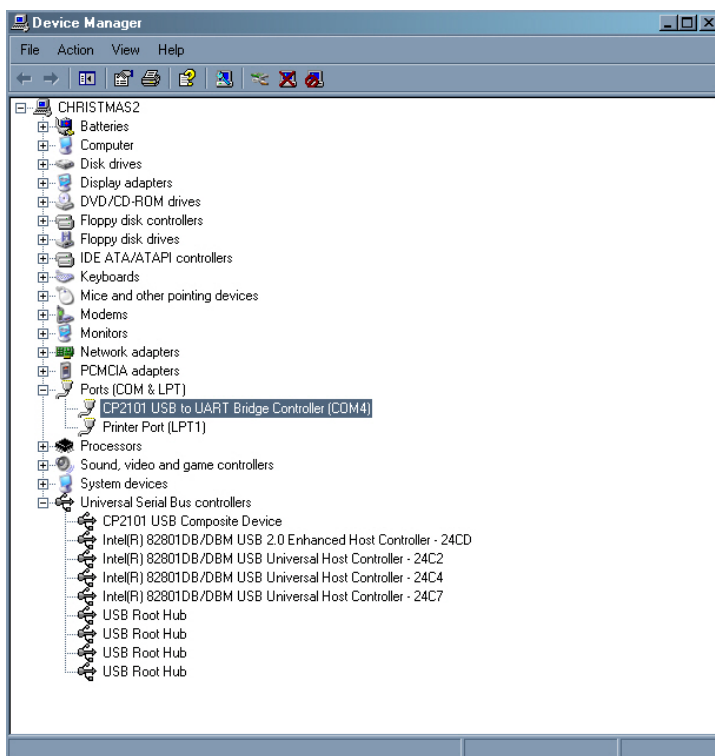
d. Expand **Ports (COM & LPT)**.

- If the CP2101 USB to UART Bridge Controller (COMx) appears, the driver was successfully installed. In this example, the virtual port COM4 is used.

- If the driver is not shown, repeat the previous installation procedure steps starting at step 1.

2. After you connect the cable and the USB driver is successfully installed, you can access the NE using a terminal emulation program. For more information, see Using Terminal Emulation Programs.

Directly Connecting a PC to the Ethernet Interface

Complete the steps in this section to establish a direct Ethernet connection between the management computer and the NE. For this connection to be successful, the management computer IP address must be in the same range as the NE IP address. See the *Network Element Director (NED) Online Help* for details.

	The term *NCU* refers to the NCU-3, NCU-II, NCU-II-P, and NCU-S modules.

Required Tools and Equipment

- A management PC or laptop with:
    - Windows or Linux operating system
    - An Ethernet port
- An Ethernet cable
- Knowledge of the NE IP address

Procedure

1. Connect one end of the Ethernet cable to an Ethernet port on your management PC.
2. Connect the other end of the Ethernet cable to one of these ports on the NE. If the NE has a:
    - NCU-II, connect to C1 or C2 RJ45 Ethernet port
    - NCU-II-P, connect to C1, C2, or C3 Ethernet port
    - NCU-3, connect to C1, C2, or C3 Ethernet port
    - NCU-S, connect a mini USD cable to the USB port
3. Ensure that your management computer IP address is in the same range as the NE IP address. This table lists these addresses must correspond if the NE IP address is still set to the factory default address.

Table 32: NE and Management PC IP Addresses

Default IP Addresses for the NE		IP Addresses for the Management PC
mini USB-port for NCU-S	192.168.1.1	192.168.1.x /24 subnet; x = 2 to 254
C2-port for NCU-II	192.168.2.1	192.168.2.x /24 subnet x = 2 to 254
C3-port for NCU-II-Pand NCU-3	192.168.3.1	192.168.3.x /24 subnet x = 2 to 254

If the management PC IP address is in the same IP range as the NE IP address, this procedure is complete.

If the management PC IP address is in a different IP range from the NE IP address, you will not be able to access the NE using the Ethernet connection. You must change the management PC IP address. See Finding the NE IP Address, if necessary.

Finding the NE IP Address

Complete these steps to find the IP address of the NE.

Required Privileges

You must log on with a user account that has Admin privileges.

Procedure

1. First check your planning documentation. The IP address is defined with the installation. If you cannot find this information or it is unavailable, you must use a serial cable to access the NE the first time.

2. To make a serial USB connection, see Connecting a PC to the USB Interface.

3. Log in to the NE.

4. You can find the IP addresses of the NE on the craft console main menu:

   - Select **System Management** > **System IP Settings**.

   - Select **Service Management** > **SHELF** > **MOD-1A (NCU)**. For each assigned dependent entity, look in the **Config** tab.

Connecting a PC to the NE Ethernet Interface

Complete the steps in this section to establish an Ethernet connection between the management computer and the NE. For this connection to succeed:

- The NE must have correct IP addresses.

- The necessary routes must be set up in the network so that the NE and the management computer can reach each other.

Required Tools and Equipment

- A management PC or laptop:
  - Running a Windows or Linux operating system.
  - Must connect to and be configured to operate on the Ethernet network.

- If necessary for the two devices to reach each other, the network administrator must first establish network routes.

Procedure

1. Ensure that your management PC connects to its local IP network.

2. Connect one end of the Ethernet cable to the NE NCU module RJ45 Ethernet port labeled C, C1, or C2. See the *Network Element Director (NED) Online Help* for information about how to make this connection using the UTM.

3. At the installation site, connect the other end of the Ethernet cable to the local IP network. This step completes the connection to the NE using the network Ethernet connection.

Changing a Master Shelf to a Main Shelf

To change the master shelf to a main shelf, first turn off any telemetry alarms, which the CEM/9HU front panel telemetry port LEDs indicate. Then remove the NCU. These LEDs are set using relay contacts. If they are not reset before changing the master shelf, they remain on when the new main shelf is powered on.

NOTICE	The conversion of a master shelf to a main shelf is an out-of-service traffic-affecting event.

Figure 115:   Alarms on CEM/9HU Front Panel
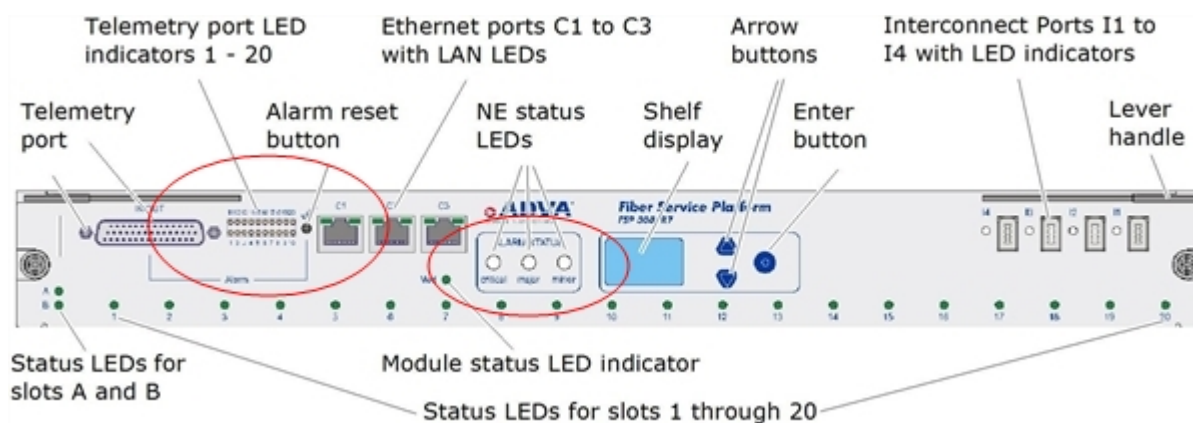
Procedure

1. Remove the telemetry alarm cable from the CEM/9HU, if connected.

2. Check to see if any telemetry port or NE status LED indicators are illuminated. If not, go to Step 4.

3. On the module, press the alarm reset button to clear the remaining LED indicators.

4. Remove the NCU from the master shelf. The master shelf is now a main shelf.

5. Insert SFPs into the main shelf SCU if the SCU currently contains no SFPs. If it does, proceed to the next step.

6. Connect the SCU patch fiber to the SCU main shelf. See Interconnecting 9HU, 7HU, and 1HU Shelves using SCU-II or SCU-S Modules.

7. Set the shelf ID number on the new main shelf. See Managing the Shelf ID.

8. Address any firmware mismatch alarms on the new main shelf.

9. The main shelf is ready to provision services.

Using Terminal Emulation Programs

ADVA recommends that you use PuTTY for login. PuTTY is a more secure way to access the NE because of its Secure Shell protocol (SSH) support with an encrypted communication protocol.

📑	After 15 minutes of inactivity, the craft console automatically closes, and the terminal emulation session terminates. The craft console initiates this log out process, rather than the Linux operating system initiating the log out. You can configure this timeout period.

This section contains these topics:

Creating a Serial PuTTY Connection

Complete these steps to use the terminal emulation program PuTTY to access the NE through a serial connection.

PuTTY is free available at no charge here:

> http://www.chiark.greenend.org.uk/~sgtatham/putty/download.html.

Procedure

📑	You can create a keyboard shortcut, which shows the 🖧 icon, to open the PuTTY window.

1. To start PuTTY, double-click the putty.exe file or by click the 🖧 icon. The PuTTY Configuration window opens.
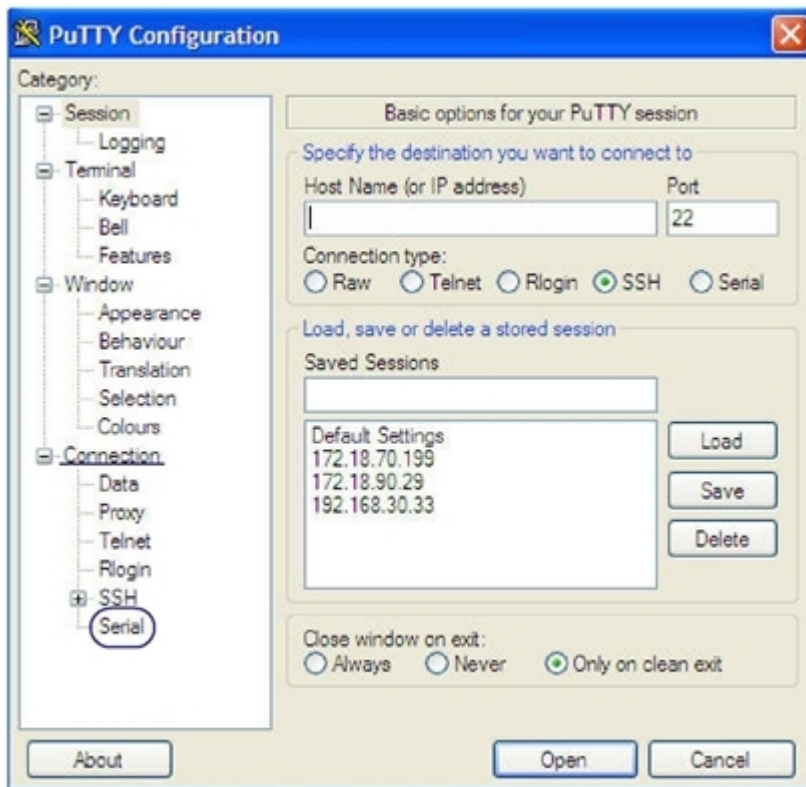
In this window, you can control the PuTTY actions. You might need to change only some configuration options.

2. Select **Category**, **SSH**, **Serial**.

3. To determine which COM port your PC uses, on your PC:

    a. Select **Start** > **Control Panel** > **System**.

    b. Select the **Hardware** tab.

    c. Select **Device Manager**.

4. In the **PuTTY** window, in the **Select a serial line** area, **Serial line to connect to** field, select the COM port your PC uses.

5. In the **Configure the serial line** area, set these parameters:

    a. **Speed (baud)** field, enter the bits per second. The baud rate for the NCU-3 is 115200. All other NCUs have a baud rate of 19200.

    b.   **Data bits**, 8.

    c. **Stop bits**, b.

    d. **Parity**, None.

    e.   **Flow control**, None.

6. Click **Open** to start the serial connection to the network element.

Using SSH to Create a PuTTY Connection

Complete these steps to use PuTTY with the SSH protocol to access the NE, through an Ethernet connection.

	To use PuTTY, you need the IP address of your FSP 3000R7 unit.

PuTTY is available at no charge here:

> http://www.chiark.greenend.org.uk/~sgtatham/putty/download.html.

Generate the SSH2 RSA and DSA keys before you use PuTTY with the SSH protocol. The first time you access the NE using the craft console over a serial line, the system automatically generates these keys.

To force key generation on the NE, at the command prompt type:

```
/etc/init.d/sshd force_keygen
```

Procedure

	You can create a keyboard shortcut, which shows the icon, to open the PuTTY window.

1. To start PuTTY, double-click the putty.exe file or click the [icon] icon. The **PuTTY Configuration** window opens.

   You can set PuTTY actions in the **PuTTY Configuration** window and for the most part, might only need to change some of the configuration options.

2. In the **Specify the destination you want to connect to** area, **Connection type** field, select **SSH**.
   After you change the selected connection type, the number in the **Port** field changes because servers usually provide different protocols on different network ports. The FSP 3000R7 uses standard port numbers, and you do not need to change the **Port** setting.

3. To set up the SSH protocol type, select **Category**, **Connection**, **SSH**.

4. In the **Protocol**, **options**, **Preferred SSH protocol version** field, select **2 only**.

5. To optimize the appearance of the menus in the craft console:
   a. Select **Connection**, **Category**, **Data**.
   b. In the **Terminal details** area, **Terminal-type string** field, type **vt100**.

6. To save the PuTTY settings:
   a. Select **Category**, **Session**.
   b. In the **Load, save or delete a session** area **Saved Sessions** field , enter a name for your PuTTY configuration, for example SSH.
      Or, in the **Saved Sessions** list, select **Default Settings** to set this configuration as the default.
   c. In the **Load, save or delete a session** area, click **Save**.

If you have no specific NE that you want to store the connection details for, create a saved session as follows.

1. Select **Category**, **Session**.

2. In the **Host Name** field, enter the IP address of the NE.

3. In the **Load, save or delete a session**area, **Saved Sessions** field, enter a name for this host and PuTTY configuration.

4. In the **Load, save or delete a session** area, click **Save**.

Starting an Existing PuTTY Session

This section describes how to start a PuTTY connection that you previously created and saved.

Procedure

📄	You can create a keyboard shortcut, which shows the ⬚ icon, to open the PuTTY window.

1. To start PuTTY, double-click the putty.exe file, or click the ⬚ icon.

2. In the **Saved sessions** list, double-click the session you want to open. If this session has an previoulsy-defined IP address , PuTTY automatically establishes the connection.
   If you are connecting to an NE using SSH for the first time, this PuTTY Security Alert appears:

> This message warns you about a possible network attack known as spoofing, which secretly redirects you to a different computer, and you inadvertently send your password to the incorrect machine. To prevent spoofing attacks, the SSH protocol requires that each server that supports SSH has a unique identifying code — a host

key. If PuTTY registers a host key that differs from the expected one, the server might have been switched and a spoofing attack might be in progress.

However, when you connect to a server you have not connected to before, PuTTY cannot determine whether the host key is the right one. The warning shown previously is displayed so that you can decide whether to trust this host key.

3. If you are certain that this NE is correct, click **Yes**. If not, click **No**. If you click
   - **Yes**, you can access the NE login prompt. The process adds this NE host key to the registry so that you will not see this warning the next time you connect to this NE.
   - **No**, you can access the NE but the process does not add this NE host key to the registry. Therefore you will see this warning again the next time you connect to this NE.

Logging In to the Network Element

Before you can configure and monitor the NE, you must first log in to the NE for authentication. To change the access rights to the NE, first log off, and then log in with the appropriate user account and password.

Procedure

1. At the login prompt, enter the relevant user account name.
   When the NE is in its initial state, the factory default user accounts are ADMIN, PROVISION, OPERATOR, MONITOR.
2. Type the relevant password.
   When the NE is in its initial state, the password for all factory default user accounts is CHGME.1A.
   After you enter the appropriate user name and password, the craft console becomes available.

Provisioning Cable Connection

	Cable provisioning applies only for management systems, for example, Siemens TNMS, and not for the FSP 3000R7 equipment operation. You do not need to provision the cables you use with the FSP 3000R7.

The FSP 3000R7 equipment uses cables to interconnect. You can register these physical connections in the NE database. For that reason, you must enter the access identifier (AID) addresses for all cable connections. See the *Network Element Director (NED) Online Help*.

NOTICE	If you use third-party equipment, make sure you have the installation information and cabling plan available.

Procedure

1. Identify the first cable described in the cabling plan. Write down or make a note of the starting and ending modules and ports.

2. Use the craft console or NED management tools to select the module for the cable starting point, which you identified in the cabling plan.

📝	Use the craft console for first time installation and commissioning using a serial connection. For information on management tools, see the *Network Element Director (NED) Online Help*.

3. Select the **Config** tab.

4. To create a physical connection for the module, select **Connections**, **Create Connection**. See the *Network Element Director (NED) Online Help* for details.

5. Enter the AID addresses for the cable starting and ending points.

6. Select **Equipment Connection** to specify a two-way or one-way connection, if relevant. See the *Network Element Director (NED) Online Help*.

7. Click **Apply** to save your settings.

8. Identify the next cable described in the cabling plan. Make a note of the starting and ending modules and ports.

9. Repeat the previous relevant steps.

10. Continue to repeat the relevant steps until you enter all cables in the NE database. See the **PTP & Physical Connections Table** located in the NE database.

Setting Date and Time

Complete the steps in this procedure to manually set the time, date, and time zone of the NE. The procedure applies to both a first time configuration and later changes.

📝	You must first enable and configure NTP synchronization on the NE before you can perform operations such as scheduled equalization of ROADMs.

Any action that changes the date and time results in an entry in the event log, which indicates whether the change was because of one of these events:

- A manual change, including the user account that made the change.

- An NTP step correction.

- A daylight saving time action.

When an NTP step correction occurs, the NTP daemon automatically restarts internally. This action raises an NTP Not Synchronized alarm, which clears after a short time span. Raising this alarm is a normal reaction and conforms to the standard RFC 5905 §11.2.3, as follows.

> "STEP means the offset is less than the panic threshold, but greater than the step threshold STEPT (125 ms). In this case, the clock is stepped to the correct offset, but since this means all peer data have been invalidated, all associations MUST be reset and the client begins as at initial start."

We recommend that you change the date and time of the NE, either directly using the time zone, or with changes to the NTP configuration when you commission the system.

	Any action that changes the time and date can affect the performance records in a system that is already running.

For example, if you change the date and time of the NE after it is already in operation, the performance record intervals that the system gathered when the time changed will be incomplete. Those performance records will be marked as invalid. Additionally, if you set the time back in an already operating system, multiple performance records will have the same timestamp. To avoid confusion, we recommend that you retrieve performance records from the NE that the system already collected before you change the time. However, multiple performance records with identical timestamps will still be listed chronologically, in the order they were gathered, to ease confusion.

	If you configure the NE to operate as an NTP client, which means you set NTP mode to Client or Relay, the system uses NTP to synchronize the time. You will not be able to manually set the time or date for this NE. However, you can change the time zone.

Requirements

- Before you change the date, time, or time zone in an already operating system, retrieve the performance record history from the NE. Collect all performance records and store them in a safe place before you complete this procedure. Use the FSP Network Manager to collect performance records.

- You must log in on with an ADMIN-level user account to complete this procedure.

Procedure

1. From the craft console main menu, select System Management.

```
– System Management
```

```
                              . System General Settings
                              . System OSPF Settings
                              . System IP Settings
                              . Logical Interfaces
                              . System Date & Time
                              . SNMP Configuration
                              . Software & Database Control
                              + Profiles
                              + Scheduled Actions
```

2. Select **System Date & Time**.

```
+------------------------- System Date & Time ---------------------------+
|| 1 General | 2 Fault |                                                  |
||          +--------------------------------------------------------+|
|| NTP Operation:                      [Server ]                       ||
||                                                                     ||
|| Date (yyyy-mm-dd):                  [2012-06-26 ]                    ||
|| Time (hh:mm:ss on a 24 clock):      [00:29:23 ]                     ||
|| Time Zone:                          [MET              ]             ||
||                                                                     ||
|| Time Difference from GMT (hh:mm:ss):  01:00:00                      ||
|| Daylight Savings Time:                Automatic Adjustment          ||
||                                                                     ||
||                                                                     ||
||  IP        Own IP  Admin State Synchr. Status Last Check Status     ||
|| +------------------------------------------------------------------+ ||
|| |172.27.3.1 Default In Service  No Data       Idle                 | ||
|| |                                                                  | ||
|| |                                                                  | ||
|| +------------------------------------------------------------------+ ||
|| [  Add   ] [ Config  ] [ Delete  ] [Check NTP Servers]             ||
|| [ Cancel ] [ Refresh ] [  Apply  ]                                 ||
||                                                                     ||
|+---------------------------------------------------------------------+|
------------------------------------------- 2012-06-26 00:29:53 MEST
```

3. Select the **Time (hh:mm:ss on a 24 clock)** field, and use the syntax hh:mm:ss and 24-hour time to edit this setting.

4. Select the **Time Zone** field.

5. In the Time Zone list, navigate to and select the relevant time zone. The options are country names, city names, or GMT+<offset>, where offset is the applicable offset from GMT.
    GMT+x represents a time zone west of Greenwich and GMT–x represents a time zone east of Greenwich. Daylight saving time rules are in effect as applicable.

6. Click **Apply**.

7. Ensure that your time zone settings are correct. If you enter a country or city, the resulting offset from GMT appears in the **Time Difference from GMT** field. The **Daylight Savings Time** field indicates if DST is in effect.

Defining NTP Servers

Many carrier and enterprise networks use NTP to synchronize their system clocks. Complete the steps in this section to specify remote NTP servers that the NE will use to synchronize its clock:

- Create new remote NTP server configurations — see Steps 5 through 10
- View or edit existing remote NTP server configurations — see Steps 11 through 16
- Delete an existing remote NTP server configuration — see Steps 17 through 22
- Check the availability of a configured remote NTP server — see Steps 23 through 27

NOTICE	• Before you change the date, time, time zone, or NTP configuration in an already operating system, retrieve your performance record history from the NE. Collect all performance records and store them in a safe place before you complete this procedure. Use the FSP Network Manager to collect performance records. • You must log in with a user account that has ADMIN privileges.

Procedure

1. From the craft console menu, select **System Management**.

```
        - System Management
            . System General Settings
            . System OSPF Settings
            . System IP Settings
            . Logical Interfaces
            . System Date & Time
            . SNMP Configuration
            . Software & Database Control
            + Profiles
            + Scheduled Actions
```

2. Select **System Date & Time**.

```
+-------------------------- System Date & Time ----------------------------+
|| 1 General | 2 Fault |                                                    |
||           +-----------------------------------------------------------+|
|| NTP Operation:                       [Relay  ]                        ||
||                                                                       ||
|| Date (yyyy-mm-dd):                    2013-06-20                       ||
|| Time (hh:mm:ss on a 24 clock):        02:51:43                         ||
|| Time Zone:                           [GMT+0100       ]                 ||
||                                       timezone 0100 East of Greenwich  ||
|| Time Difference from GMT (hh:mm:ss):  01:00:00                         ||
|| Daylight Savings Time:                Manual Adjustment                ||
||                                                                       ||
||                                                                       ||
||  IP           Own IP  Admin State Synchr. Status Last Check Status    ||
|| +-----------------------------------------------------------------+ ||
|| |172.18.70.15  Default In Service  Discarded      Fail             | ||
```

```
|| |172.18.70.253 System  In Service  System Peer    Pass                  | ||
|| |                                                                       | ||
|| +----------------------------------------------------------------------+ ||
|| [   Add   ] [ Config  ] [ Delete  ] [Check NTP Servers]                    ||
|| [ Cancel ] [ Refresh ] [  Apply  ]                                         ||
||                                                                            ||
|+---------------------------------------------------------------------------+|
NE250_DOKU  --------------------------------  2013-06-20 02:52:18 GMT+1
```

3. Navigate to the **NTP Operation** field and press Enter to display list with these options:

NTP Operation	Definition
Disable	Time synchronization using NTP is disabled.
Client	The NE operates as an NTP client and receives its timing information from a remote NTP server.
Server	The NE operates as an internal NTP server. You must manually set the date, time, and time zone for this NE. The NE uses the local hardware clock as time reference. Internal NEs that operate as NTP clients can use this NE as their NTP server.
Relay	The NE operates as an internal NTP server for the internal NEs and the NTP clients. This NE is an NTP client to a remote NTP server, which is relevant for a gateway NE. The NE relays the timing information from the remote NTP server to the NEs within the network.

4. In the **NTP Operation** list, navigate to the relevant mode and press Enter to select that mode. Existing NTP servers display in the NTP Operation field list. You can create up to three NTP servers. If multiple NTP servers display in the list, the NE uses the closest available NTP server.

5. To configure a new remote NTP server, select **Add** . The Add: NTP Server window appears:

```
+---------------------------- Add: NTP Server -----------------------------+
|| 1 General | 2 Fault |                                                   |
||           +----------------------------------------------------------+|
|| IP Address:         [  0.  0.  0.  0 ]                                 ||
|| Source IP Address: [Default]                                          ||
|| Admin State:       [In Service]                                       ||
||                                                                       ||
|| [  Back   ] [ Refresh ] [  Apply  ]                                   ||
||                                                                       ||
||                                                                       ||
|+---------------------------------------------------------------------+|
NE250_DOKU  --------------------------------  2013-06-20 02:57:15 GMT+1
```

6. In the **IP Address** field, type the IP address of the remove NTP server. Press ENTER.

7. In the **Source IP Address** field, select **Default** or **System**.

    The NE sends requests using the IP address that you select. The NE will automatically use **Default** if the NTP server address is not registered in the routing table.

    > If you select **Default**, the packets that transmit from the NCU will be assigned the interface IP address as the source address. The term NCU refers to the NCU-3, NCU-II, NCU-II-P, and NCU-S modules.

8. In the **Admin State** field, select **In Service** or **Disabled**.

    To set the NTP server to be available, select **In Service**.

9. Select **Apply** to save your settings and this message appears.

    ```
    +--------------------------------+
    |                                |
    | Entity was successfully created. |
    |                                |
    |              [   OK    ]       |
    |                                |
    +--------------------------------+
    ```

10. Select **OK**. The new NTP server will display in the list of configured NTP servers.

Continue with these steps.

11. To view or edit a configured remote NTP server, navigate and select the relevant remote NTP server that appears in the configured remote NTP servers list.

12. On your keyboard, press **i** to select **Config** to view or edit the selected remote NTP server parameters.

    ```
    +---------------------Remote NTP Server 172.18.70.253---------------------+
    || 1 General | 2 Fault |                                                  |
    ||          +---------------------------------------------------------------+|
    || Admin State:         [In Service]                                      ||
    ||                                                                        ||
    || Source IP Address:    System                                          ||
    || NTP Synchronization:  System Peer                                     ||
    ||                                                                        ||
    ||                                                                        ||
    || [  Back   ] [ Refresh ] [  Apply  ] [Check NTP Server]                ||
    ||                                                                        ||
    ||                                                                        ||
    ||                                                                        ||
    |+----------------------------------------------------------------------+|
    NE250_DOKU  --------------------------------- 2013-06-20 03:00:41 GMT+1
    ```

13. Edit or check these remote NTP server parameters, if required:

   - Select the **Admin State** field or **Source IP Address** field and select the relevant option.
   - Select **Check NTP Server** to verify whether this remote NTP server is available. This message appears: Please wait a moment! followed by a window that shows the result of the verification.

14. Select the **Fault** tab to view fault information related to the NTP server.
    Select **Severities** to review and edit the condition severities for this remote NTP server. The conditions display in a window. Select the relevant condition and press ENTER.

15. Select **Apply** to save your settings.

16. Select the **General** tab to return to the main System Date & Time window.

17. To delete a remote NTP server configuration:

18. Navigate to and select the relevant remote NTP server in the configured remote NTP servers list.

19. On your keyboard, press e to select Delete. This action deletes the selected remote NTP server. This window appears.

```
+-------------------------------------------------------------+
|                                                             |
| Are you sure you want to destroy the 172.18.70.253 NTP Server? |
|                                                             |
|                    [   OK    ] [ Cancel  ]                  |
|                                                             |
+-------------------------------------------------------------+
```

20. Select **OK** to confirm the deletion. This confirmation window appears:

```
+------------------------------------+
|                                    |
| The entity was successfully deleted. |
|                                    |
|              [   OK    ]           |
|                                    |
+------------------------------------+
```

21. Select **OK**.

22. The deleted remote NTP server no longer appears in the list of configured remote NTP servers. To check the availability of all the configured remote NTP servers:

23. To check the availability of all the configured remote NTP servers:

24. Select **Check NTP Servers**. This message appears:
```
+---------------------------------+
|                                 |
```

```
| This will take few seconds      |
| Are you sure you wish to continue? |
|                                 |
|     [   OK    ] [ Cancel  ]     |
|                                 |
+---------------------------------+
```

25. Select **OK** to start the verification process.

    After you select OK, the verification process immediately starts, which can take a few seconds. While the process is running, the status appears in this window, where you can cancel the operation if needed:

```
+-------------------------------+
|                               |
|     Please wait a moment!     |
|                               |
|                               |
|         [ Cancel  ]           |
|                               |
+-------------------------------+
```

After a few seconds, the result window appears. All configured remote NTP servers are shown. Their status of availability for time synchronization also appears. An available server indicates success. An unavailable server indicates could not get time.

```
+----------------------------------------+
|                                        |
| Result of check:                       |
| 1. NTP Server 1.0.0.1: could not get time |
| 2. NTP Server 1.0.0.2: success         |
|                                        |
|                                        |
|              [   OK    ]               |
|                                        |
+----------------------------------------+
```

26. Select **OK** to return to the System Date & Time window.

27. Select **Apply** to save your settings.

28. Select **Cancel** to return to the craft console main menu.

Provisioning Management Ports

This section contains these topics:

Setting Up Serial Port Settings

Complete these steps to set up the serial line that communicates with the NE. See the *Network Element Director (NED) Online Help* for details.

📝	If you change the default value of the baud setting, you will not be able to perform the emergency password reset.

Procedure

1. From the craft console main menu, navigate to **Service Management**.
2. Select **Shelf 1 SH7HU** and then **Mod-1-A-NCU**.
3. Select **LINK-1-A-SER SERIAL**.

```
- FSP 3000R7
   + Service Overview
   - Service Management
     - SHELF-1 SH7HU
       . SHELF-1 SH7HU
       . FCU-1 FCU7HU
       + MOD-1-1 PSU7HU-AC
       + MOD-1-3 VSM
       + MOD-1-4 4TCC2G5
       + MOD-1-5 4TCC10G-D
       + MOD-1-6 4TCC2G5
       + MOD-1-7 2TCA2G5
       + MOD-1-9 8TCE2G5-D
       + MOD-1-10 WCA2G5
       + MOD-1-12 WCA2G5
       - MOD-1-A NCU
         . MOD-1-A NCU
         . LINK-1-A-SER SERIAL
         . SC-1-A-C LANIP
         . LINK-1-A-1 [UAS]
```

4. Select the **Config** index tab and this window appears:

```
+------------------------- LINK-1-A-SER, Serial ----------------------------+
|| 1 State | 2 Fault | 3 Config | 4 Info |                                  |
|+-----------------+        +-------------------------------------------+|
|| Facility Type: Serial                                                  ||
|| Alias:         [                                  ]                    ||
|| Rate:          [19200 ]                                                ||
||                                                                        ||
|| [ Cancel  ] [ Refresh ] [  Apply  ]                                    ||
||                                                                        ||
||                                                                        ||
||                                                                        ||
|+------------------------------------------------------------------------+|
```

5. Navigate to the **Rate** field to display a list of options.

6. Select the required baud rate. The recommended setting is 19200.

7. Select **Apply** to save your settings.

Creating Ethernet Port Settings for the NCU Ethernet Port

Procedure

Review your the DCN plan for how the configuration will use the interfaces. If the DCN plan shows that the configuration will use numbered interfaces, ensure that the planned IP addresses for the loopback IP interface, the Ethernet IP interfaces, and the PPP IP interfaces are unique. The configuration process will deny non-unique IP addresses.

For a numbered interface, first provision the IP address and subnet mask. An unnumbered interface re-uses the system IP address and subnet mask. All unnumbered interfaces share the same values. Only one Ethernet IP interface can be unnumbered at any one time.

1. In the craft console main menu, navigate to **Service Management**.

2. Select **Shelf 1 SH7HU** and then **Mod-1-A-NCU**.

3. If the Ethernet IP interface — SC-1-A-C-LANIP, SC-1-A-C1-LANIP, or SC-1-A-C2-LANIP — is unassigned (UAS): go to Step 16.

4. Select the Ethernet IP entity, either SC-1-A-C-LANIP, SC-1-A-C1-LANIP, or SC-1-A-C2-LANIP.

```
- MOD-1-A NCU
  . MOD-1-A NCU
  . SC-1-A-C LANIP
  . LINK-1-A-SER SERIAL
  . LINK-1-A-1 [UAS]
  . LINK-1-A-2 [UAS]
  . LINK-1-A-3 [UAS]
  . LINK-1-A-4 [UAS]
  . LINK-1-A-5 [UAS]
```

5. Select the **Config** tab. This screen appears:

```
+--------------------------- SC-1-A-C1, IP LAN ---------------------------+
|| 1 State | 2 Fault | 3 Config | 4 Info |                              |
|+-----------------+        +-----------------------------------------+|
|| Facility Type:        IP LAN                                        ||
|| Rate[Mbps]:           100                                           ||
|| Duplex Mode:          Full                                          ||
|| IP Configuration:     Numbered                                      ||
|| Alias:                [                                   ]        ||
|| IP Address:           [172. 18. 77.250 ]                           ||
|| IP Mask:              [255.255.240.  0 ]                           ||
|| OSPF Routing:         [Enable ]                                     ||
```

```
|| Routing Metric:          [100   ]                                    ||
|| Data Rate:               [100 Mbps]                                  ||
|| Auto Negotiation:        [Disable]                                   ||
|| Duplex Mode:             [Full]                                      ||
|| Priority:                [1   ]                                      ||
|| OSPF Authentication:     [None  ]                                    ||
|| OSPF Authentication Key: [                  ]                        ||
|| OSPF Area:               [OSPFAREA-0.0.1.15  ]                       ||
||                                                                      ||
|| [ Cancel  ] [ Refresh ] [  Apply  ]                                  ||
||                                                                      ||
|+----------------------------------------------------------------------+|
NE250_DOKU  ----------------------------------  2013-08-22 21:21:58 GMT+1
```

6. Enter the planned IP address and IP subnet mask.

7. If relevant, enter an alias for this interface.

8. If you plan to use the OSPF protocol for dynamic routing on this interface:

   - Enable OSPF routing.

   - Enter the OSPF routing metric.

   - The default routing metric is 100, regardless of the IP interface bandwidth. The higher this number is, the higher the route cost is.

   - Enter the OSPF area.
     The area ID can differ for different IP interfaces. If you configure multiple area IDs, the NE becomes an Area Border Router. One of the IP interfaces must connect to and be assigned to the backbone area ID 0.0.0.0. You can change the area ID only while OSPF is disabled.

9. If required, change the auto negotiation setting for the Ethernet IP interface.

10. Select **Apply** to save changes.

Continue with these steps.

1. Open the **State** tab and set the administrative state to the current relevant value.

2. For the interface to become operational, you must set the administrative state to In Service or Auto In Service.

3. Reboot the NE for the new IP address to take effect.

Configuration is complete.

To create the Ethernet IP interface, enter the required parameters:

- Specify whether the interface will be numbered or unnumbered, according to the DCN plan. However, only one Ethernet interface of type LANIP can be unnumbered on one NE.

- If the interface is numbered: Enter the planned IP address and IP subnet mask.

- Enter the relevant information provided in the previous steps.

ROADM-C40/40/OPM-3HU/2DC Commissioning

This section describes how to commission the ROADM-C40/40/OPM-3HU/2DC shelf and includes these main tasks:

- Assign shelf numbers to the ROADM-C40/40/OPM-3HU/2DC shelves.
- Set up a Telnet session with the FSP 3000R7 master shelf.
- Set the ROADM-C40/40/OPM-3HU/2DC to In Service.
- Set the ROADM-C40/40/OPM-3HU/2DC ports to In Service.

	See Commissioning the NE for an overview of the FSP 3000R7 commissioning procedure.

Before you begin this procedure, ensure that:

- The FSP 3000R7 master shelf is powered on.
- Shelf cabling is complete.
- You defined the shelf IP address.
- You configured the basic parameters for the shelf.
- The master shelf communicates with the other shelves in the rack.

Use one of these interfaces on the NCU C port to establish communications with the FSP 3000R7 master shelf:

- Network Element Director (NED)
- Craft console
- TL-1

Procedure

1. Use a terminal emulation program to connect a serial cable directly to the ROADM-C40/40/OPM-3HU/2DC. No login is required.
   a. Type the shelf number — 2 to 20 — and press Enter.
   b. Disconnect the serial cable from the ROADM-C40/40/OPM-3HU/2DC.
   c. Reboot the ROADM-C40/40/OPM-3HU/2DC.
2. Use the craft console or TL1 to open a Telnet session.

In the **Service Management** menu:

1. Select the shelf number assigned to the first ROADM-C40/40/OPM-3HU/2DC that you want to commission. The system automatically discovers the shelf number.
2. Select **Create Shelf**.
3. In **Equipment Type**, select eROADM-DC.
4. Select **Next**.
5. Change the eROADM to In Service.
6. Click **Apply**.

In the **Service Management** menu, continue with these steps. The variable *x* represents the shelf number.

> Place management ports D and U to In Service only if you use them in the configuration. Check your cabling plan.

1. Select the **eROADM** shelf number you just assigned.
2. Select **PL - *x* - D**. Select **Next**, set the management plug port D to In Service, and click **Apply**.
3. Select port **SH - *x* - D**. Set this port to In Service and click **Apply**.
4. Select port **PL - *x* - U**. Select **Next**, set the management (UP) port U to In Service, and click **Apply**.
5. Select port **SH - *x* - U**. Set this port to In Service and click **Apply**.
6. Select **OM - *x* - U**, the upgrade port U located on right side of the eROADM. Set port U to In Service.
7. Select port **OM - *x* - U**. Set the port to In Service and click **Apply**.
8. Select **OM - *x* - N**, upgrade port N located on right side of eROADM. Set port N to In Service.
9. Select port **OM - *x* - N**. Set this port to In Service, and click **Apply**.

> When you set the N port to In Service, this process creates VCH entities. VCH entities are required to set up cross connections.

In the Network Port window, continue with these steps. See your cabling plan for the correct Tilt, Setpoint, and Acceptable Range values to enter for port N.

1. Select network port **N**.
2. Enter the correct **Tilt**, **Setpoint**, and **Acceptable Range** values.

> You can enter **Tilt**, **Setpoint**, and **Acceptable Range** values or leave the default values. You can change the values at a later time when you set up cross connections.

Repeat the applicable steps for the next eROADM. After you complete all eROADM setting, you can provision the NE. See *Network Element Director (NED) Online Help* for procedures to provision the eROADM cross connections.

Chapter 11

Optical Network Leveling

This section describes how to check and set the optical power levels on a network link and contains these topics:

Introduction

This procedure ensures that —

- All network receivers receive the sufficient amount of optical input power.
- Your configuration does not overuse network receivers or damage the receivers by the use of excessive input power.
- All network connections work correctly.

After you complete the procedures in this section, you can configure the NE, and then test its operation.

Audience

This section is for service personnel who set up and test fiber links.

Required Expertise

Personnel who set up and test a fiber link must have training in laser-based technology and optical fiber communication systems. We assume that these personnel have experience in handling optical fibers and optical test equipment, and know how to clean optical connectors. Personnel must be knowledgeable about laser safety standards such as:

- IEC/EN 60825-1, IEC/EN 60825-2
- ITU-T G.664, ITU-T G.665
- 21CFR1040.10, 21CFR1040.11 and ANSI Z136.1

Knowledge of the appropriate eye safety precautions and understanding of the safe use of the FSP 3000R7 and management software is imperative. In addition, personnel must be familiar with how to use ESD-preventive equipment.

Associated Documentation

Make sure you have the applicable network plans.

Precautions

To service and maintain the FSP 3000R7, you might need to turn off the auto laser shutdown (ALS) at the GUI. You could also defeat the laser aperture interlock by removing the cover.

	LASER RADIATION WARNING
⚠	When the protective housing is open and interlocks are defeated, you are exposed to laser radiation.
	Disconnected fibers or connectors can emit invisible laser radiation. Do not stare into beams or use optical instruments to view beams directly.

	LASER RADIATION WARNING — HAZARD LEVEL 3B • Only service personnel are qualified to configure a network laser, amplifier, or switch to Forced On mode. • Forced On mode is only for testing and servicing purposes. • When you set a network laser, amplifier, or switch to Forced On mode, the hazard level of the device increases. The operating organization is solely responsible for the safety of the end-to-end system. • Service personnel must place the device in an appropriate area and guarantee that the location meets Hazard Level 3B conditions.

	LASER RADIATION WARNING The organization in charge of installation and service must ensure that: • Personnel responsible for installation and service receive the proper laser safety training. • Mandatory access controls and warning signs for secured areas are in effect.

Measuring the Network Fiber Attenuation

You must use an estimated network fiber attenuation when you provision the NE. Verify these values and take any appropriate actions. This procedure requires a second person at the remote site.

	You cannot measure the attenuation of amplified lines. Separately measure each span between optical amplifiers.

Procedure

1. Connect a 1550-nm light source to an optical power meter.
2. Turn on the equipment.
3. Measure and notate the output power of the light source.

4. Turn off the light source. Remove the fiber from the light source.

5. Remove the transmit network fiber from the NE and connect it to the light source. Do not connect the light source farther down the line, for example, at a patch panel.

6. Connect an optical power meter to the opposite end of the network fiber where it enters the network receiver.

7. Turn on the light source.

8. Measure and record the received optical power.

9. To compute the network fiber attenuation, use the difference between the two measured optical powers and convert this value to dB.

10. Compare the network fiber attenuation to the value you estimated when you provisioned the NE.

11. Take the required action, for example, adapt the provisioned attenuators.

12. Reconnect the network fiber to the NE.

13. Measure the other fiber on the line.

Measuring Unamplified End-to-End Connections

During basic NE installation, the network fibers did not successfully connect to the channel modules for these reasons:

- Network transmitters provide an amount of optical power that can destroy a network receiver because of
  - A network fiber with insufficient attenuation.
  - A connection between a near-end network receiver and a near-end network transmitter that has an error.
- Light moves across many connectors and modules as it traverses from the transmitter to the receiver. Check this path before you place the NE into service to prevent service affecting errors.

Procedure

1. Set your optical power meter to 1550 nm.

2. Connect the optical power meter to the fiber that you plan to connect to the network receiver.

3. Check the optical power to ensure only minimal power is evident, typically < −30 dBm.

4. If optical power is high, look for a wiring error. If an interruption occurs to the ⊥ optical circuit, the automatic laser shutdown (ALS) should have turned off the transmitter that connects to this fiber.

5. Find the network transmitter that connects to this network receiver fiber. You need the network plan, the NE, and the respective remote NE for this search.

6. From the menu, select the relevant module (MOD-x-y), and then the respective channel (CH-x-y-N).

7. Set Admin state to **Maintenance** and confirm.

8. Navigate to the **Operation** tab. Force the laser for the respective network transmitter to on either through a management tool and DCN or with the help of a colleague at the remote site.

9. Measure and notate the received optical power. This value should be within the limits specified by the channel module spec for the intended data rate and mode.

10. Set **Laser Operation** to **Normal** to disable the transmitter.

11. If the received optical power is out of specification:

    - If turning on the Laser does not change the power reading: Check whether you accessed the correct transmitter module. If yes: Search for the wiring error.

    - If the optical input power was too high: Insert an attenuator to correct this error.

    - If the optical input power was too low: Search the optical path for the error, or replace an attenuator in the path. The changed or removed attenuator might influence other optical paths, so check for respective side effects.

12. If the optical input power is within the specification limits, insert the network receiver fiber into the appropriate network receiver port.

Measuring and Leveling Amplified Lines

Consider these guidelines when you level an amplified line:

- EDFAs have a limited dynamic range with minimum and maximum input levels. Level your line span-by-span from the network transmitter on one side of the circuit to the network receiver on the other side.

- Internal EDFA signals can interact. An EDFA that is saturated by a transmitted signal reduces the other signal levels on the line. This distortion can reduce the optical signal to noise ration (OSNR).

- Pump power-controlled EDFAs have no fixed gain. Measure power at their input. You cannot rely on a specific gain.

- The most important measurement is OSNR. You can easily amplify a signal, but you cannot improve the OSNR after it is too low.

- For optimum transmission characteristics, the goal of leveling is to ensure equal optical power levels across all active channels in the system.

Procedure

1. Use an optical spectrum analyzer or optical power meter to measure the attenuation of each fiber span. See Measuring Unamplified End-to-End Connections.
   Measure

   - From channel module network output to amplifier input.

   - From amplifier output to the next amplifier input.

   - From the last amplifier output to the channel module input.

   Record the power levels at all intermediate filters between transponder modules and amplifiers.

2. Compare these values to the values in the fiber system plan.

3. If the measured values differ from those planned, discuss the differences with your network planners.

> If you use an optical power meter, make sure only one channel is active when you measure. This precaution ensures that the optical power readings into and out of the amplifiers reflect an accurate per-channel level.

1. Measure the first span in the same way that you meansure spans in an unamplified system.

2. Compare the EDFA input power to the EDFA specification. This value is especially critical in systems that use several optical channels on a fiber.

3. If the input power is lower than the specification for a single channel, troubleshoot the connection.

4. If the input power is too high:

   - Fixed gain amplifier — Insert an appropriate attenuator into the amplifier input.

   - Variable gain amplifier — In the software interface, adjust the amplifier gain to the appropriate output power.

5. Connect the fiber to the amplifier input.

6. Measure the input power at the next amplifier input.

7. Ensure a correct input level.

8. Repeat Steps 4 to 10 until you reach the last network receiver.

If you use an optical spectral analyzer, complete these steps.

1. Measure the OSNR at the input of the channel demultiplexer located in front of the receiving channel module.

2. Check the OSNR with the channel module specification.

3. If the OSNR is too low:

    - One or more of your amplifiers do not receive enough input power.
    - Check the OSNR at all amplifier outputs.

4. Activate all signals that conduct signal power through the amplifier.

5. Check the OSNR at each amplifier output.

6. Correct the problem at the amplifier that is responsible for the low OSNR, which is the first amplifier in the line that delivers the low OSNR.