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55400A

SYNCHRONIZATION SUPPLY UNIT

SYSTEM MANUAL

This manual describes a Symmetricom synchronization system for a telecommunications network. This system includes source clocks, receiver clocks, and network management software.

This manual is the primary document for the 55400A synchronization supply unit (SSU) and 55409A mini-SSU hardware. The other elements of the synchronization system are described here to a lesser degree. The SSU, the mini-SSU, the 55300A GPS telecom reference source, and the 5071A primary frequency source receive the most coverage.

This manual applies to the 55400A SSU system you have received unless update information is included with the equipment.

For assistance, contact:

Symmetricom, Inc.
2300 Orchard Parkway
San Jose, CA 95131-1017

U.S.A. Call Center:
888-367-7966 (from inside U.S.A. only – toll free)
408-428-7907

U.K. Call Center:
+44.7000.111666 (Technical Assistance)
+44.7000.111888 (Sales)
+44.1604.586740

Fax: 408-428-7998

E-mail: ctac@symmetricom.com

Internet: http://www.symmetricom.com

Warning Symbols That May Be Used In This Book

Instruction manual symbol; the product will be marked with this symbol when it is necessary for the user to refer to the instruction manual.

Indicates hazardous voltages.

Indicates earth (ground) terminal.

or

Indicates terminal is connected to chassis when such connection is not apparent.

Indicates Alternating current.

Indicates Direct current.

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E2 Equipment Tests

F1 Troubleshoot the System

F2 Troubleshoot the SSU

In This Manual

This part of the system manual helps you identify system tasks and indicates where to go for more information. It includes information on the organization, tasks, and abbreviations used in this manual.

Although most of this system manual supports the 55400A synchronization system, it also describes the installation, configuration, and some initial troubleshooting information for two Symmetricom source clocks:

- 5071A primary frequency standard
- 55300A GPS telecom primary reference source

References to the manuals supplied with these products are made where more detailed information is available. Where this occurs, specific document titles are included.

Finding information fast

To quickly locate a topic, turn to one of the following areas:

Table of contents

Find it at the front of this manual. It is a listing of all the topics covered in this manual. Use it to examine the overall content of this manual.

System manual organization

It starts on the next page. The information here describes the structure of the system manual. Find the topic you want and go to the location in the document for more information about it.

List of tasks

This list comes after the manual organization pages. Some major objectives, such as putting an SSU into service, are divided into the individual tasks necessary to accomplish each objective.

Index

Use the index at the back of this manual when you need information about a specific topic.

55400A System Manual Organization

This manual is organized into six major sections. Each chapter expands on the major topic of the section.

Section A—Learn the System

Information on what it is and how it works.

Chapter A1 System Overview—Provides an overview of the Symmetricom synchronization system.

Chapter A2 System Description—Describes the SSU in more detail.

Chapter A3 System Specifications—Presents the technical specifications for the system.

Chapter A4 Event/Alarm System—Describes the event and alarm system for the SSU that provides status about the system.

Chapter A5 Local/Remote Management—Tells what communication alternatives are supported for the 55400A SSU, 55409A mini-SSU, 55300A GPS, and 5071A frequency standard.

Section B—Prepare for the System

Information on preparing the site and the tools required.

Chapter B1 Tools and Equipment—Lists the tools and equipment needed to install the system.

Chapter B2 Equipment Rack—Describes a rack cabinet, equipment placement, and cable routing.

Chapter B3 Equipment Requirements—Specifies the dimensions and power requirements for the system equipment.

Section C—Install the System

Information on how to install the SSU, GPS primary reference source, and primary frequency standard.

Chapter C1 Installation Guidelines—Presents guidelines for the installation.

Chapter C2 Install the 55400A SSU—How to install the 55400A SSU master subrack.

Chapter C3 Install Expansion Subracks—How to install the 55400A SSU expansion subrack.

Chapter C4 Install the 55300A Primary Reference—How to install the 55300A GPS.

Chapter C5 Install the 5071A Frequency Standard—How to install the 5071A cesium clock.

Chapter C6 Install the 55409A Mini-SSU—How to install the 55409A mini-SSU subrack.

Section D—Configure the SSU

Describes the plug-in cards for the SSU: theory of operation, switch settings, and basic operation.

Chapter D1 Configure ITH Clock Cards—Understand and configure the ITH cards.

Chapter D2 Configure Output Cards—Understand and configure the output cards.

Chapter D3 Configure Communication Cards—Understand and configure the AIC/IMC/NIMC cards.

Section E—Qualify the System

Ensure the system is ready to be put into service.

Chapter E1 Qualification Procedures—Perform qualification procedures on the SSU, GPS, and cesium clock.

Chapter E2 Equipment Tests—Perform equipment tests on the SSU, GPS, and cesium clock.

Section F—Repair the System

Determine cause of problems and return the system to service.

Chapter F1 Troubleshoot the System—Troubleshoot problems with the system.

Chapter F2 Troubleshoot the SSU—Repair the SSU.

Chapter F3 Replacement Parts—Replace parts in the SSU.

Objective — Put SSU master subrack into service

Tasks	Topics	Description	See Chapter
Prepare site for equipment	Summary of tools needed.	a list of tools used to install SSU	B1
	Information about racking equipment	see recommended positioning in rack	B2
	Size and power requirements	Dimensions and current usage	B3
Install master subrack	Unpack and inspect	guidelines	C1
	Subrack	install into rack	C2
	Power connections	how to fabricate and run cables	C2
	Alarm connection	relay information and connector pinout	C2
	Remote connection	user information and connector pinout	C2
	Inputs	types of connectors	C2
	Outputs	types of connectors	C2
	Local connection	user information and connector pinout	C2
Configure cards	ITH cards	set parameter switches	D1
	Output cards	set parameter switches	D2
	Communication card	set parameter switches	D3
Install cards	ITH cards	installation steps	C2
	Output cards	installation steps	C2
	Communication card	installation steps	C2
Qualify for operation	Initial settings	verify configuration, set date, time, and ID	E1
	Configure for network operation	set network parameters for LAN, TP4, or X.25 interface using 55450A local craft terminal software	See Chapter 10 in TL1 Reference Manual for parameter descriptions
Test	Final checks	check alarms and outputs	E2
The SSU is ready to operate			

Objective — Put SSU expansion subrack into service

Tasks	Topics	Description	See Chapter
Prepare site for equipment	Summary of tools needed.	a list of tools used to install SSU	B1
	Information about racking equipment	see recommended positioning in rack	B2
	Size and power requirements	Dimensions and current usage	B3
Install expansion subrack	Unpack and inspect	guidelines	C1
	Subrack	install into rack	C2
	Power connections	how to fabricate and run cables	C2
	Outputs	types of connectors	C2
	Subrack cabling	cabling requirements between subracks	C3
Configure cards	Expansion synchronization cards	set parameter switches	C3
	Expansion communications card	set parameter switches	C3
	Output cards	set parameter switches	D2
Connect subrack cables and install cards	Add first expansion subrack	installation steps	C3
	Add additional expansion subrack	installation steps	C3
	Replace expansion subrack	removal steps	C3
Qualify for operation	Communication	verify communication between subracks	C3
Test	Final checks	check outputs	E2
The SSU is ready to operate			

Objective — Put mini-SSU subrack into service

Tasks	Topics	Description	See Chapter
Prepare site for equipment	Summary of tools needed.	a list of tools used to install mini-SSU	B1
	Information about racking equipment	see recommended positioning in rack	B2
	Size and power requirements	Dimensions and current usage	B3
Install subrack	Unpack and inspect	guidelines	C1
	Subrack	install into rack	C2
	Power connections	how to fabricate and run cables	C2
	Alarm connection	relay information and connector pinout	C2
	Remote connection	user information and connector pinout	C2
	Inputs	types of connectors	C6
	Outputs	types of connectors	C6
	Local connection	user information and connector pinout	C2
Configure cards	ITH cards	set parameter switches	D1
	Output cards	set parameter switches	D2
	Communication card	set parameter switches	D3
Install cards	ITH cards	installation steps	C2
	Output cards	installation steps	C2
	Communication card	installation steps	C2
Qualify for operation	Initial settings	verify configuration, set date, time, and ID	E1
	Configure for network operation	set network parameters for LAN, TP4, or X.25 interface using 55450A local craft terminal software	See Chapter 10 in TL1 Reference Manual for parameter descriptions
Test	Final checks	check alarms and outputs	E2
The mini-SSU is ready to operate			

Objective — Put 55300A GPS Reference Source into service

Tasks	Topics	Description	See Chapter
Prepare site for equipment	Summary of tools needed.	a list of tools used to install GPS unit	B1
	Information about racking equipment	see recommended positioning in rack	B2
	Size and power requirements	Dimensions and current usage	B3
Install GPS reference source	Unpack and inspect	guidelines	C1
	Rack mount shelf	install into rack	C4
	GPS module	install into shelf	C4
	Power connections	how to fabricate and run cables	C4
	Port 1 connection	user information and connector pinout	C4
	Alarm connection	relay information and connector pinout	See Chapter 3 in User's Guide for GPS reference source
	Time of Day connection	user information and connector pinout	See above
	Remote Access Port connection	user information and connector pinout	See above
	Signal connectors	description	C4
Qualify for operation	SatStat application	install and run to verify general health of the GPS reference source	See Chapter 1 in User's Guide for GPS reference source
	Initial settings	set local time and verify holdover actions	E1
Test	Final checks	check outputs	E2
The GPS reference source is ready to operate			

Objective — Put 5071A Frequency Standard into service

Tasks	Topics	Description	See Chapter
Prepare site for equipment	Summary of tools needed.	a list of tools used to install GPS unit	B1
	Information about racking equipment	see recommended positioning in rack	B2
	Size and power requirements	Dimensions and current usage	B3
Install frequency standard	Unpack and inspect	guidelines	C1
	Rack mount unit	install into rack	C5
	Power connections	how to fabricate and run cables	C5
	Signal connectors	description	C5
Qualify for operation	Initial settings	set continuous operation, output ports, and local time	E1
Test	Final checks	check outputs	E2
The frequency standard is ready to operate			

Abbreviations used in this manual

The terms listed here are used throughout this system manual.

Table 1. List of Terms

Term	Definition
ACO	Alarm cutoff
AIC	Alarm interface card
AIS	Alarm indication signal
AMI	Alternate mark inversion
CAS	Channel associated signaling
CCS	Common channel signaling
CRC4	Cyclic redundancy check
DCE	Data communications equipment
DDFS	Direct digital frequency synthesis
DTE	Data terminal equipment
E1	European signal, 2048 kbps
EEPROM	Electrically erasable programmable read only memory
EIA	Electronics Industries Association
ETSI	European Telecommunications Standards Institute
FFOFF	Fractional frequency offset
GPS	Global positioning system
HDB3	High-density bipolar 3
IMC	Information management card
ITH	Input track and hold card
LED	Light emitting diode
LMRTIE	Latest maximum relative time interval error
LOS	Loss of signal
MRTIE	Maximum relative time interval error
NC	Normally closed
NIMC	Network information management card
NO	Normally open
NVRAM	Non-volatile random access memory
OOF	Out of frame
OSMF	Open synchronization management framework
PRC	Primary reference clock

Table 1. List of Terms (cont'd)

Term	Definition
SDH	Synchronous digital hierarchy
SSM	Synchronization status message
SSU	Synchronization supply unit
SWDL	Software download mode
TDEV	Time deviation
TL1	Transaction language 1
TRSC	Traffic re-synchronization card

C1

Installation Guidelines

Unpacking, inspection, handling, and recommendations

In This Chapter

This chapter describes the following topics:

- Unpacking and inspecting equipment
- Procedures to avoid electrostatic discharge damage
- Installation guidelines

Unpacking and Inspection

Unpacking

After receiving the shipment containers, move them to a suitable unpacking and staging location, then carefully unpack each shipping container.

NOTE

Retain all packing containers and materials. Keep plug-in cards in ESD protection packaging until ready to configure and install the cards.

Inspection

Inspect the shipping container and cushioning material for damage. If damage is evident, keep the packing materials until the contents of the shipment have been checked for completeness and the equipment has been checked mechanically and electrically.

a. Verify that the shipment is complete by checking the actual materials received against the packing slip, bill of lading, and purchase order.

b. If there is shipping damage to any of the equipment, notify the shipping company and Symmetricom. File a damage report and claim with the shipping company.

c. Notify the shipping company when there is a difference between the bill of lading and the materials received.

d. Notify Symmetricom if there are differences between the materials received and the purchase order or packing slip.

ESD Prevention Procedures

Electronic components and assemblies can be permanently degraded or damaged by ESD (electrostatic discharge). Use the following precautions when installing or maintaining the equipment:

a. Ensure that static-sensitive devices or assemblies are stored in static shielding bags or containers.

b. Ensure that static-sensitive devices or assemblies have their switches or jumpers configured at static-safe work stations providing proper grounding for technical personnel.

c. Do not wear clothing subject to static charge build-up, such as wool or synthetic materials.

d. Do not handle components or assemblies in carpeted areas.

e. Do not remove an assembly or component from its static shielding protection until installation.

f. Avoid touching assembly edge connectors (handle by card edges or assembly front panel).

g. Use one of the available front-panel ESD banana-plug ground jacks for an ESD wrist-strap connection during installation or maintenance procedures.

System Guidelines

Assumptions made

The person installing the equipment is familiar with basic electronics and the typical requirements associated with telecom equipment installations.

A –48 Vdc source is being used to power all telecom equipment to be installed.

Recommendations

The equipment described in this manual has two power inputs so that the failure of one power source cannot cause the equipment to fail. Ensure this redundancy is maintained by running power from two separate sources to the dual-power input equipment.

C2

Install the 55400A SSU

Power, cables, subrack, and cards

In This Chapter

This chapter covers installing the SSU. References are made to other chapters for the configuring of cards, but the installation instructions are here.

NOTE

See "In This Manual" for a list of tasks to put an SSU master subrack into service.

Master Subrack Connector Characteristics

There are three variations of master subrack that have been released. The differences relate to the characteristics of the applicable connectors as summarized in the following table.

Table C2-1. Master subracks

Connector	55401B	55401C	55401D
PRC input and Status input	Grounded BNC	Grounded BNC	Grounded BNC
2048 kHz/kbps inputs	Floating	Floating	Floating
Outputs (80)	Floating	Grounded	Grounded
–48 Vdc	Non-locking	Locking	Locking
Expansion signals	Non-terminated	Terminated	Terminated and shielded

Accessories, Tools, and Equipment

Accessories

An installation accessories kit will be supplied with the 55401D master subrack. The items in this kit are described in Table C2-2.

Table C2-2. Accessories supplied with 55401D master subrack

Accessory	Qty	Purpose	Part #
Locking power connector	2	–48 Vdc power inputs	1251-5272
Spare 1A telecom fuse	1	Communication card	2110-1129
Spare 2A telecom fuse	1	Output cards	2110-1125
Spare 3A telecom fuse	1	ITH cards	2110-1000
Crimp lug terminal	2	Frame ground connection	0360-0041
Screw–10-32 w/nylon washer	6	EIA rack mounting	0570-1366
U-nut	6	EIA rack mounting	0590-0804
Connector pins	8	Power connector	1251-2418

Two pairs of rack mounting flanges are also included for mounting the SSU into an EIA or ETSI rack.

Tools

Table C2-3 describes the required tools and where they are used. The list of tools does not include a crimp tool that will be needed to make the mating connectors for the input/output connectors.

Table C2-3. Tools needed to install 55401D master subrack

Tool	Purpose
Large Phillips or Pozidriv #2 screwdriver	Rack mounting screws
Molex Hand Crimping Tool (11-01-0084)	Power cables
7 mm nut driver	Frame ground stud on subrack front panel
Wire strippers	Making cables
Diagonal cutters	making cables
ESD wrist strap	ESD protection when installing cards

Equipment

Table C2-4 describes the required equipment and where they are used.

Table C2-4. Equipment needed to qualify 55401D master subrack

Equipment	Purpose
Digital multimeter	Check voltage and cables for opens/shorts
54603A general purpose oscilloscope, or equivalent	Check signal characteristics during qualification

Install the Master Subrack

The following paragraphs provide the information for mounting a master subrack in a rack cabinet. Review chapter B2 for master subrack positioning information. Try to install it near the bottom of the rack cabinet if there are plans to add expansion subracks.

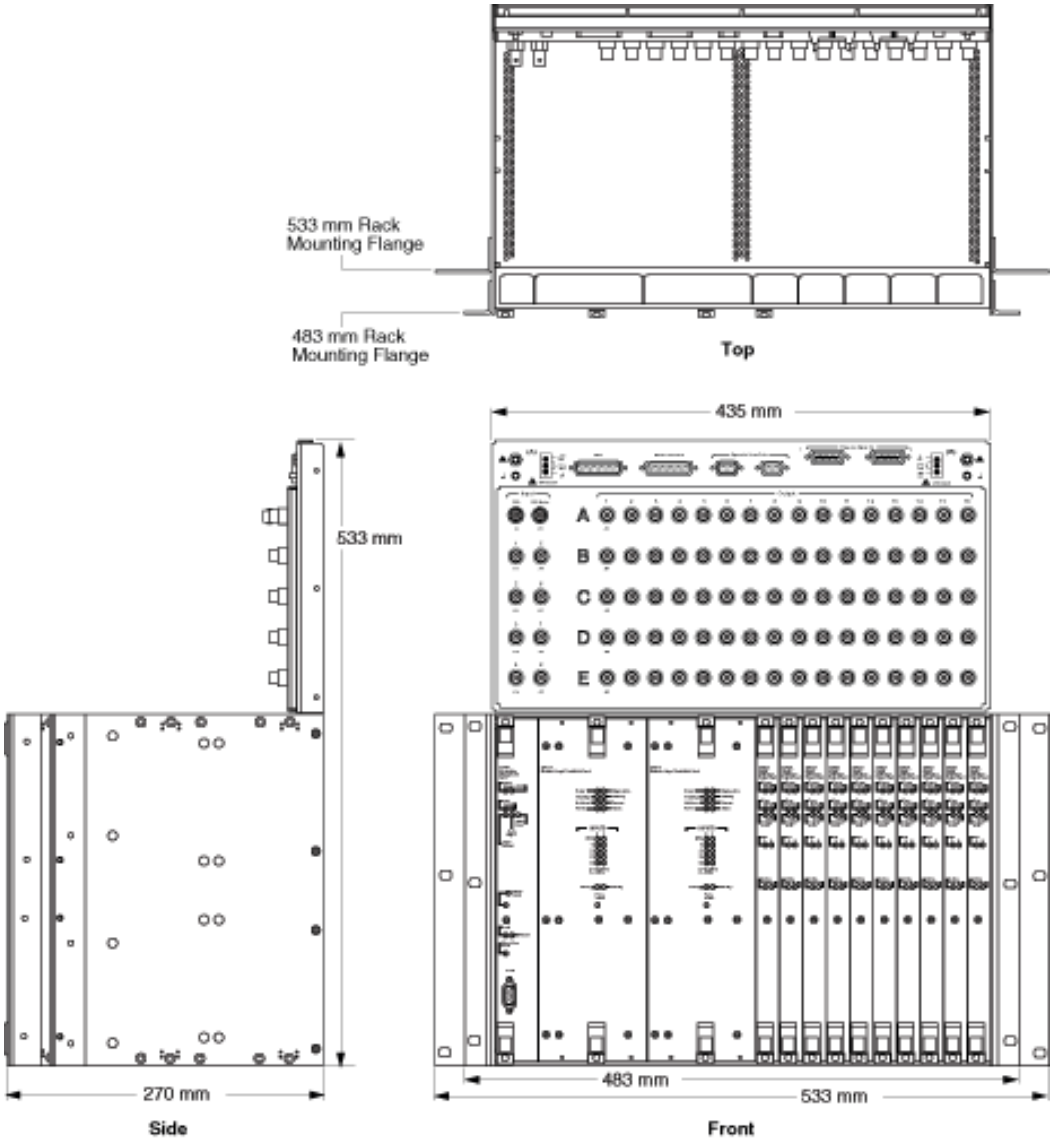


Figure C2-1. 55401D Master Subrack Dimensions

Subrack Mounting Standards

The 55401D master subrack can be mounted using one of two dimension standards

- ETSI—535 mm
- EIA—482 mm

These two standards are accommodated by the two different sizes of mounting flanges supplied with the subrack. The flanges can be mounted at various positions on the subrack to vary the depth at which the subrack is installed in the rack.

Subrack Installation Procedure

Use the following procedure to attach the mounting flanges to the 55401D subrack and install the subrack into the rack cabinet. Figure C2-2 and Figure C2-3 show the positioning for each of the flanges.

1 Place the subrack (with all cards removed) on a work surface with the front panel facing you. Select the mounting flanges you will use.

2 Position each mounting flange with its mounting holes so it aligns with the mounting holes in the side of the subrack (front or middle).

3 Attach the flanges to the subrack with the supplied hardware.

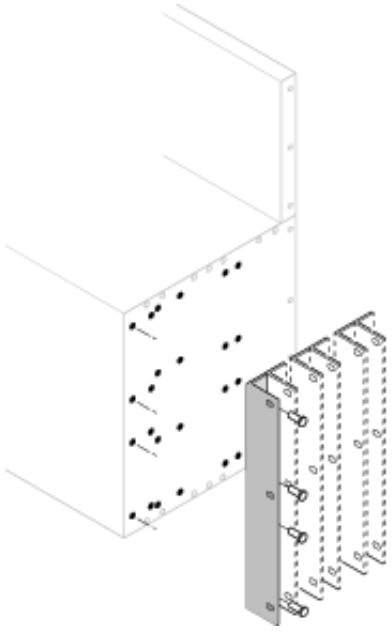


Figure C2-2. ETSI mounting flange attachment

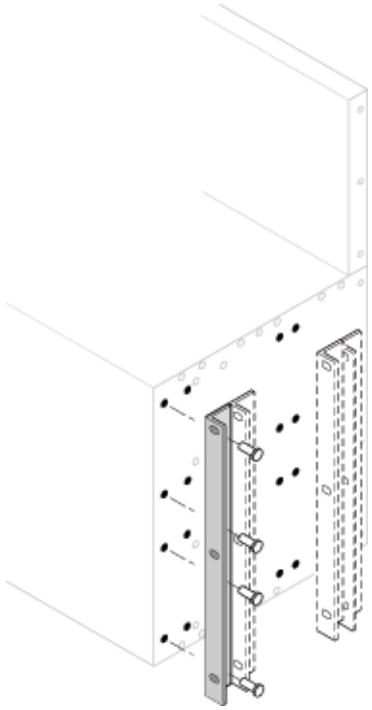


Figure C2-3. EIA mounting flange attachment

4 Place the subrack in position in the rack. Refer to chapter B2 for positioning details.

NOTE

If the rack cabinet will hold 55400A master and expansion subracks, cable interconnections will be easier if the master subrack is installed near the bottom of the rack. Position it no lower than 2 RU (90 mm) from bottom of rack.

5 Attach the subrack to the rack with the hardware supplied with the mounting flanges.

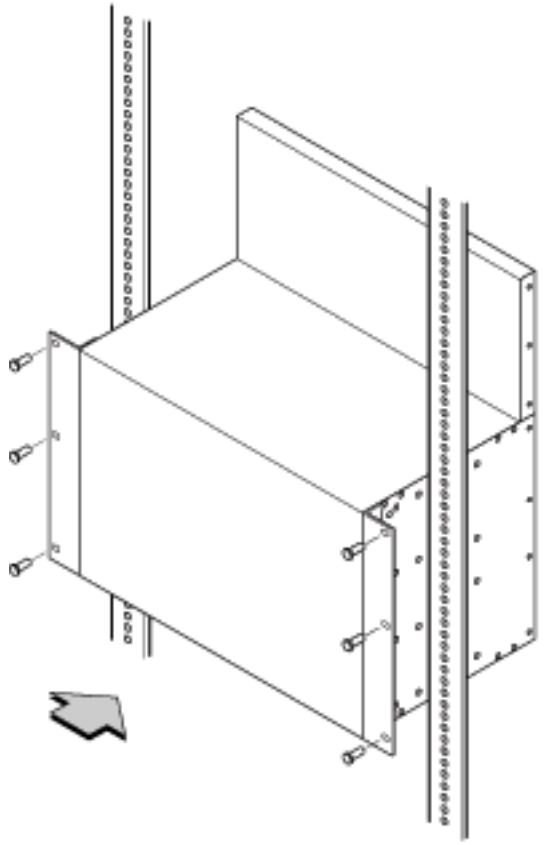


Figure C2-4. Subrack installation

Backplane Switch

The subrack has a configuration switch on the backplane used to define whether subrack is a master or expansion subrack. As shown in Figure C2-5, this switch is set at the factory to the “0” position. Verify that the setting is “0” for the master subrack. Change the selection, if necessary, using a flat-blade screwdriver.

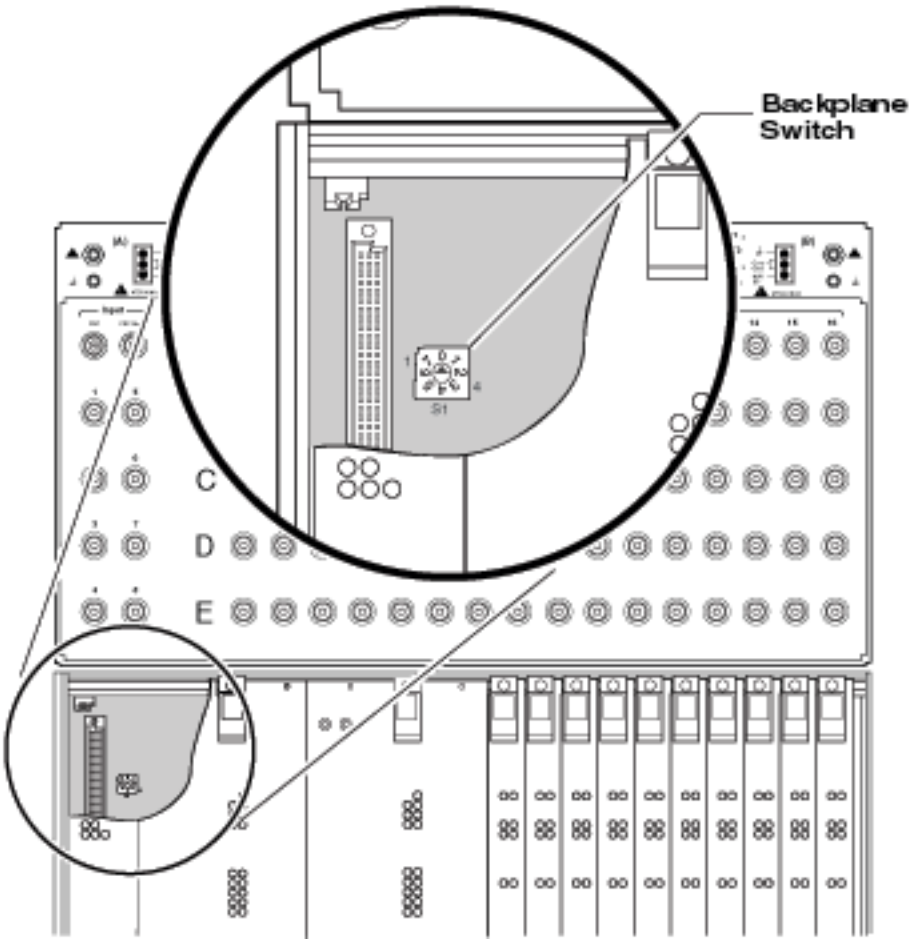


Figure C2-5. Backplane Switch Location

Connectors and Cabling

This section discusses the front panel connectors and the pinouts needed to build the connecting cables.

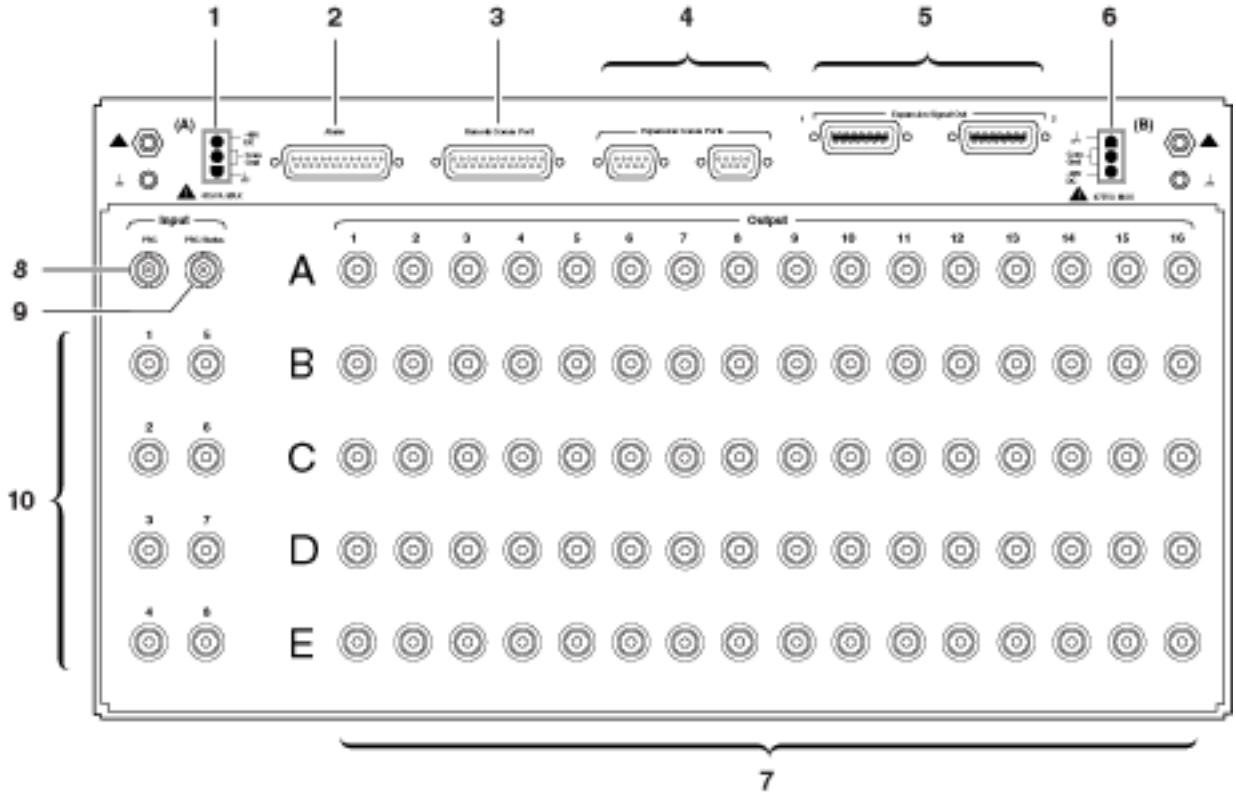


Figure C2-6. Connector panel details

1— Locking power input connector (A)

2— Alarm connector, 25-pin (male), IDC type

3— Remote Comm Port connector, 25-pin (female), IDC type

4— Expansion Comm Port connectors, two 9-pin (one male, one female)

5— Expansion Signal connectors, two 15-pin (female)

6— Locking power input connector (B)

7— 80 output connectors. BNC-type or Siemens-type available.

8— PRC (5 or 10 MHz) BNC-type input reference connector

9— PRC Status input BNC-type 50 Ω connector

10— Eight 2048 kbps/kHz 75 Ω input reference connectors. BNC-type or Siemens-type available.

–48 Vdc Power Inputs

The SSU supports use of redundant power sources.

CAUTION

The SSU uses a –48 Vdc office battery as its primary voltage source. Though not normally considered high voltage, the office battery has more than the minimum power necessary to present a potential fire hazard. Use extreme caution when working around or connecting circuits energized by the office battery.

Grounding issues

Before running power cables, consider how best to provide frame grounding for the subrack. A frame ground can be connected in one of three ways:

1. As part of the cabling through the –48 Vdc power connector.
2. Through a single-wire connection to the ground stud on the connector panel.
3. Through the rack mount brackets when the rack cabinet itself is properly grounded.

NOTE

To prevent battery return-to-frame ground faults, do not connect battery return on the subrack to the frame ground.

Recommendations for cabling to the subrack

Power to the master or expansion subrack is applied at the connector panel. Use the following procedure as a guide to supply power wiring to the subrack.

a. Following local practices, select a wire size appropriate to ensure an office battery voltage of –36 to –57 Vdc at the subrack. The current requirement for the subrack can be from 7 to 10 A. The connector pins used for the power connectors can accept a wire size up to 1.2 mm (0.05 in). This wire size corresponds to an AWG (American Wire Gauge) value of 18.

b. Switch off the circuit breakers or remove the fuses to the branch circuit feeds that will supply the subrack.

c. Route redundant (“A” and “B”) –48 Vdc office battery feeds to the subrack to ensure uninterrupted operation. If your facility does not provide redundant “A” and “B” battery sources, split the power feeds at the main battery distribution fuse board (BDFB), the branch battery feed panel, or at the rack cabinet.

d. If the battery feeds originate at the BDFB or branch panel, run the two battery feeds to the subrack through cable runs on opposite sides of the facility. Running both feeds in the same cable rack creates a single-point source of power failure and should be avoided.

e. Route the power cables on opposite sides of the rack cabinet. Leave a length of cable for both feeds sufficient for later dressing into cable bundles.

f. Check the battery feed lines for possible shorts to one another or to ground using a multimeter.

Assembling the power connectors

Use the following procedure to attach the power connectors to the battery feed lines.

a. Strip 5 mm (3/16 in) of insulation from one set of the power supply wires.

b. Crimp the terminal pins to the wires according to standard procedures. Figure C2-7 shows a crimped connector pin. The connector pins can accept a wire size up to 1.2 mm (0.05 in). If possible, use a crimping tool such as Molex Hand Crimping Tool 11-01-0084.

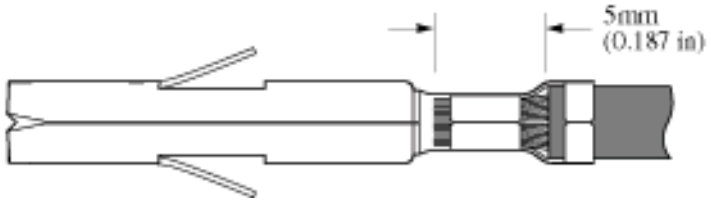
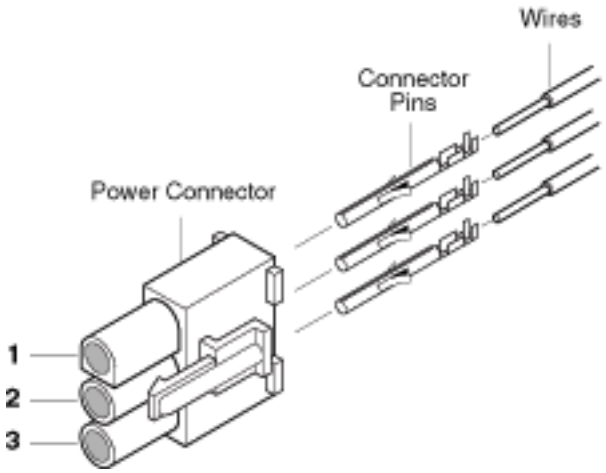


Figure C2-7. View of crimped connector pin

c. Position the power connector so that it matches the drawing in Figure C2-8 (the locking mechanism should face you). Take the Ground wire and grasp the wire insulation behind the connector pin. Push this wire into plug position "1" (as shown in the drawing) of the power connector until the connector pin snaps into place.



1 – Ground (frame ground)
2 – Common Gnd (battery return
3 – –48 Vdc

Figure C2-8. Subrack –48 Vdc power connector

d. Using the same procedure as for step c., push the Com Gnd wire into connector position "2" and the –48 Vdc wire into connector position "3".

e. Repeat steps a. through d. for the second power connector.

Making the frame Ground Connection

If a dedicated wire to the frame ground stud is selected as the method for grounding the subrack, follow these steps for each of the ground connections:

a. Route wiring from ground to the subrack.

b. At the subrack, crimp the supplied spade lug connector to the ground wire.

c. Using a 7 mm nut driver loosen the frame ground stud nut.

d. Slide the spade lug connector under the ground stud nut and tighten.

Connecting dc Power

The following procedure describes how to connect power to the subrack. To connect the finished power cables for the two dc supplies, follow these steps:

a. Using a multimeter, verify that there are no multiple battery grounds, or any shorts at the power source end of the wires.

b. Reinstall the fuses or set the circuit breakers to On at the branch circuit distribution that supplies the –48 Vdc power.

c. Use a multimeter to measure the voltage of the battery feed leads at the subrack. The voltage must measure in the range –36 Vdc to –57 Vdc.

d. Plug the left-hand dc power connector into the left-side (A) power jack on the subrack connector panel.

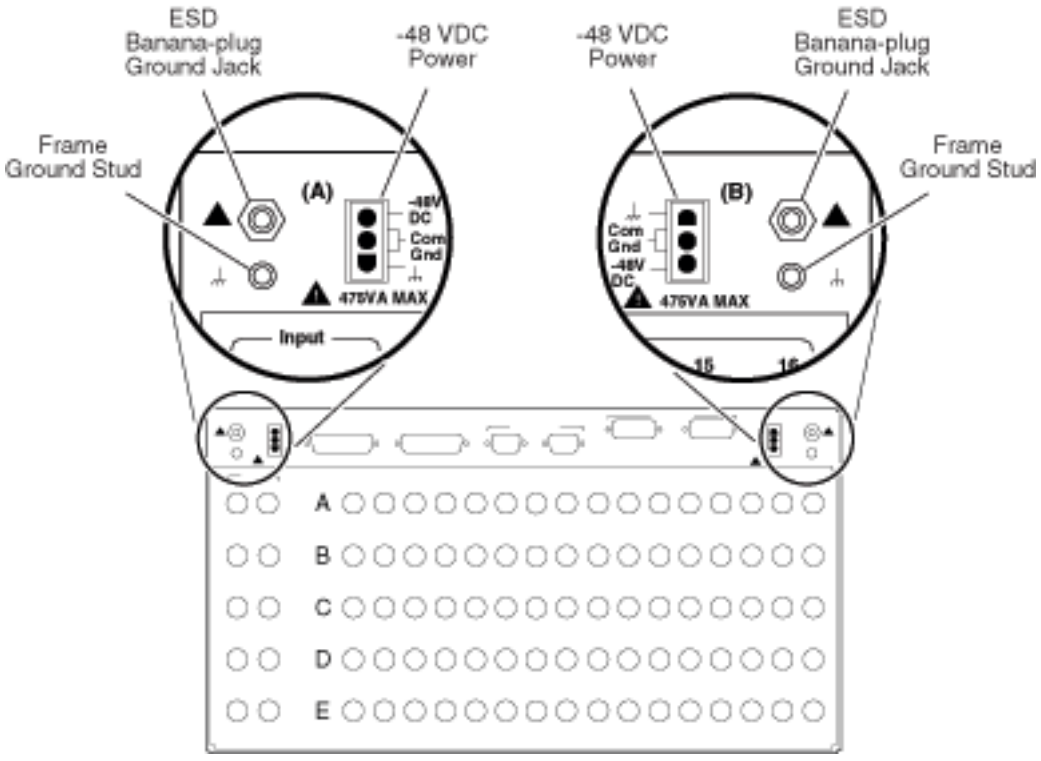


Figure C2-9. Power connector and ground stud locations

e. Plug the right-hand dc power connector into the right-side (B) power jack.

Alarm connector

The master subrack connector panel has a 25-pin D connector (male) for all office alarms supported by the 55400A. A total of seven alarms are available:

- Critical visual
- Critical audible
- Major visual
- Major audible
- Minor visual
- Minor audible
- Card assembly fuse

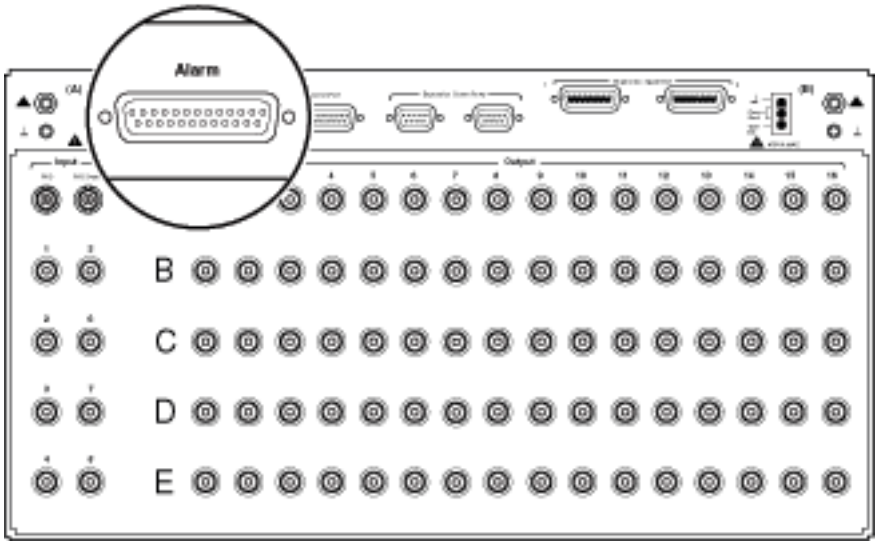


Figure C2-10. Alarm connector location

Relay type

All alarm relay outputs are Form-C, dry contact closures (common, alarmed open, and alarmed closed) except for the card assembly fuse alarm which supplies a –48 Vdc alarm-active output.

Combining critical and major alarms

If your facility supports only major and minor alarms, the communication card can be configured to combine critical and major alarms. This is accomplished through a switch setting on the communication card. (Communication card is a reference to the Information Management Card and Network IMC.)

Remote detection of someone pressing the ACO button

When critical alarms are combined with major alarms by a switch setting (S5–3 on the communication card), the critical alarm relays (visual and audible) may be used to indicate an Alarm Cutoff (ACO) button press on the front panel.

HOW THIS WORKS

Following the occurrence of an alarm condition in the 55400A, if someone presses the ACO button to reset the audible alarm relay, the critical alarm relays move into the alarmed condition. The critical alarm relays remain in the alarmed state until the alarm condition is no longer present. This optional behavior is useful when a remote indication of someone pressing the ACO button is desired.

Relay operation

Each alarm can be wired as alarmed open or alarmed closed. Refer to your alarm system to determine the appropriate configuration.

An alarmed-open relay contact is held closed during normal operation (also called normally closed or NC). An alarm condition will cause the NC relay contact to open. Likewise, an alarmed-closed relay will have its contact held open during normal operation (also called normally open or NO). An alarm condition will cause the NO relay contact to close. Refer to the diagram in Figure C2-11.

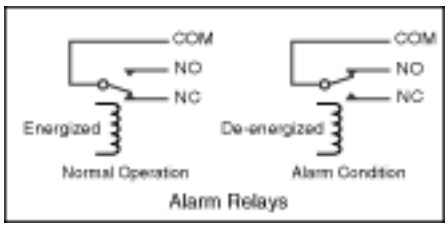


Figure C2-11. Relay circuit diagram

Wiring the alarm cable

Use the table below to fabricate an alarm cable. If your office alarm system uses alarmed open contacts, provide jumpers on your alarm system to override the alarms while wiring the office alarm connector.

If your office alarm system uses only major and minor alarms, wire those pins only. Then configure the communication card to combine critical and major alarms. (This switch setting is described in chapter D3.)

Table C2-5. Alarm connector pinout

Pin Number	Description
1	Card assembly fuse alarm (–48 V)
2	Minor alarm – audible – alarmed open (NC)
3	Minor alarm – audible – common
4	Minor alarm – visual – alarmed open (NC)
5	Minor alarm – visual – common
6	Major alarm – audible – alarmed open (NC)
7	Major alarm – audible – common
8	Major alarm – visual – alarmed open (NC)
9	Major alarm – visual – common
10	Critical alarm – audible – alarmed open (NC)
11	Critical alarm – audible – common
12	Critical alarm – visual – alarmed open (NC)
13	Critical alarm – visual – common
14	GND (Ground)
15	Minor alarm – audible – alarmed closed (NO)
17	Minor alarm – visual – alarmed closed (NO)
19	Major alarm – audible – alarmed closed (NO)
21	Major alarm – visual – alarmed closed (NO)
23	Critical alarm – audible – alarmed closed (NO)
25	Critical alarm – visual – alarmed closed (NO)

TEST CABLE

Once the alarm cable is fabricated, test the wiring as needed for this installation. Short together the common and alarm lines for alarmed closed relays to generate an alarm. Remove jumper from the common and alarm lines for alarmed open relays. (Alarms will be generated in the 55400A during qualification procedures.)

Remote Comm Port connector

The master subrack provides a 25-pin D connector (female) for remote serial-data communications. It is possible to perform management tasks through this port including: security management, configuration, performance monitoring, and fault diagnosis. These same tasks can also be accomplished using the Local port that is part of the Information Management Card and the Network IMC.

Why use the remote port?

The remote port supports the following configurations:

- RS-232 serial interface (on IMC supports modem operation)
- X.25 network interface (on NIMC with Option 002 supports RS-232/V.24 DTE)

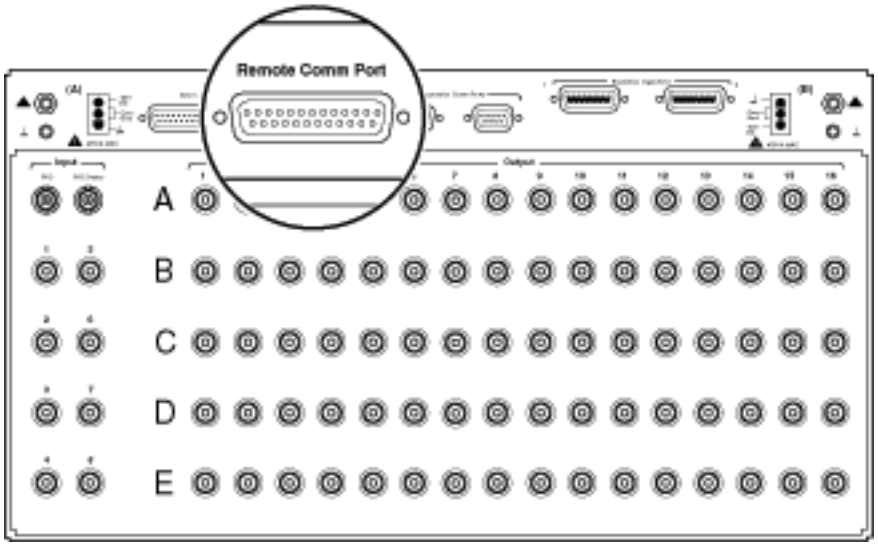


Figure C2-12. Remote connector location

RS-232 Serial Interface

Requires an information management card to be installed as the communication card. The interface is RS-232. Modem operation is supported. (55441A IMC)

X.25 Network Interface

Requires a network information management card with option 002 to be installed as the communication card. The interface is RS-232/V.24 DTE. (55442A Option 002 NIMC)

Wiring the remote cable

Use the tables below to fabricate a remote cable. The pinouts are included here for the two remote port configurations. The signal paths present at the remote port are determined by the type of communication card installed:

- A standard RS-232 interface with the IMC installed
- An X.25 network interface with the NIMC (Option 002) installed

A connector for the subrack-end of the cable is supplied as part of the Installation Accessories Kit included with the subrack.

Remote Port RS-232 Interface

The remote connector provides a standard serial interface with full duplex capability (DTE configuration). Signal voltage levels comply with the EIA-232-E standard. For more on a modem connection to the remote port, refer to chapter A5, “Local/Remote Management.”

Table C2-6. Remote connector pinout

Pin Number	Description
1	No connection
2	TxD (Transmitted data)
3	RxD (Received data)
4	RTS (Request to send)
5	CTS (Clear to send)
6	DSR (Data set ready)
7	GND (Signal ground)
8	DCD (Data carrier detect)
9–19	No connection
20	DTR (Data terminal ready)
22	RI (Ring indicator)
23–25	No connection

Remote port RS-232 wiring diagram

Here is an example of an available Symmetricom interface cable used to connect a computer to the remote port.

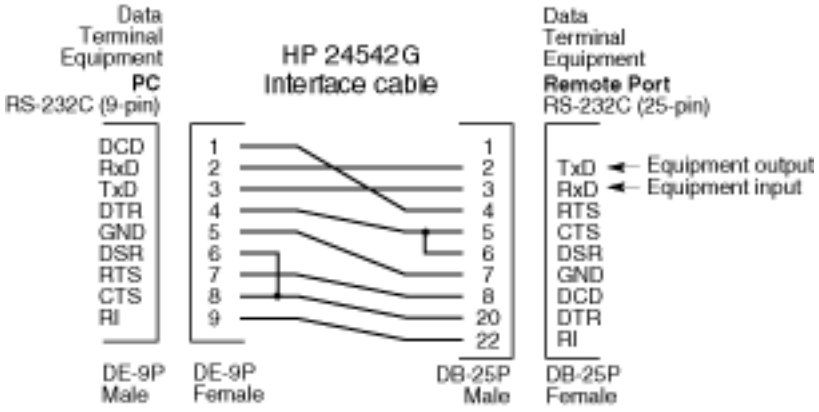


Figure C2-13. Remote port cabling example

Remote Port X.25 Network Interface

In this configuration, the remote port can only be used for an X.25 network connection. The remote connector supports compliance with the RS-232/V.24 DTE physical layer. The major difference as compared to the standard RS-232 interface is the accommodation for the external transmit and receive clock signals on pins 15 and 17 that are part of the X.25 interface. The X.25 interface requirements and configuration procedures are covered in chapter 10 of the *55400A TL1 Programming Reference Manual*.

Table C2-7. Remote connector pinout for X.25

Pin Number	Description	Signal Direction
1	No connection	—
2	TxD (Transmitted data)	Out
3	RxD (Received data)	In
4	RTS (Request to send)	Out
5	CTS (Clear to send)	In
6	DSR (Data set ready)	In
7	GND (Signal ground)	—
8	DCD (Data carrier detect)	In
9–14	No connection	—
15	Tx clk (Transmitted clock)	In
16	No connection	—
17	Rx clk (Received clock)	In
18–19	No connection	—
20	DTR (Data terminal ready)	Out
21–25	No connection	—

System Expansion connectors

The 55401D master subrack provides expansion capability to accommodate up to four expansion subracks. Each expansion subrack provides up to 80, 1:1 protected outputs enabling an expanded system to have a total of 400 outputs maximum.

The expansion connectors include expansion comm ports and expansion signal connectors. When any subrack is connected to another, there are four communication cables that interconnect them. Instructions for installing expansion subracks are not contained in this chapter. If you need to install an expansion subrack go to chapter C3, “Install Expansion Subracks.”

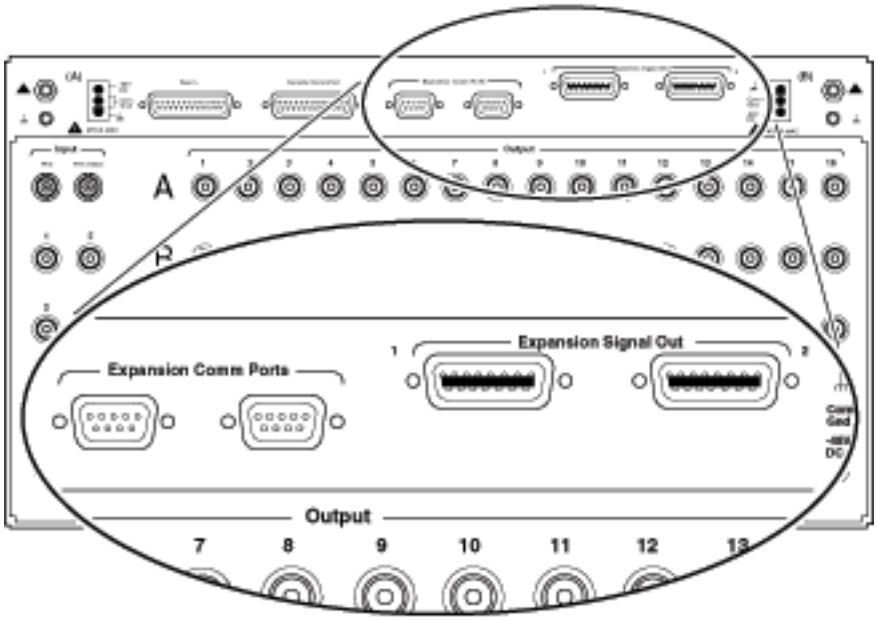


Figure C2-14. Expansion connector locations

Reference Input connectors

The input portion of the 55401D master subrack provides two grounded BNC connectors for a PRC (primary reference clock) and a PRC status signal. In addition, there are eight floating inputs for 2048 kbps or 2048 kHz signals. Those can be ordered as BNC or Siemens-type connectors.

NOTE

Only the first four 2048 kbps/kHz inputs (1–4) are usable when standard clock cards (Input Track & Hold Cards) are installed in the master subrack. Option 001 clock cards are required to support an additional four inputs (5–8).

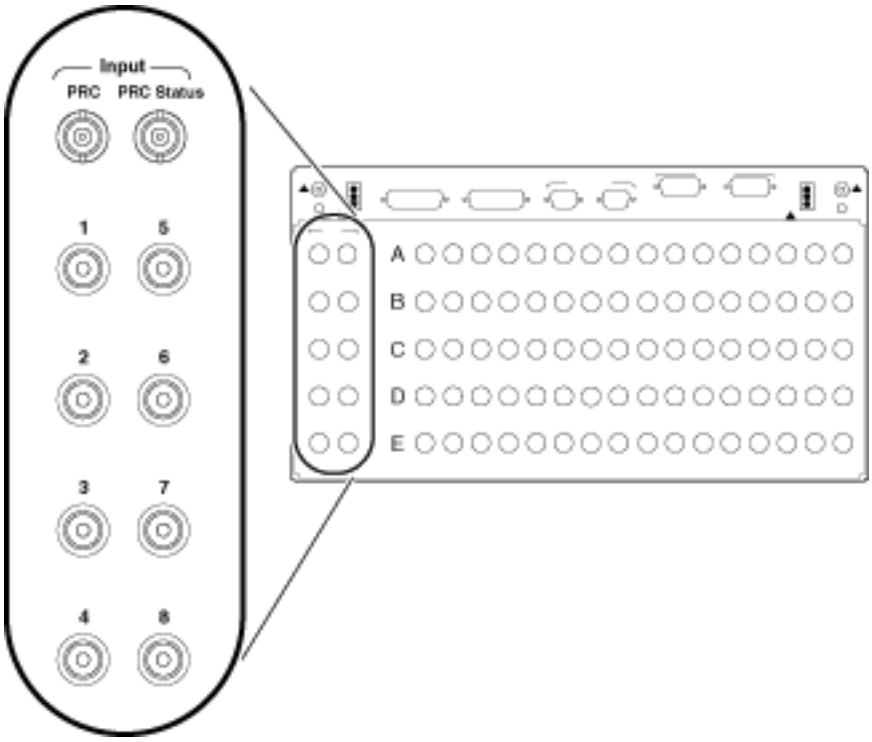


Figure C2-15. Input connector locations

The following table summarizes the input connectors and their requirements.

Table C2-8. Input connector descriptions

Description	Comments	Impedance
PRC	5 or 10 MHz only	50 Ω input
PRC Status	TTL High level in—PRC is normal, TTL Low level in—PRC has problem	
Inputs 1–8	2048 kbps or 2048 kHz	75 Ω inputs

Output connectors

The master subrack connector panel has 80 grounded output connectors arranged into five rows of 16 connectors. These can be BNC or Siemens-type connectors. Each row of 16 connectors corresponds to a pair (typically) of output cards installed in the output card slots labeled A through E on the subrack. Up to 16 outputs are provided by an output card (or a protected pair of output cards), although the exact number is dependent on the specific card type.

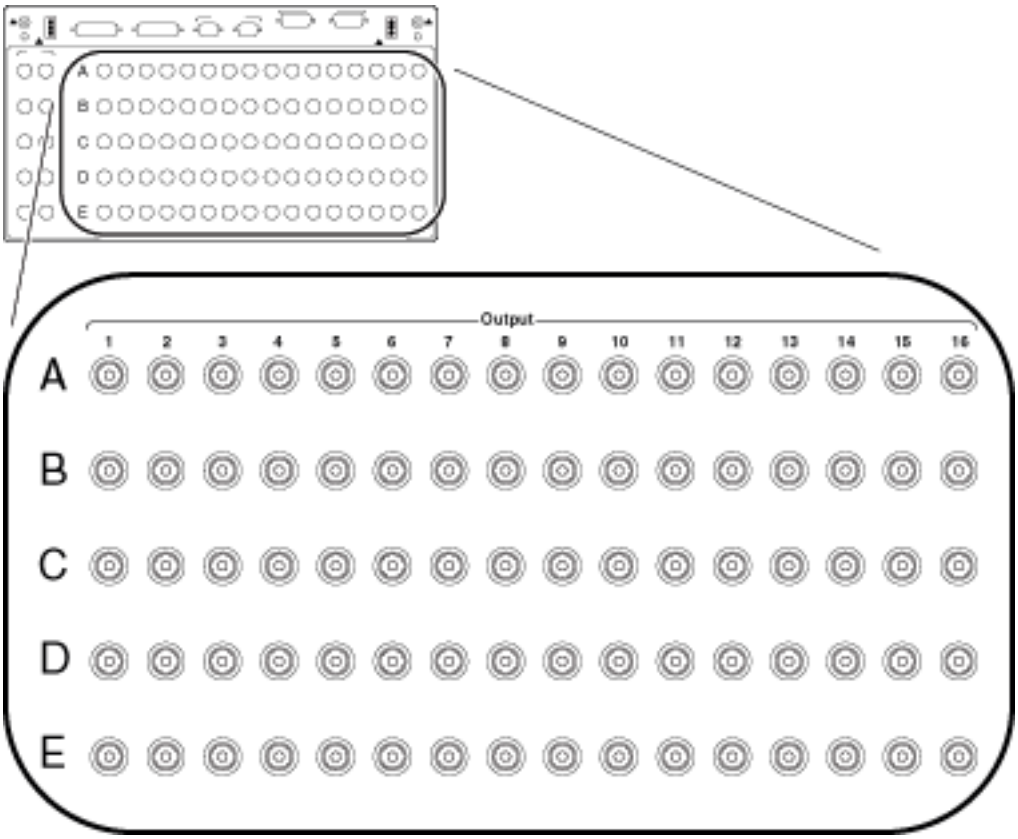


Figure C2-16. Output connector locations

BALUNs for Inputs and Outputs

Except for the 50 Ω input impedance of the PRC connector, all the input and output connectors on the SSU have an impedance of 75 Ω (unbalanced). If the office where the SSU is installed requires 120 Ω balanced inputs or outputs, a Balun transformer will be required for each SSU signal connector. The Baluns are available from Symmetricom. The part numbers are listed in chapter F3, Replacement Parts.

Installation

Parts needed:

- Balun
- Solid conductor wire (twisted pair)
- Impact tool

The wire thickness should be between 0.511mm or 0.643 mm (24 or 22 AWG). The impact tool simplifies the attachment of the wires to the Balun. No stripping of the wire is required. The use of a ground wire at the connector is optional.

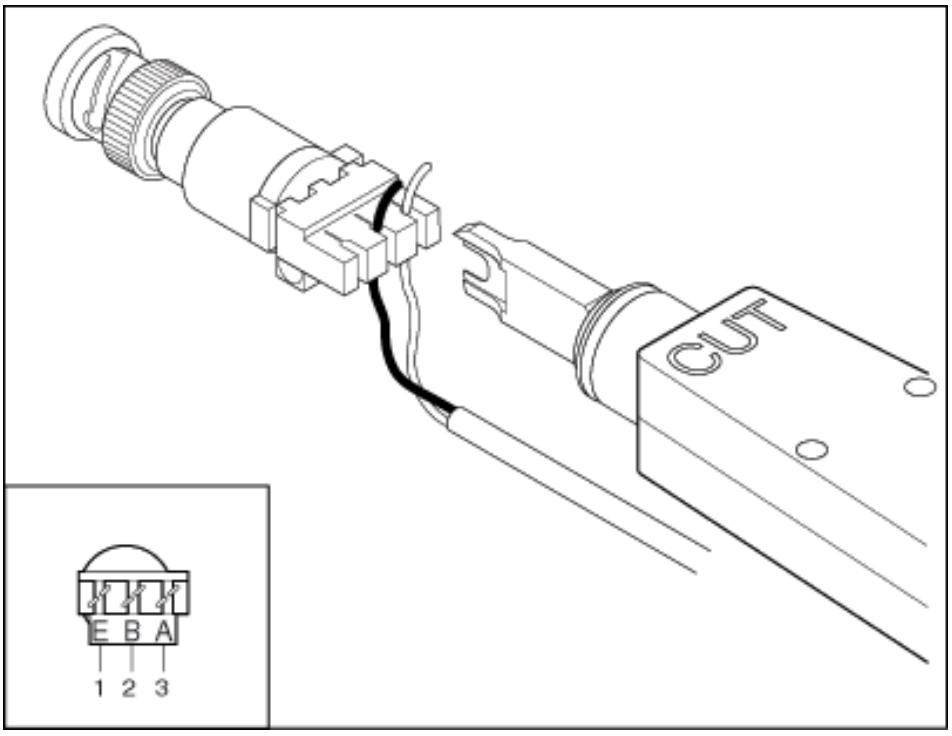


Figure C2-17. Wiring of Balun for 120 Ω balanced operation

Balun Terminals: 1–Earth ground, **2**–one twisted-pair wire, **3**–one twisted-pair wire

Local Port connector

This port is not on the subrack but the communication card. Both the Information Management Card and the Network IMC contain the local port on the card itself. It is a 9-pin DE connector (female) using an RS-232 interface.

This port is wired as a DCE device and provides for system communication with a local terminal or computer running a terminal emulator program. The 55400A supports the use of the TL1 language communication and control. A more convenient way to communicate with the SSU is using the 55450A local craft terminal software. This Windows-based application presents a point-and-click interface as a way to configure the SSU instead of having to use TL1 command syntax.

Through this port it is possible to perform management tasks including security management, configuration, performance monitoring, fault diagnosis, and firmware download. These same tasks can be performed via the remote port described earlier in this chapter.

Wiring the local cable

A serial communications interface cable wired as a “straight-through” cable is needed to connect between the local port and a computer.

A connector for the SSU-end of the cable is supplied as part of the Installation Accessories Kit included with the subrack.

Local Port RS-232 Interface

The local port connector provides a standard serial interface with full duplex capability (DCE configuration). Signal voltage levels comply with the EIA-232-E standard.

Table C2-9. Local Port connector pinout

Pin Number	Description
1	DCD (Data carrier detect)
2	RxD (Received data)
3	TxD (Transmitted data)
4	DTR (Data terminal ready)
5	GND (Signal ground)
6	DSR (Data set ready)
7	RTS (Request to send)
8	CTS (Clear to send)
9	RI (Ring indicator)

Local port RS-232 wiring diagram

Here is an example of an interface cable used to connect a computer to the local port.

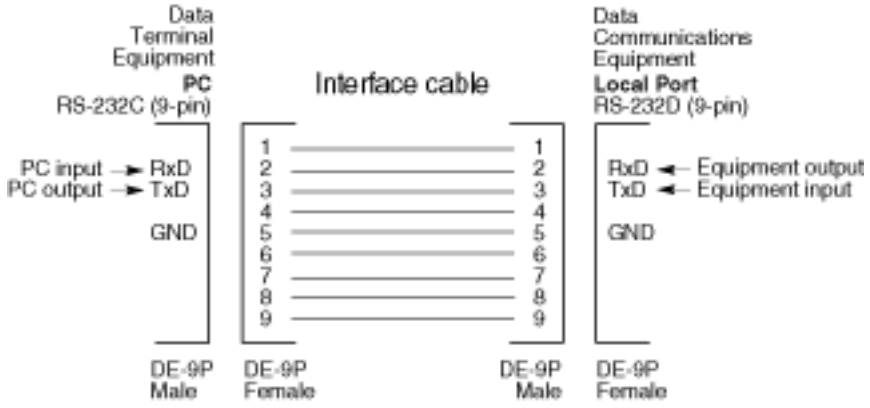


Figure C2-18. Local port cabling example

Connect the Input Signal Cables

Connect the appropriate input signals to the SSU. With the standard ITH cards, the PRC input and inputs 1 through 4 will accept signals. If you have ITH cards with Option 001, inputs 5 through 8 can also be used.

Reference Input Signals

Ensure that the reference signals meet the requirements for the SSU input signals. See chapter A3 for input reference requirements.

NOTE

If the inputs are taken from the 5071A or 55300A equipment, refer to chapter E2 for the testing of those output signals before using them with the SSU.

Connecting the input signals at this time will ensure fewer problems during the installation of the SSU plug-in cards. When setting switches on the ITH cards, be sure to disable unused input channels.

Refer to Figure B2-5 on page B2-8 for the recommended way to route cables to and from the SSU.

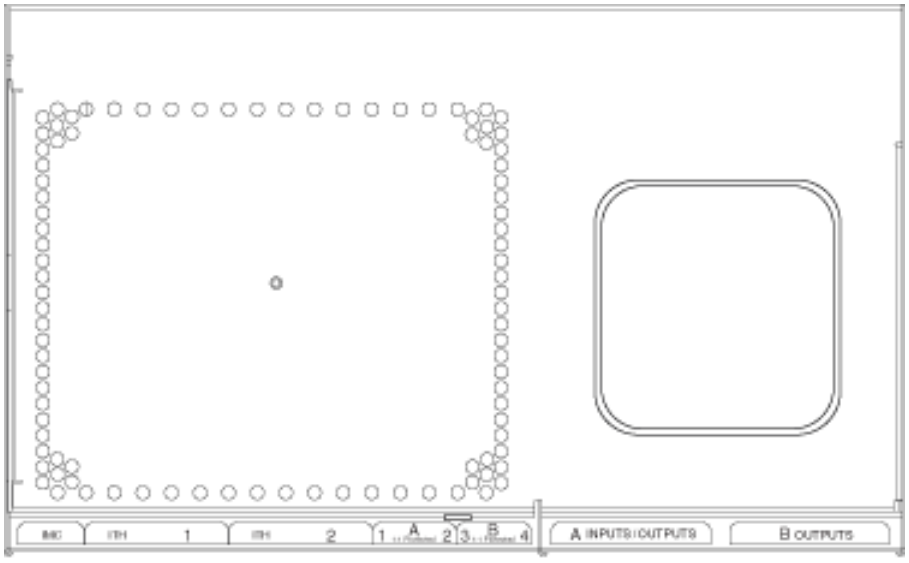
Install the Plug-in Cards

The following sections describe how to install the ITH cards, output cards, and communication card in turn. The procedures assume that the subrack has already been installed and power is applied.

The 55400A uses a redundant architecture. This means that no single failure can bring down the system. To support this concept, all of the output cards, as well as the clock cards, should be installed in protected pairs.

Plug-in Card Locations

The subrack has space for a communication card, two clock cards, and five pairs of output cards (A, B, C, D, and E slots).



Top View

Figure C2-19. Guide for card installation

The communication card slot (labeled AIC/IMC) takes one of the two communication cards:

- Information Management Card
- Network Information Management Card

The ITH slots take the two clock cards, and the "A" to "E" slots each accept pairs of output cards. Each row of outputs on the connector panel (labeled "A" to "E") corresponds to a pair of output cards installed in slots "A" to "E."

NOTE If the output cards will not be installed as protected pairs, install only one card per labeled pair of slots. For example, one output card could be installed in either of the two slots designated as "B." The second slot should remain empty.

Plug-in Card Identification

Card assemblies are identified by:

- Symmetricom model number on the front panel of each assembly
- Serial number on the side panel of cards

If there are any questions regarding a specific component, note the model number and serial number on each card assembly and include it in any correspondence with Symmetricom.

Overview of Card Switch Settings

Each plug-in card contains switches that need to be configured before use to ensure proper operation. As the procedure describes each card to be installed, there will be a pointer to the location of the switch settings the card in this manual.

TIP Create and maintain a switch configuration record for each card being installed in the system. One way to do this is to copy the switch configuration tables in this manual and mark your settings. Keep this documentation accessible. If a card ever needs to be replaced, the record is then available for configuring the replacement card correctly.

Initial Installation of 55400A System Cards

This is the procedure to follow when installing 55400A system cards for the first time:

- Configure the card
- Install the card
- Observe the card status
- Repeat for the next card

Install the cards in this order as instructed in the following topics:

- ITH clock cards
- Output cards
- Communication card

NOTE

It is strongly recommended that all card configuration at the time of the initial installation be accomplished by making the switch settings on the cards. This approach ensures that all card parameters are initially set to known states and can avoid confusion later during the service life of the SSU.

Install the ITH Clock Cards

These cards are very important to the overall performance of an SSU. They each contain a local oscillator that will track an input reference as well as all the circuitry for judging the health of the input signals. The two clock cards regularly compare individual results to increase the likelihood that a bad reference is quickly detected.

To install the first ITH card

1. Set switches

a. Set the switch settings for this card include enabling inputs, selecting input formats, PRC frequency, and tracking mode. *Refer to chapter D1 for ITH card switch settings, and then return to this procedure.*

CAUTION

The next step should only be performed during initial installation of the SSU.

b. Set switch S5–7 to "Off." (See Note below.)

NOTE

If this ITH card assembly contains Option 001, there can be confusion about the location of this S5 switch. If the ITH assembly is labeled as Option 001 on the front panel, there are three circuit boards rather than the standard two boards. In this case, the S5 switch referenced here is located on the middle board. Otherwise, S5 is on the top board.

2. Plug in card

a. Carefully insert the first ITH card into the ITH-1 slot.

b. Ensure that the card assembly is in proper alignment with its mating backplane connector.

c. Push the card assembly into place until it is fully seated into the backplane connectors without any binding or jamming.

3. Observe

a. The self-test routine will execute.

b. Wait until the ITH diagnostics LED starts blinking. Typically this takes less than one minute.

WHAT IS HAPPENING?

When the ITH card is first installed, the switch settings are read into on-card non-volatile memory overwriting any existing settings (this process is also called the "Istate transfer"). The blinking LED indicates that the switch settings have been written into memory.

4. Last step

Remove the card, set switch S5–7 to "On" and reinsert the card.

NOTE

To avoid situations where one ITH card may in the future inadvertently copy its configuration parameters to the other, performing the last step is required. The ITH card will stop operating and set a major alarm if the S5–7 switch is not set back to "On" shortly after the diagnostic LED starts blinking.

To install the second ITH card

1. Set switches

Set the switches for this card the same as for the first ITH card with switch S5–7 set to On.

NOTE

If this ITH card assembly contains Option 001, there can be confusion about the location of this S5 switch. If the ITH assembly is labeled as Option 001 on the front panel, there are three circuit boards rather than the standard two boards. In this case, the S5 switch referenced here is located on the middle board. Otherwise, S5 is on the top board.

2. Plug in card

Carefully install the second ITH card into the ITH-2 slot.

WHAT IS HAPPENING?

The settings contained in the memory of the first card will automatically be copied to the second card.

3. Observe

The self-test routine will execute.

4. Next actions

a. Before installing any more cards, wait until the ITH warmup LEDs go off. Depending on conditions, this can take from 2–20 minutes.

b. Now connect the input references you have configured the ITH cards to expect. Wait until at least one input has been qualified ("Q" LED is on) and is being tracked as the active reference ("A" LED is on).

c. Do not continue to the next section until both ITH cards indicate a tracking condition and all alarm LEDs are off.

NOTE

A minor alarm will occur if input channels are enabled yet have no input signal connected to that input. If necessary, recheck the ITH cards for the correct switch settings. If changes are made to the switch settings, repeat this procedure beginning at step 1 of "To install the first ITH card."

Important

The ITH clock cards are different from the other cards because they share information about their operating condition and their judgments of the input signals. Provisioning is kept in non-volatile memory, with the switch settings as a backup for the most important variables. A replacement ITH card will generally obtain provisioning from the active ITH card already in the system. Changes to the ITH provisioning state can be made to an operating system without taking it out of service.

ITH Card Changes During Service

At least two major types of ITH card changes can take place during the service operation of an SSU:

- ITH card replacement
- Change to a parameter setting while in service

These two situations are described here.

To Replace an ITH Card while the System is in Service

Use this procedure if you are replacing one ITH card with another without making any changes to the configuration of the ITH cards.

1. Remove the failed ITH card

NOTE

When replacing an ITH card in a system that is in service, be sure that the card being replaced is in the standby mode. (DO NOT remove the active card.)

2. Set switches

a. Set the switches on the replacement card to be the same as the card it is replacing.

b. Check that switch S5–7 is set to "On." This setting ensures that the parameter settings from the active ITH card will automatically be copied into the memory of the replacement card when it is installed.

3. Plug in card

a. Carefully insert the ITH card into the subrack.

b. Ensure that the card assembly is in proper alignment with its mating backplane connector.

c. Push the card assembly into place until it is fully seated into the backplane connectors without any binding or jamming.

4. **Observe**
   a. The self-test routine will execute.
   b. Wait until the ITH card completes the warm-up period and successfully completes the qualification of inputs.
5. **Last Step**
   a. Tighten the mounting screws at the top and bottom of the card.

To Force an ITH Parameter Change during Service

There may be instances during the operation of a system when you want to change a parameter setting without taking the system out of service. For example, you may need to disable an input or change a format type from 2048 kHz to kbps.

NOTE

Although it is possible to change parameter settings during service by modifying switch settings it is not recommended because this method can cause the SSU to go into holdover if the switches are not set correctly.

Most parameter changes to operating ITH cards can be accomplished more easily using TL1 commands or the local/remote management software from Symmetricom described earlier in this manual. For more information about the software applications and connecting a computer to the SSU, refer to chapters A1 and A5.

Install the Output Cards

The output cards determine the number and type of output signals the SSU will provide for downstream network elements.

Typically, output cards are installed as protected pairs.

NOTE

Problems may be encountered when different model output cards are combined in pairs. DO NOT install as a pair output cards that have different model numbers. For example, a 55481B should never be installed as a pair with a 55484A card. In cases where two different cards are combined, alarms may, or may not, be set and most often the output signals from the cards will be degraded to the point that the output signals no longer meet the requirements of the pulse mask.

This procedure assumes that the output cards are installed as protected pairs.

1. **Set switches**
   a. Set the switch settings for the first card of a pair. *Refer to chapter D2 for output card switch settings, and then return to this procedure.*
   b. Set the switches on the second card of the pair the same as the first.
2. **Plug in cards**
   a. Carefully insert the output cards, one at a time, into one of the slots labeled with a letter from “A” to “E.”
   b. Ensure that each card assembly is in proper alignment with its mating backplane connector.
   c. Push each card assembly into place until it is fully seated into the backplane connectors without any binding or jamming.
3. **Observe**
   a. The self-test routine for each card will execute.
   b. LEDs indicating power is applied, the active ITH card, and the active or standby state for the individual card.
4. **Next actions**
   a. Repeat this procedure for the additional output cards to be installed.

Install the Communication Card

The communication card for the 55400A SSU can be either of the following:

- Information Management Card
- Network Information Management Card

To install the communication card

1. **Set switches**
   a. Set the switch settings for this card as appropriate. *Refer to chapter D3 for communication card* switch settings, and then return to this procedure.
2. **Plug in card**
   a. Carefully insert the communication card into the IMC slot.
   b. Ensure that the card assembly is in proper alignment with its mating backplane connector.
   c. Push the card assembly into place until it is fully seated into the backplane connectors without any binding or jamming.
3. **Observe**
   a. The self-test routine will execute.
   b. LED indicating power is applied, diagnostics LED flashes once, alarm LED flashes once, and critical alarm LED remains on.
4. **Press**
   a. Alarm Cutoff push-button to turn off critical alarm LED.

At this point, SSU system should be in an all-green LED status.

NOTE

This will not be true if there are any enabled inputs that have no reference signal connected. Inputs are disabled/enabled on the ITH cards using switch settings or the local/remote management software from Symmetricom described earlier in this manual.

What is Next?

1 Perform the qualification tasks in chapter E1 and then the equipment tests in chapter E2.

The qualification tasks consist of:

- Display current status
- Verify SSU configuration
- Set SSU date and time
- Set SSU system ID
- Configure SSU for network operation (if needed)

The equipment tests consist of:

- Alarm tests
- Output checks

NOTE If installing the SSU with the frequency standard or GPS reference source, complete those installations before starting the qualification procedures.

2 Connect the outputs to network elements.

The last step is to connect the output signals to the network elements that require synchronization.

Backdating

NOTE

This section contains material that applies to older versions of subracks prior to the 55401D and 55402D.

External Line Filters

Subracks before models 55401D and 55402D require the use of external line filters (two per subrack). These filters are required to satisfy the European-based CE mark requirements for conducted emissions. For all other installations, use of these filters is recommended as a safeguard against emission leakage onto the –48 Vdc power supply lines. The subracks affected are:

- 55401B
- 55401C
- 55402C

The following information provides recommendations for the power supply cabling to the subrack, assembly of the power connectors for the external filters, and installation of the external line filters.

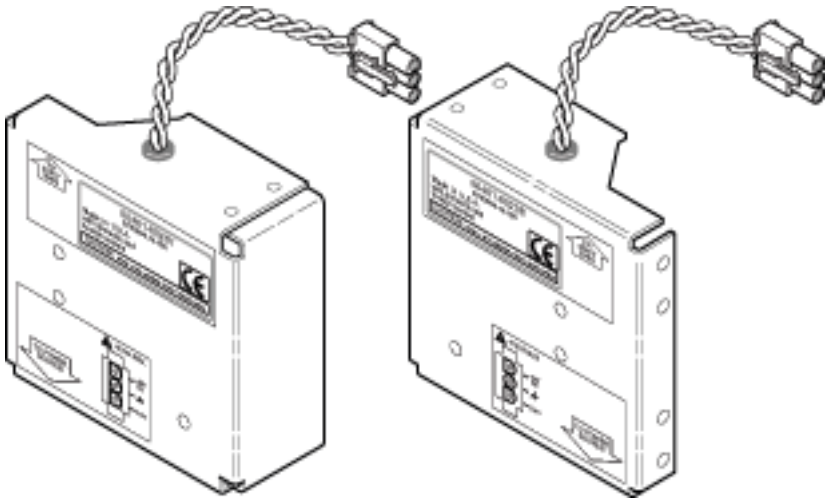


Figure C2-20. External line filters

NOTE

Two different types of connectors are used on some subracks. If the connectors at the end of the line filter cables are not the same type as those on the subrack, read the following information.

Changing Connector Types

Parts for assembling two additional power connectors are included for instances where the power connectors on the subrack are different from those on the external line filter cables that connect to the subrack. Connectors can be a three-pin or four-pin configuration.

If it is necessary to replace a three-pin type connector with a four-pin type, follow the next procedure. If a four-pin type should need to be replaced with a three-pin type follow the procedure on page C2-12.

To install four-pin power connector

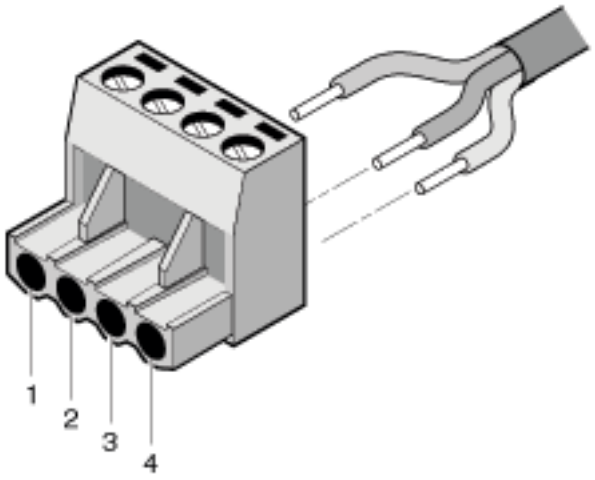


Figure C2-21. Power Connector

1 – Ground (frame ground)

2, 3 – Common Gnd (battery return)

4 – –48 Vdc

Wire identification

Refer to this wire identification information when replacing a connector on the external line filter:

- Green wire = Ground (frame ground)
- Black wire = Common Ground (battery return)
- Red wire = –48 Vdc

Assembly procedure

1. Strip 9 mm of insulation from the wires. (Use wire no larger than 2 mm diameter.)
2. Connect the frame ground wire (if present) to plug position 1.
3. Connect the common ground wire to plug position 2 or 3.
4. Connect the –48 Vdc wire to plug position 4.

CAUTION

Common ground pins of the two –48 Vdc subrack connectors are internally connected.

Grounding issues

Before running power cables, consider how best to provide frame grounding for the subrack. A frame ground can be connected in one of three ways:

1. As part of the cabling through the –48 Vdc power connector.
2. Through a single-wire connection to the ground stud on the connector panel.
3. Through the rack mount brackets when the rack cabinet itself is properly grounded.

NOTE

To prevent battery return-to-frame ground faults, do not connect battery return on the subrack to the frame ground.

Install the Filters and Apply Power to the Subrack

1. If necessary, review the recommendations for running power cables to the subrack. (See page C2-11.)
2. Connect the leads of the battery feed lines to the branch circuit power source terminals according to local practices.
3. Set the branch circuit breakers to on, or re-install the branch fuses.
4. Measure the voltage of the battery leads at the subrack. The voltage must measure from –36 to –57 Vdc.
5. Plug the assembled power connector on the left-hand side of the subrack into the 55401-60207 External Filter.
6. Attach the external filter to the equipment rack using the supplied screws. (See Figure C2-22.)
7. Plug the power cable at the top of the filter into the “A” power connector on the subrack.

8. Plug the assembled power connector on the right-hand side of the subrack into the 55401-60208 External Filter.
9. Attach the external filter to the equipment rack using the supplied screws. (See Figure C2-22.)
10. Plug the power cable at the top of the filter into the “B” power connector on the subrack.

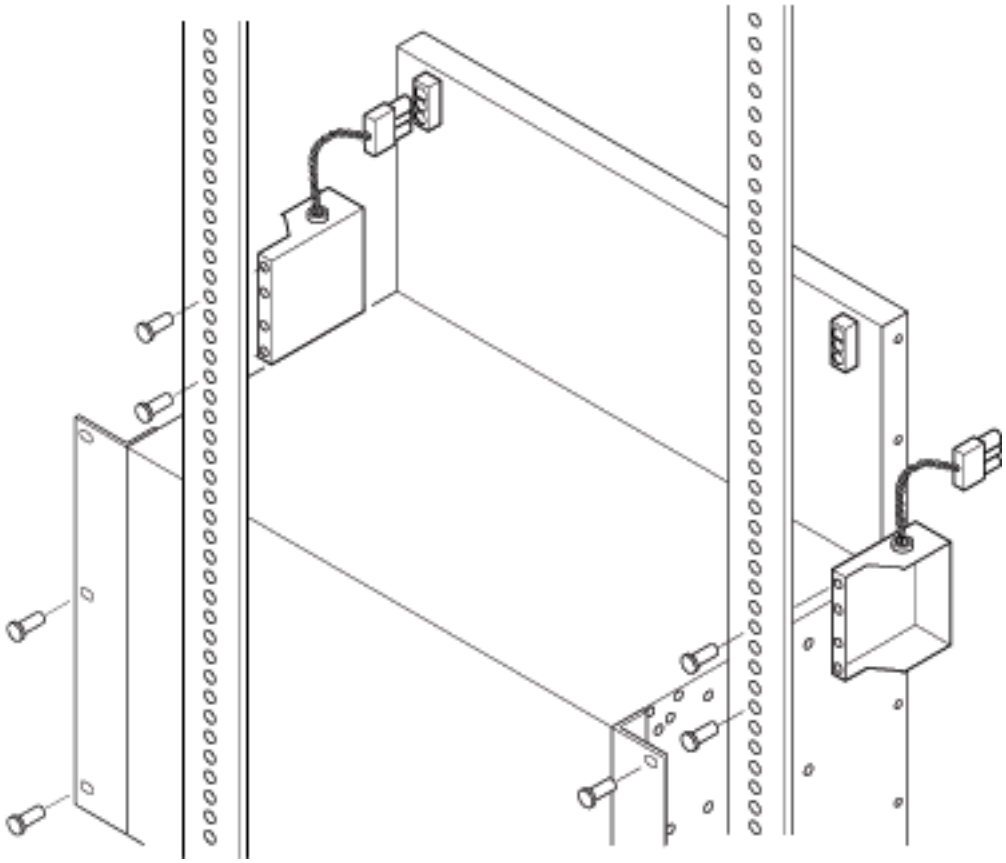


Figure C2-22. View of subrack with external filters

C3

Install Expansion Subracks

Installation, cabling, verifying, and backdating

In This Chapter

This chapter describes how to install an expansion subrack on a system that is already in service. The topics include:

- General information
- Equipment rack recommendations
- Switch settings for expansion subrack communication cards
- Cabling information
- Installing the first expansion subrack
- Installing an additional subrack
- Replacing or removing an expansion subrack
- Using local craft terminal software and TL1 syntax to verify communication between master and expansion subracks
- Expansion subrack events
- Installing the adapter box on the “B” or “C” subrack

NOTE

See “In This Manual” for a list of tasks to put an SSU expansion subrack into service.

Assumptions in these procedures

- Although the procedures show a 55402D expansion subrack being installed, replaced, or removed in a system with a 55401D master subrack, the procedures apply to the other subracks, as well.
- Typically, all SSU systems include a master subrack that contains two ITH clock cards. These procedures assume that your master subrack contains two ITH clock cards which makes it possible to install or remove an expansion subrack while the master subrack is in service.
- These procedures call out some steps that must only be performed on the standby side of the system to ensure that the active, online side is not disturbed.

Subracks Covered by the Procedures

These installation procedures apply to the following subrack configurations:

- 55401D
- 55402D
- 55401B with adapter box
- 55401C with adapter box
- 55402C with adapter box

NOTE The adapter box is described in the backdating section of this chapter.

Expansion Subrack Connector Characteristics

There are two variations of expansion subracks that have been released. The differences relate to the characteristics of the connectors as summarized in the following table.

Table C3-1. Expansion subrack connectors

Connector	55402C	55402D
Outputs (80)	Grounded	Grounded
–48 Vdc	Locking	Locking
Expansion signals	Terminated	Terminated and shielded

NOTE Refer to the chapter on specifications (chapter A3) for more details about the subracks including dimensions and power requirements.

Accessories, Tools, and Equipment

Accessories

An installation accessories kit will be supplied with the 55402D expansion subrack. It contains connectors that can be used for making connecting cables. The items in this kit are described in Table C3-2.

Table C3-2. Accessories supplied with 55402D expansion subrack

Accessory	Qty	Purpose	Part #
Locking power connector	2	–48 Vdc power inputs	1251-5272
Spare 1A telecom fuse	1	Communication card	2110-1129
Spare 2A telecom fuse	1	Output cards	2110-1125
Spare 3A telecom fuse	1	ITH cards	2110-1000
Crimp lug terminal	2	Frame ground connection	0360-0041
Screw–10-32 w/nylon washer	6	EIA rack mounting	0570-1366
U-nut	6	EIA rack mounting	0590-0804
Connector pins	8	Power connector	1251-2418

Two pairs of rack mounting flanges are also included for mounting the SSU into an EIA or ETSI rack.

Tools

Table C3-3 describes the required tools and where they are used. The list of tools does not include a crimp tool that will be needed to make the mating connectors for the input/output connectors.

Table C3-3. Tools needed to install 55402D expansion subrack

Tool	Purpose
Large Phillips or Pozidriv #2 screwdriver	Rack mounting screws
Molex Hand Crimping Tool (11-01-0084)	Power cables
7 mm nut driver	Frame ground stud on subrack front panel
Wire strippers	Making power cables
Diagonal cutters	Making power cables
ESD wrist strap	ESD protection when installing cards

Equipment

Table C3-4 describes the required equipment and where they are used.

Table C3-4. Equipment needed to qualify 55402D expansion subrack

Equipment	Purpose
Digital multimeter	Check voltage and cables for opens/shorts
54603A general purpose oscilloscope, or equivalent	Check signal characteristics during qualification

Install the Expansion Subrack

The physical installation of the expansion subrack is the same as for the master subrack. For this reason, there are references back to the installation of the master subrack for rack positioning and power inputs.

Position in the Rack Cabinet

It is recommended that the master subrack be installed near the bottom of the rack cabinet and the expansion subrack be installed above it. See chapter B2 for drawings of three different equipment configurations showing master and expansion subracks. The recommended spacing between the equipment is shown as well.

With the master subrack near the bottom, the installation of the first expansion subrack above it simplifies the cabling between the subracks.

NOTE

Cable Length Limit: The following cable length limitation will determine how far from the master subrack any expansion subrack may be located:

The master subrack can drive the expansion signals through up to 8 meters of cable length. This means that if you were to take one cable from each pair of Expansion Signal cables used to connect the subracks together and lay them out end-to-end, the total cable length cannot exceed 8 meters.

For example, if you were connecting two expansion subracks to a master subrack and the first subrack was located 6m from the master subrack, the second expansion subrack should be no more than 2m away from the first.

Installing the expansion subrack

Follow the instructions in chapter C2, “Subrack Installation Procedure” to install the expansion subrack in the rack cabinet.

Connecting the –48 Vdc power inputs

Follow the procedures in chapter C2, “–48 Vdc Power Inputs” through “Connecting dc Power” to apply power to the expansion subrack.

Expansion Subrack Cabling

When a master and expansion subrack are cabled together, there are four cables that interconnect them. Two cables connect the Expansion Comm ports and two cables connect the Expansion Signal ports.

The following drawings show in diagram form how the cables are connected for single and multiple expansion subrack configurations.

Expansion Subrack Cable Kits

There are two cable kits required for an expansion subrack:

- 55424A Expansion Subrack Cable Kit
- 55425A Expansion Subrack Comm Return Kit

55424A kit contains

- 1 expansion comm cable
- 2 expansion signal cables

All cables are the same length. An option number to the product specifies the desired length. Lengths of 2, 3, 4, 5, 6, 7, and 8 meters are available.

55425A kit contains

- 1 expansion comm cable
- 2 connector terminators

The single cable is used to connect from the last (most-distant expansion subrack back to the master subrack. An option number to the product specifies the desired length. Lengths of 2, 3, 4, 5, 6, 7, 8, 10, 13, and 18 meters are available.

NOTE

When determining the length of cable needed, be sure to take into account any distance in going from rack to rack via cable trays, etc. Do not route cables around motors, generators, or other equipment that produces electromagnetic fields.

Expansion Subrack Cable Diagrams

The drawings are to show only the cable connections between subracks. No effort is made to indicate the proper routing of cables. In all diagrams, the subrack connector designations from left to right are:

- Expansion Comm port (9-pin male connector)
- Expansion Comm port (9-pin female connector)
- Expansion Signal In (two 15-pin female connectors)
- Expansion Signal Out (two 15-pin female connectors)

Master with Single Expansion Subrack

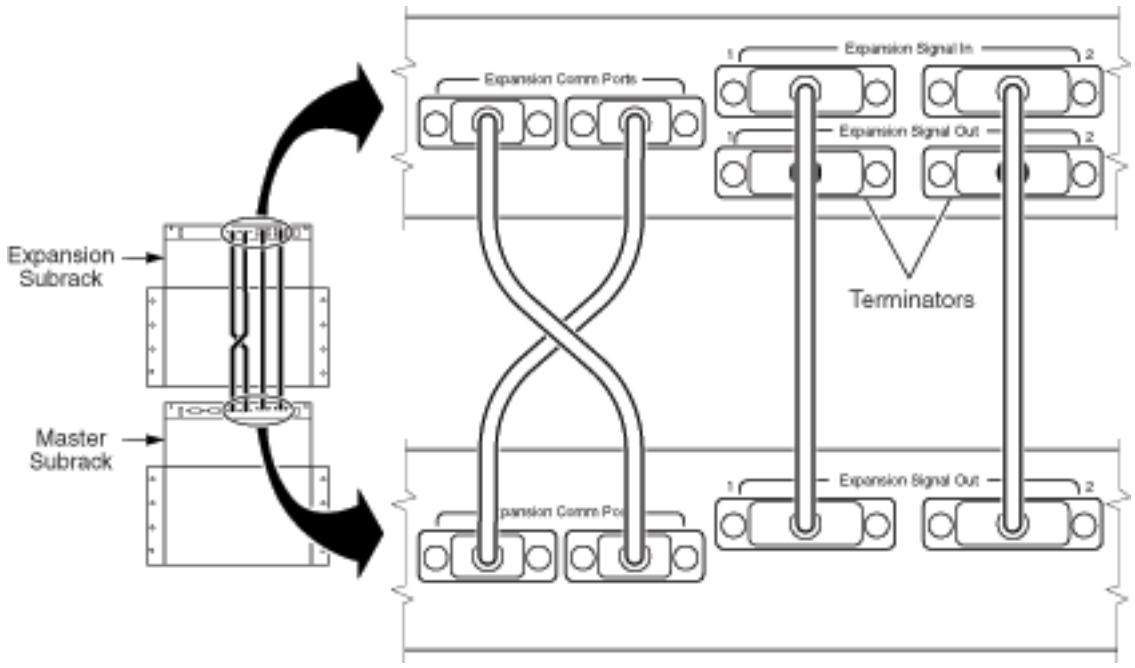


Figure C3-1. Cable diagram of master and one expansion subrack

NOTE

Two terminators plug into the unused Expansion Signal Out 1 and 2 connectors on the expansion subrack.

Master with Two Expansion Subracks

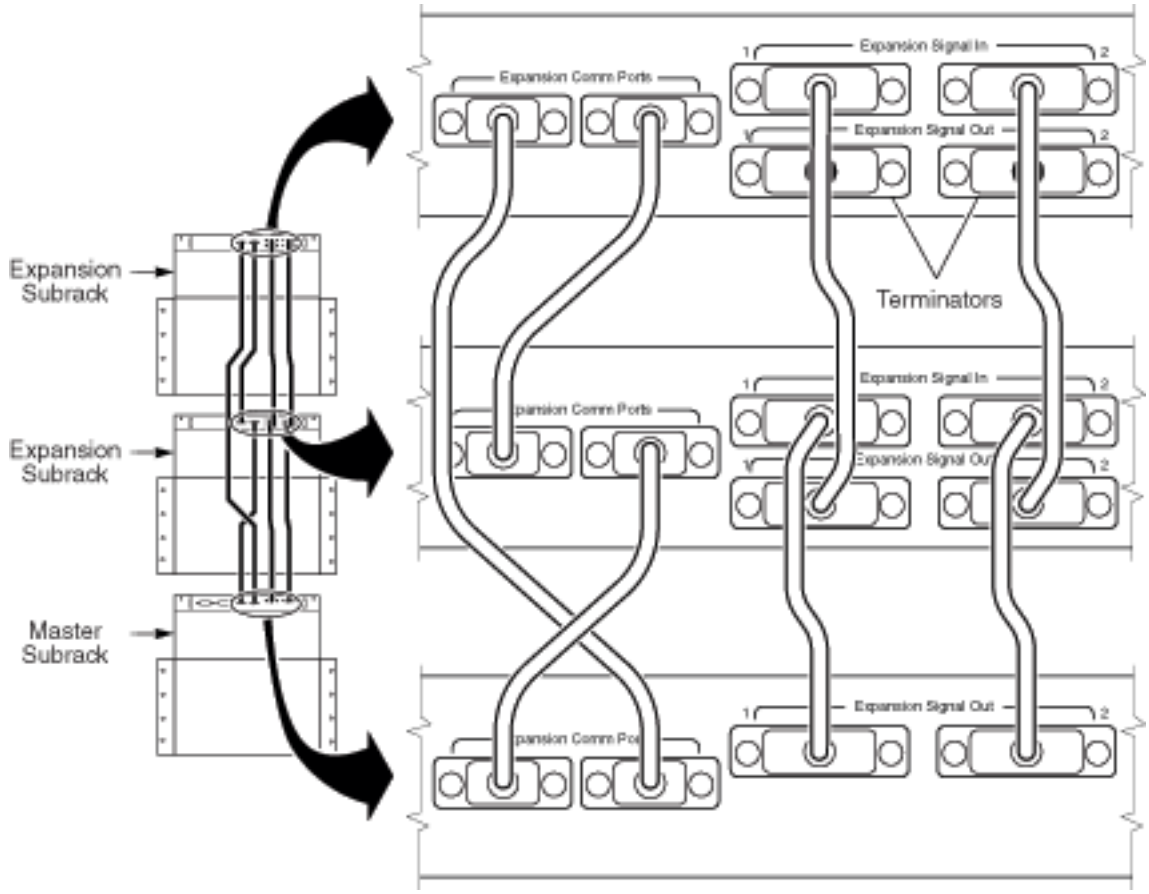


Figure C3-2. Cable diagram of master and two expansion subracks

NOTE

Two terminators plug into the unused Expansion Signal Out 1 and 2 connectors on the last expansion subrack.

Master with Three Expansion Subracks

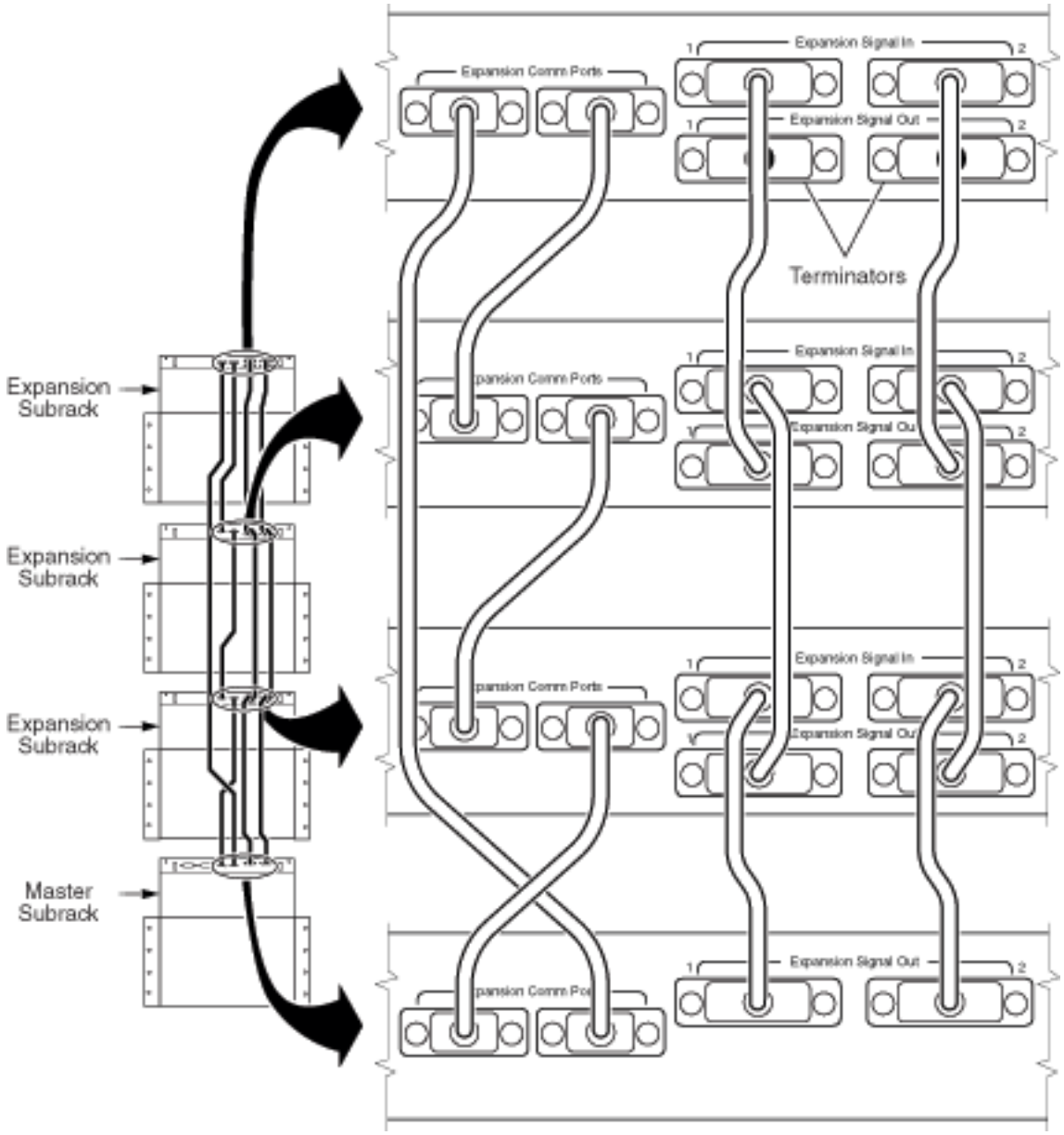


Figure C3-3. Cable diagram of master and three expansion subracks

NOTE Two terminators plug into the unused Expansion Signal Out 1 and 2 connectors on the last expansion subrack.

Master with Four Expansion Subracks

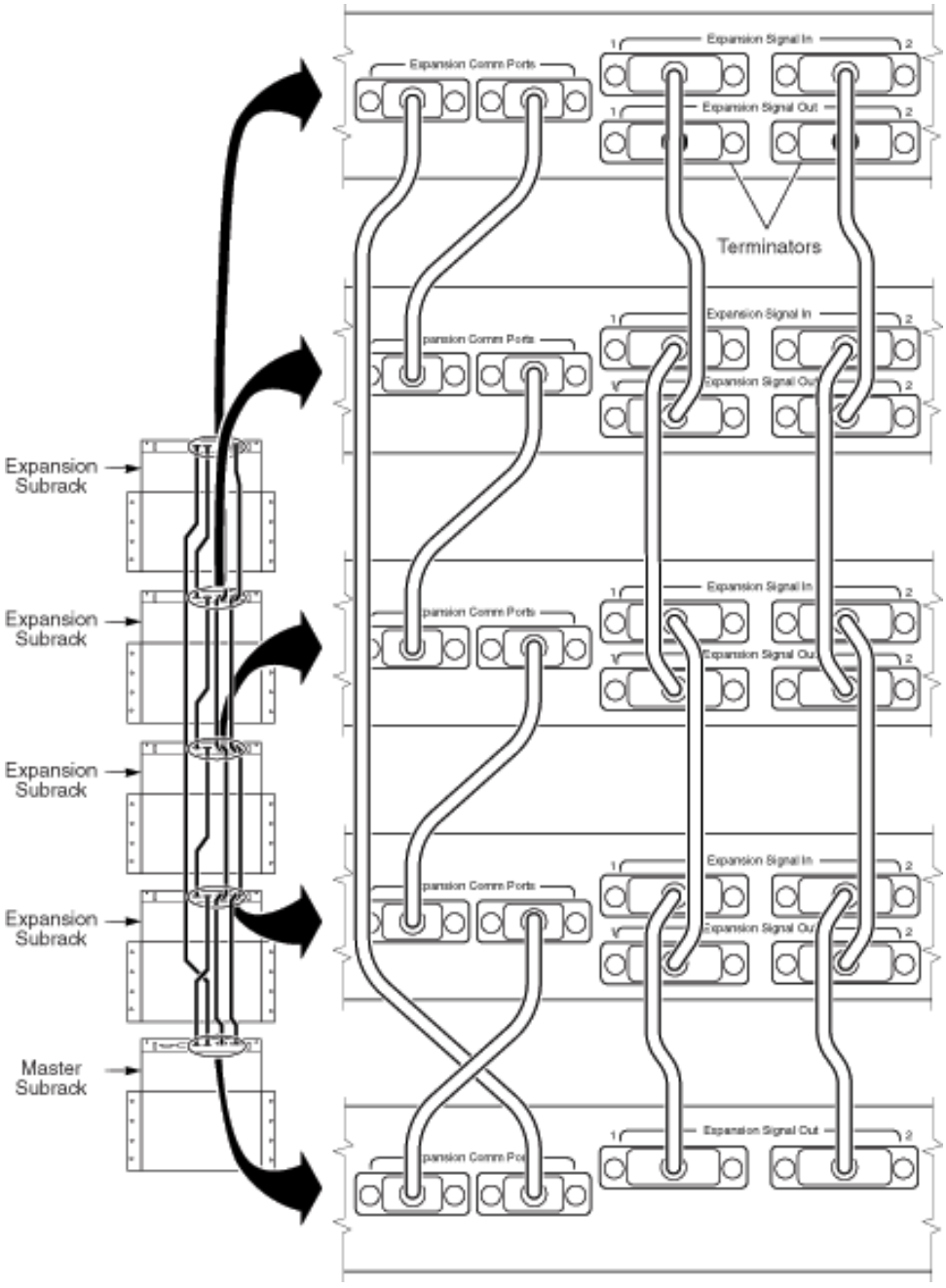


Figure C3-4. Cable diagram of master and four expansion subracks

NOTE

Two terminators plug into the unused Expansion Signal Out 1 and 2 connectors on the last expansion subrack.

Expansion Subrack Cards

The expansion subrack contains output cards for generating timing signals as well as the cards needed to maintain communication and synchronization with the master subrack and other expansion subracks. Each of the communication and synchronization cards has switch settings.

There are two types of expansion cards that handle the alarm management, the routing of synchronization signals, and communication with the master subrack:

- 55419A Expansion Synchronization Card
- 55443A Expansion Communications Card

55419A Expansion Synchronization Card

There are normally two synchronization cards in each expansion subrack to provide redundant operation. The function of these cards in the expansion subrack is similar to that of the ITH clock cards in the master subrack. See Table C3-5 for the card's switch settings.

Table C3-5. Expansion Sync Card Switch Setting

Switch	Bit	Parameter	Off	On (Default)
S4	1-7	Reserved	—	—
	8	Firmware Startup State	Force download mode	Verify firmware on startup

Switches S1, S2, S3, and S5 are not used.

55443A Expansion Communications Card

A single communications card is required in each expansion subrack. The function of this card is similar to the communication card in the master subrack. See Table C3-6 for the card's switch settings.

Table C3-6. Expansion Comm Card Switch Setting

Switch	Bit	Parameter	Off	On (Default)
S5	1	Firmware Startup State	Force download mode	Verify firmware on startup
	2-8	Reserved	—	—
S6	1	Single ITH operation	One ITH card in master subrack	Two ITH cards in master subrack
	2-4	Reserved	—	—

Switches S3 and S4 are not used.

Access Identifier for Multiple Subracks

An additional <aid> parameter in TL1 command strings is needed to identify the location of the output cards in multiple-subrack systems. The particular subrack must be identified in the command line to ensure that the correct card is configured or identified.

What follows is an example of how to interpret the access identifier for output cards in expansion subrack systems. Refer to the *55400A TL1 Programming Reference Manual* for more information on how to use and interpret access identifiers.

<aid> Parameter

The access identifier for multiple-subrack systems is in the form:

S*n*-OUT*x*

Where *n* is the ID number of the subrack and *x* is the letter of the output card slots where the card, or pair of cards, is located. (When two output cards are installed as a protected pair, the command applies to both cards.)

Example Command

In this example, the command sets the output cards in slot C of the first expansion subrack to squelch their outputs when the master subrack goes into holdover mode.

```
ED-EQPT::S1-OUTC:1:::HLDACT=SQUELCH;
```

ID Number

The ID number of the subrack is set with a switch at the time the subrack is installed. Values can be 0, 1, 2, 3, or 4. The master subrack always takes the “0” value. The remaining numbers are used for the expansion subracks. In this case, the command is directed to the subrack with its ID number set to “1.”

Card Slot

The letter (A, B, C, D, or E) refers to the position in the subrack where the output card is located. The ten slots for output cards are divided into pairs with each pair of slots having a letter assigned using a label on the subrack itself.

Adding the First Expansion Subrack

NOTE

This procedure is written to allow the expansion subrack to be installed while the master subrack is in service.

Install the subrack and the cards

a. Install the empty expansion subrack into the rack cabinet and apply –48 Vdc at power inputs A and B. Refer to chapter C2 for information on rack mounting and applying power to the subrack.

b. Set the backplane switch on the expansion subrack to "1" (for the first expansion subrack). This step establishes the expansion subrack's identification number. The switch is located near the upper left of the backplane behind where the expansion communications card will be installed. (See Figure C3-5.)

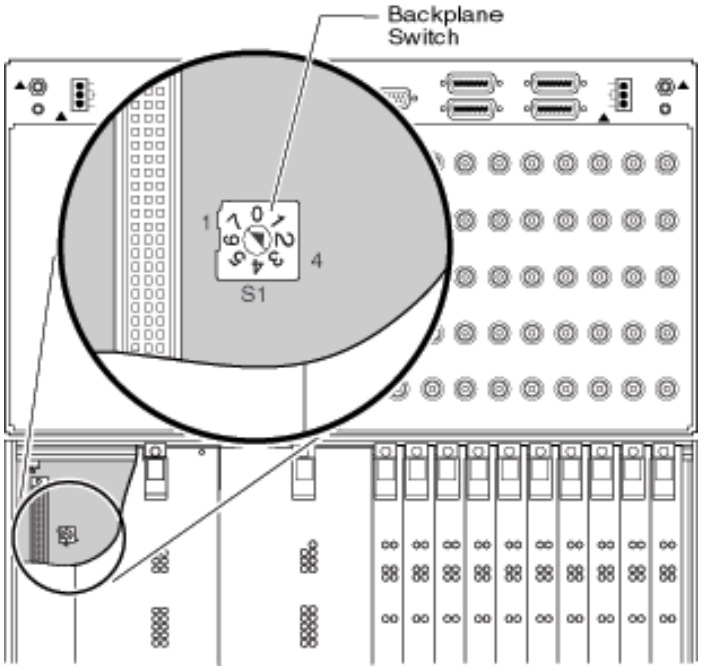


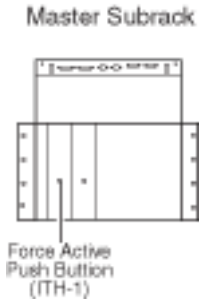
Figure C3-5. Expansion subrack backplane switch location

c. Check the switch settings on the expansion synchronization cards, as described earlier in this chapter, and install the two cards into the expansion subrack. The cards go into the same slots in the expansion subrack that the ITH-1 and ITH-2 cards do in the master subrack. Ignore any alarms in the expansion subrack until the end of this procedure. Tighten the retaining screws.

d. Configure and install the output cards that are part of this expansion subrack. Refer to chapter D2 for more on configuring the output cards. Tighten the retaining screws.

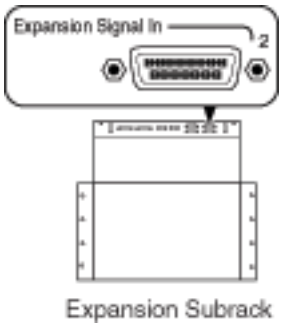
e. On the master subrack, verify that no alarm conditions exist and take note of which ITH card is in the Active mode. (This is important so that at the end of this procedure the same ITH card can be returned to its role as the active ITH card.)

f. On the master subrack, set the ITH-1 card to the Active mode by pressing the **Force Active** push button on this card.

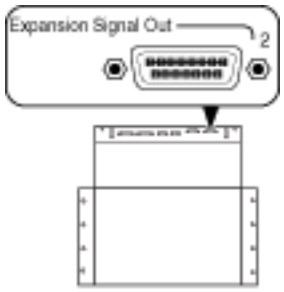


Connect the first expansion signal cable

a. Take one of the expansion signal cables (15-wire) and connect one end to the expansion subrack at the **Expansion Signal In—2** connector. Tighten the cable connector in place.

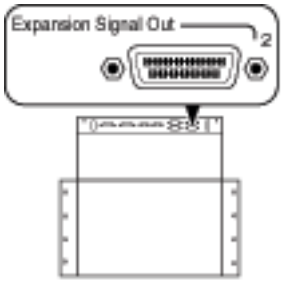


b. Connect the other end of the expansion signal cable to the master subrack at the **Expansion Signal Out—2** connector. Tighten the cable connector in place.

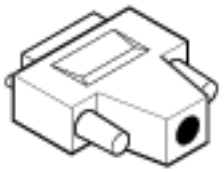


Master Subrack

c. Plug one of the connector terminators into the expansion subrack at the open **Expansion Signal Out—2** connector.



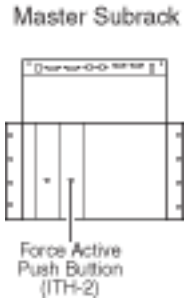
Expansion Subrack


Terminator

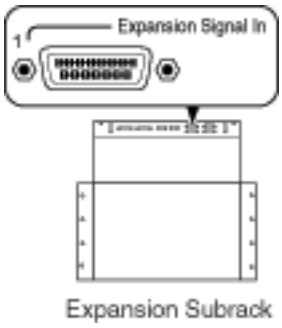
Connect the second expansion signal cable

a. In the expansion subrack, verify that the 55419A expansion sync card in slot "ITH-2" is in the active mode by observing that the **Active** LED is on.

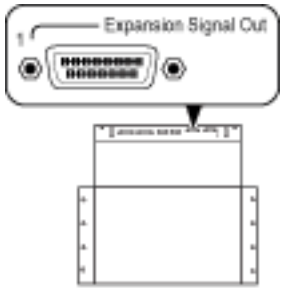
b. In the master subrack, set the ITH-2 card to the active mode by pressing the **Force Active** push button on this card.



c. Take the second expansion signal cable (15-wire) and connect one end to the expansion subrack at the **Expansion Signal In—1** connector. Tighten the cable connector in place.

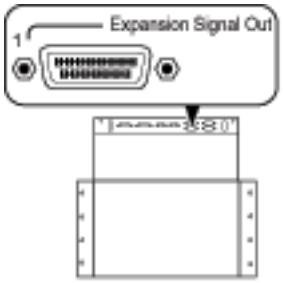


d. Connect the other end of the expansion signal cable to the master subrack at the **Expansion Signal Out—1** connector. Tighten the cable connector in place.

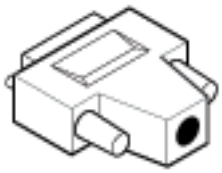


Master Subrack

e. Plug the second connector terminator into the expansion subrack at the open **Expansion Signal Out—1** connector.



Expansion Subrack


Terminator

f. In the expansion subrack, verify that the 55419A expansion sync card in slot "ITH-1" is in the standby mode by observing that the **Standby** LED is on.

g. Set the ITH card that was the active master at the beginning of the procedure to the active mode again by pressing the **Force Active** push button on that ITH card. This step ensures that the ITH card that was the active master at the start of this installation is again in that same role.

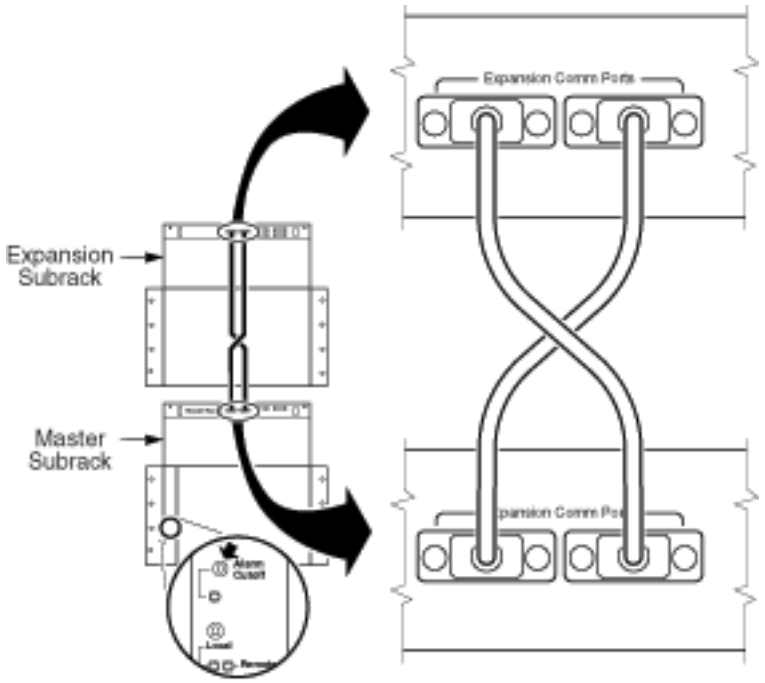
Connect the expansion communication cables

a. Configure and install the 55443A expansion communications card into the left-most slot of the expansion subrack. Tighten the retaining screws.

b. Take one of the expansion comm cables (9-wire) and connect between the expansion and master subrack at the Expansion Comm Port connectors. Tighten the cable in place using the securing posts.

c. Install the second expansion comm cable between the expansion and master subrack. Tighten the cable in place.

d. On the master subrack, press the **Alarm Cutoff** push button several times to clear all alarms. If alarms still remain, review this installation procedure before continuing.



e. Perform the communication test procedure that is included later in this chapter under “Verify Communication Between Subracks.”

Expansion Subrack Events

The 55400A system is constantly monitoring itself for the presence of alarm conditions. After adding or removing an expansion subrack, check to ensure that no expansion-related events are being reported. As described later in this chapter, the check can be accomplished using TL1 commands or a management software application from Hewlett-Packard.

Send the following TL1 command to the master subrack and verify that no expansion subrack events are active:

```
RTRV-NETYPE-ALL:::ABC1;
```

Expansion Event Descriptions

A brief explanation of the expansion subrack events is given here. These events are described in more detail in chapter A5.

IMCNCDN — (No IMC communication downward) In a multiple-subrack system, the communications link is a loop supporting communications in two directions: up and down. This event indicates that there is a break in the downward direction. Check expansion comm port cabling from the right-side port. (Minor alarm)

IMCNCUP — (No IMC communication upward) In a multiple-subrack system, the communications link is a loop supporting communications in two directions: up and down. This event indicates that there is a break in the upward direction. Check expansion comm port cabling from the left-side port. (Minor alarm)

RACKDUP — (Duplicate subrack number) This event occurs in a multiple-subrack system when two, or more, subracks have their backplane switch set to the same value. It is extremely important that each of the subracks have different switch settings and that the master subrack always has its backplane switch set to the "0" position. The backplane switch is located behind the communications card.

NOTE

It is a good idea to maintain a record of the assigned subrack numbers and their location in the communications loop. This information can help diagnose a communications problem.

After correcting a problem of duplicate subrack numbers, execute the RTRV-COND-TSG and RTRV-NETYPE-ALL commands to verify that the system has corrected its internal inventories of card modules. If reports of missing output cards continue, the RMV-EQPT command can be used to correct the actual inventory by deleting cards from the existing inventory of cards. (Major alarm)

RACKOOR — (Subrack number out of range) This event occurs when a subrack backplane switch has been set to a number outside the established range. The allowable settings are: 0, 1, 2, 3, 4. The master subrack must always be set to "0". The backplane switch is located behind the communications card. (Major alarm)

NOTE

It is a good idea to maintain a record of the assigned subrack numbers and their location in the communications loop. This information can help diagnose a communications problem.

ITHNCDN — (No ITH communication downward) In a multiple-subrack system, the ITH communications link is a loop supporting communications in two directions: up and down. This event indicates that there is a break in the downward direction. Check expansion comm port cabling from the right-side port. (Minor alarm by default, can be modified)

ITHNCUP — (No ITH communication upward) In a multiple-subrack system, the ITH communications link is a loop supporting communications in two directions: up and down. This event indicates that there is a break in the upward direction. Check expansion comm port cabling from the left-side port. (Minor alarm by default, can be modified)

SRINVMM — (Subrack inventory mismatch) This event is generated by the IMC/NIMC and indicates that the subrack inventories maintained separately by the IMC/NIMC and ITH cards in the master subrack do not agree. (Major alarm)

NOTE

Alarm LED Behavior with Expansion Subracks: An alarm occurring in an expansion subrack is indicated with an alarm LED on the failed card, an alarm-level indication (minor, major, or critical) on the Expansion Comm card in the expansion subrack containing the failed card, and an alarm-level indication on the IMC or NIMC in the master subrack.

Add Additional Expansion Subrack

NOTE

This procedure is written to allow the expansion subrack to be installed while the master subrack is in service.

Install the subrack and the cards

a. Install the empty expansion subrack into the rack cabinet and apply –48 Vdc at power inputs A and B. Refer to chapter C2 for information on rack mounting and applying power to the subrack.

b. Set the backplane switch on the new expansion subrack to one of the allowed numbers that is not being used. It is critical that each subrack has a different ID number. The master subrack must always be set to "0" and the expansion subracks can use numbers from 1 to 4. The switch is located near the upper left of the backplane behind where the expansion communications card will be installed.

c. If you do not know what numbers are being used by other expansion subracks, either send the TL1 command: RTRV-NETYPE-ALL:::ABC1 to identify the current subrack numbers or remove the communications card from each expansion subrack to check on the backplane switch setting. Set the backplane switch on the new expansion subrack to the next unused ID number. This step establishes the expansion subrack's identification number.

d. Check the switch settings on the expansion synchronization cards, as described earlier in this chapter, and install the two cards into the expansion subrack. The cards go into the same slots in the expansion subrack that the ITH-1 and ITH-2 cards do in the master subrack. Ignore any alarms in the expansion subrack until the end of this procedure. Tighten the retaining screws.

e. Configure and install the output cards that are part of this expansion subrack. Refer to chapter D2 for more on configuring the output cards. Tighten the retaining screws.

f. On the master subrack, verify that no alarm conditions exist and take note of which ITH card is in the Active mode. (This is important so that at the end of this procedure the same ITH card can be returned to its role as the active ITH card.)

g. On the master subrack, set the ITH-1 card to the Active mode by pressing the **Force Active** push button on this card.

Connect the first expansion signal cable

a. Take one of the expansion signal cables (15-wire) and connect one end to the new expansion subrack at the **Expansion Signal In—2** connector. Tighten the cable connector in place.

b. Connect the other end of the expansion signal cable to the expansion subrack that is "upstream" from the one being installed at the **Expansion Signal Out—2** connector. Tighten the cable connector in place.

c. Plug one of the connector terminators into the new expansion subrack at the open **Expansion Signal Out—2** connector. These terminators are not required for the master subrack.

Connect the second expansion signal cable

a. In the new expansion subrack, verify that the 55419A expansion sync card in slot "ITH-2" is in the active mode by observing that the **Active** LED is on.

b. In the master subrack, set the ITH-2 card to the active mode by pressing the **Force Active** push button on this card.

c. Take the second expansion signal cable (15-wire) and connect one end to the new expansion subrack at the **Expansion Signal In—1** connector. Tighten the cable connector in place.

d. Connect the other end of the expansion signal cable to the expansion subrack that is "upstream" from the one being installed at the **Expansion Signal Out—1** connector. Tighten the cable connector in place.

e. Plug the second connector terminator into the new expansion subrack at the open **Expansion Signal Out—1** connector.

f. In the new expansion subrack, verify that the 55419A expansion sync card in slot "ITH-1" is in the standby mode by observing that the **Standby** LED is on.

g. Set the ITH card that was the active master at the beginning of the procedure to the active mode again by pressing the Force Active push button on that ITH card. This step ensures that the ITH card that was the active master at the start of this installation is again in that same role.

Connect the expansion communication cables

Overview: The expansion communication cables connect from the master subrack to the first expansion subrack, from that expansion subrack to the next expansion subrack, and finally from the last expansion subrack back to the master subrack.

a. Configure and install the 55443A expansion communications card into the left-most slot of the expansion subrack. Tighten the retaining screws.

NOTE

The connectors on each expansion comm cable (9-pin) include a male and female gender type. This configuration reduces the chance of connecting cables incorrectly.

b. Connect an expansion comm cable such that the cable from the male connector on the first expansion subrack connects to the next expansion subrack. Repeat this until all expansion subracks are connected.

c. Connect an expansion comm cable from the male connector on the last expansion subrack to the female connector on the master subrack. Tighten all cables in place.

d. On the master subrack, press the **Alarm Cutoff** push button several times to clear all alarms. If alarms still remain, review this installation procedure before continuing.

e. Perform the communication test procedure that is included later in this chapter under “Verify Communication Between Subracks.”

Replace an Expansion Subrack

NOTE

This procedure is written to allow the expansion subrack to be replaced while the master subrack is in service.

Prepare to remove expansion subrack

a. Ensure that the expansion subrack to be replaced is no longer providing synchronization signals for downstream equipment.

b. Verify that no alarm conditions exist in the system.

c. On the master subrack, take note of which ITH card is in the Active mode. (This is important so that at the end of this procedure, the same ITH card can be returned to its role as the active ITH card.)

d. On the master subrack, set the ITH-1 card to the Active mode by pressing the **Force Active** push button on this card.

Remove the expansion subrack

a. On the expansion subrack to be replaced, unplug the expansion signal cables at the **Expansion Signal In—2** and **Expansion Signal Out—2** connectors.

b. On the master subrack, set the ITH-2 card to the Active mode by pressing the **Force Active** push button on this card.

c. On the expansion subrack to be replaced, unplug the expansion signal cables at the **Expansion Signal In—1** and **Expansion Signal Out—1** connectors.

d. On the expansion subrack to be replaced, unplug the expansion communication cables.

e. Disconnect the power cables from the expansion subrack.

f. Remove the expansion subrack from the rack cabinet.

Install the expansion subrack

a. Install the replacement expansion subrack into the rack cabinet and apply –48 Vdc at power inputs A and B.

b. Set the backplane switch on the replacement subrack to the same value as the subrack that was removed. The switch is located near the upper left of the backplane behind where the expansion communications card will be installed.

c. Transfer the expansion synchronization cards into the replacement expansion subrack. Tighten the retaining screws.

d. Transfer the output cards into the replacement expansion subrack.Tighten the retaining screws.

Connect the expansion signal cables

a. Connect the expansion signal cables at the **Expansion Signal In—1** and **Expansion Signal Out—1** connectors. If the replaced expansion subrack had connector terminators attached, plug a connector terminator into the **Expansion Signal Out—1** connector.

b. On the master subrack, set the ITH-1 card to the Active mode by pressing the **Force Active** push button on this card.

c. Connect the expansion signal cables at the **Expansion Signal In—2** and **Expansion Signal Out—2** connectors. If the replaced expansion subrack had connector terminators attached, plug a connector terminator into the **Expansion Signal Out—2** connector.

d. Set the ITH card that was the active master at the beginning of the procedure to the active mode again by pressing the **Force Active** push button on that ITH card. This step ensures that the ITH card that was the active master at the start of this replacement procedure is again in that same role.

Connect the expansion communication cables

a. Transfer the expansion communications card into the left-most slot of the expansion subrack. Tighten the retaining screws.

b. Connect the expansion communication cables as before.

c. On the master subrack, press the Alarm Cutoff push button several times to clear all alarms. If alarms still remain, review this replacement procedure before continuing.

d. Perform the communication test procedure that is included later in this chapter under “Verify Communication Between Subracks.”

Remove an Expansion Subrack

NOTE

This procedure is written to allow the expansion subrack to be removed while the master subrack is in service.

In a system with multiple expansion subracks, it is assumed that the expansion subrack most distant from the master subrack is removed from service.

Prepare to remove expansion subrack

a. Ensure that the expansion subrack to be removed is no longer providing synchronization signals for downstream equipment.

b. Verify that no alarm conditions exist in the system.

c. On the master subrack, take note of which ITH card is in the Active mode. (This is important so that at the end of this procedure, the same ITH card can be returned to its role as the active ITH card.)

d. On the master subrack, set the ITH-1 card to the Active mode by pressing the **Force Active** push button on this card.

Remove the expansion signal cables

a. On the expansion subrack to be removed, unplug the expansion signal cable at the **Expansion Signal In—2** connector and the subrack to which it is connected. Remove the connector terminator from the **Expansion Signal Out—2** connector.

b. On the last remaining expansion subrack, attach the connector terminator at the **Expansion Signal Out—2** connector. Ignore any alarm conditions for now.

c. On the master subrack, set the ITH-2 card to the Active mode by pressing the **Force Active** push button on this card.

d. On the expansion subrack to be removed, unplug the expansion signal cable at the **Expansion Signal In—1** connector and the subrack to which it is connected. Remove the connector terminator from the **Expansion Signal Out—1** connector.

e. On the last remaining expansion subrack, attach the connector terminator at the **Expansion Signal Out—1** connector.

f. Set the ITH card that was the active master at the beginning of the procedure to the active mode again by pressing the **Force Active** push button on that ITH card. This step ensures that the ITH card that was the active master at the start of this removal procedure is again in that same role.

Remove the expansion communication cables

a. Unplug the expansion communication cables from the expansion subrack to be removed.

b. If the only expansion subrack is being removed, jumper the Expansion Comm Port connectors on the master subrack together with a cable. This is done so that the master subrack can perform a new inventory of the remaining equipment.

c. If one or more expansion subracks remain, connect an expansion comm cable from the last expansion subrack to the master subrack.

d. After a short time (approximately 2 minutes), the system will complete a new inventory of the remaining equipment. For the system that now only consists of a master subrack, The jumper cable can now be removed.

e. On the master subrack, press the **Alarm Cutoff** push button several times to clear all alarms. If alarms still remain, review this removal procedure before continuing.

f. Perform the communication test procedure that is included later in this chapter under “Verify Communication Between Subracks.”

Verify Communication Between Subracks

NOTE

To verify communications between the master and expansion subracks and to check for alarm conditions, perform either procedure 1 or 2 described below.

Procedure 1—TL1 Commands

This procedure instructs you to send two TL1 commands to the master subrack that should return information about the pair of subracks indicating that the two subracks are able to communicate. The first command identifies the equipment installed in both the master and expansion subracks. The second command retrieves any active alarms.

a. Send the following command to the master subrack:

```
RTRV-NETYPE-ALL:::1;
```

b. The information returned will be similar to the following example response:

```
SSU 98-12-03 13:36:22
1 COMPLD
“TSG:Symmetricom,55400,TSG
“S0,IMC:,55441,,R3833D
“S0,ITH1:,55411,,R3833D
“S0,ITH2:,55411,,R3833D
“S0-OUT1A:,55481”
“S0-OUT2A:,55481”

SSU 98-12-03 13:36:23
1 COMPLD
“TSG:Symmetricom,55400,TSG
“S1,IMC:,55443,,R3833D
“S1,ITH1:,55419,,R3833D
“S1,ITH2:,55419,,R3833D
“S1-OUT1A:,55481”
“S1-OUT2A:,55481”
```

c. Send the following command to the master subrack:

```
RTRV-COND:::1;
```

This command retrieves both equipment and signal-related conditions from the 55400A system. The expansion subrack events are described earlier in this chapter.

d. Verify that no expansion subrack events are still active.

Procedure 2—Local Craft Terminal Software

This procedure uses the 55450A local craft terminal software as a tool for verifying communication between the master and the just installed expansion subrack.

Refer to the documentation in chapter A5 for information on connecting a computer to the Local Port of the master subrack.

a. Start the application, connect to the SSU, and go to the pull-down menu, SSU>Show 55400A Status.

b. Observe that a status window is displayed for each SSU subrack that is part of the system. Verify that no alarms are active in the status windows.

c. Click on the status window of the master subrack (the status window is larger than the others and lists subrack events below the front panel representation.

d. Observe that all ITH or IMC/NIMC rack communication events have been cleared. Check the cabling between the subracks if alarms exist.

This completes the installation of the expansion subrack.

What is Next?

1 Perform the appropriate output card checks in chapter E2.

The equipment tests consist of:

- Output checks

2 Connect the outputs to network elements.

The last step is to connect the output signals to the network elements that require synchronization.

Backdating Information

NOTE

This section contains material that applies to versions of subracks prior to the 55401D and 55402D.

Systems with subracks before models 55401D and 55402D require the 55426A adapter box to support the use of expansion subracks. These subracks are:

- 55401B–uses 55426A Option 001 adapter box
- 55401C–uses 55426A adapter box
- 55402C–uses 55426A adapter box

If you are installing a 55402D expansion subrack into a system that contains a 55401B or 55401C master subrack, an adapter box will need to be installed only on the master subrack. Follow the procedure in this section to install the adapter box and then refer to “Adding the First Expansion Subrack” installation procedure earlier in this chapter.

Expansion Adapter Box

The 55400A synchronization supply unit requires the use of an adapter box on older subracks (before version “D”). The adapter box provides the correct termination for the expansion signal cabling that carries the synchronization signals between master and expansion subracks.

The installation procedure presented here shows how to install the box on the version “B” or “C” subracks. A master subrack that had been previously installed will require an adapter box when an expansion subrack is added for the first time.

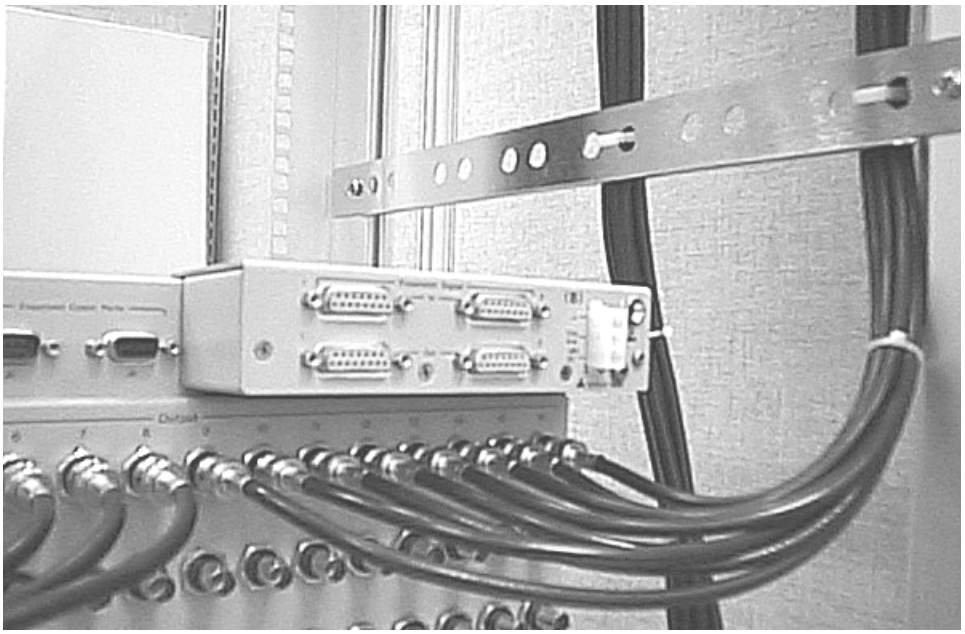


Figure C3-6. View of adapter box

There are two versions of the 55426A adapter box.The only difference is the type of power connector used on the adapter box:

- 55401B master subrack requires the 55426A Option 001 SSU expansion adapter box with a 4-pin press-on connector
- 55401C master subrack requires the 55426A SSU expansion adapter box with a Molex 3-pin locking connector
- 55402C expansion subrack requires the 55426A SSU expansion adapter box with a Molex 3-pin locking connector

Parts supplied with adapter boxes

Table C3-7. Adapter box supplied parts

Quantity	Description
1	51 mm stand-off
1	screw and lock washier for stand-off
7	flat-head screws
1	pan-head screw and lock washer
2	spare nuts for rear panel

Tools required

- 5.5 mm nut driver
- 7 mm nut driver
- small Phillips or Pozidriv screwdriver
- large Phillips or Pozidriv screwdriver

System Firmware Requirements

If an expansion is being added to an older system that includes a 55401B or 55401C master subrack, ensure that the system firmware is revision 3724A, or later. In the master subrack, the communication card and the ITH clock cards all contain control firmware.

Check firmware revision

The firmware revision number can be checked one of the following ways:

1. Send a TL1 command using the 55450A local craft terminal software or a terminal emulation program connected to the local port of the communication card. The information retrieved will include the firmware revision at the end of the lines describing the IMC and ITH cards in the format Rxxxxx.

   ```
   RTRV-NETYPE-ALL:::1;
   ```

2. Remove the communication card from the master subrack. The EEPROMs on the card will have a label indicating a firmware revision.
3. Review the system test data pack forms shipped with the master subrack from the factory. The firmware revision number is included on the system final configuration/shipping log form.

NOTE

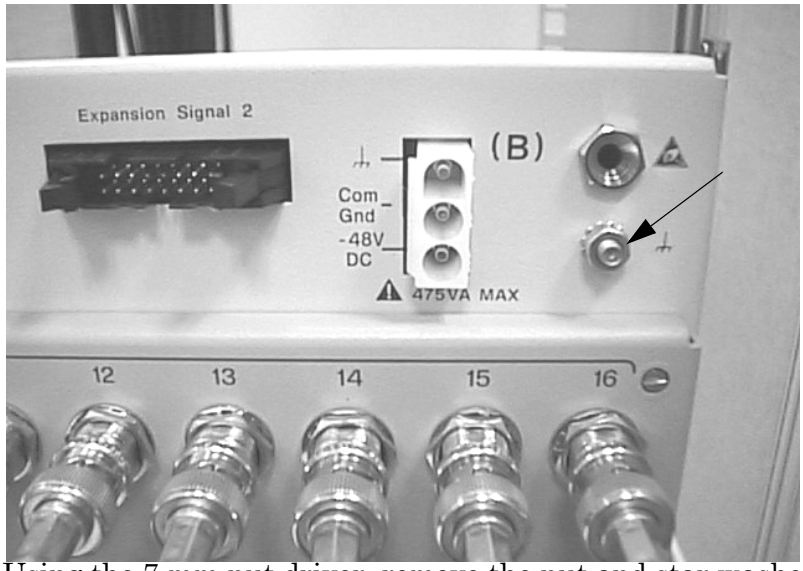
Methods 2 and 3 may not be valid if newer firmware has been downloaded to the EEPROMs without making a modification to the labels.

Firmware upgrade

Newer versions of firmware for the master subrack may be available for download over the Internet. Contact Symmetricom for details.

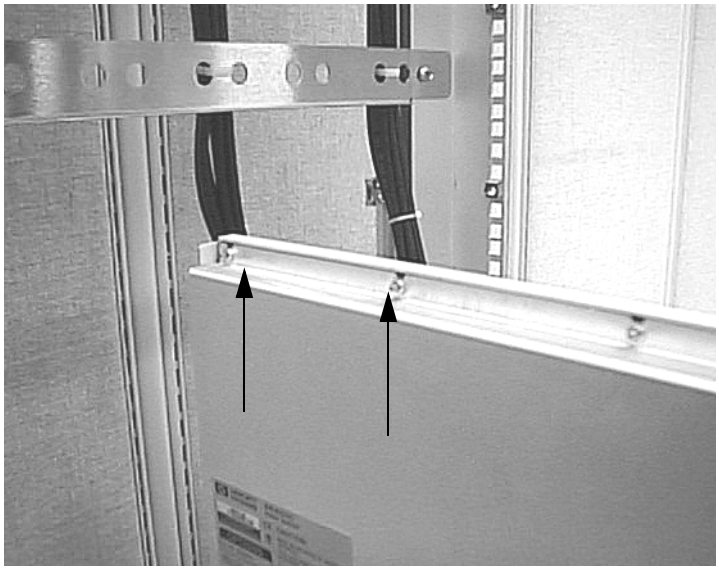
Install the adapter box

1. Remove nut on grounding stud



Using the 7 mm nut driver, remove the nut and star washer from the grounding stud shown in the picture above. Discard the nut and washer.

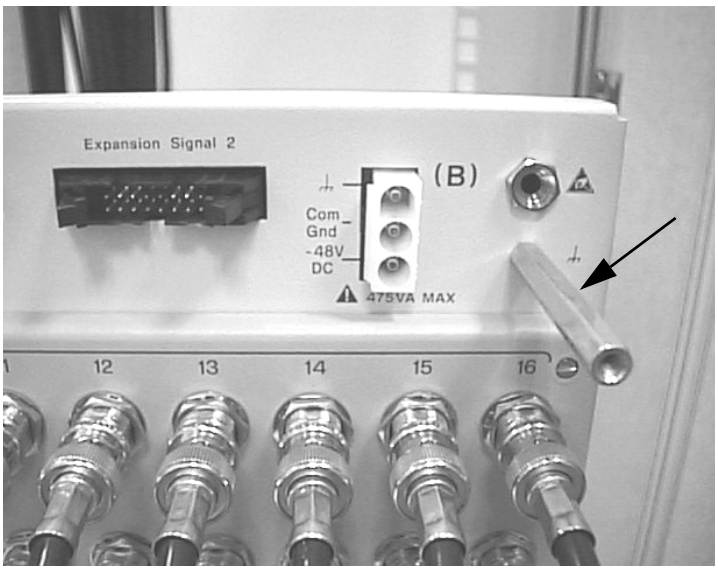
2. Loosen rear panel nuts



Using the 5.5 mm nut driver, loosen the two nuts on the subrack rear panel shown in the picture above.

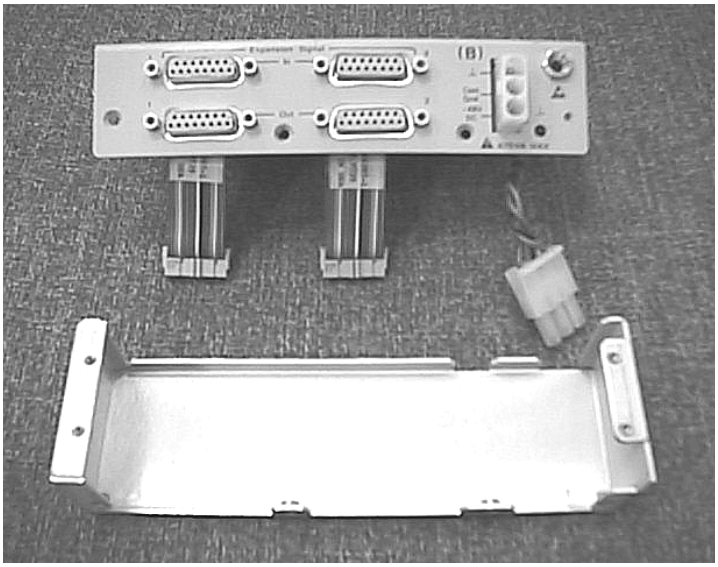
TIP: Use your fingers to loosen the nuts once they can be turned easily. Back off each nut only until it is flush with the end of the screw shaft. Extra nuts are included in the event the nuts are dropped.

3. Attach the stand-off



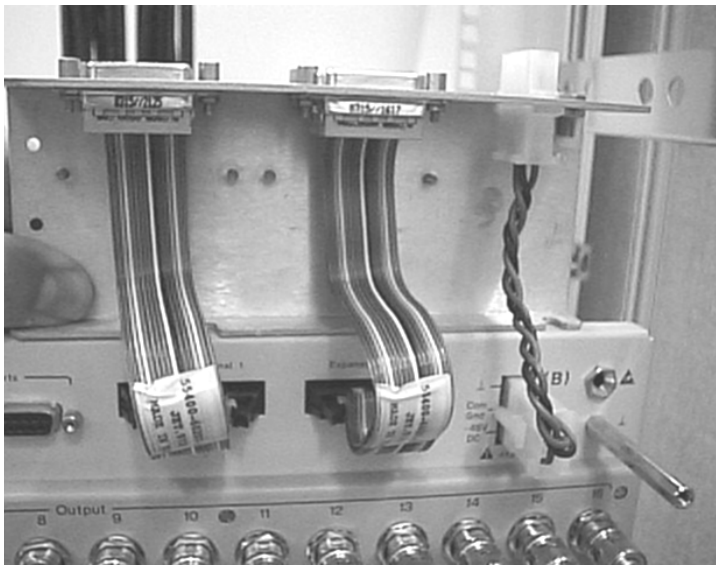
On the front panel, hand-tighten the stand-off to the grounding stud.

4. Disassemble adapter box



Remove the screws holding the two halves together.

5. Attach adapter box cables to the subrack



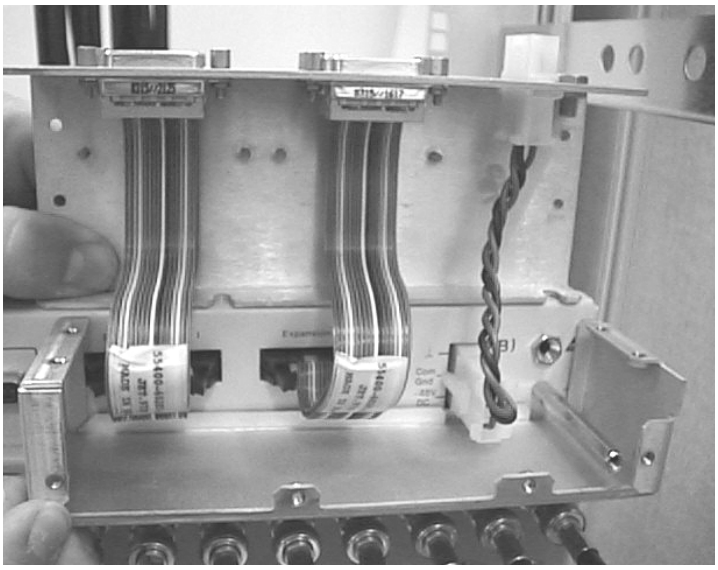
NOTE

For a system that is online, to perform this step it is necessary to remove the “B” side power cable from the subrack. Be aware that this action will cause a Major alarm to be generated by the SSU.

Position the top half of the adapter box above the subrack and connect the three cables as shown in the picture above: 2 expansion signal cables and 1 power cable.

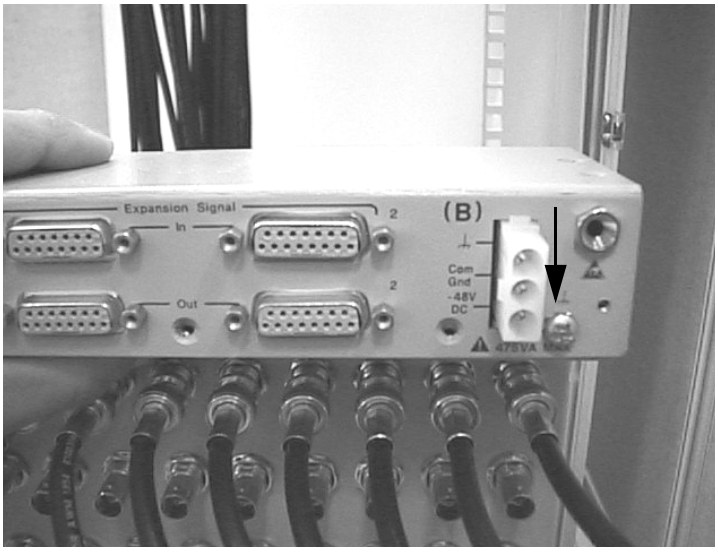
Make sure all three cables are locked securely in place.

6. Position adapter box for assembly



Set the bottom half of the adapter box on the ledge below the expansion signal and power connectors while holding the top half out of the way. (There are cutouts in the bottom piece to allow it to fit around the stand-off and power connector.)

7. Assemble and add screws



a. Carefully hook the top half of the box over the top of the subrack at an angle so that the bend at the top fits between the loosened nuts and the rear panel as it is lowered into place.

b. Close the top part of the box over the bottom half. Squeeze the top and bottom together so that the screw holes for both halves line up. Thread the stand-off screw and lock washer into place loosely as shown in the picture above.

c. Thread the 8 remaining screws (7 flat-head and 1 pan-head with lock washer) into place loosely.

d. Using the large Philips screwdriver, tighten the stand-off screw.

e. Using the small Philips screwdriver, tighten the remaining screws.

f. Re-connect the "B" side power supply to the connector on the adapter box.

NOTE

For a system that is online, clear the Major alarm by pressing the **Alarm Cutoff** push button.

Next Steps

Now that the adapter box is installed on the subracks that require it, review the rest of this chapter for information on installing the expansion subrack, cables, cards, and verifying correct operation of the expansion subracks after installation. Go to "Adding the First Expansion Subrack" installation procedure earlier in this chapter.

C4

Install the 55300A GPS Reference Source

Tools, power, cables, antenna, and rack

In This Chapter

This chapter describes the installation of the primary reference source.

For more details about the GPS product, refer to the following manuals that are supplied with the 55300A GPS reference source:

- 55300A User's Guide
- 55300A Programming Guide

PURPOSE The goal of this chapter is to provide enough information that you can install and apply power to this equipment.

If you do not already have a GPS antenna feed to your rack cabinet, this element may be the more difficult part of any 55300A installation. The next section provides more detail about GPS accessories.

NOTE See "In This Manual" for a list of tasks to put a GPS reference source into service.

GPS Accessories and Tools

The GPS accessories needed for the installation of the primary reference source will depend on the specific characteristics of your situation. All of the accessories include documentation that describes how to install them.

Accessories

A minimum set of GPS accessories to support installation consists of the following:

- 58532A GPS L1 Antenna (Option AUB provides mounting mast)
- 58521A LMR 400 Cable (other cable type available)

If the antenna installation requires a long cable run between the antenna and the GPS receiver, add the following accessory:

- 58529A Line Amplifier with Bandpass Filter

  An amplifier is required if the run of LMR 400 cable is more than 115 meters (377 feet). Two amplifiers are recommended when cable length exceeds 240 meters (787 feet).

When an antenna system is being installed in an area with high lightning activity, it is a good idea to provide protection from electromagnetic fields associated with nearby lightning strikes. The impact of surge voltages and currents can be minimized if the system is well grounded to earth through a lightning arrestor. Symmetricom offers the following:

- 58539A GPS L1 Lightning Arrestor

Tools

- GPS handheld receiver–this device can be useful both during installation and in case troubleshooting the GPS antenna system is required. The receiver can help you select the best antenna location to provide optimal reception of GPS signals. It should come with its own antenna and a BNC-type connector that will allow connection of the handheld device to your GPS antenna system to help isolate problems that may come up during installation and operation. It should be capable of providing +5 Vdc to power the antenna system.
- Molex Hand Crimping Tool 11-01-0084–a crimping device for making power cables

- Pozidriv #2 or large Phillips screwdriver for rack mount screws
- 7 mm nut driver for frame ground stud on the front panel of the rack mount shelf
- wire strippers for making cables
- diagonal cutters for making cables
- multimeter for checking voltage levels and cables for opens/shorts
- oscilloscope for checking output signals

Antenna System Overview

Where to go for antenna installation information

Information Note–supplied with each accessory

Basic antenna system

The most simple antenna system consists of the antenna and mounting base, mounting mast and cable. This configuration assumes the following:

- The length of cable used is less than 115 m (LMR 400 cable)
- The installation is NOT in an area where lightning activity is a concern
- There are no known sources of possible interference with the GPS signal

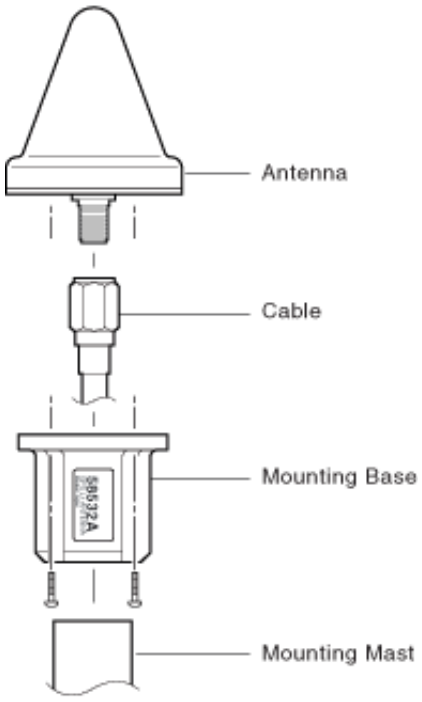


Figure C4-1. Basic antenna system

Antenna system with amplifier/filter

This antenna system configuration includes an amplifier/filter because of a long distance (> 115 m) between antenna and 55400A. This configuration assumes the following:

- The length of cable used is greater than 115 m (LMR 400 cable) and there could be sources of possible interference with the GPS signal so the amplifier/filter is included
- The installation is NOT in an area where lightning activity is a concern so a lightning arrestor is not included

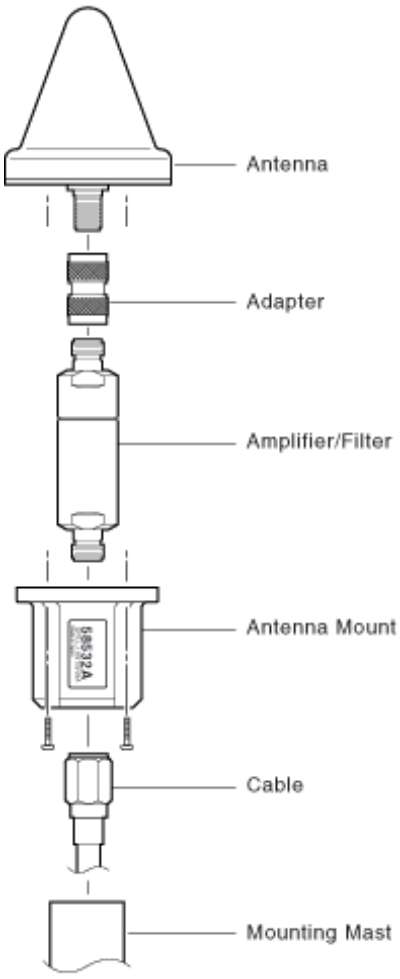


Figure C4-2. Antenna system with amplifier/filter

Lightning arrestor for antenna system

In areas where lightning activity is a concern, include a lightning arrestor in the antenna system. Typically, it will be installed just inside the building where the antenna cable enters.

NOTE

For more on installation, refer to the Information Note supplied with the lightning arrestor.

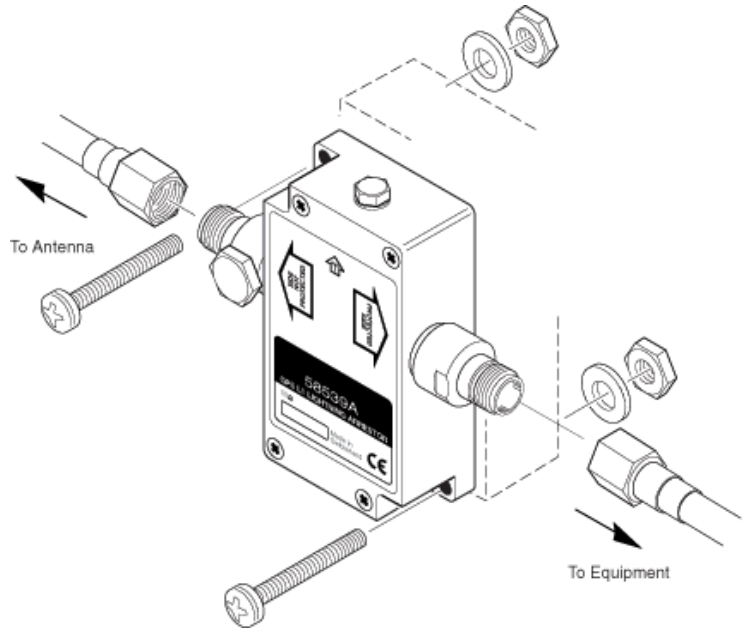


Figure C4-3. Lightning arrestor

Install the Rack Mount Shelf

The 55300A is actually a module that fits into a rack mount shelf. Two types of ETSI rack mount shelves are available for the 55300A module:

- 55320A GPS rack mount shelf for unbalanced outputs
- 55322A GPS rack mount shelf for balanced outputs

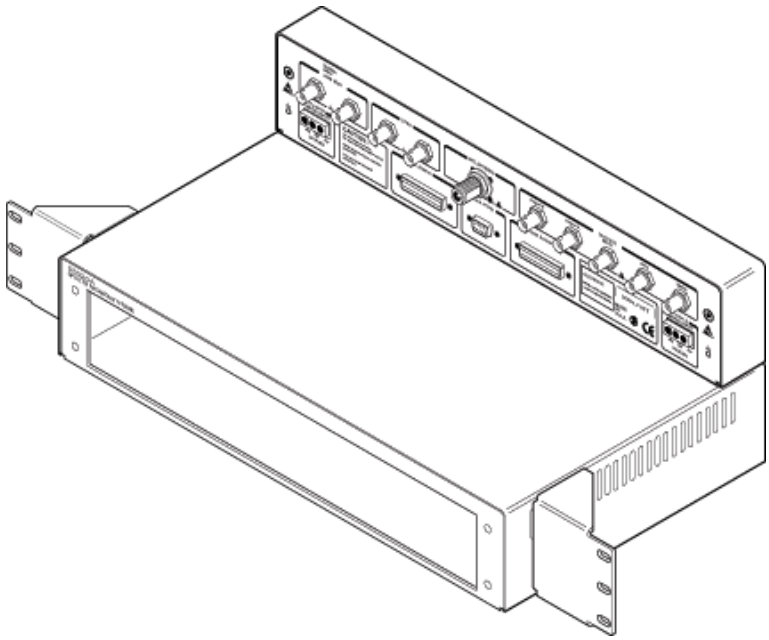


Figure C4-4. 55320A rack mount shelf

Rack mount shelf installation procedure

Use the following procedure to attach the mounting flanges to the shelf and install the shelf into the rack cabinet.

1. Place the subrack (without the 55300A installed) on a work surface with the front panel facing you.
2. Position each mounting flange with its mounting holes so it aligns with the mounting holes in the signal of the shelf.
3. Attach the flanges to the shelf with the supplied hardware.

4. Place the shelf in position in the rack. Refer to the figure below for recommended position. Installing the shelf near the top of the rack cabinet will usually make it easier to run the antenna cable to the GPS unit.

GPS reference and 2 SSUs

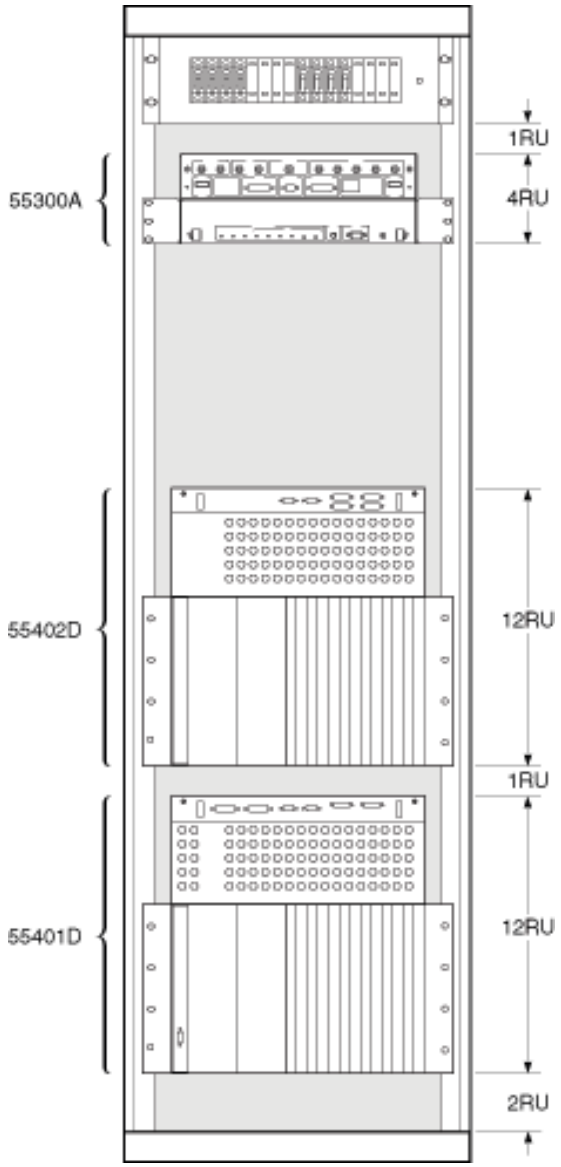
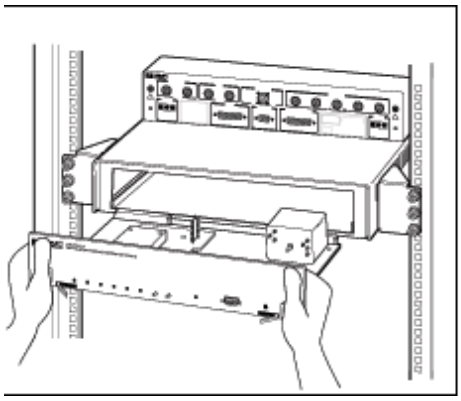


Figure C4-5. Rack position for 55300A

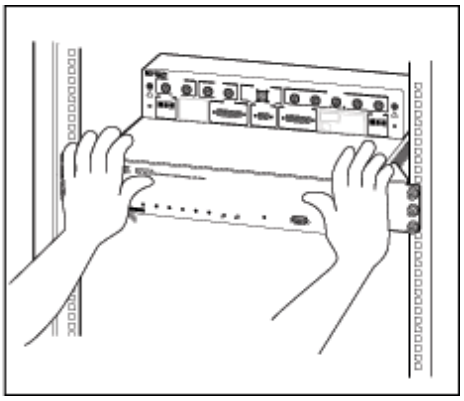
5. Attach the shelf to the rack with the hardware supplied with the mounting flanges.

Install the GPS Module

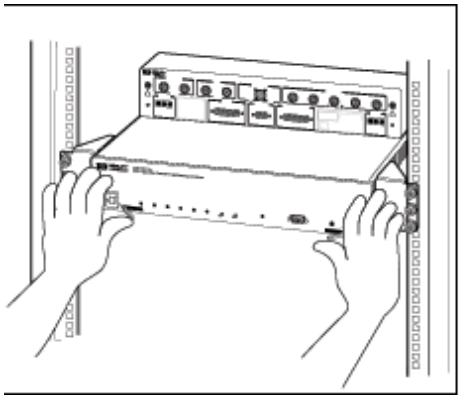
Install the 55300A GPS module into the rack mount shelf as shown in Figure C4-6.



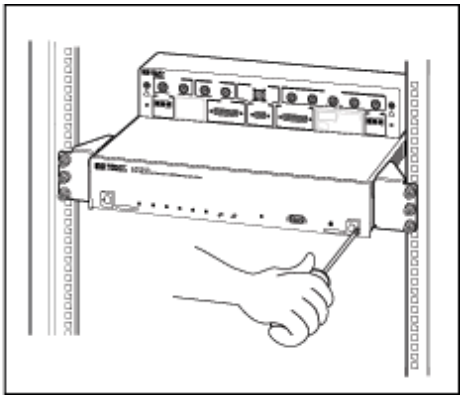
1. Align and position the edges of the module with the guide rails inside the shelf.



2. Firmly press the unit all the way back into the shelf.



3. Push in levers.



4. Tighten both screws.
Note: Failure to tighten screws can cause unreliable behavior.

Figure C4-6. Installing the 55300A into the rack mount shelf

Connectors and Cabling

This section discusses the front panel connectors and the pinouts needed to build the connecting cables.

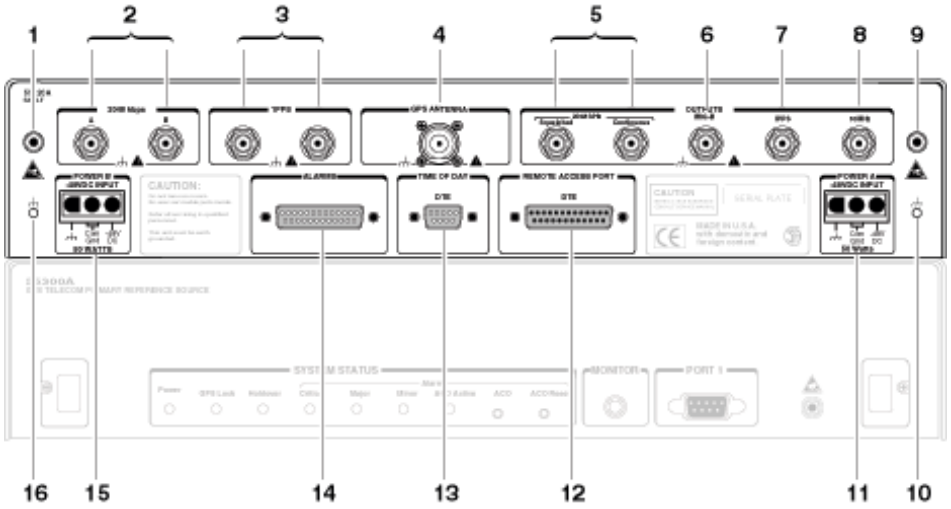


Figure C4-7. 55320A front panel

1 **Banana jack** for grounding an ESD wrist strap

2 **2048 kbps outputs** (75 Ω)

3 **1PPS**–RS-422 differential pair output signals. The left connector outputs a positive 1PPS signal, and the right connector outputs a negative 1PPS signal.

4 **GPS antenna input**, N-type connector (female)

5 **Two 2048 kHz outputs**. The squelched signal is present only after the unit is locked to GPS. The continuous signal is always present.

6 **IRIG-B output**. It provides formatted time-code signals after the unit is locked to GPS.

7 **1PPS**–50 Ω TTL level signal

8 **10 MHz output** (50 Ω)

9 **Banana jack** for grounding an ESD wrist strap

10 **Frame ground stud** for chassis ground connection

11 **Power A** –48 Vdc input

12 Remote Access Port–RS-232, DB-25S (female). DTE configuration serial interface port for remote control, monitoring, and retrieving the unit's memory data. The communication language is TL1.

13 Time of Day–DE-9P (male). DTE configuration serial interface port supplying time of day and a 1PPS signal (accurate to UTC) for the network time protocol driver. This port is also used with the SatStat application.

14 Alarms–DB-25P (male). Provides alarm relays for critical, major, and minor office alarms (both visual and audible).

15 Power B –48 Vdc input

16 Frame ground stud for chassis ground connection

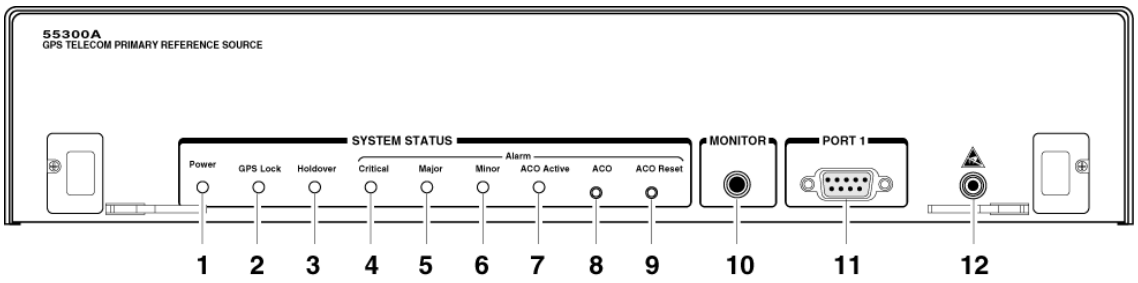


Figure C4-8. 55300A front panel

1 Power–indicates that power is applied to the unit.

2 GPS Lock–indicates that the unit is tracking satellites and phase-locked its internal reference to the GPS reference.

3 Holdover–indicates that the unit has lost GPS lock.

4 Critical–indicates a hardware condition or other failure that requires attention.

5 Major–indicates there is a problem that can potentially affect the output signals. For example, the unit has been operating in holdover for an extended period of time. This duration can be user-specified.

6 Minor–indicates the unit has detected a momentary, abnormal internal condition, but this condition will not affect the operation of the unit.

7 ACO Active–indicates that the local alarm cutoff is active.

8 ACO–a push-button switch that, when pressed, silences the audible, local external alarms without turning off the alarm LED.

9 **ACO Reset**–a push-button switch that, when pressed, resets the local alarm cutoff.

10 **Monitor**–a 2048 kbps output from a standard miniature telecommunication phone jack. This telecom output is a protected test output with a signal level –18 dB from the level of the 2048 kbps signals at the 55320A panel.

11 **Port 1**–RS-232, DE-9S (female). DCE configuration serial interface port for local monitoring and retrieving data stored in the unit's memory data. The communication language is TL1.

12 **Banana jack** for grounding an ESD wrist strap.

–48 Vdc power inputs

The PRS supports use of redundant power sources.

CAUTION

The PRS uses a –48 Vdc office battery as its primary voltage source. Though not normally considered high voltage, the office battery has more than the minimum power necessary to present a potential fire hazard. Use extreme caution when working around or connecting circuits energized by the office battery.

Grounding issues

Before running power cables, consider how best to provide frame grounding for the subrack. A frame ground can be connected in one of three ways:

1. As part of the cabling through the –48 Vdc power connector.
2. Through a single-wire connection to the ground stud on the connector panel.
3. Through the rack mount brackets when the rack cabinet itself is properly grounded.

NOTE

To prevent battery return-to-frame ground faults, do not connect battery return on the subrack to the frame ground.

Recommendations for cabling to the shelf

Power to the shelf is applied at the connector panel. Use the following procedure as a guide to supply power wiring to the shelf.

a. Following local practices, select a wire size appropriate to ensure an office battery voltage of –37 to –60 Vdc at the shelf. The current requirement for the PRS can be from 0.75 to 1 A. The connector pins used for the power connectors can accept a wire size up to

1.2 mm (0.05 in). This wire size corresponds to an AWG (American Wire Gauge) value of 18.

b. Switch off the circuit breakers or remove the fuses to the branch circuit feeds that will supply the subrack.

c. Route redundant ("A" and "B") –48 Vdc office battery feeds to the subrack to ensure uninterrupted operation. If your facility does not provide redundant "A" and "B" battery sources, split the power feeds at the main battery distribution fuse board (BDFB), the branch battery feed panel, or at the rack cabinet.

d. If the battery feeds originate at the BDFB or branch panel, run the two battery feeds to the subrack through cable runs on opposite sides of the facility. Running both feeds in the same cable rack creates a single-point source of power failure and should be avoided.

e. Route the power cables on opposite sides of the rack cabinet. Leave a length of cable for both feeds sufficient for later dressing into cable bundles.

f. Check the battery feed lines for possible shorts to one another or to ground using a multimeter.

Assembling the power connectors

Use the following procedure to attach the power connectors to the battery feed lines.

a. Strip 5 mm (3/16 in) of insulation from one set of the power supply wires.

b. Crimp the connector pins to the wires according to standard procedures. Figure C4-9 shows a crimped connector pin. The connector pins can accept a wire size up to 1.2 mm (0.05 in). If possible, use a crimping tool such as Molex Hand Crimping Tool 11-01-0084.

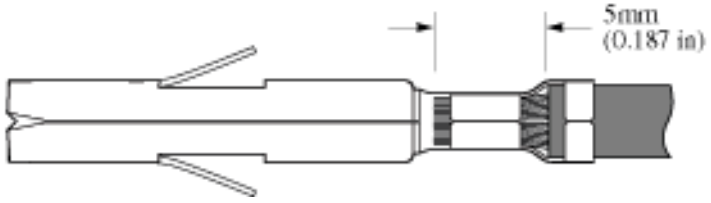
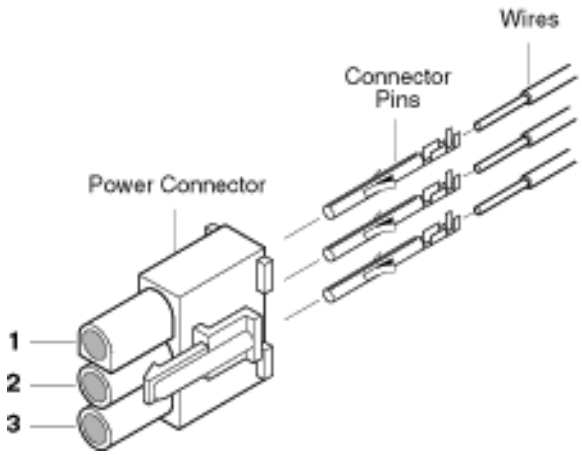


Figure C4-9. View of crimped connector pin

c. Position the power connector so that it matches the drawing in Figure C4-10 (the locking mechanism should face you). Take the Ground wire and grasp the wire insulation behind the connector pin. Push this wire into plug position "1" of the power connector until the connector pin snaps into place.



1 – Ground (frame ground)
2 – Com Gnd (battery return
3 – –48 Vdc

Figure C4-10. Subrack –48 Vdc power connector

d. Using the same procedure as for step c., push the Com Gnd wire into connector position "2" and the –48 Vdc wire into connector position "3".

e. Repeat steps a. through d. for the second power connector.

Making the frame Ground Connection

If a dedicated wire to the frame ground stud is selected as the method for grounding the shelf, follow these steps for each of the ground connections:

a. Route wiring from ground to the shelf.

b. At the shelf, crimp the supplied spade lug connector to the ground wire.

c. Using a 7 mm nut driver loosen the frame ground stud nut.

d. Slide the spade lug connector under the ground stud nut and tighten.

Connecting dc power

The following procedure describes how to connect power to the shelf. To connect the finished power cables for the two dc supplies, follow these steps:

NOTE

Do not connect power to the 55300A unless a fully operational antenna system is already connected to the GPS antenna input. Power applied with no antenna input, or a non-functioning antenna system will cause the GPS unit to initiate an extended search process that may increase the time to reach a GPS lock condition. The extended search process can be halted by disconnecting and reconnecting both of the external –48 Vdc supplies (leave power off for more than five seconds).

Before continuing, install the antenna system and verify operation, if possible, using a GPS handheld receiver that can supply +5 Vdc to the antenna. (Refer to chapter F1, "Troubleshoot System.")

a. Using a multimeter, verify that there are no multiple battery grounds, or any shorts at the power source end of the wires.

b. Reinstall the fuses or set the circuit breakers to On at the branch circuit distribution that supplies the –48 Vdc power.

c. Use a multimeter to measure the voltage of the battery feed leads at the shelf. The voltage must measure in the range –37 Vdc to –60 Vdc.

d. Plug the right-hand dc power connector into the right-side (A) power jack.

e. Plug the left-hand dc power connector into the left-side (B) power jack on the subrack connector panel.

Power-up sequence

When the 55300A is powered-up for the first time, the unit will normally step through the following sequence:

a. An internal diagnostic check is performed and all front-panel indicators flash

b. All front-panel indicators turn off except for the Power indicator

c. After approximately five minutes, the 55400A may go into Major alarm. The front-panel indicator and alarm relay are activated.

d. At this point, the 55300A begins to search for all available satellites.

e. When four, or more, satellites are tracked, the unit will automatically compute its location.

f. The 55300A then reaches a stable operating condition. The GPS Lock indicator turns on and the Major alarm is cleared indicating that the unit has phase-locked its internal reference to the GPS timing reference.

Port 1 connector

This port is on the 55300A module card. It is a 9-pin DE connector (female) using an RS-232 interface.

This port is wired as a DCE device and provides for system communication with a local terminal or computer running a terminal emulator program. The 55300A supports the use of the TL1 language communication and control.

Through this port it is possible to perform management tasks including security management, configuration, performance monitoring, and fault diagnosis. These same tasks can be performed via the remote access port described earlier in this chapter.

Wiring the local cable

A serial communications interface cable wired as a “straight-through” cable is needed to connect between the local port and a computer.

Port 1 RS-232 Interface

The Port 1 connector provides a standard serial interface with full duplex capability (DCE configuration). Signal voltage levels comply with the EIA-232-E standard.

Table C4-1. Local connector pinout

Pin Number	Description
1	DCD (Data carrier detect)
2	RxD (Received data)
3	TxD (Transmitted data)
4	DTR (Data terminal ready)
5	GND (Signal ground)
6	DSR (Data set ready)
7	RTS (Request to send)
8	CTS (Clear to send)
9	RI (Ring indicator)

Port 1 RS-232 wiring diagram

Here is an example of an interface cable used to connect a computer to the Port 1 connector.

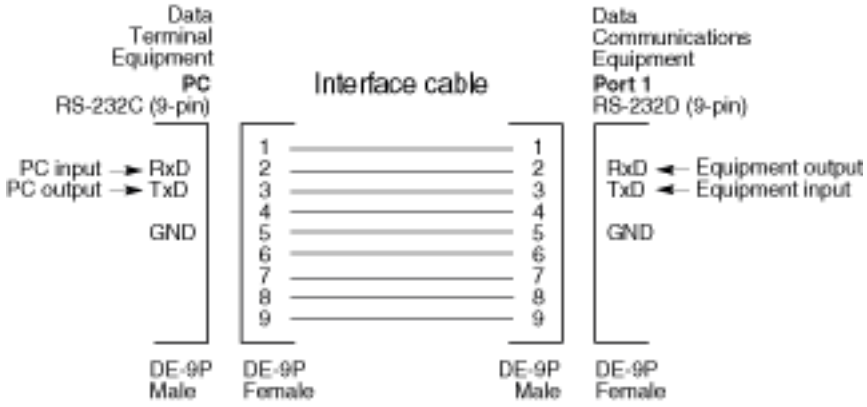


Figure C4-11. Port 1 connection example

What is Next?

1 Perform the qualification tasks in chapter E1 and then the equipment tests in chapter E2.

The qualification tasks consist of:

- Run SatStat to verify operation
- Set local time
- Verify holdover actions
- Configure the GPS reference source for network operation (if needed)

The equipment tests consist of:

- Verify outputs (10 MHz, 2048 kHz/kbps)

NOTE

If installing the GPS reference source with the frequency standard or SSU, complete those installations before starting the qualification procedures.

2 Connect the output to the SSU.

Once the outputs from the GPS reference source have been checked, the last step is to connect the output signal to the SSU.

C5

Install the 5071A Frequency Standard

Power, cables, accessories, and tools

In This Chapter

This chapter describes the installation of the primary frequency standard.

For more details about the frequency standard product, refer to the following manuals that are supplied with the 5071A primary frequency standard:

- 5071A Operating and Programming Manual
- 5071A Telecommunications Options Supplemental Manual

PURPOSE The goal of this chapter is to provide enough information that you can install and apply power to this equipment.

NOTE See "In This Manual" for a list of tasks to put a frequency standard into service.

Accessories and Tools

The accessories needed for the installation of the primary frequency standard will depend on the specific characteristics of your situation.

Accessories

A minimum set of accessories to support installation consists of the following:

Due to the length of the 5071A and the placement of the output connectors on the rear panel, the use of 90-degree adapters is required.

- Right angle Type-N adapter (m to f) for 5 or 10 MHz output (50 Ω)
- Right angle BNC adapter for 2048 kbps output (75 Ω)

CAUTION The weight of the 5071A is 30 kg. Supporting the weight of the unit requires the use of both a rack mount kit AND mounting shelves or rails.

- Rack cabinet shelves or rails (19-inch rails are required when installing the 5071A in an ETSI equipment rack)
- Option 908 Rack Flange Kit (for use without handles)
- ring or spade lugs for rear-panel power supply connections

Tools

- Pozidriv #2 or large Phillips screwdriver for rack mount screws and rear-panel power connections
- wire strippers for making cables
- diagonal cutters for making cables
- multimeter for checking voltage levels and cables for opens/shorts
- oscilloscope for checking output signals

Install the 5071A

The 5071A is a frequency standard that requires no inputs of any sort to provide Stratum 1-level timing signals.

Rack Mount Procedure

Use the following procedure to attach the mounting flanges to the frequency standard and install it into the rack cabinet.

1. Place the frequency standard on a work surface with the front panel facing you.
2. Install the mounting flanges as instructed in the supplied documentation.
3. Remove the plastic feet from the bottom of the frequency standard.
4. Install a support tray or rails into the rack cabinet to support the 5071A. Refer to the figure below for recommended position.

   Since the air exhausted from the 5071A is usually 13°C warmer than ambient air, mount the frequency standard in the upper portion of the rack cabinet.

Frequency Standard, GPS reference, and 2 SSUs

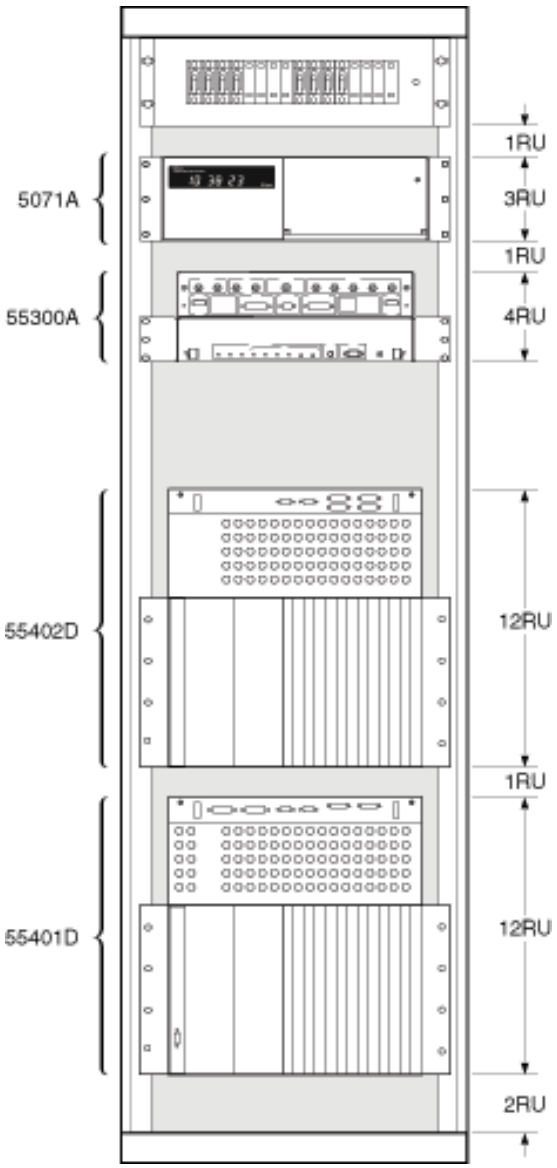


Figure C5-1. Rack position for 5071A

5. Lift the frequency standard into the rack cabinet.

CAUTION

The weight of the 5071A is 30 kg. Mounting the unit into a rack cabinet requires two installers.

6. Attach the frequency standard to the rack with the hardware supplied with the mounting flanges.

Connectors and Cabling

This section discusses the rear-panel connectors of the 5071A with telecommunications options.

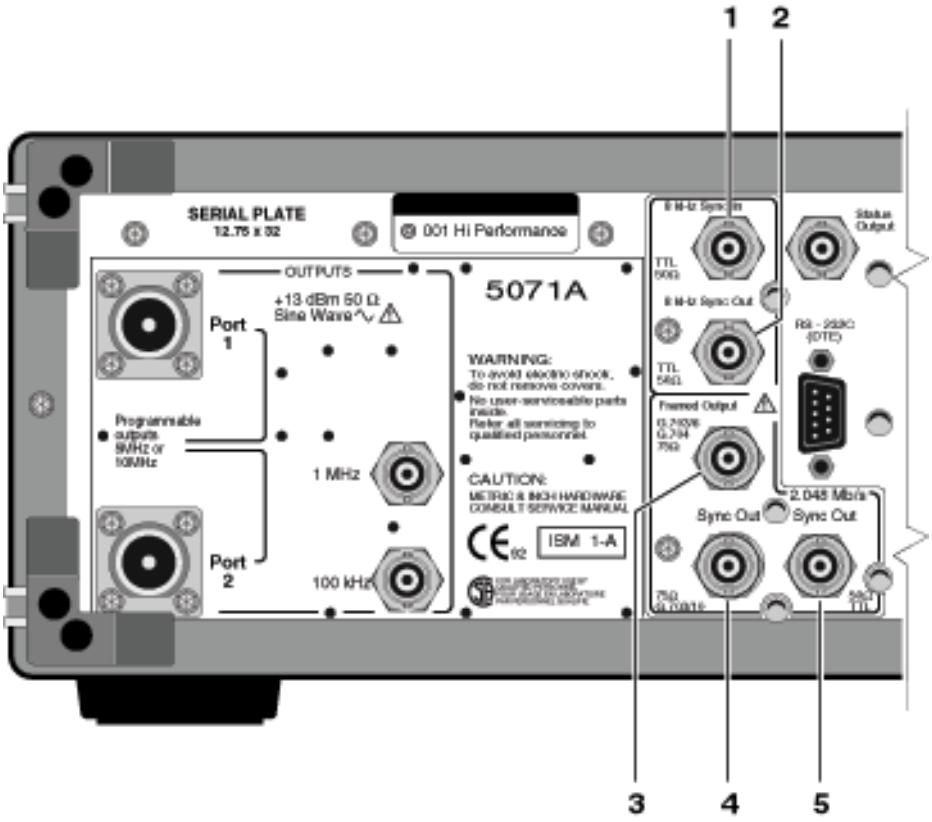


Figure C5-2. Rear panel (1) of telecom option

Table C5-1. Callout descriptions (1)

Callout Number	Function	Connector Type	Signal Characteristic
1	8 kHz Sync In	BNC (f)	8 kHz, TTL level into 50 Ω
2	8 kHz Sync Out	BNC (f)	8 kHz, TTL level into 50 Ω
3	2048 kbps Framed Output	BNC (f)	4.8 V p-p max into 75 Ω (6 V p-p into 100 or 120 Ω
4	2048 kHz Sync Out	BNC (f)	3 V p-p max into 75 Ω
5	2048 kHz Sync Out	BNC (f)	TTL level into 50 Ω

NOTE

The drawings on these two pages show a 5071A with Telecom Options 048 and 272. When the telecom option includes either 100 or 120 Ω balanced outputs, the Framed Output connector will be a two-center-conductor BNC.

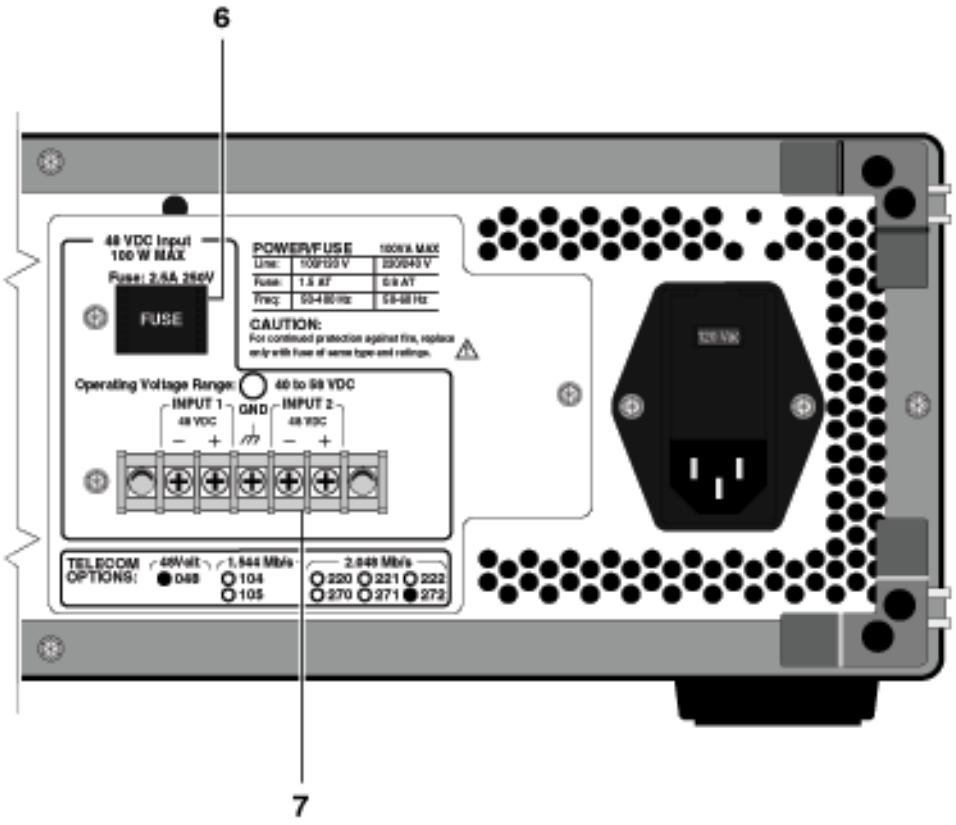


Figure C5-3. Rear panel (2) of telecom option

Table C5-2. Callout descriptions (2)

Callout Number	Function	Connector Type	Signal Characteristic
6	DC Power Fuse	Cartridge Fuse	Fuses external dc power, 2.5 A, 250 Volt rating, time delay
7	DC Power Input	5-screw Terminal Strip	40–58 Vdc, 100 W max, as labeled on rear panel

–48 Vdc Power Inputs

The frequency standard supports use of redundant power sources.

CAUTION

The 5071A with telecom options uses a –48 Vdc office battery as its primary voltage source. Though not normally considered high voltage, the office battery has more than the minimum power necessary to present a potential fire hazard. Use extreme caution when working around or connecting circuits energized by the office battery.

Recommendations for cabling to the frequency standard

Power to the unit is applied at the terminal strip. Use the following procedure as a guide to supply power wiring to the unit.

a. Following local practices, select a wire size appropriate to ensure an office battery voltage of –40 to –58 Vdc at the frequency standard. The current requirement for the unit can be up to 3 A.

b. Switch off the circuit breakers or remove the fuses to the branch circuit feeds that will supply the subrack.

c. Route redundant ("Input 1" and "Input 2") –48 Vdc office battery feeds to the subrack to ensure uninterrupted operation. If your facility does not provide redundant battery sources, split the power feeds at the main battery distribution fuse board (BDFB), the branch battery feed panel, or at the rack cabinet.

d. If the battery feeds originate at the BDFB or branch panel, run the two battery feeds to the subrack through cable runs on opposite sides of the facility. Running both feeds in the same cable rack creates a single-point source of power failure and should be avoided.

e. Route the power cables on opposite sides of the rack cabinet. Leave a length of cable for both feeds sufficient for later dressing into cable bundles.

f. Route wiring from ground to the terminal strip on the rear panel.

g. Check the battery feed lines for possible shorts to one another or to ground using a multimeter.

Connecting dc power

The following procedure describes how to connect power to the frequency standard. To connect the finished power cables for the two dc supplies, follow these steps:

a. Using a multimeter, verify that there are no multiple battery grounds, or any shorts at the power source end of the wires.

b. Reinstall the fuses or set the circuit breakers to On at the branch circuit distribution that supplies the –48 Vdc power.

c. Use a multimeter to measure the voltage of the battery feed leads at the frequency standard. The voltage must measure in the range –40 Vdc to –58 Vdc.

d. Uninstall the fuses or set the circuit breakers to Off at the branch circuit distribution while attaching the battery feeds to the power terminal strip.

e. Attach the Input 1 battery feeds to the terminal strip using spade lugs or similar technique. Connect the system or power source ground to the GND terminal.

f. Attach the Input 2 battery feeds to the terminal strip using spade lugs or similar technique. Connect the system or power source ground to the GND terminal.

g. Reinstall the fuses or set the circuit breakers to On at the branch circuit distribution that supplies the –48 Vdc power.

Start-up sequence

After power is applied to the 5071A, the unit will normally step through the following sequence:

a. The amber Attention light is lit indicating normal power-up sequence and the following messages are displayed on the LCD in the order shown:

- Warming up (Indicates self-test passed successfully)
- Setting Osc. Control
- Setting RF amplitude
- Setting E_mult voltage
- Logging signal levels
- Setting C-field
- Locking servo loops
- Operating normally

b. After about 15 minutes, the Attention light goes off, and the Continuous light (green) flashes.

c. Open the front-panel door to access the controls by turning the knob to the left and pulling out.

d. Press the blue Shift key, then 5 (Utilities). The display shows >Reset<.

e. Press the Enter key. This resets the continuous operation circuit, causing the LED to be on constantly. Any subsequent fault will cause the Continuous LED to start flashing, or go off.

What is Next?

1 Perform the qualification tasks in chapter E1 and then the equipment tests in chapter E2.

The qualification tasks consist of:

- Set to continuous operation
- Configure output ports
- Synchronize to an external 1PPS reference signal (if 55300A is part of the sync system)
- Set local time and display it

The equipment tests consist of:

- Verify 5/10 MHz output ports
- Verify telecom outputs

NOTE If installing the frequency standard with the GPS reference source or the SSU, complete those installations before starting the qualification procedures.

2 Connect the output to the SSU.

Once the outputs from the frequency standard have been checked, the last step is to connect the output signal to the SSU.

C6

Install the 55409A Mini-SSU

Power, cables, subrack, and cards

In This Chapter

This chapter describes how to install the 55409A mini-SSU system. The topics include:

- General information
- Accessories, tools, and equipment needed
- Mini-SSU description
- Installing the 55409A mini-SSU subrack
- Configuring the cards
- Installing the cards
- Troubleshooting

NOTE

See "In This Manual" for a list of tasks to put a mini-SSU subrack into service.

Assumptions in this Chapter

- There is a great deal of similarity between the standard SSU and the mini-SSU. There are references here to other chapters for the information needed to install the subrack and configure the plug-in cards for the mini-SSU.
- Typically, the mini-SSU system includes a subrack that contains two ITH clock cards. At any time, one card will be in the active mode and the other will be in standby. These procedures assume that your mini-SSU subrack contains two ITH clock cards.

Firmware Requirement

The 55409A mini-SSU requires firmware revision 3851D, or later.

Mini-SSU Subrack Connector Characteristics

The following table summarizes the characteristics of the mini-SSU subrack connectors.

Table C6-1. Mini-SSU subrack connectors

Connector	55409A
PRC input and Status input	Grounded BNC
2048 kHz/kbps inputs	Floating
Outputs	Grounded
–48 Vdc	Locking

NOTE

Refer to the chapter on specifications for more details about the subracks including dimensions and power requirements.

Accessories, Tools, and Equipment

Accessories

An installation accessories kit will be supplied with the 55409A mini-SSU subrack. The items in this kit are described in Table C6-2.

Table C6-2. Accessories supplied with 55409A mini-SSU subrack

Accessory	Qty	Purpose	Part #
Locking power connector	2	–48 Vdc power inputs	1251-5272
Spare 1A telecom fuse	1	Communication card	2110-1129
Spare 2A telecom fuse	1	Output cards	2110-1125
Spare 3A telecom fuse	1	ITH cards	2110-1000
Crimp lug terminal	1	Frame ground connection	0360-0041
Screw–10-32 w/nylon washer	6	EIA rack mounting	0570-1366
U-nut	6	EIA rack mounting	0590-0804
Connector pins	8	Power connector	1251-2418

Two pairs of rack mounting flanges are also included for mounting the mini-SSU into an EIA or ETSI rack.

Tools

Table C6-3 describes the required tools and where they are used. The list of tools does not include a crimp tool that will be needed to make the mating connectors for the input/output connectors.

Table C6-3. Tools needed to install 55409A mini-SSU subrack

Tool	Purpose
Large Phillips or Pozidriv #2 screwdriver	Rack mounting screws
Molex Hand Crimping Tool (11-01-0084)	Power cables
7 mm nut driver	Frame ground stud on subrack front panel
Wire strippers	Making power cables
Diagonal cutters	Making power cables
ESD wrist strap	ESD protection when installing cards

Equipment

Table C6-4 describes the required equipment and where they are used.

Table C6-4. Equipment needed to qualify 55409A mini-SSU subrack

Equipment	Purpose
Digital multimeter	Check voltage and cables for opens/shorts
54603A general purpose oscilloscope, or equivalent	Check signal characteristics during qualification

Description of the 55409A Mini-SSU

The 55409A mini-SSU provides highly accurate frequency outputs of 2048 kHz and 2048 kbps, which can be used to distribute synchronization signals at nodes in a telecommunications network. The mini-SSU is a modular, fully redundant timing distribution system intended for use where the greater number of inputs and outputs of the standard SSU are not needed.

The mini-SSU has fewer reference inputs and outputs than the standard 55400A SSU. The mini-SSU is suitable for smaller, remote sites where 32 or fewer outputs are needed, whereas the standard SSU is recommended for large central office sites.

The mini-SSU conforms to key telecommunications standards. It supports both ETSI SSU and Bellcore BITS (Building Integrated Timing Supply) standards. The SSU tracks up to *three* incoming reference signals from equal, or higher, levels of the network, qualifies the signals, then filters and distributes precise timing to the node's equipment. Incoming reference signals may come from cesium standards at the top level of the network, GPS reference sources, non-traffic E1 signals, or live traffic signals.

System Components

The mini-SSU hardware consists of one subrack, one or two Input Track and Hold (ITH) cards, one Network Information Management (NIMC) card or Information Management (IMC) card, and up to four output cards.

See Figure C6-1 for an illustration of a fully-loaded subrack with NIMC card, ITH cards, and output cards.

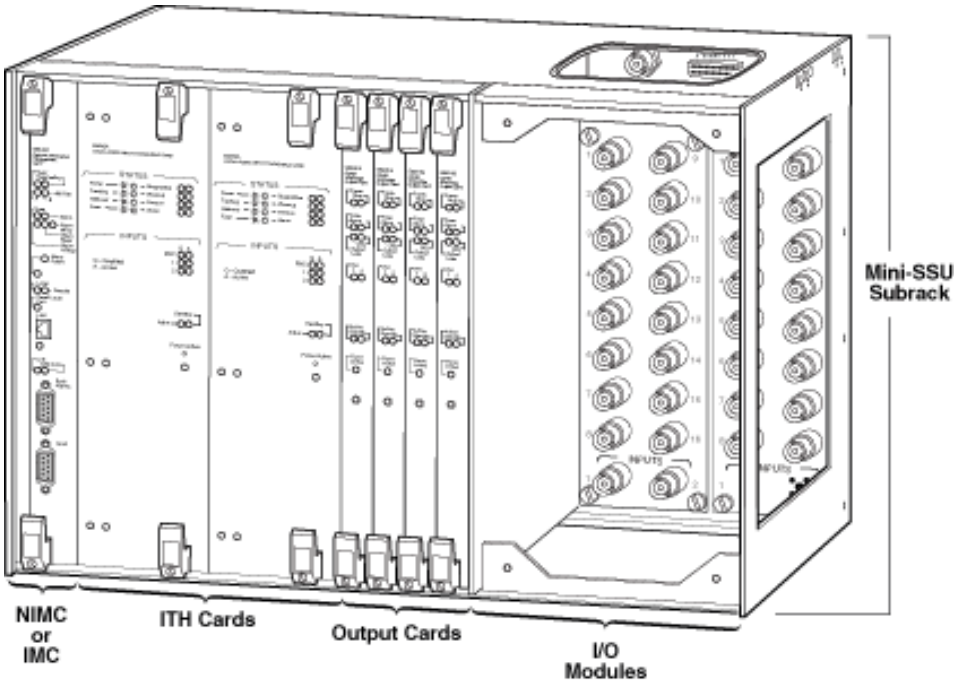


Figure C6-1. 55409A Mini-SSU

System Power

Power for the mini-SSU is supplied via redundant –48 Vdc office battery inputs. Each plug-in card is individually fused and contains its own dc-to-dc converter.

Reference Input Signals

The mini-SSU can accept three reference signals when the system is using the standard ITH cards. The Primary Reference Clock (PRC) input signal can be 5 or 10 MHz. The other two inputs can be either 2048 kHz or 2048 kbps signals.

Subrack

The 55409A subrack is the frame that houses the plug-in cards and accepts external signals and power for system operation. It consists of a chassis, backplane, and input/output modules.

Input Track/Hold Cards

The ITH cards are typically used in a protected-pair configuration as shown in Figure C6-2. The clock on each ITH card qualifies the input signals while filtering jitter and wander on the selected input signal before sending a reference signal to the output cards. The ITH cards duplicate functions in the event that the active ITH card fails and the standby card has to take over. The active ITH card tracks the selected input and takes over as the system reference should all the input reference signals fail.

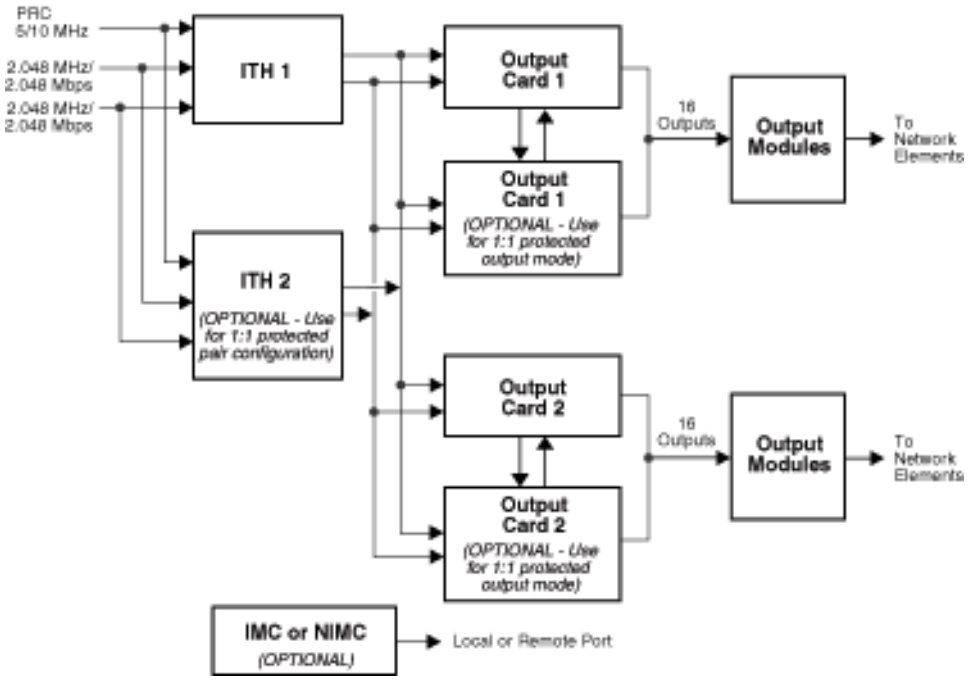


Figure C6-2. 55409A Mini-SSU—System Block Diagram

Output Cards

When configured in the recommended 1:1 protected mode as shown in Figure C6-1, each pair of output cards provides 16 protected outputs for network elements. The 1:1 protection mode employs a combination of an active card paired with a standby card ready to take its place should the active card develop a problem. Alternately, a single unprotected output card can provide 16 output signals.

Alarm/Communication Card

Each subrack can contain a communication card (NIMC or IMC), as shown in Figure C6-1. This card manages alarms from the system and can also provide an interface for communication with local or remote controllers.

The communication card collects alarms from every other card in the subrack. Upon detection of one or more alarm conditions, the card determines if the one alarm, or combination of alarms, is a minor, major, or critical alarm state and activates the alarm relays and appropriate LED indicators on the front panel.

NOTE

The communication capabilities of the mini-SSU are the same as for the standard SSU as described in chapter A5.

Input/Output Modules

The input and output connectors for the mini-SSU are contained on plug-in modules that attach to the subrack. Different types of connectors are available.

Each module provides 16 outputs. The output signals are produced by the output cards contained in the subrack. The modules may have input connectors.

55409A Mini-SSU Front-Panel Details

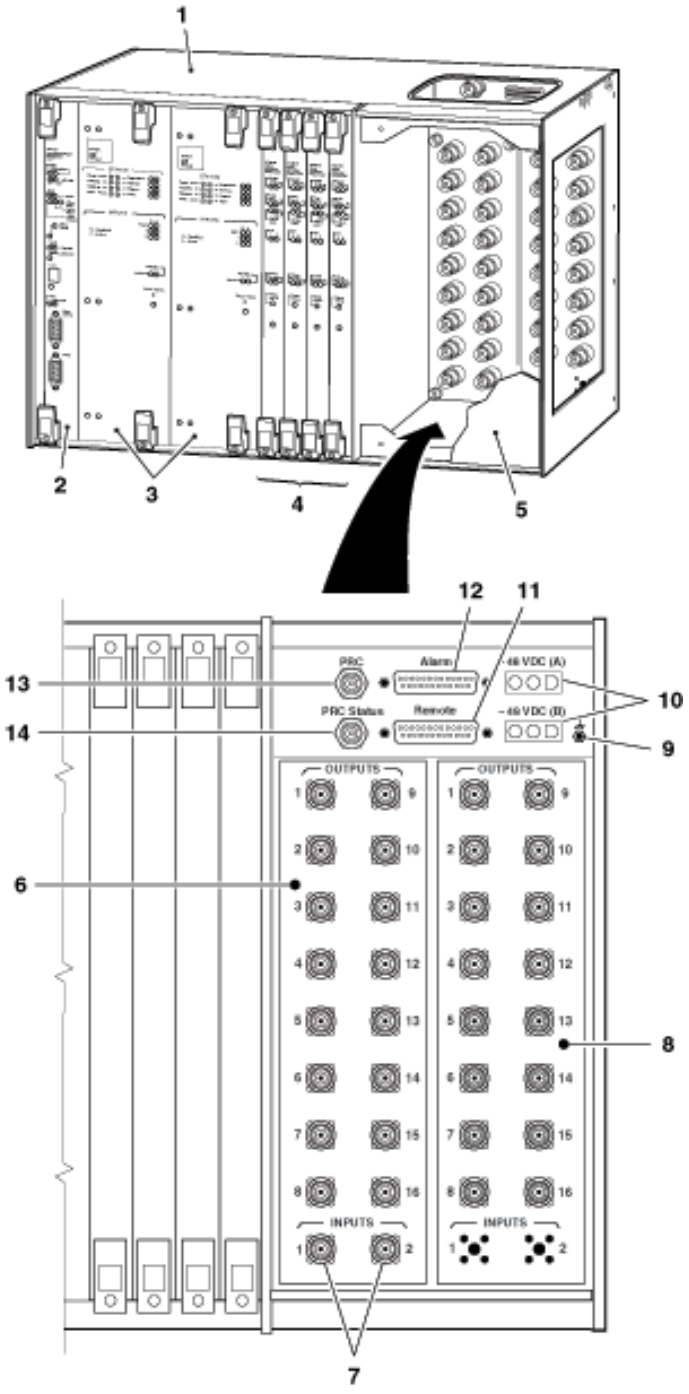


Figure C6-3. Mini-SSU Front-Panel Details

1 **55409A Subrack**. This subrack can be mounted into an equipment rack using one of two mounting dimension standards: EIA 482.6 mm and ETSI 535 mm. These standards are accommodated by the two pairs of supplied rack mounting flanges. See the installation section in the *55400A SSU System Manual*.

2 **55442A Network Information Management card (NIMC), or 55441A Information Management card (IMC)**.

When the *NIMC* or *IMC* card is used in the SSU, it provides ports for computer communications with the SSU (local, remote, and LAN) plus alarm functions.

3 **55429B Input Track and Hold cards**. Each card qualifies input signals while filtering jitter and wander on the selected input. The clock on the ITH card tracks the selected input and takes over as the system reference should the input signals fail.

4 **Output cards**. When configured in the 1:1 protected output mode, each pair of output cards provides 16 protected outputs for network elements. The 1:1 protection mode employs a combination of an active card paired with a standby card ready to take its place should the active card develop a problem.

A single, unprotected output card provides 16 outputs.

5 **Protective cover**. Secures over the opening at the front of the subrack to limit access to the cables.

6 **55498A I/O Module**. It contains 16 output connectors. This module allows you to connect the distributed 2048 kHz/kbps output signals derived from the reference input signals to the network elements. The slot "A" output cards provide the signals for this I/O module.

7 **2048 kHz/kbps inputs** (part of 55498A). Each of these two inputs accepts a 2048 kHz or kbps input reference signal.

8 **55497A Output Module**. It provides an additional 16 output connectors. The slot "B" output cards provide the signals for this output module.

9 **Frame-ground stud** for chassis-ground connection.

10 **–48 VDC(A)** and **(B)** office battery input connectors, modular interlocking. These are for connecting redundant dc power to the SSU. The dc voltage range to power the SSU is –36 Vdc to –57 Vdc.

11 **Alarm** interface DB-25P (male) connector provides three independent alarm relays for the critical, major, and minor alarms for all office alarms (both visual and audible).

12 **Remote** Comm Port RS-232, DB-25S (female), DTE configuration, serial interface port for remote control, monitoring, and retrieving of SSU's memory data. The communication language is TL1.

13 **PRC** (5 or 10 MHz Primary Reference Clock) BNC 50Ω input connector. This input accepts a Stratum 1-level 5 or 10 MHz signal from a cesium clock (e.g., 5071A) or a GPS receiver (e.g., 55300A). This input connector is grounded.

14 **PRC Status** BNC 50Ω input connector. This input, associated with the PRC input, accepts a TTL signal (positive true) that can indicate if the primary clock has a problem. This condition can be used to disqualify the PRC. This input connector is grounded.

Mini-SSU Inputs and Outputs

Figure C6-4 shows the origin and direction flow for mini-SSU signals.

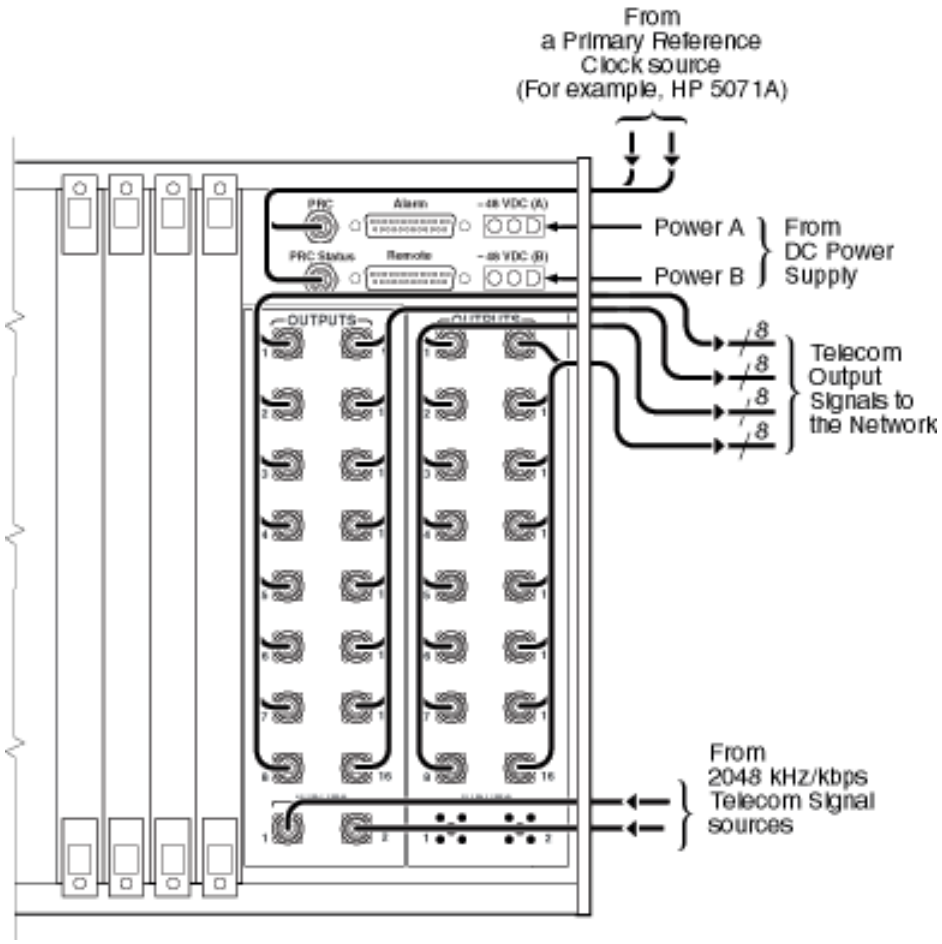


Figure C6-4. Typical Input and Output Connections for Mini-SSU

Install the Mini-SSU Subrack

The physical installation of the expansion subrack is the same as for the master subrack. For this reason, there are references back to the installation of the master subrack for rack positioning and power inputs.

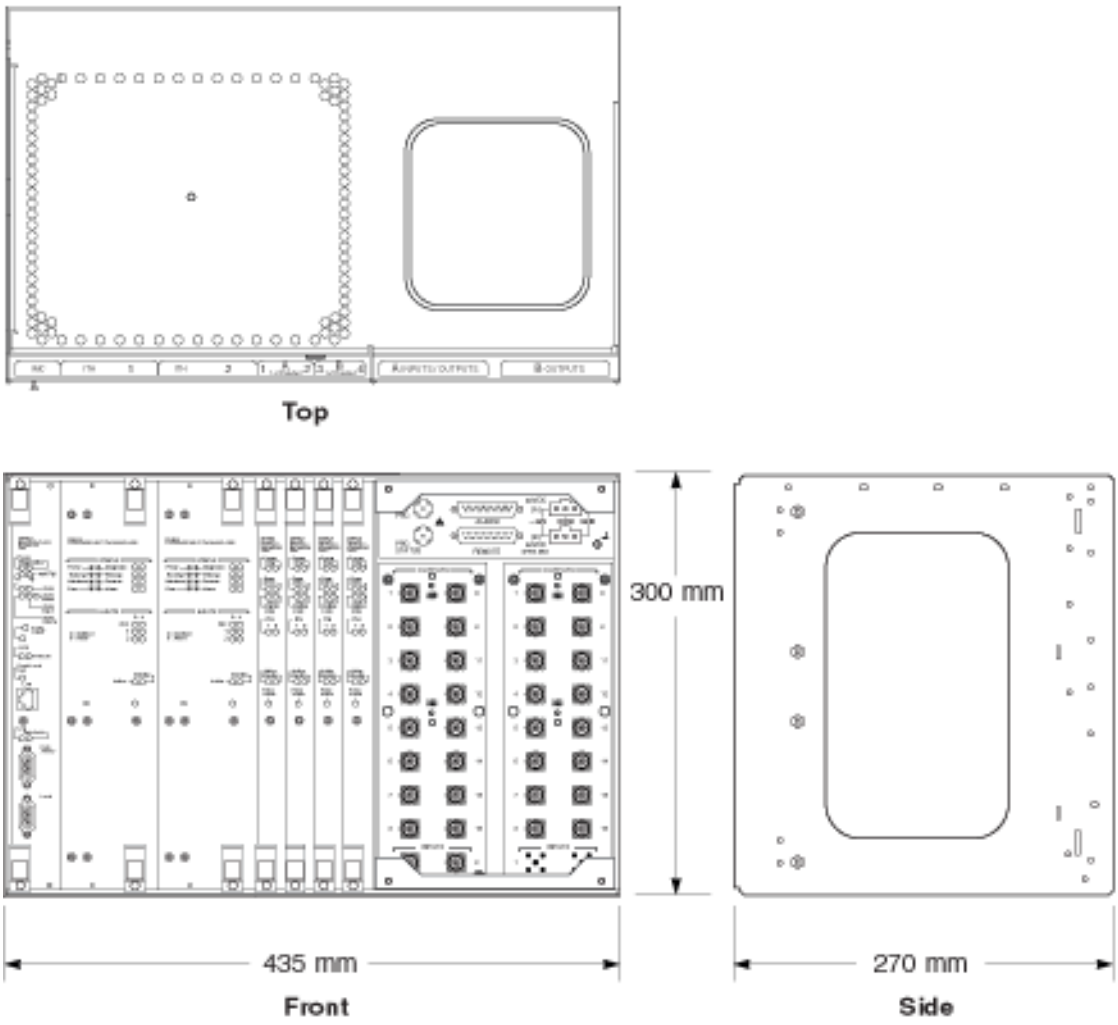


Figure C6-5. 55409A Mini-SSU Subrack Dimensions

Position in the Rack Cabinet

A possible location for the mini-SSU subrack in a rack cabinet is shown in chapter B2. The recommended spacing between the equipment is shown as well.

Installing the mini-SSU subrack

Follow the instructions in chapter C2, “Install the 55400A SSU” on page C2-6 to install the mini-SSU subrack in the rack cabinet.

Connecting the –48 Vdc power inputs

Follow the procedures in chapter C2, “–48 Vdc Power Inputs” on page C2-11 through “Connecting dc Power” on page C2-14 to assemble power cables and apply power to the mini-SSU subrack.

Alarm Port

If using the alarm connector to feed alarms from the mini-SSU to the office alarm system, review the description and pinout beginning on page C2-15.

Remote Port

If using the remote connector, review the description and pinout beginning on page C2-18.

Local Port

If using the local port on the communication card for configuring the mini-SSU or troubleshooting, review the description and connector pinout beginning on page C2-26.

Configure the Plug-in Cards

Before the plug-in cards are installed into the mini-SSU, the switch settings on each card need to be checked and set as appropriate.

Overview of Card Switch Settings

Each plug-in card contains switches that need to be configured before use to ensure proper operation. As the following sections describe each card to be installed, there will be a pointer to the location of the card's switch settings in this manual.

TIP Create and maintain a switch configuration record for each card being installed in the system. One way to do this is to copy the switch configuration tables in this manual and mark your settings. Keep this documentation accessible. If a card ever needs to be replaced, the record is then available for configuring the replacement card correctly.

ITH Card

Chapter D1 describes the ITH clock cards including the jumper and switch settings. Turn to that chapter for information on setting up the ITH card for use.

Review the information starting on page D1-17 to set switches and jumpers for the ITH card.

NOTE The 55429B ITH card for the mini-SSU is identical in performance to the 55413B, except that the mini-SSU ITH card supports only two 2048 kbps/kHz inputs, instead of four or eight. Use switch "S2" on the ITH card to set the parameters for the two inputs.

Output Cards

Chapter D2 covers the switch settings for the output cards. The information is organized by the type of card.

Communication Card

Chapter D3 contains the switch settings for the communication cards. A description of the IMC switch settings begins on page D3-8. The NIMC switch settings are covered beginning on page D3-18.

Network Usage

If the mini-SSU will be used on a network, there are additional parameters that will need to be configured. Review the topic, "Preparing the NIMC for Network Use" on page D3-21. Important additional network information is covered in chapter 10 of the *55400A TL1 Programming Reference Manual*.

Connect the Input Signal Cables

Now is a good time to connect the input signals to the mini-SSU. The PRC input and two 2048 kbps/kHz inputs on the I/O module are supported.

Connecting the input signals at this time will ensure fewer problems during installation. When setting switches on the ITH cards, be sure to disable unused input channels.

Refer to Figure B2-6 on page B2-10 for the recommended way to route cables to and from the mini-SSU.

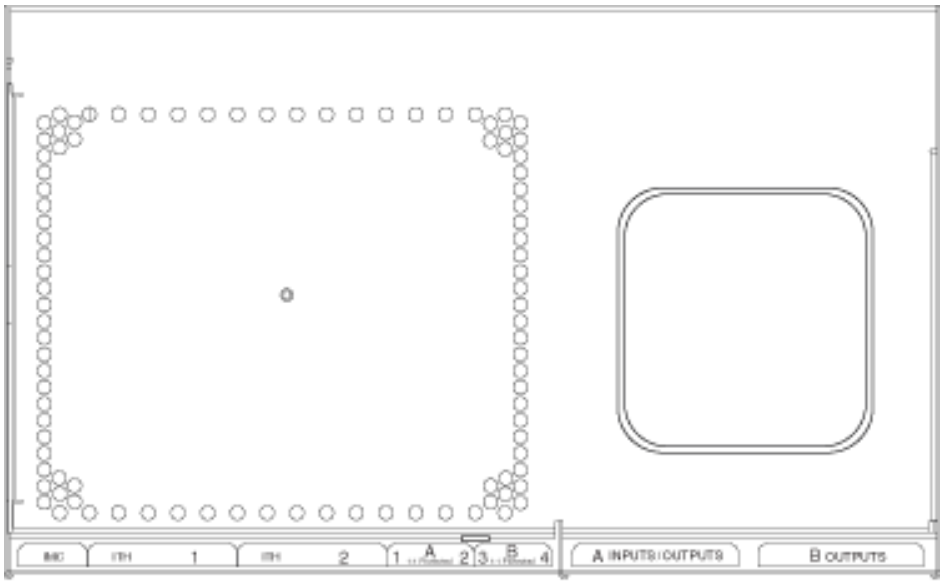
Install the Plug-in Cards

The following sections describe how to install the ITH cards, output cards, and communication card in turn. The procedures assume that the subrack has already been installed and power is applied. No input reference signals have yet been connected.

The 55409A mini-SSU uses a redundant architecture. This means that no single failure can bring down the system when separate power sources and plug-in cards are used in protected pairs. To support this concept, the output cards and the clock cards should be installed in protected pairs. If redundant operation is not needed, the mini-SSU can operate with a single ITH card and a single output card for each 16 outputs.

Plug-in Card Locations

The subrack has space for a communication card, two clock cards, and two pairs of output cards (A and B slots).



Top View

Figure C6-6. Guide for card installation

The communication card slot (labeled IMC) takes one of the two communication cards:

- Information Management Card
- Network Information Management Card

The ITH slots take the two clock cards, and the "A" and "B" slots each accept a pair of output cards. Each group of 16 outputs on the connector modules (labeled "A outputs" and "B outputs") corresponds to the pair of output cards installed in slots "A" or "B."

NOTE

If the output cards will not be installed as protected pairs, install only one card per labeled pair of slots. For example, one output card could be installed in either of the two slots designated as "B." The second slot should remain empty.

Plug-in Card Identification

Card assemblies are identified by:

- Symmetricom model number on the front panel of each assembly
- Serial number on the side panel of cards

If there are any questions regarding a specific component, note the model number and serial number on each card assembly and include it in any correspondence with Symmetricom.

Initial Installation of 55409A System Cards

This is the sequence to follow when installing 55409A cards for the first time:

- Configure the card
- Install the card
- Observe the card status
- Repeat for the next card

Install the cards in this order as instructed in the following topics:

- ITH clock cards
- Output cards
- Communication card

NOTE

It is strongly recommended that all card configuration at the time of the initial installation be accomplished by making the switch settings on the cards. This approach ensures that all card parameters are initially set to known states and this can avoid confusion later during the service life of the SSU.

ITH Clock Cards

Go to "Install the ITH Clock Cards" on page C2-32.

Output Cards

Go to "Install the Output Cards" on page C2-37.

Communication Card

Go to "Install the Communication Card" on page C2-38.

Input/Output Modules

Normally, there is no need to remove these modules. The only time these modules need to be removed would be to be to configure them for use with the 55471A Traffic Re-synchronization Card (TRSC). The TRSC is the only output card that contains both inputs and outputs so some of the connectors that are normally outputs for all other output cards are used as inputs for the TRSC. Those inputs require a 75 Ω termination for proper signal matching to the backplane of the subrack.

The modules have jumpers on the back side of the board to select a 75 Ω termination for the connectors used as inputs with the TRSC. The designated inputs are connectors 1, 3, 5, 7, 9, 11, 13, and 15 when using the TRSC. Some are buffered channels and some are re-timed. For detailed information on the TRSC, refer to the description beginning on page D2-27.

Output module jumpers

The mini-SSU output modules have jumpers to provide a 75 Ω termination for the connectors used as inputs to the Traffic Re-synchronization Card (TRSC). This capability takes the place of external feed-thru 75 Ω terminations that are required if these inputs are not terminated on the module using the jumpers.

Procedure for jumper placement:

1. Remove the module by loosening the thumbscrews at the corners of the module.

2. See Figure C6-7 for a view of the output module and the jumper pins. There are eight jumper locations on each output module at connectors: 1, 3, 5, 7, 9, 11, 13, and 15. These connectors are used as inputs for the TRSC.
3. To set a 75 Ω termination for one of the connectors used as an input to the TRSC, move the jumper to the "TM" position (place the jumper over the top pin and the middle pin).
4. To remove a 75 Ω termination from one of the connectors, move the jumper to the "NC" position (place the jumper over the middle pin and the bottom pin).

CAUTION

Jumpers must be moved back to the "NC" position whenever TRSC cards are no longer used in the mini-SSU. For example, if a TRSC card is replaced by another type of output card, the failure to reset jumpers on the output module will cause an attenuation of the output signals from those terminated connectors.

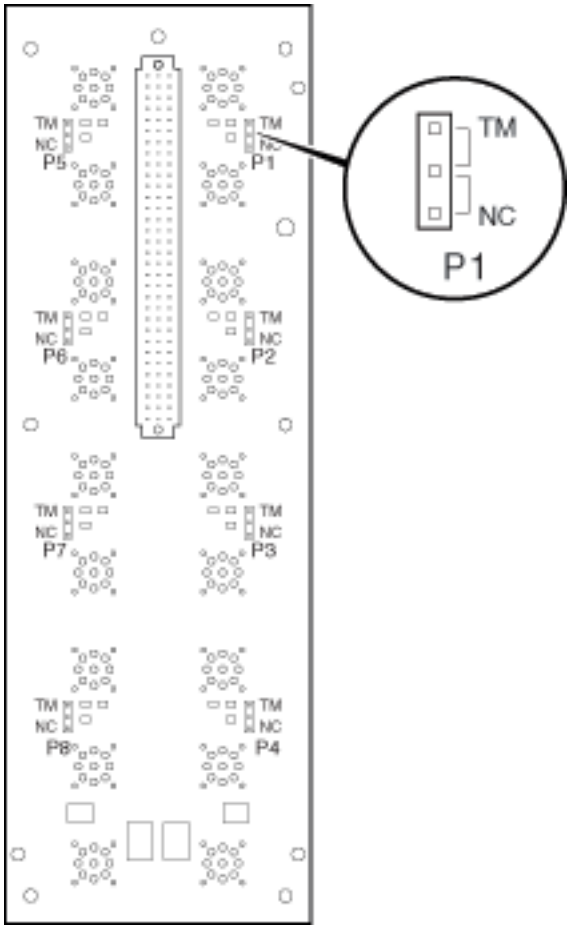


Figure C6-7. Output Module rear view

What is Next?

1 Perform the qualification tasks starting with "Prepare 55400A for Operation" on page E1-14. Then follow the test procedures starting with "Perform 55400A SSU Tests" on page E2-7.

The qualification tasks consist of:

- Display current status
- Verify mini-SSU configuration
- Set mini-SSU date and time
- Set mini-SSU system ID
- Configure mini-SSU for network operation (if needed)

The equipment tests consist of:

- Alarm tests
- Output checks

NOTE If installing the mini-SSU with the frequency standard or GPS reference source, complete those installations before starting the qualification procedures.

2 Connect the outputs to network elements.

The last step is to connect the output signals to the network elements that require synchronization.

Troubleshooting

Follow procedures starting on “Before You Begin” on page F1-2.

To Check firmware revision

The firmware revision number can be checked one of the following ways:

1. Send a TL1 command using the 55450A local craft terminal software or a terminal emulation program connected to the local port of the communication card. The information retrieved will include the firmware revision at the end of the lines describing the IMC and ITH cards in the format Rxxxxx.

   ```
   RTRV-NETYPE-ALL:::1;
   ```

2. Remove the communication card from the mini-SSU subrack. The EEPROMs on the card will have a label indicating a firmware revision.
3. Review the system test data pack forms shipped with the master subrack from the factory. The firmware revision number is included on the system final configuration/shipping log form.

NOTE

Methods 2 and 3 may not be valid if newer firmware has been downloaded to the EEPROMs without making a modification to the labels.

Firmware upgrade

Newer versions of firmware for the mini-SSU subrack may be available for download over the Internet. Contact Symmetricom for details.

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