08-01023-01

Elastic Networks

ELMo 120 Multiplexer

Installation and Maintenance Guide

Revision: 2.01
Publication Date: November 1999

EtherLoop™ Technology

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Publication history

November 1999

Document release for general publication.

Contents

About this document

This document contains the installation and maintenance procedures for the ELMo 120 Multiplexer shelf.

Audience

This document is intended for installation technicians charged with installing and maintaining the ELMo 120 Multiplexer in an EtherLoop system.

Introducing the ELMo 120 Multiplexer

This document describes the installation and maintenance procedures for the ELMo 120 Multiplexer. The ELMo 120 Multiplexer shelf is the backbone component of an EtherLoop system, supporting 120 Elite modems in voice/data or data-only applications.

Chapter Contents

This chapter includes the following information.

ELMo 120 Multiplexer installation overview

The ELMo 120 Multiplexer uses a dedicated EtherLoop cross-connect to connect to the Elite modems installed in an existing customer premise equipment (CPE) network. Installing the ELMo 120 Multiplexer consists of two main tasks:

- installing the ELMo 120 Multiplexer shelf into an equipment bay

  Note: In voice/data applications, the shelf installation includes installing the auxiliary voiceband filter shelf.

- connecting the ELMo 120 Multiplexer to the Elite/CPE network, the Ethernet data network, and the external voice network via the dedicated EtherLoop cross-connect

Chapter 2 contains the installation procedures for the ELMo 120 Multiplexer.

ELMo 120 Multiplexer shelf

One ELMo 120 Multiplexer shelf supports 120 EtherLoop lines. The ELMo 120 Multiplexer shelf contains the following components:

- Power card
- Ethernet 10/100Base-T switch card
- EtherLoop 12:1 multiplexer modem cards (10)

Figure 1-1 shows the front view of the ELMo 120 Multiplexer shelf. Figure 1-2 shows the connections on the ELMo 120 Multiplexer shelf backplane. The following sections briefly describe the ELMo 120 Multiplexer shelf components.

Figure 1-1
ELMo 120 Multiplexer shelf and cards

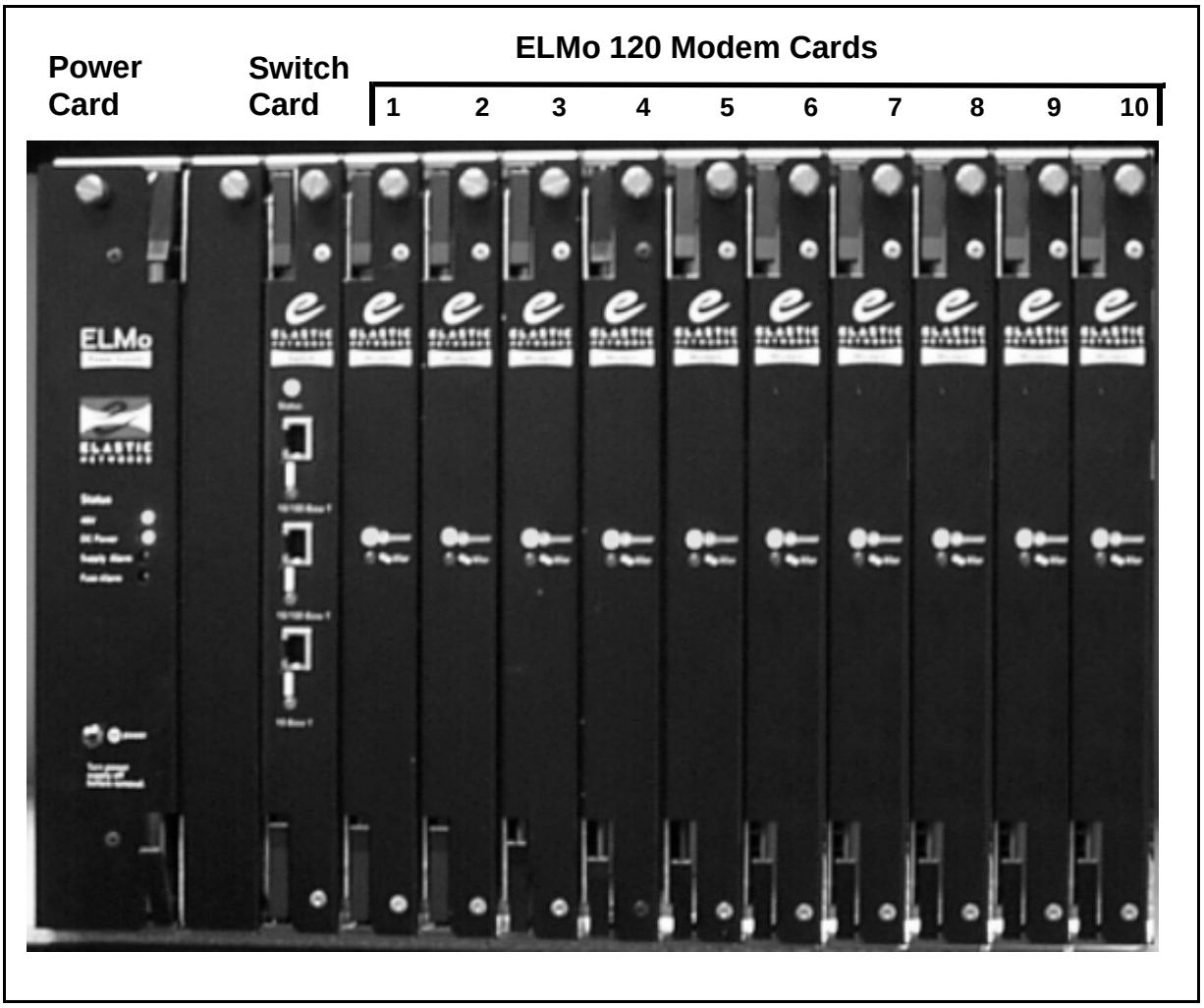
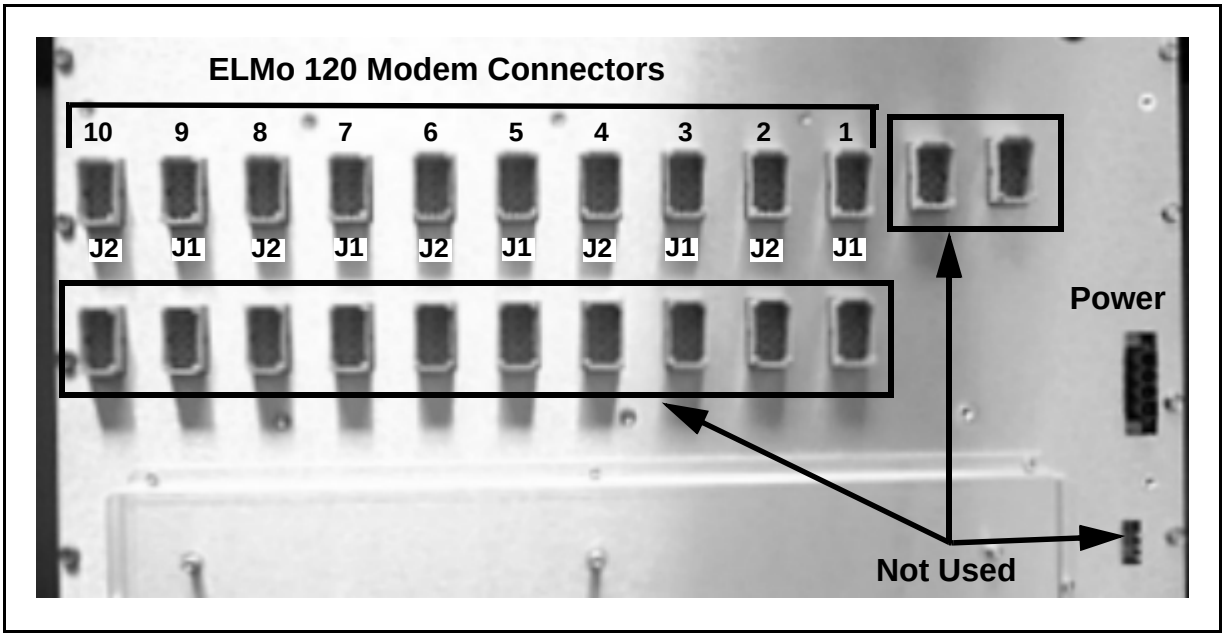


Figure 1-2
ELMo 120 Multiplexer backplane connections



ELMo 120 Multiplexer components

This section describes the function and purpose of each of the ELMo 120 Multiplexer component cards.

Power card

The Power card converts the -48 V dc power feed to the power levels used by the ELMo 120 Multiplexer components.

Ethernet 10/100Base-T Switch card

The Ethernet 10/100Base-T switch card collects the Ethernet traffic generated by the ELMo 120 Multiplexer modem cards and passes it to the local data network.

Switch card ports

The Switch card has two "up-link" Ethernet ports and one "interconnect" port on the front faceplate of the card. The top two up-link ports are autosensing Ethernet 10/100Base-T ports (uncrossed) that can be used to connect the ELMo 120 Multiplexer shelf to the data network. The bottom Ethernet 10Base-T port is a crossed port that can be used to interconnect or "stack" connections between ELMo shelves in a multi-shelf bay.

Modem cards

One ELMo 120 Multiplexer shelf can support up to 10 Modem cards. Each ELMo 120 Multiplexer modem card controls 12 Elite modems, directing data traffic flow between the Elite modems and the data network.

Modem card and port numbering

ELMo 120 Multiplexer Modem cards are numbered 1-10, from left to right (when viewed from the front). The 12 logical ports on each modem card are numbered 0-11. Each logical port on a Modem card corresponds to one Elite modem/CPE phone line.

> ***Note:*** The ELMo 120 Modem card ports are provisioned using the **Port Manager** application on the YesWare Server. For information on how to provision ELMo120 Modem card ports, see the *YesWare Applications User's Guide*.

Voiceband filter shelf l

The voiceband filter shelf is used with the ELMo 120 Multiplexer in EtherLoop applications where voice service is required. The voiceband filter cards remove out-of-voiceband signals from the voiceband traffic between the Elite modems and the external voice facility equipment. The voiceband filter shelf contains one filter card for each ELMo 120 Multiplexer modem card.

Figure 1-3 shows the voiceband filter shelf. The filter shelf installs in the bay directly above the ELMo 120 Multiplexer shelf.

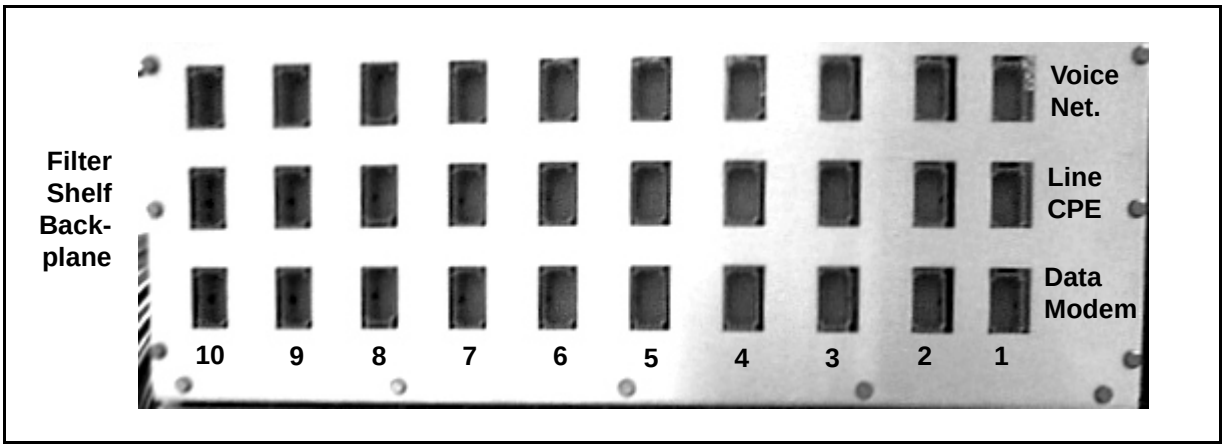
Figure 1-3
Voiceband filter shelf

Voiceband filtershelf connectors

The voiceband filter shelf contains three rows of connectors, all located on the backplane of the shelf. The top row supports the connection from the facility external voice network (PSTN or PBX). The middle row supports the connection from the customer premise equipment (CPE) lines. The bottom row supports the connection from the ELMo 120 Modem cards.

Figure 1-4 shows the voiceband filter shelf.

Figure 1-4
Voiceband filter shelf connectors



ELMo 120 Multiplexer installation and testing

This chapter contains the procedures for installing and testing the ELMo 120 Multiplexer.

Chapter task list

This chapter includes the following tasks.

Task	See
Installing the ELMo 120 Multiplexer modem and voiceband filter shelves	page 2-2
Connecting power to the ELMo 120 Multiplexer modem shelf	page 2-6
Installing the data network connection	page 2-10
Installing ELMo 120 Multiplexer connections for data-only service	page 2-14
Installing ELMo 120 Multiplexer connections for voice/data service	page 2-17
Installing the connections to the external voice facility	page 2-22
Testing the ELMo 120 Multiplexer installation	page 2-24

Task:
Installing the ELMo 120 Multiplexer modem and voiceband filter shelves

Use this procedure to install the ELMo 120 Multiplexer modem shelf and voiceband filter shelf. The voiceband filter shelf is not required in data-only applications.

Requirements

This procedure requires the following:

- equipment bay with enough space available installed, secured, and electrically grounded according to standard industry practice (specifications for a suitable bay are described in Appendix A)
- installation hardware kit supplied with shelf
- phillips head screwdriver (#1 or #2)

CAUTION
Potential damage to ELMo 120 Multiplexer

Do NOT rest objects such as tools or anything else on top of the ELMo 120 Multiplexer shelves. The mounting fasteners can only support the weight of the shelf. Additional weight could cause the mounting to fail and damage the shelf.

—continued—

Installing the ELMo 120 Multiplexer modem and voiceband filter shelves (continued)

Action

Step	Action

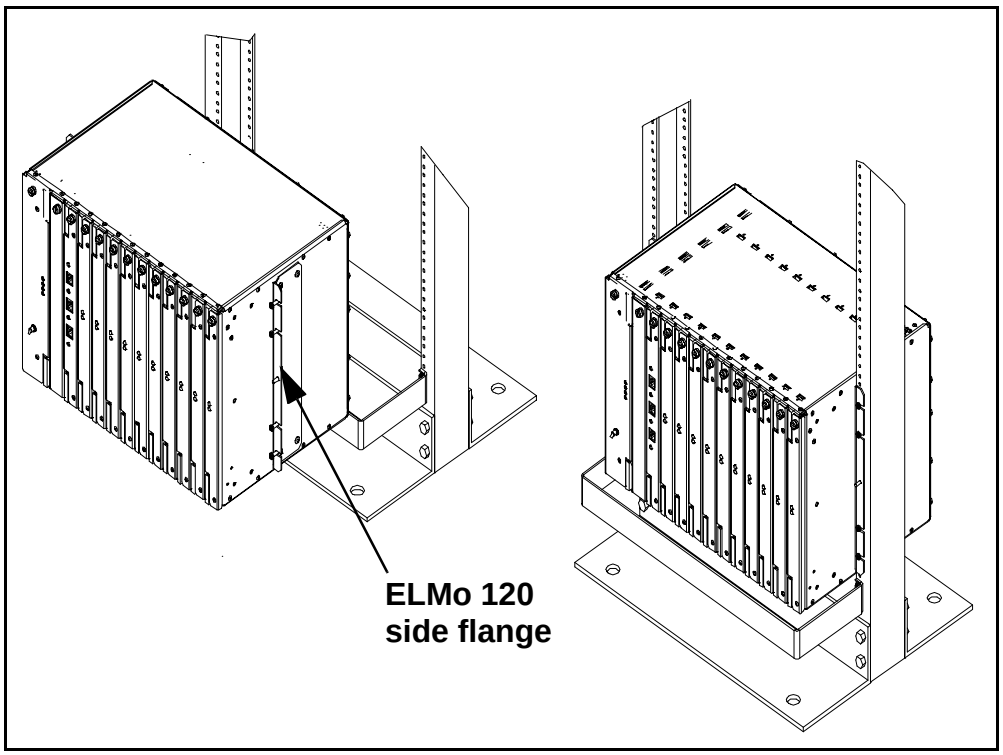
1 Select and apply antistatic protection.

CAUTION
Antistatic protection required
The ELMo 120 Multiplexer shelves are shipped with the circuit packs installed. When handling any circuit pack, you must use some form of antistatic protection. The discharge of static electricity can damage the ELMo 120 circuit packs.

2 Select the mounting point in the bay where the top holes of the shelf mounting flanges will be attached.

3 Align the holes of the shelf mounting flanges with the mounting holes in the bay as shown in Figure 2-1.

Figure 2-1
Aligning ELMo 120 Multiplexer shelf

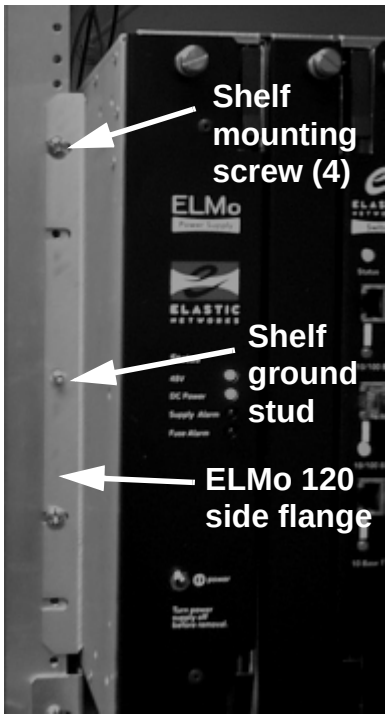


—continued—

Installing the ELMo 120 Multiplexer modem and voiceband filter shelves (continued)

Step	Action
4	Using the shelf mounting screws provided in the shelf hardware kit, fasten the left and right side flanges to the bay as shown in Figure 2-2.

Figure 2-2
ELMo 120 Multiplexer shelf fastened to bay



—continued—

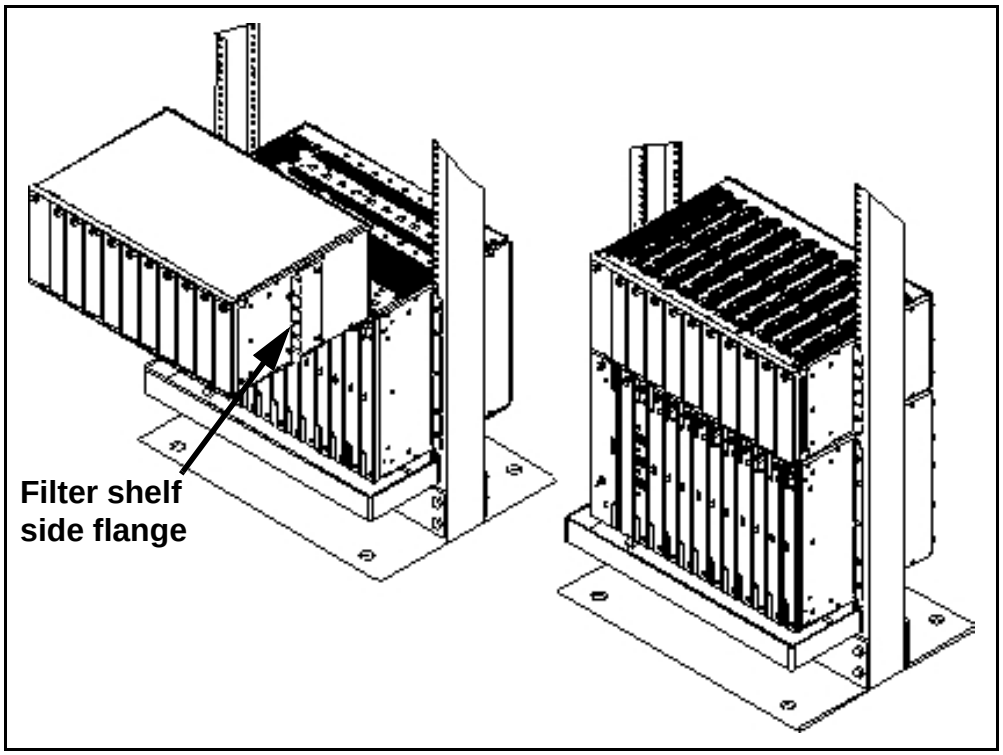
Installing the ELMo 120 Multiplexer modem and voiceband filter shelves (continued)

Step	Action

5 Proceed acording to the following table:

If the application is	Then
voice/data	Align and mount a voiceband filter shelf directly above the ELMo 120 modem shelf as shown in Figure 2-3.
data-only	Do **not** install the voiceband filter shelf. End of procedure.

Figure 2-3
Voiceband filter shelf mounting in bay



STOP

You have completed this task.

Task:
Connecting power to the ELMo 120 Multiplexer modem shelf

Use this procedure to install the power feeds from a -48 V dc power source to the ELMo 120 Multiplexer modem shelf.

Note: The voiceband filter shelf does not require a power feed.

Requirements

This procedure requires the following:

- volt-ohm meter
- ELMo 120 Multiplexer power harness
- -48 V dc power fuse bay or dc rectifier

Power supply and wiring specifications are described in Appendix A.

Action

Step	Action
1	Eject all cards (Power, Switch, and Modems) from the backplane of the shelf. Ensure that the cards completely dislodge from their backplane connectors.

CAUTION
Serious equipment damage
Never connect untested power to the ELMo 120 with any circuit packs installed. If the power feed polarities happen to be reversed, the ELMo 120 shelf and rectifier could be seriously damaged.

2	Route and connect a ground wire from the building's grounding facility to the ground stud on the shelf side-flange. See Appendix A, "Grounding environment specifications" on page A-3 for ELMo 120 Multiplexer grounding requirements.

—continued—

Connecting power to the ELMo 120 Multiplexer modem shelf

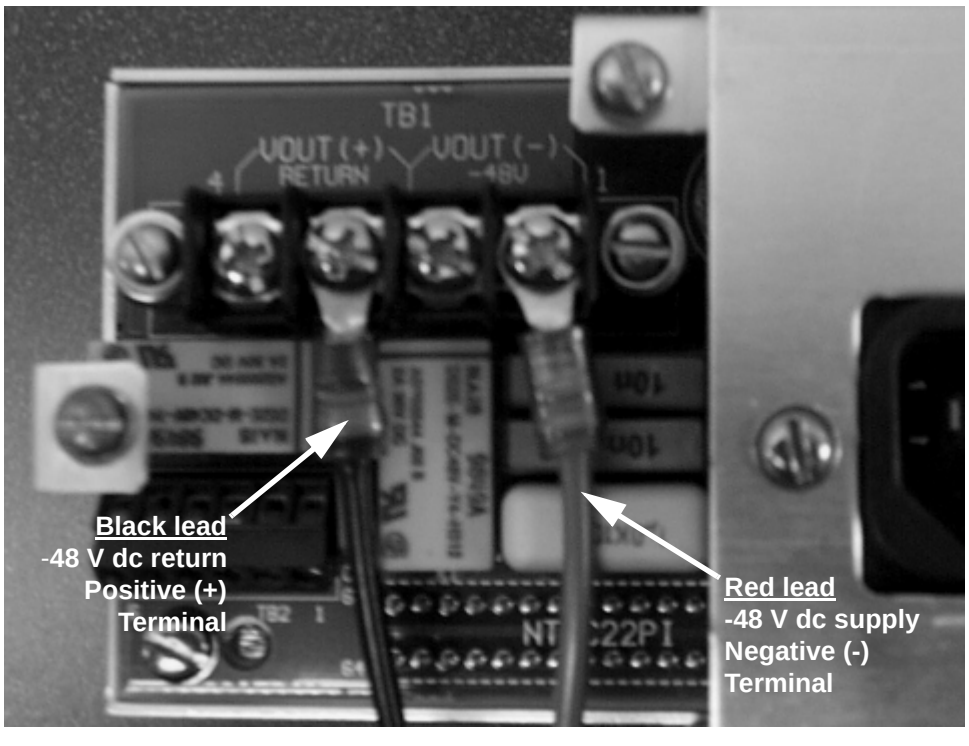
3 With the power supply turned off, connect the leads of the ELMo 120 power harness to the -48 V dc power source according to the following table:

ELMo 120 Multiplexer power leads	Power source	Terminal connection
Red	-48 V dc supply	Negative (-)
Black	-48 V dc return	Positive (+)

CAUTION
Serious equipment damage

Reversed polarities on the power feed can irreparably damage the ELMo 120 Multiplexer shelf components. Be certain power feeds are connected properly to the power source, with the **red** lead connected to the **-48 V dc supply (negative terminal)** as shown in the table above. Note that this is the opposite of other (non-telecommunications) applications, in which the red lead is usually connected to the positive (+) terminal.

Figure 2-4
Typical ELMo 120 power harness connection to -48 V dc power source

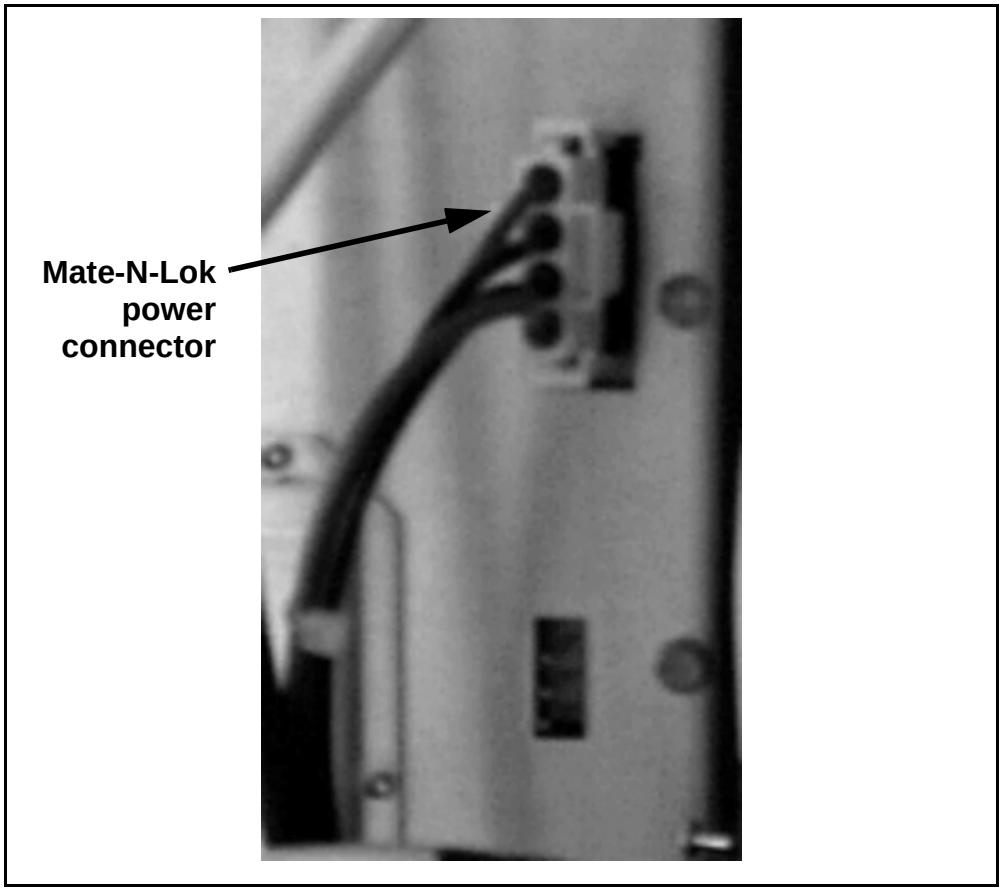


—continued—

Connecting power to the ELMo 120 Multiplexer modem shelf (continued)

Step	Action
4	Route the other end of the ELMo 120 Multiplexer power harness to the power connector on the backplane of the ELMo 120 Multiplexer modem shelf.
5	Connect the ELMo 120 Multiplexer power harness to the matching connector on the ELMo 120 Multiplexer backplane. The connector fits only one way (see Figure 2-5).

Figure 2-5
ELMo 120 Multiplexer power harness connected to shelf



—continued—

Connecting power to the ELMo 120 Multiplexer modem shelf (continued)

Step	Action
6	Turn ON the -48 V dc power supply.
7	Using an appropriate volt-ohm meter, test the power feed at the shelf backplane connection. Verify that the red power feed at the shelf is the -48 V dc supply. The meter should read between -46 and -56 V dc.
8	Check and ensure that the toggle switch on the Power card is in the OFF position.
9	Re-seat the cards into their shelf backplane connectors.
10	Secure the power harness cable in accordance with local office procedures.

You have completed this task.

Task:
Installing the data network connection

Use this procedure to connect the ELMo 120 Multiplexer to the Ethernet data network.

Requirements

This procedure requires the following:

- Ethernet 10/100Base-T data network installed
- 2-Category 5 crossover or straight cables terminated with RJ-45 connectors according to Table 2-1

Table 2-1
Data cable selection

Switch Card Connection Port	Application	Cable Requirements
ELMo 120 Switch card 10/100Base-T uplink(s) (Not crossed)	To a crossed port such as an intermediate switch or hub port (non-uplink)	• Category 5 straight cable
ELMo 120 Switch card 10/100Base-T uplink(s) (Not crossed)	To another uncrossed connection such as an uplink port or PC	• Category 5 cross-over cable
ELMo 120 Switch card 10Base-T port (Crossed)	To a crossed port on an intermediate switch or hub ***Note:*** Switch/hub must contain connection to EtherLoop network router.	• Category 5 cross-over cable
ELMo 120 Switch card 10Base-T port (Crossed)	To an uncrossed connection such as an uplink port, network router or PC	• Category 5 straight cable

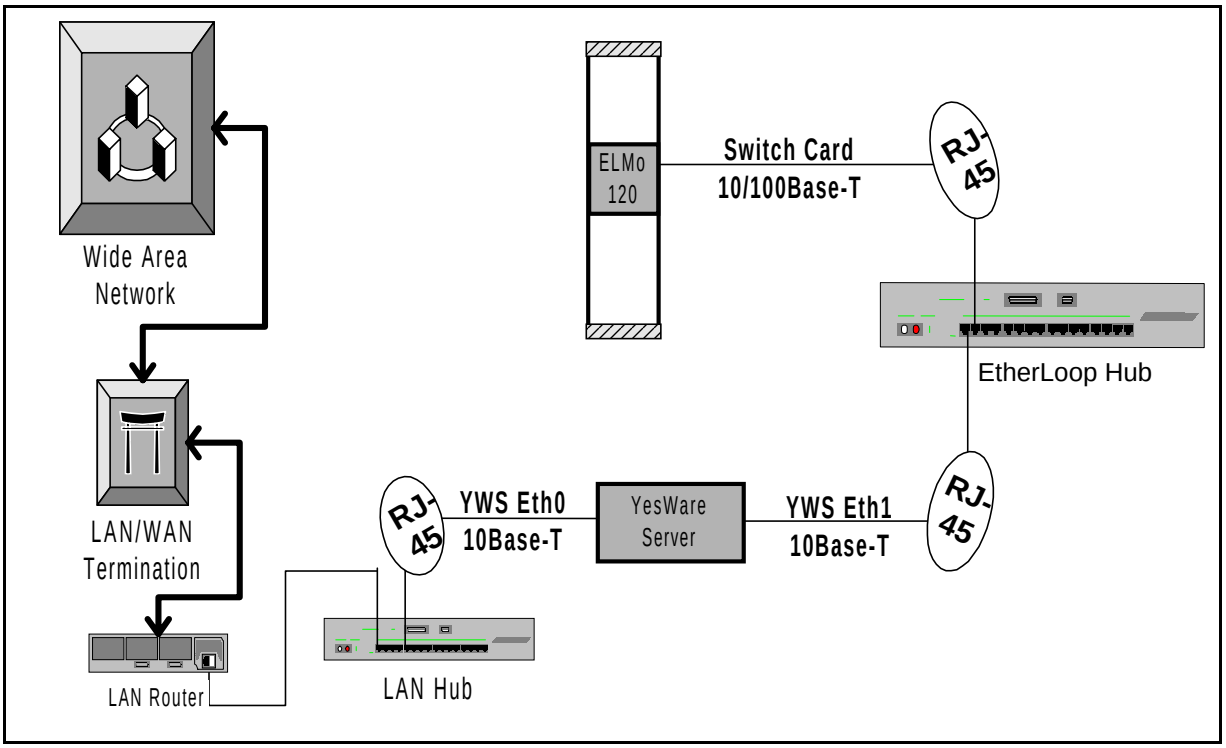
—continued—

Installing the data network connection (continued)

Action

Step	Action
1	Connect one end of the Category 5 cable to the Ethernet 10/100Base-T data network supporting the ELMo 120.
2	Route the other end of the cable to the Ethernet 10/100Base-T Switch card slot on the front of the ELMo 120 Multiplexer modem card shelf. **Figure 2-6 shows a typical ELMo 120 data network connection requirements.**

Figure 2-6
Typical ELMo 120 data network connection requirements



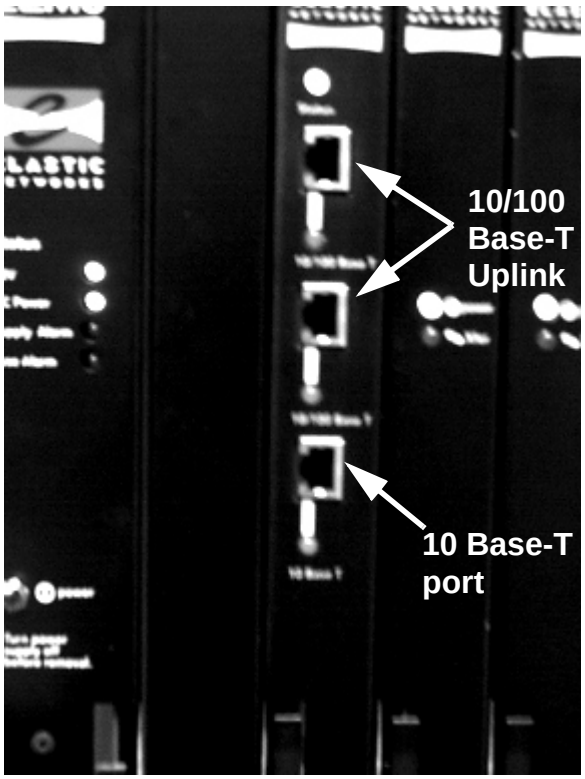
—continued—

Installing the data network connection (continued)

Step	Action

3 Connect the RJ-45 plug to one of the three RJ-45 receptacles on the front faceplate of the Ethernet 10/100Base-T Switch card. See Figure 2-7.

Figure 2-7
ELMo 120 Switch card connections



4 Secure the cable in accordance with local office procedures.

—continued—

Installing the data network connection (continued)

Step	Action

5 Repeat steps 1-4 for the second and third 10/100 Base-T ELMo 120 Multiplexer connections (if required). Be sure to connect the ELMo 120 Multiplexer data connections to separate LAN segments.

CAUTION
Potential service loss

Do not connect the second or third port on the ELMo 120 Multiplexer to the same hub used to support the first. This creates a logical loop which will cause the ELMo 120 Multiplexer system to lock up.

6 Verify that the LEDs illuminate on the ELMo 120 Switch card and at the EtherLoop hub/router port, indicating connectivity is established from the ELMo 120 shelf to the hub/router.

Note: If a 10/100Base-T port on the ELMo 120 Switch card is connected to a 10Base-T network, that port LED should illuminate yellow-orange. If a 10/100Base-T port on the ELMo 120 Switch card is connected to a 100Base-T network, that port LED should illuminate green.

7 Proceed according to the following table:

If the application is	Then
Data-only	go to “Installing ELMo 120 Multiplexer connections for data-only service” on page 2-14
Voice/data	go to “Installing ELMo 120 Multiplexer connections for voice/data service” on page 2-17

You have completed this task.

Task:
Installing ELMo 120 Multiplexer connections for data-only service

Use this procedure to connect the ELMo 120 Multiplexer to the EtherLoop cross-connect in applications where no voice service is required.

Requirements

This procedure requires the following tools and materials:

- 5-ELMo 120 Multiplexer cable harnesses
- 5-intermediate cables
- cross-connect block(s) of the same type used in the existing main distribution frame (MDF)
- cross-connect punch-down tool

Appendix B contains the specifications for the cables and wiring required in this procedure.

Action

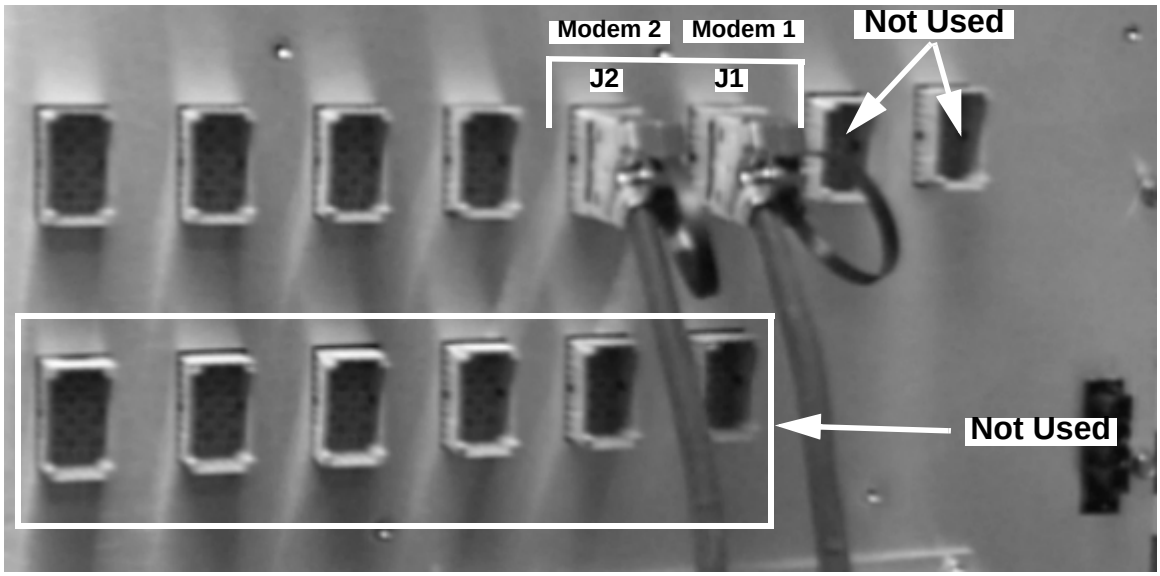
Step	Action
1	Place and secure the dedicated EtherLoop cross-connect blocks on the facility main distribution frame.
2	Connect one Amp-Champ connector of an intermediate cable to the matching connector on the dedicated EtherLoop cross-connect block, and route the other connector to the equipment bay containing the ELMo 120 Multiplexer.

—continued—

Installing ELMo 120 Multiplexer connections for data-only service (continued)

Step	Action
3	Connect the J1/J2 split connectors on the ELMo 120 Multiplexer cable harness to the matching J1/J2 modem connectors of two adjacent modem cards in the ELMo 120 Multiplexer shelf. See Figure 2-8.

Figure 2-8
ELMo 120 Multiplexer data-only connections



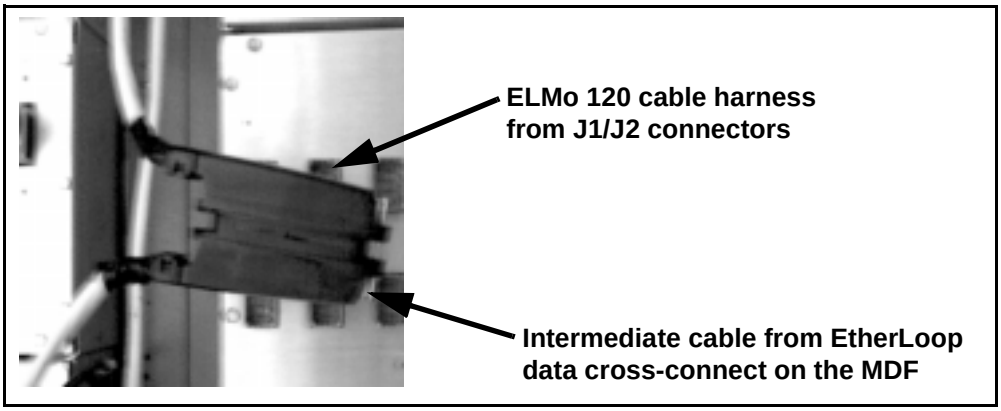
(ELMo 120 Modem Connectors 7-10 not shown)

—continued—

Installing ELMo 120 Multiplexer connections for data-only service (continued)

Step	Action
4	Connect the Amp-Champ 25-pair connector of the ELMo 120 Multiplexer cable harness to the matching Amp-Champ 25-pair connector on the intermediate cable. See Figure 2-9.

Figure 2-9
ELMo 120 Multiplexer intermediate data connection



5	Route the Tip/Ring pairs originating from the Elite/CPE lines to the EtherLoop cross-connect.
6	Terminate the Elite/CPE Tip/Ring connections to the EtherLoop cross-connect block.
7	Record the Elite/CPE Tip/Ring assignments of the EtherLoop cross-connect according to local office procedures.
8	Secure all cables in accordance with local office procedures.
9	Record the EtherLoop connection assignments.
	This concludes the ELMo 120 Multiplexer data-only installation.
10	Go to “Testing the ELMo 120 Multiplexer installation” on page 2-24.

STOP

You have completed this task.

Task:
Installing ELMo 120 Multiplexer connections for voice/data service

Use this procedure to connect the ELMo 120 Multiplexer to the EtherLoop cross-connect in voice/data applications.

Requirements

This procedure requires the following tools and materials:

- 10-ELMo 120 Multiplexer cable harnesses
- 10-intermediate cables
- 10-ELMo 120 Multiplexer data jumper cables

Appendix B contains the specifications for the cables and wiring required in this procedure.

Action

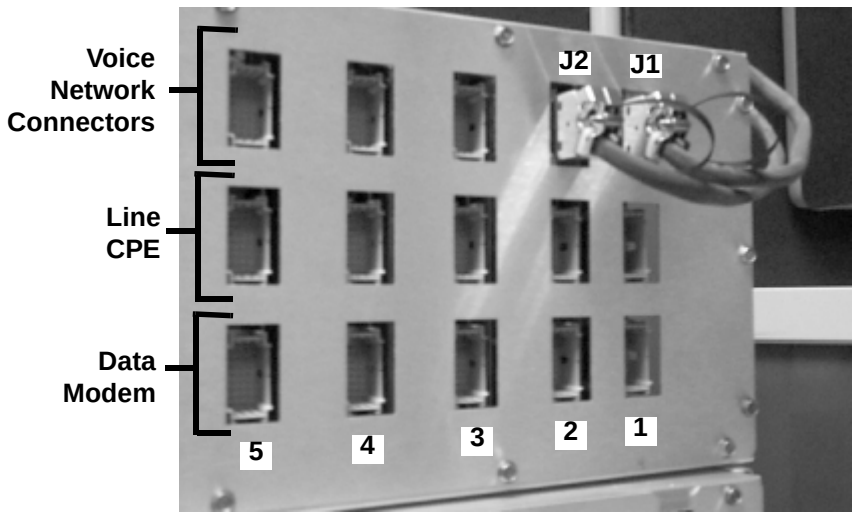
Step	Action
1	Place and secure the dedicated EtherLoop cross-connect blocks on the facility main distribution frame.
2	Designate and label one side of each block as "Line/CPE", and the other side as "Voice."
3	Connect one Amp-Champ connector of an intermediate cable to the to the "Line/CPE" side of the EtherLoop cross-connect block, and route the other connector to the equipment bay containing the voiceband filter shelf.
4	Connect the Amp-Champ connector of a second intermediate cable to the "Voice" side of the EtherLoop cross-connect block, and route the other connector to the equipment bay containing the voiceband filter shelf.

—continued—

Installing ELMo 120 Multiplexer connections for voice/data service (continued)

5 Connect the two split connectors of an ELMo 120 cable harness to the "Voice Network" connectors of two adjacent filter cards in the voiceband filter shelf. See Figure 2-10.

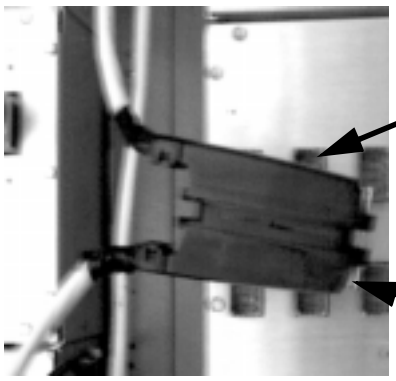
Figure 2-10
Voice network connections on the filter shelf



(Filter shelf connectors 6-10 not shown)

6 Connect the Amp-Champ connector of the "Voice Network" cable harness to the Amp-Champ connector originating from the "Voice" connection on the EtherLoop cross-connect.

Figure 2-11
ELMo 120 Multiplexer intermediate voice connection

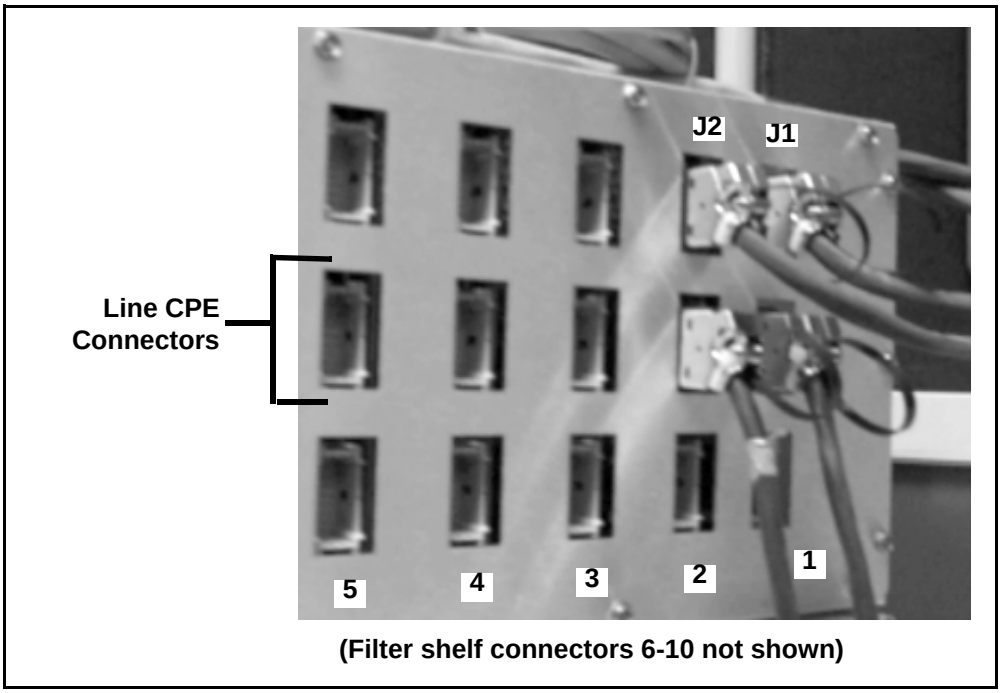


—continued—

Installing ELMo 120 Multiplexer connections for voice/data service (continued)

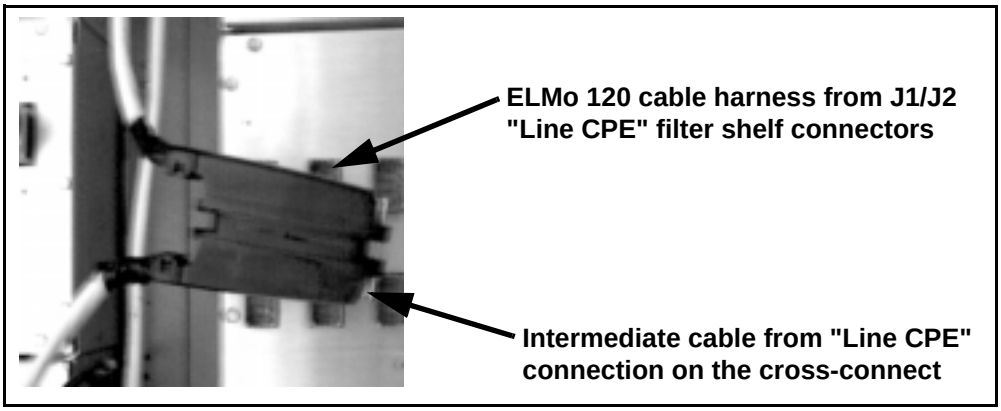
7 Connect the two split connectors of a second ELMo 120 cable harness to the "Line CPE" connectors of the same two filter cards connected in step 5. See Figure 2-12.

Figure 2-12
Line/CPE connections on the filter shelf



8 Connect the Amp-Champ connector of the "Line CPE" cable harness to the Amp-Champ connector originating from the "Line CPE" connection on the EtherLoop cross-connect.

Figure 2-13
ELMo 120 Multiplexer intermediate Voice Networkconnection

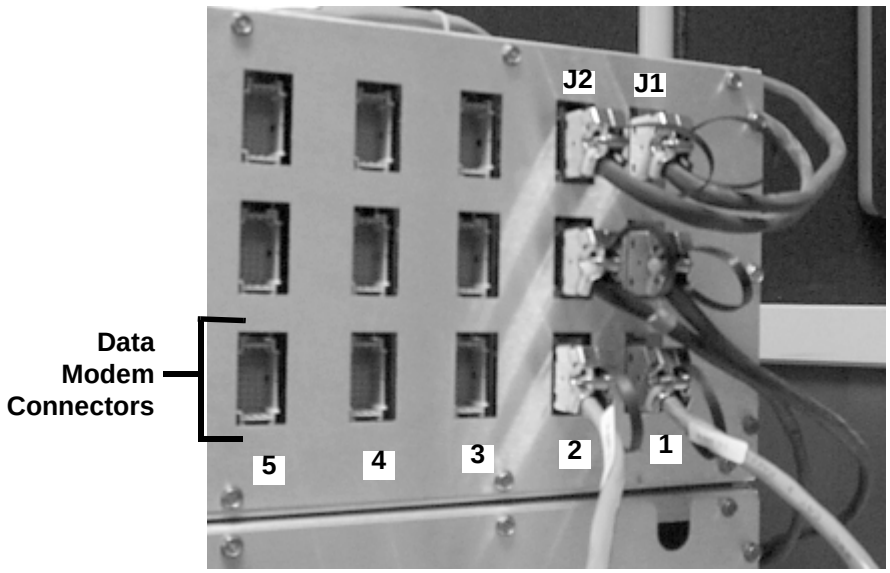


—continued—

Installing ELMo 120 Multiplexer connections for voice/data service (continued)

9 Connect the "Filter" connector on the ELMo 120 Multiplexer data jumper cable to the "Data Modem" connector on each filter card.

Figure 2-14
ELMo 120 Multiplexer data jumper connections on the filter shelf



(Filter shelf connectors 6-10 not shown)

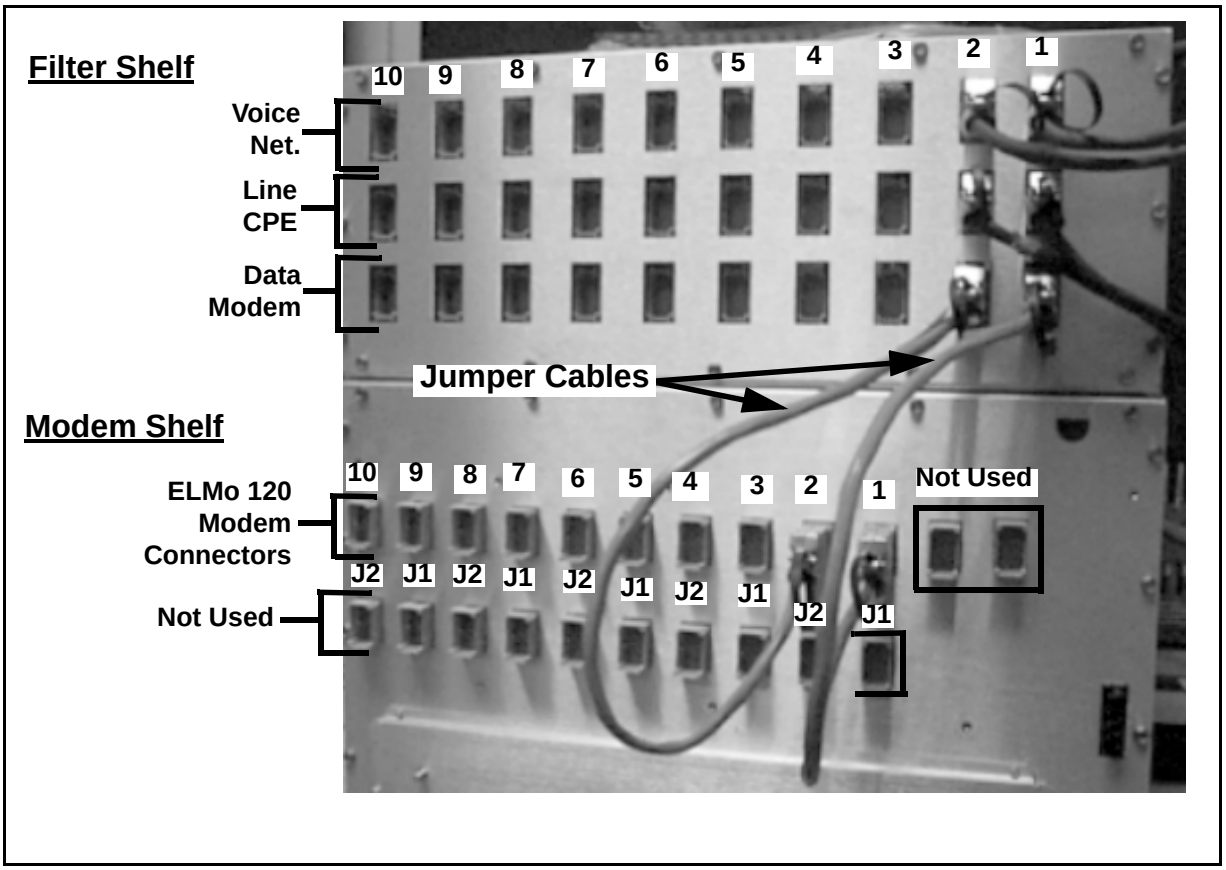
—continued—

Installing ELMo 120 Multiplexer connections for voice/data service (continued)

10 Connect the "Modem" connector on the ELMo 120 Multiplexer data jumper cable to the appropriate J1/J2 modem connectors for each modem card.

Figure 2-15 shows the ELMo 120 Multiplexer the complete voice/data connections for one pair of Modem cards.

Figure 2-15
ELMo 120 Multiplexer voice/data connections



11 Secure the cables in accordance with local office procedures.

12 Go to “Installing the connections to the external voice facility” on page 2-22.

STOP

You have completed this task.

Task:
Installing the connections to the external voice facility

Use this procedure to connect the ELMo 120 Multiplexer lines to an external voice facility.

Requirements

This procedure requires the following tools and materials:

- 24 jumper wires (24 AWG) for each ELMo 120 Multiplexer modem card installed (240 wires for a full shelf)
- cross-connect punch-down tool

Appendix B contains the specifications for the cables and wiring required in this procedure.

Action

Step	Action
1	Identify the existing Tip and Ring jumper connections from the external voice facility cross-connect block to the customer-premise equipment (CPE) cross-connect block.
2	Verify dial tone on the existing voice facility at the CPE cross-connect block for the line being rerouted.

—continued—

Installing the connections to the external voice facility (continued)

Step	Action
3	Remove the Tip and Ring jumper connections from the line.
4	Terminate the Tip/Ring jumper wires from the cross-connect of the external voice facility to the "Voice" side of the EtherLoop cross-connect.
5	Terminate the jumper wires from the CPE Tip/Ring connections to the "EtherLoop" side of the cross-connect block.
6	Verify the new connection by testing dial tone again at the CPE cross-connect block. Modem traffic "noise" should be heard at this point.
7	Secure all cabling in accordance with local office procedures.
8	Record the EtherLoop cross-connect Tip/Ring assignments for the voice facility according to local office procedures. **This concludes the ELMo 120 Multiplexer voice/data installation.**
9	Go to “Testing the ELMo 120 Multiplexer installation” on page 2-24.

You have completed this task.

Testing the ELMo 120 Multiplexer installation

Testing an ELMo 120 Multiplexer installation in an EtherLoop system includes the following tasks:

- Testing voice connectivity (see page 2-27)
- Testing data connectivity (see page 2-28)
- EtherLoop end-to-end testing (see page 2-29)

The following sections contain testing-related information followed by the ELMo 120 Multiplexer testing tasks. Testing tasks for network support equipment such as LAN/WAN routers are not included in this document.

ELMo 120 testing locations

Primary test points for an EtherLoop installation include the following:

- customer premise cross-connect containing the connections for the ELMo 120 Multiplexer and customer premise equipment
- Elite modem user rooms

If the system is having trouble, other test points may be required.

ELMo 120 test point diagrams

Figure 2-16 on page 2-25 shows the schematic layout and primary test points of an ELMo 120 voice/data system. Figure 2-17 on page 2-26 shows the schematic layout and primary test points of an ELMo 120 data-only system.

Figure 2-16
ELMo 120 voice/data system test points

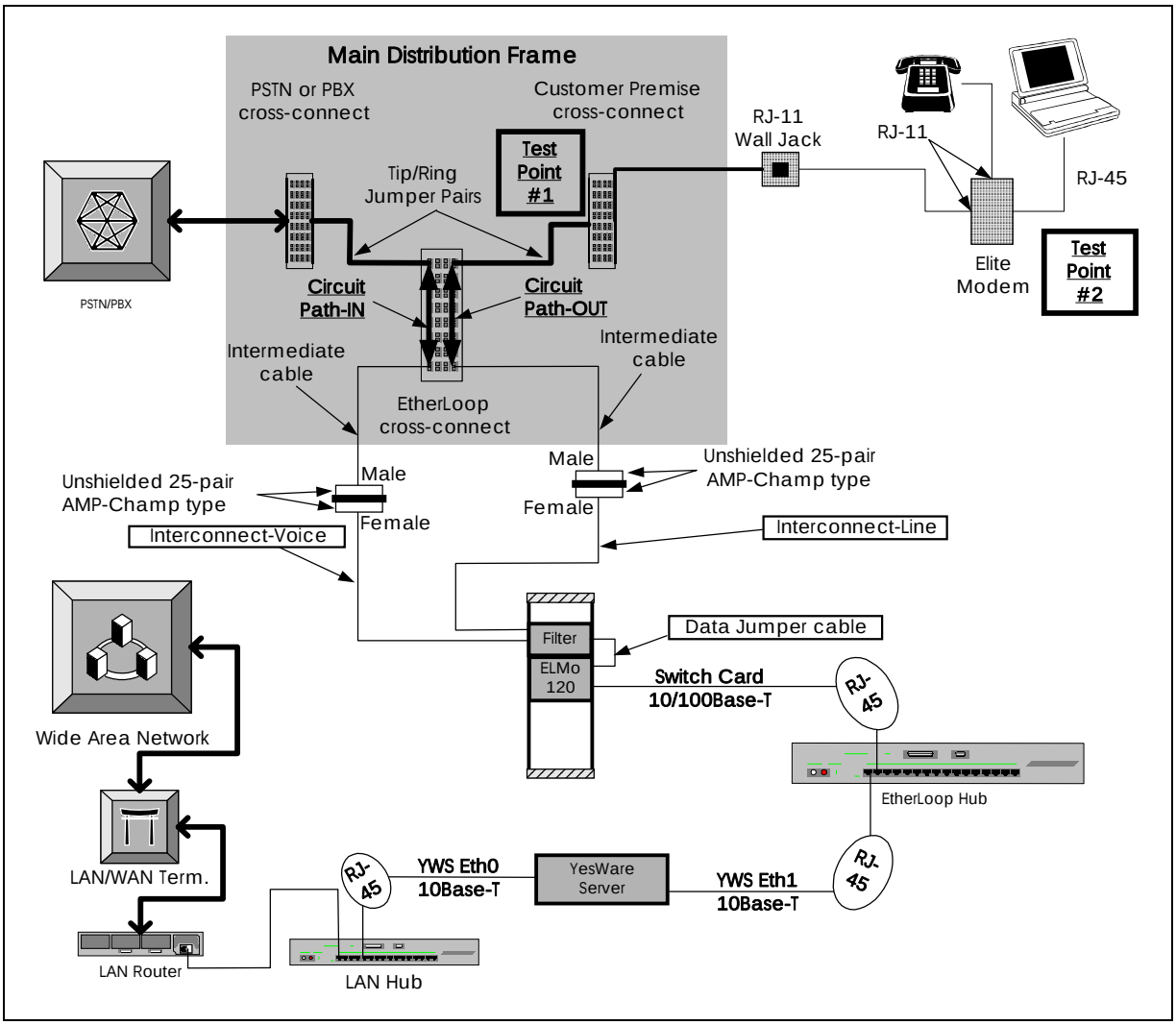
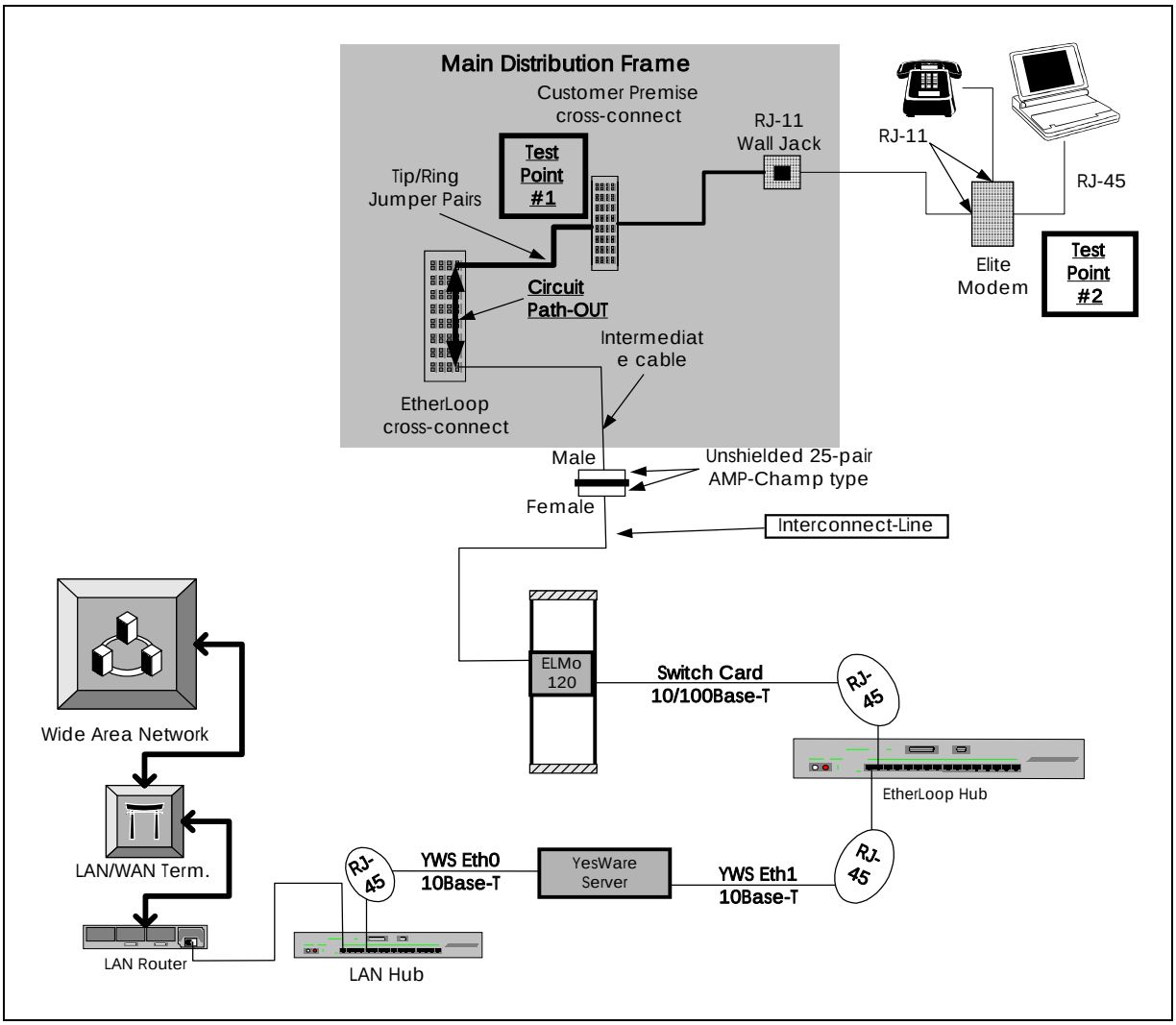


Figure 2-17
ELMo 120 data-only system test points



Task:
Testing voice connectivity

This procedure checks the voice connectivity in ELMo 120 Multiplexer voice/data applications.

Requirements

The following is required to do this procedure:

- external voice facility point-of-presence equipment installed
- Tip/Ring assignments
- standard telecommunications hand-test telephone set

Action

Step	Action
1	Identify the voice line being tested.
2	Switch the power switch on the ELMo 120 Multiplexer Power card to the ON position.
3	Connect the hand test set Tip and Ring to the Tip/Ring pair at the customer premise cross-connect (Test Point #1 in Figure 2-17 on page 2-26).
4	Test for dial tone. A successful test indicates that voice service is passing through the voiceband filter shelf.
5	If no dial tone is present, see Chapter 3, “ELMo 120 Multiplexer maintenance.”

You have completed this task.

Task:
Testing data connectivity

This procedure verifies data connectivity from the customer premise cross-connect and the ELMo 120 shelf.

Requirements

The following is required to do this procedure:

- Elite modem with power adapter and extension cord (if necessary)

Action

Step	Action
1	Identify the data connections being tested at the EtherLoop cross-connect block and the Modem card on the ELMo 120 Multiplexer shelf.
2	Install and connect the Elite modems on the corresponding lines at the customer premise locations as described in the *Elite Modem Installation Guide*.
3	Connect power to the Elite modem.
4	Switch the power switch on the ELMo 120 Multiplexer Power card to the ON position.
5	Observe the Elite modem and ELMo 120 Modem card LEDs. After about 4-5 minutes, all LEDs at both the ELMo 120 Multiplexer and CPE locations should be green, with the transfer LEDs flickering.
6	If the LEDs do not respond properly, see Chapter 3, “ELMo 120 Multiplexer maintenance.”

You have completed this task.

Task:
EtherLoop end-to-end testing

This procedure verifies the EtherLoop system installation, including simultaneous voice and data EtherLoop tests from the Elite modem to the voice and data networks.

Requirements

The EtherLoop end-to-end system testing requirements include the following:

- Elite modem installed and powered as described in the *Elite Modem Installation Guide*
- data network equipment installed and configured, including connection from EtherLoop to Internet, intranet or LAN
- user room telephone or telephone test set with RJ-11 connection to the Elite modem
- Ethernet 10Base-T cable with RJ-45 terminations
- laptop personal computer equipped with the following:
  - — Ethernet PC card configured for TCP/IP
  - — Ethernet PC card RJ-45 adapter cable
  - — Internet browser application, either *Internet Explorer* 4.0 or *Netscape Navigator* 3.0/4.0

—continued—

EtherLoop end-to-end testing (continued)

Action

Step	Action
1	Identify the modem pair being tested.
2	Switch the power switch on the ELMo 120 Multiplexer Power card to the ON position.
3	Verify dial tone on the room phone.
4	If the laptop is running, shut it down.
5	Connect the Ethernet PC card RJ-45 adapter cable to the Ethernet PC card.
6	Connect one RJ-45 plug of the Ethernet cable to the PC card RJ-45 adapter, and the other end to the "To PC" RJ-45 port on the Elite modem.
7	Start the laptop, and launch the browser application.
8	In the browser application, enter the IP address of a known, working site on your network or on the Internet. Repeat this step for several sites.
9	Once data connectivity has been established in step 8, verify dial tone again on the room phone.
10	If the voice or data connectivity fails, see Chapter 3, “ELMo 120 Multiplexer maintenance.”

You have completed this task.

ELMo 120 Multiplexer maintenance

Chapter contents

This chapter contains the following information.

Maintenance guidelines

The following factors can cause service problems in an EtherLoop system installation:

- poor wiring conditions
- incomplete cable connections
- improper ELMo 120 Multiplexer equipment installation
- improper data network equipment configuration
- equipment failure

The following sections briefly describe each of these potential problem causes.

Wiring conditions

In general, EtherLoop systems can function well on standard, twisted pair phone lines (Category 3 or better). However, in older facilities, extremely poor wiring conditions may exist that can adversely impact EtherLoop performance, Also, RJ-11 wall jack connectors can become corroded, which may not impact voice service other than generating some static on the line, but can interfere with EtherLoop data service.

Cable connections

Figure 2-17 on page 2-26 shows every connection point in an EtherLoop system. An incomplete connection at any one of these points could cause the EtherLoop system to malfunction. Ensure that all connections to the EtherLoop system are firmly seated and secured.

ELMo 120 Multiplexer equipment installation

ELMo 120 Multiplexer equipment is relatively simple to install. However, if an equipment card is installed in the wrong slot, or if the cards are not firmly seated in their backplane connectors, the EtherLoop system will not function.

Data network equipment configuration

For an EtherLoop system to function, the data network supporting the system must be properly configured. For example, IP addresses must be correct, and the network router must be configured properly.

Equipment failure

The LEDs on the ELMo 120 Multiplexer shelf and on the Elite modem indicate any equipment failures in the EtherLoop system.

Maintenance checklists

This section contains the maintenance checklists for resolving EtherLoop service problems.

Voice and data connectivity maintenance in facility room

Problem	Maintenance Check
No voice or data service	• Verify that the correct Tip/Ring pairs are being tested for both voice and data • Verify power at all points in the system • Check jumper connections at all cross-connects • Verify connections and wiring conditions at all points
Voice but no data service	• Verify that the correct Tip/Ring pairs are being tested for both voice and data • Check jumper connections • Check LEDs at intermediate hub or YesWare Server/router connections • Check for 10Base-T cable damage • Verify that Modem card is present in correct slot and fully seated in ELMo 120 backplane connection • Replace Modem card to check for bad card • Verify that Ethernet Switch card is present in correct slot and fully seated in ELMo 120 backplane connection • Replace Switch card to check for bad card
Data but no voice service	• Verify that the correct Tip/Ring pairs are being tested for both voice and data • Check jumper connections at PSTN/PBX cross-connect • Check dialtone at the PSTN/PBX cross-connect to verify that there is not an external voice network problem • Verify that Filter card is present in correct slot and fully seated in ELMo 120 backplane connection • Replace Filter card in ELMo 120 shelf to check for bad card

End-to-end maintenance checklist

Problem	Check
No voice or data service	• Verify power at all points in the system • Verify connections and wiring conditions at all points
Voice but no data service	• Verify that there is not an external network problem such as a server being down • Verify that the Ethernet card on the PC connected to the Elite modem has been configured • Verify that the correct type of Ethernet cable (“straight” or “crossover”) is being used for the application. • Verify that all LEDs on Elite modems are green • Verify that the green LEDs at the various Ethernet connection points are lit • Check for 10Base-T cable damage • Verify router configuration and installation • See “Voice and data connectivity maintenance in facility room” checklist
Data but no voice service	• Check dialtone at the PSTN/PBX cross-connect to verify that there is not an external voice network problem • Check/replace Filter card in voiceband filter shelf • See “Voice and data connectivity maintenance in facility room” checklist

Appendix A - ELMo 120 Multiplexer installation requirements

This appendix describes the facility requirements for the ELMo 120 Multiplexer shelf and voiceband filter shelf.

Chapter Contents

This chapter contains the following information.

ELMo 120 Multiplexer support equipment

Equipment and materials that must be installed to support the ELMo 120 Multiplexer shelf include the following:

- telecommunications bay/rack to support the ELMo 120 Multiplexer shelf and the auxiliary filter shelf (if applicable)
- -48 V dc power supply
- grounding facility
- network support equipment

The following sections list the specifications and requirements for each of these components.

Bay requirements and specifications

The bay containing the ELMo 120 Multiplexer shelf must meet the following requirements:

- The equipment bay must be capable of supporting the ELMo 120 Multiplexer weight and dimensions. Elastic Networks recommends a standard 19-inch wide x 7-foot tall bay intended for use with data or telecommunications equipment. A 23-inch wide telecommunications bay can be used with the appropriate 19-inch flange adapters.
- The bay must be installed and secured in accordance with standard data and telecommunications industry practices.
- The bay must be electrically grounded according to standard telecommunications industry practices. See “Grounding environment specifications” on page A-3 for the recommended bay grounding environment.

Power specifications

Table A-1 shows the power specifications for the ELMo 120 Multiplexer shelf.

Table A-1
ELMo 120 power specifications

Power Specification	ELMo 120 Multiplexer value
Supply	-48 V dc (nominal) -46 to -56 V dc (required)
Conversion and distribution	12 V dc 5.0 V dc 3.3 V dc 2.5V dc -5 V dc

Grounding environment specifications

The grounding environnment for the bay containing the ELMo 120 Multiplexer shelf must meet local electrical codes and Integrated Building Distribution Network (IBDN) standards. The grounding environment for the ELMo 120 Multiplexer shelf and its supporting bay can be either a Common Bonding Network (CBN) or an Isolated Bonding Network (IBN) environment. Either of these environments may use a 1/0 AWG ground collector.

The following sections offer guidelines for each of these environments, with and without ground collectors. See local electrical codes or the appropriate IBDN standards for more information.

CBN grounding environment

In most facilities using the CBN environment, the bay containing the ELMo 120 shelf should be grounded to a frame ground bar (FGB) as the common ground point using a 6 AWG, stranded, ground conductor. In smaller facilities where no FGB exists, the building principal ground (BPG) must be used.

If the facility has a ground collector, the bay must be grounded to the connector using a 6 AWG (stranded) ground conductor to the collector. The collector must then be grounded to the common ground point (FGB or BPG) using a 2 AWG (stranded) ground conductor.

If the distance from the FGB, BPG or ground collector is greater than 53 ft (16 m), a 2 AWG (stranded) ground conductor must be used to ground the bay.

IBN grounding environment

In most facilities using the IBN environment, the bay containing the ELMo 120 shelf should be grounded using a 6 AWG, stranded, ground conductor to the building single-point ground (SPG) as the common ground point. In smaller facilities where no SPG exists, the building principal ground (BPG) must be used.

If the facility has a ground collector, the bay must be grounded to the connector using a 6 AWG (stranded) ground conductor to the collector. The collector must then be grounded to the common ground point (SPG or BPG) using a 2 AWG (stranded) ground conductor.

If the distance from the SPG, BPG or ground collector is greater than 53 ft (16 m), a 2 AWG (stranded) ground conductor must be used to ground the bay.

Network support equipment

The network support equipment that may need to be installed includes the following:

- Ethernet 10Base-T hub port for ELMo 120 Hub card connection (one per ELMo 120 shelf)
- Ethernet 10Base-T hub ports for NSS/InterProxy (two per NSS)
- LAN router connections
- WAN gateway connection

Network support requirements will vary according to the existing facility resources. See the completed Elastic Networks *Site Survey Questionnaire* for more information.

ELMo 120 Multiplexer installation accessory requirements

Table A-2 lists the cables and accessories required for the ELMo 120 installation. See Appendix B for more information about the ELMo 120 Multiplexer cables.

Table A-2
ELMo 120 cabling

Part description	Elastic Networks Part Number	Function	Quantity required
ELMo 120 Multiplexer cable harness	04-00007-10	Connects ELMo 120 Multiplexer or filter shelf to intermediate cable	One harness for every two ELMo 120 modems or voiceband filter cards
Intermediate Cable (50 ft.)	04-0000<u>9</u>/<u>10</u>/<u>11</u>-50	Connects cable harness to EtherLoop cross-connect	One cable for every ELMo 120 Multiplexer cable harness
Data Jumper Cable	04-00008-18	Connects filter shelf to ELMo 120 Multiplexer	One cable for each filter/modem card pair
ELMo 120 Multiplexer Power Harness	04-00012-18	Connects ELMo 120 Multiplexer to -48 V dc power source	One harness for every ELMo 120 Multiplexer shelf
Category 5/RJ-45 Cable/Cross-over (4/6/8 ft.)	04-00001-<u>4</u>/<u>6</u>/<u>8</u>	See Table 2-1, “Data cable selection” on page 2-10	One cable for each connection from the ELMo 120 Multiplexer to the data network
Category 5/RJ-45 Cable/Straight (4/6/8 ft.)	04-00002-<u>4</u>/<u>6</u>/<u>8</u>	See Table 2-1, “Data cable selection” on page 2-10	One cable for each connection from the ELMo 120 Multiplexer to the data network
Air Baffle Assembly	03-00003-01	Assists with shelf heat dissipation/cooling	One for each ELMo 120 Multiplexer shelf or ELMo 120 Multiplexer/filter shelf pair
Kick Bar	03-00002-01	Protects shelf from physical damage	One for each bay, installs at bottom of rack

ELMo 120 Multiplexer installation tools and materials

The tools and materials required to install the ELMo 120 shelf include the following:

- 4-bay mounting screws
- 1-medium Phillips-head screwdriver
- 1-cross-connect block matching the existing blocks used in the facility MDF, such as Siemon R66, BIX, or AT&T 110 cross-connect blocks
- 1-wiring punch-down tool intended for use with the cross-connect block
- cross-connect jumper wires (24 AWG, quantity varies) for tip/ring connections

ELMo 120 Multiplexer shelf physical characteristics

This section specifies the physical dimensions and weight of the ELMo 120 modem and voiceband filter shelves.

Table A-3
ELMo 120 shelf weight and dimensions

Specification	Value (metric)
Weight (with cards)	45 lbs. (20 kg)
Height	12 in. (30.5 cm)
Width	19 in. (48.3 cm)
Depth	12 in. (30.5 cm)

Table A-4
Filter shelf weight and dimensions

Specification	Value (metric)
Weight (with cards)	15 lbs. (7 kg)
Height	7 in. (18 cm)
Width	19 in. (48.3 cm)
Depth	12 in. (30.5 cm)

ELMo 120 installation site requirements

Table A-5 presents the installation site requirements for the ELMo 120 shelf.

Table A-5
ELMo 120 operational requirements

Specification	**Requirement**
Local area network environment	TCP/IP over Ethernet
Power supply	-48 V dc nominal -46 to -56 V dc acceptable range
Environmental	**Operating temperature:** 5^{o} C (41^{o} F) to 40^{o} C (104^{o} F) **Relative Humidity:** 1% to 90% **Electromagnetic emissions:** Per FCC Part 15 Class A **Outside plant voltage limiting protection:** 3-mil carbon block or equivalent for each outside plant-exposed line, per Bellcore GR-1089.

Appendix B - ELMo 120 Multiplexer cabling specifications

This appendix contains the specifications for the cabling used with the ELMo 120 Multiplexer shelf.

Chapter Contents

This chapter includes the following information.

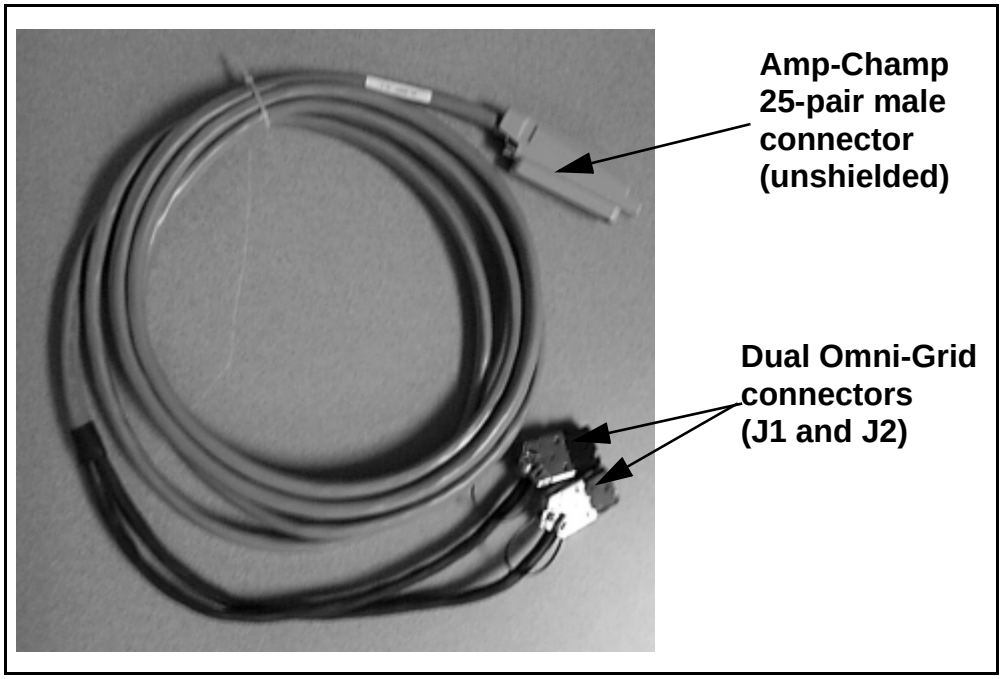
ELMo 120 Multiplexer cable specifications

This section presents the cable specifications for the cables used in the ELMo 120 Multiplexer installation.

ELMo 120 Multiplexer cable harness

Figure B-1 shows the ELMo 120 Multiplexer cable harness.

Figure B-1
ELMo 120 Multiplexer cable harness



ELMo 120 Multiplexer cable harness pin and pair assignments

Table B-1 on page B-3 presents the pair and pin assignments for the ELMo 120 Multiplexer cable harness.

Table B-1
ELMo 120 Interconnect cable harness - pin and pair assignments

Tip/ Ring Pair	Pins	Color code	Connection Assignment	Tip/ Ring Pair	Pins	Color Code	Connection Assignment
1	1	W/BL	J1/Tip	13	13	BK/G	J2/Tip
	26	BL/W	J1/Ring		38	G/BK	J2/Ring
2	2	W/O	J1/Tip	14	14	BK/BR	J2/Tip
	27	O/W	J1/Ring		39	BR/BK	J2/Ring
3	3	W/G	J1/Tip	15	15	BK/S	J2/Tip
	28	G/W	J1/Ring		40	S/BK	J2/Ring
4	4	W/BR	J1/Tip	16	16	Y/BL	J2/Tip
	29	BR/W	J1/Ring		41	BL/Y	J2/Ring
5	5	W/S	J1/Tip	17	17	Y/O	J2/Tip
	30	S/W	J1/Ring		42	O/Y	J2/Ring
6	6	R/BL	J1/Tip	18	18	Y/G	J2/Tip
	31	BL/R	J1/Ring		43	G/Y	J2/Ring
7	7	R/O	J1/Tip	19	19	Y/BR	J2/Tip
	32	O/R	J1/Ring		44	BR/Y	J2/Ring
8	8	R/G	J1/Tip	20	20	Y/S	J2/Tip
	33	G/R	J1/Ring		45	S/Y	J2/Ring
9	9	R/BR	J1/Tip	21	21	V/BL	J2/Tip
	34	BR/R	J1/Ring		46	BL/V	J2/Ring
10	10	R/S	J1/Tip	22	22	V/O	J2/Tip
	35	S/R	J1/Ring		47	O/V	J2/Ring
11	11	BK/BL	J1/Tip	23	23	V/G	J2/Tip
	36	BL/BK	J1/Ring		48	G/V	J2/Ring
12	12	BK/O	J1/Tip	24	24	V/BR	J2/Tip
	37	O/BK	J1/Ring		49	BR/V	J2/Ring
				25	--	V/S	Not Assigned
					--	S/V	Not Assigned

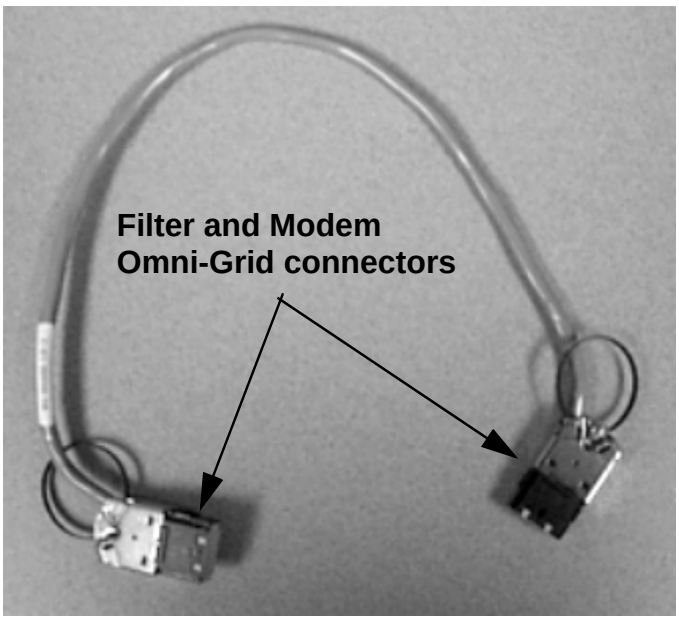
ELMo 120 Multiplexer data jumper cable

Figure B-2 shows the ELMo 120 Multiplexer data jumper cable. The ELMo 120 Multiplexer data jumper cables are used to pass data traffic from the filter shelf ELMo 120 Multiplexer shelf in voice/data applications.

Data jumper cable labeling

The data jumper connectors are labeled "Filter" and "Modem" to indicate with which shelf the connector is used. The data jumper connectors are not interchangeable. You must not connect "Filter" connector to the ELMo 120 Multiplexer shelf, or connect the "Modem" connector to the voiceband filter shelf.

Figure B-2
ELMo 120 Multiplexer cable harness



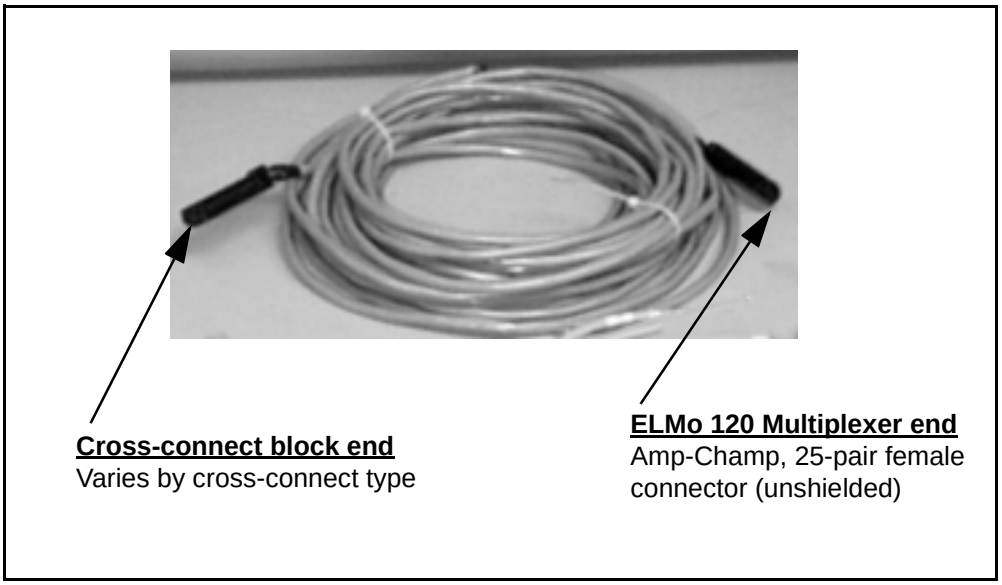
Intermediate cable specifications

ELMo 120 Intermediate cables can be obtained "off-the-shelf" from a variety of vendors, as long as cables chosen meet the following specifications:

- Category 5 bundled 25-pair cable made of 24 AWG wires
- Unshielded, 25-pair female connector (Amp-Champ or equivalent) on the end connecting to the ELMo 120 cable harness

Figure B-3 shows an example of intermediate cabling suitable for use with the ELMo 120 Multiplexer.

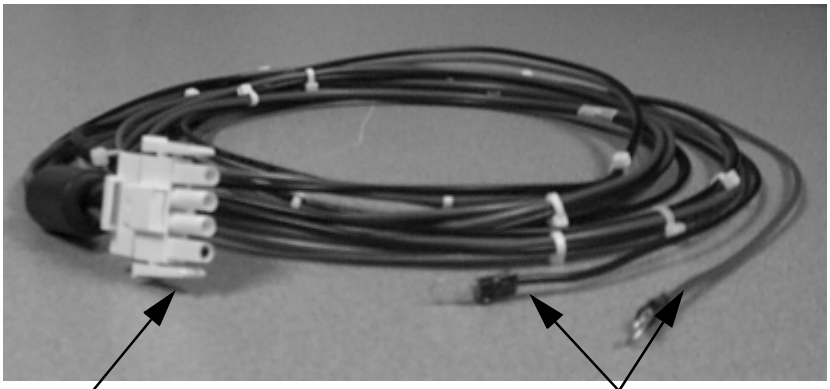
Figure B-3
Intermediate cable



ELMo 120 Multiplexer power cable

Figure B-4 shows the ELMo 120 Multiplexer cable harness. The ELMo 120 Multiplexer power cable assembly connects the -48 V dc power source to the ELMo 120 shelf. One ELMo 120 Multiplexer power cable harness contains connectors to support three ELMo 120 shelves.

Figure B-4
ELMo 120 Multiplexer power cable harness



Power connector terminations

The end of the ELMo 120 Multiplexer power cable assembly that connects to the power source has two red and two black leads. Each lead is terminated with 24-4 ring clips. The ELMo 120 power cable assembly must terminate at the -48 V dc power source as shown in the following table:

ELMo 120 power cable connector	Power source	Terminal connection
Red (2)	-48 V dc supply	Negative (-)
Black (2)	-48 V dc return	Positive (+)

CAUTION
Serious equipment damage

Reversed polarities on the power feed can irreparably damage the ELMo 120 shelf components. Be certain power feeds are connected properly to the power source, with the **red** leads connected to the **-48 V dc supply** as shown in the table above. Note that this is the opposite of other (non-telecommunications) applications, in which red leads are usually connected to the "+" terminal.

Category 5 Ethernet cabling specifications

This section specifies the Elastic Networks Category 5 Ethernet cables recommended to connect the ELMo 120 shelf.

> ***Note:*** Non-Elastic Networks Category 5 Ethernet cables may be used, but they must conform to the Electronics Industry Association / Telecommunications Industry Association (EIA/TIA) 568-B Ethernet cabling standard.

Ethernet crossover cable requirements

The Elastic ELMo 120 Ethernet crossover cables are color-coded **solid orange**. Table B-2 lists the ELMo 120 Ethernet crossover cable lengths offered by Elastic Networks.

Table B-2
ELMo 120 Ethernet crossover cables

Cable PEC Code	Length
04-00001-04	4 ft (1.2 m)
04-00001-06	6 ft (1.8 m)
04-00001-08	8 ft (2.4 m)

Ethernet straight cable requirements

The Elastic ELMo 120 Ethernet straight cables are color-coded **solid yellow**. Table B-3 lists the ELMo 120 Ethernet straight cable lengths offered by Elastic Networks.

Table B-3
ELMo 120 Ethernet straight cables

Cable PEC Code	Length
04-00002-04	4 ft (1.2 m)
04-00002-06	6 ft (1.8 m)
04-00002-08	8 ft (2.4 m)

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Elastic Networks

ELMo 120 Multiplexer

Installation and Maintenance Guide

Publication Number: 08-01023-01
Revision: 2.01
Publication Date: November 1999
Printed in the United States of America