

# High-Speed Voice and Data Link™ Access Multiplexer

CONTENTS	PAGE
Part 1. GENERAL .....	2
Part 2. INSPECTION .....	2
Part 3. APPLICATION GUIDELINES .....	3
Part 4. INSTALLATION .....	4
Part 5. PROVISIONING .....	6
Part 6. ALARMS AND LEDS .....	11
Part 7. TROUBLESHOOTING .....	12
Part 8. TECHNICAL ASSISTANCE .....	13
Part 9. WARRANTY & CUSTOMER SERVICE .....	13
Part 10. SPECIFICATIONS .....	14

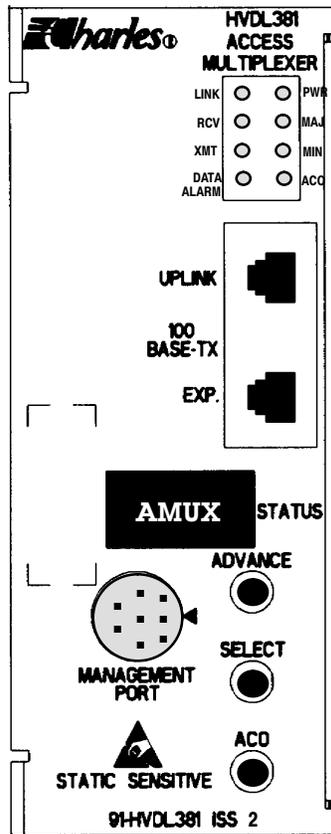


Figure 1. High-Speed Voice and Data Link (HVDL) Access Multiplexer (AMUX)

## 1. GENERAL

### 1.1 Document Purpose

This document provides a general description, application and installation information for the High-Speed Voice and Data Link (HVDL) Access Multiplexer (AMUX). This document covers model number 91-HVDL381.

### 1.2 Document Status

Issue 2 includes network management functionality that enables the user to monitor or change settings of the HVDL and Access Multiplexer remotely.

### 1.3 Equipment Purpose and Description

The HVDL Access Multiplexer collects 10BaseT Ethernet data from the HVDL central office terminal (COT) line units in its shelf and sends it to the 100BaseTx Ethernet connection at the uplink port. It also provides alarm functions for each COT line unit in the shelf. The access multiplexer eliminates the need for individual data connections from each COT, and eliminates the need for a separate alarm unit in the shelf. The unit is designed to be "plug and play" with a minimum of connections to the shelf.

Monitoring of the COT settings (such as data speed) may be done through the access multiplexer. The access multiplexer is in-system software-upgradable.

The functional management command set for the access multiplexer is documented in the *Access Multiplexer Software User's Guide*.

### 1.4 Equipment Mounting

Mounts in slots 15 and 16 of a 19-inch HVDL or DDL shelf or slots 18 and 19 of a 23-inch HVDL or DDL shelf.

### 1.5 Equipment Features

The HVDL Access Multiplexer provides the following features:

- Aggregates data from up to 17 HVDL COTs simultaneously.
- May be provisioned from the front panel.
- Eliminates the need for individual data connections from the network to each COT.
- Monitors all HVDL COTs in its shelf for alarm conditions.
- Alarm functions backward-compatible with 300-series shelves.
- Provides LEDs on the front panel to indicate MAJOR and MINOR alarms.
- Expansion port allows cascading of multiple HVDL Access Multiplexers.
- User-provisioned port-to-port blocking provides data security.
- Non-volatile storage of configuration settings (if the Access Multiplexer is restarted, its configuration settings are automatically restored).

### 1.6 Equipment Cables

100 BaseTX shelf-to-shelf cable.

## 2. INSPECTION

### 2.1 Inspect for Damages

Inspect the equipment thoroughly upon delivery. If the equipment has been damaged in transit, immediately report the extent of damage to the transportation company.

### 2.2 Equipment Identification

Charles Industries' equipment is identified by a model and issue number imprinted on the front panel or located elsewhere on the equipment. Each time a major engineering design change is made on the equipment, the issue number is advanced by 1 and imprinted on subsequent units manufactured. Therefore, be sure to include both the model number and its issue number when making inquiries about the equipment.

### 2.3 Static Concerns

Each module is shipped in static-protective packaging to prevent electrostatic charges from damaging static-sensitive devices. Use approved static-preventive measures, such as static-conductive wrist straps and a static-dissipative mat, when handling modules outside of their protective packaging. A module intended for future use should be tested as soon as possible and returned to its original protective packaging for storage.



**This equipment contains static-sensitive electronic devices. To prevent electrostatic charges from damaging static-sensitive units:**

- **Use approved static preventive measures (such as a static-conductive wrist strap and a static-dissipative mat) at all times whenever touching units outside of their original, shipped static-protective packaging.**
- **Do not ship or store units near strong electrostatic, electromagnetic, or magnetic fields.**
- **Use static-protective packaging for shipping or storage.**

## 3. APPLICATION GUIDELINES

A typical application of the HVDL Access Multiplexer consists of a 300-mechanics shelf filled with HVDL3.1 COT line units. The COT line units are connected to end-user premises equipment, providing voice and data service. The access multiplexer allows the data from all COTs in a shelf to be collected and accessed at a single card. The collected data is sent to a network switch or router through the uplink port.

Multiple access multiplexers can be daisy-chained by connecting them through their expansion ports. Figure 2 illustrates a typical application.

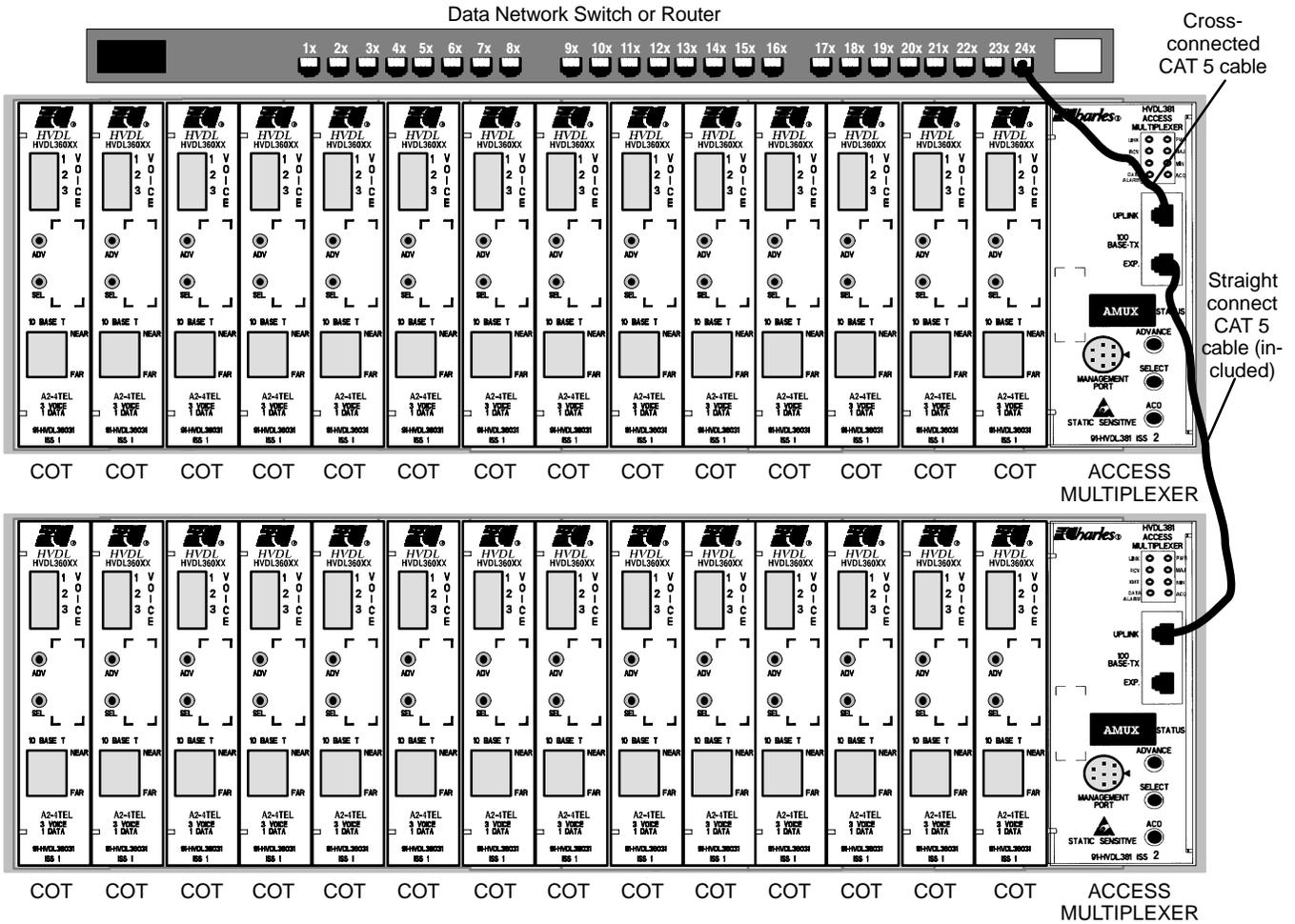


Figure 2. Typical Access Multiplexer Application

## 4. INSTALLATION

### 4.1 Mounting and Turn-Up

Mount the Access Multiplexer in slots 15 and 16 of a 19-inch HVDL or DDL shelf or slots 18 and 19 of a 23-inch HVDL or DDL shelf. Use the following steps to install the Access Multiplexer:

#### CAUTION

Installation and removal of units should be done with care. Do not force a unit into place. If excessive resistance is encountered during installation, remove the unit and check the card guide and connector to verify proper alignment and the absence of foreign material.

#### WARNING

A fan tray (92-FANHVDL for 19-inch shelves or 92-FANHVDL23 for 23-inch shelves) must be installed and powered prior to installing the Access Multiplexer.

Step	Action
1.	Disconnect any data connection on the front of the HVDL COTs.
2.	Align the unit with the appropriate card-guided slot in the shelf.
3.	<p>Slide the unit into the slot until it is seated in the backplane. Once the card is inserted in the correct slot, the power indicator on the front panel lights and the STATUS display shows the following messages, in order:</p> <p>INIT RAM ROM FPGA DMA IRQ CACH BUSI SW 1 SW 2 PASS HVDL ACCS MUX AMUX</p> <p>The green NEAR LED on the HVDL COT 10BaseT connectors should light on all COTs. AMUX is displayed during normal operation. During initialization, LEDs may blink on and off, but ignore these until AMUX remains lit.</p>

#### 4.2 Installer Connections

Step	Action
1.	<p>Connect a CAT5 <b>cross cable</b> from the front panel of the Access Multiplexer uplink connector to the network Ethernet switch/router.</p> <p>The green LINK LED on the Access Multiplexer should light.</p>
2.	<p>If multiple access multiplexers are to be daisy-chained, connect the front panel uplink port to the expansion (EXP) port of the next HVDL access multiplexer located in the HVDL shelf above (see Figure 2) using a straight-connected CAT5 cable with RJ45 connectors.</p>

#### **WARNING**

**Do not connect the access multiplexer in one shelf to COTs in another shelf.**

#### 4.3 ALARM and MISC Connections

These connections are made to the 20-pin wire-wrap field located at the rear of the DDL30X shelf, as shown in Figure 3. Alarm wiring can be made with 22 or 24 AWG wire. Figure 4 shows the ALARM and MISC connections to the DDL30X or HVDL31X.

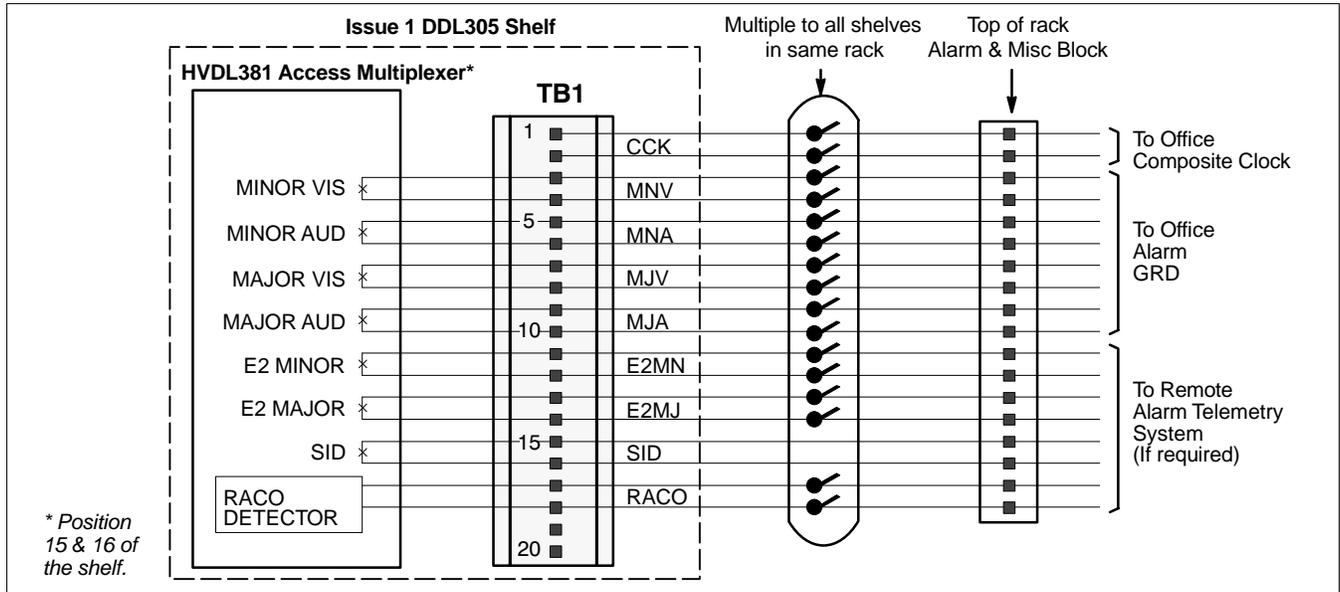


Figure 3. TB1 Pinouts on Issue 1 DDL305 Shelf

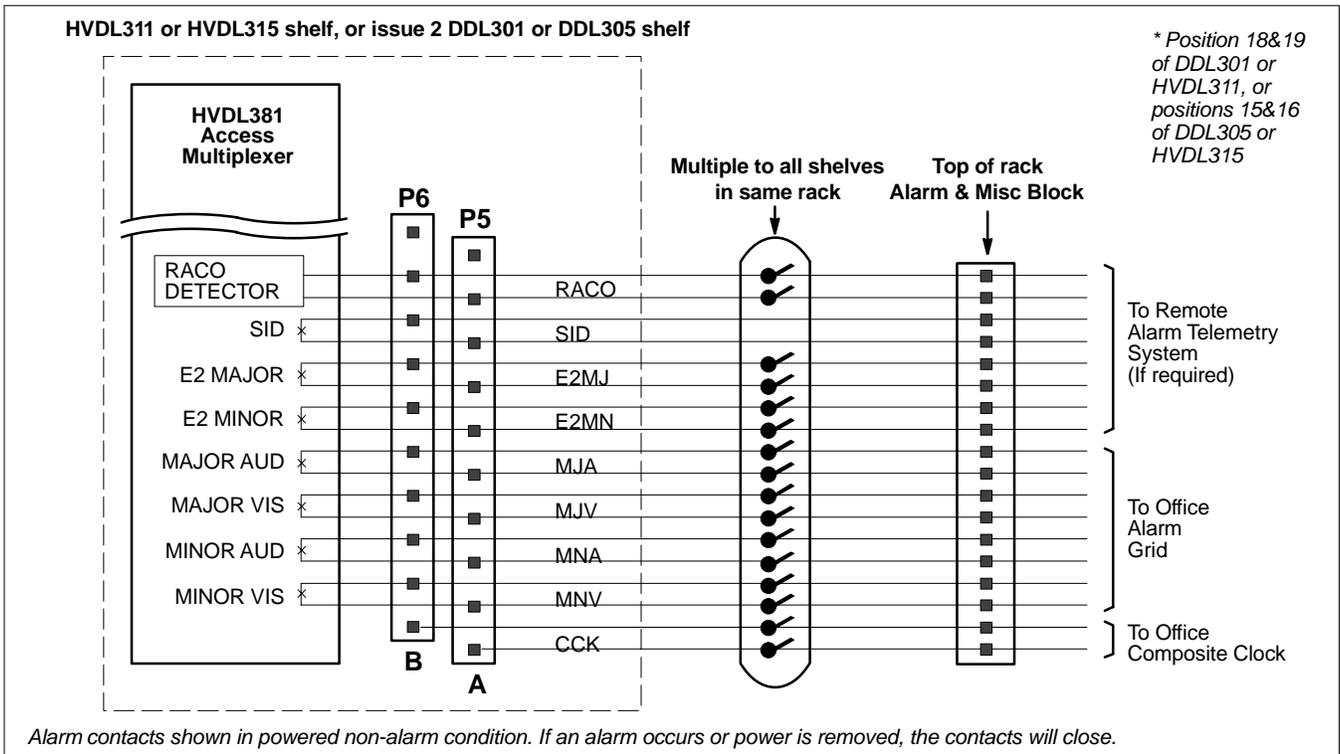


Figure 4. P5 and P6 Pinouts on Issue 2 DDL305 or DDL301 Shelves or the HVDL311 or HVDL315 Shelves

## 5. PROVISIONING

See Figure 5 for the provisioning procedure.

When the display reads...	Indicates...
AMUX	The Access Multiplexer has passed all self tests and is ready for normal operation.
AVER	Access Multiplexer version. Use this menu to look at the unit's circuit board number and software revisions.
MAC	Media Access Control (MAC) Address. Use to view the Access Multiplexer's MAC address. The MAC address is displayed as 12 characters.
SRL#	Serial Number. Use to look at the AMUX's unique 10-digit serial number.
PLCK	<p>Port Lock. Use to enable/disable port security.</p> <p><i>Note: This setting is stored in non-volatile memory. If the Access Multiplexer is restarted for any reason, this setting will be automatically restored.</i></p> <p>When PLCK is enabled (ON), AMUX Ethernet ports are locked. This prevents an HVDL user from gaining unauthorized access to another HVDL user's system. This is the factory default</p> <p>When PLCK is disabled (OFF), AMUX Ethernet ports are unlocked. Data can go directly from one HVDL system to another HVDL system in the same shelf or in another shelf in the same daisy chain.</p> <p style="text-align: center;"><b>CAUTION</b></p> <p><b>When PLCK is disabled (OFF), the AMUX allows any HVDL user to "see" any other HVDL user in the same shelf or in a different shelf. Security between AMUX ports must then be implemented by using firewalls, disabling file sharing at the user's computer(s), or other methods as required.</b></p>
NTWK	<p>Network Settings. Use to view the access multiplexer's IP address, subnet mask, and gateway address. Also used to reset the network settings to the factory default values. Once the network settings are changed the card must be reset in order for the changes to take effect. The card can be reset in one of two ways. One, by removing and reinserting the card in the shelf. Two, by using the Management Command Set for resetting the card. The factory default network settings are:</p> <p>IP Address = 192.168.0.2</p> <p>Subnet Mask = 255.255.255.0</p> <p>Gateway Address = 192.168.0.1</p>

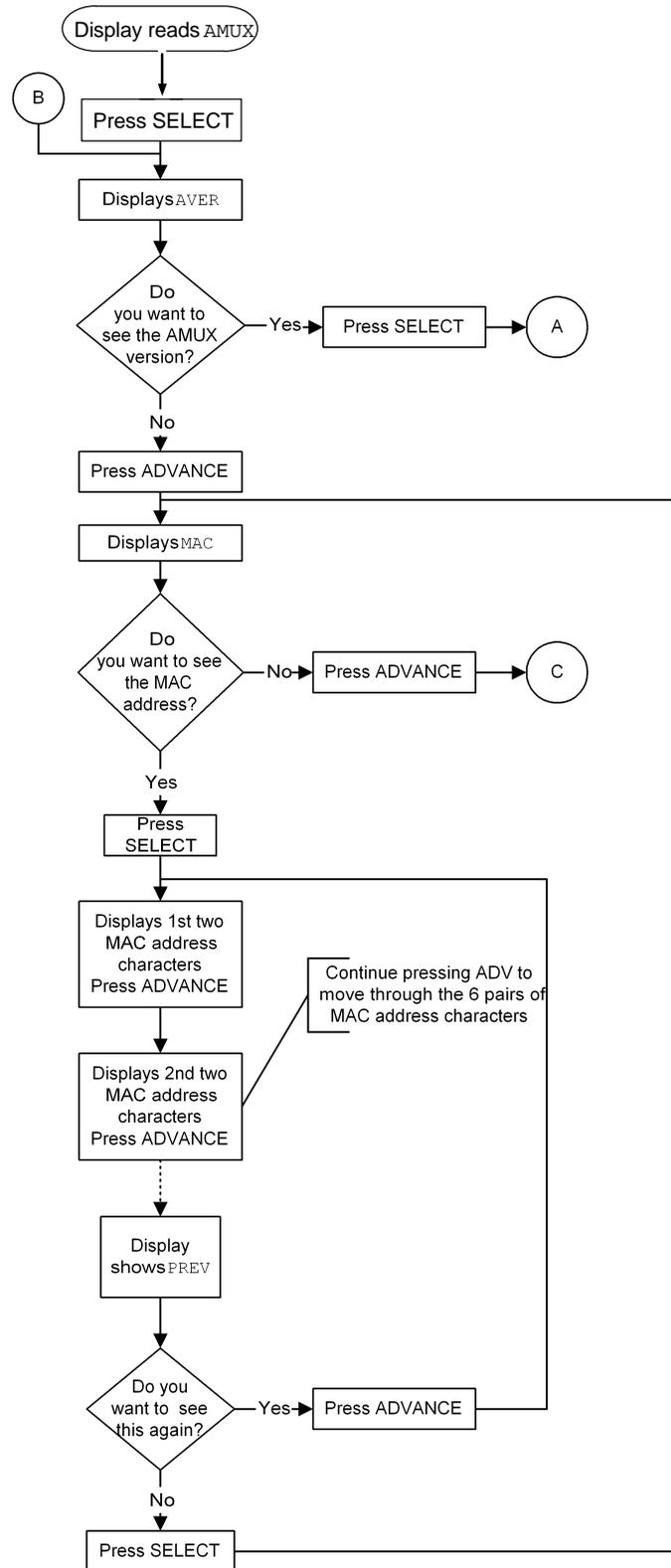


Figure 5. Optioning, page 1

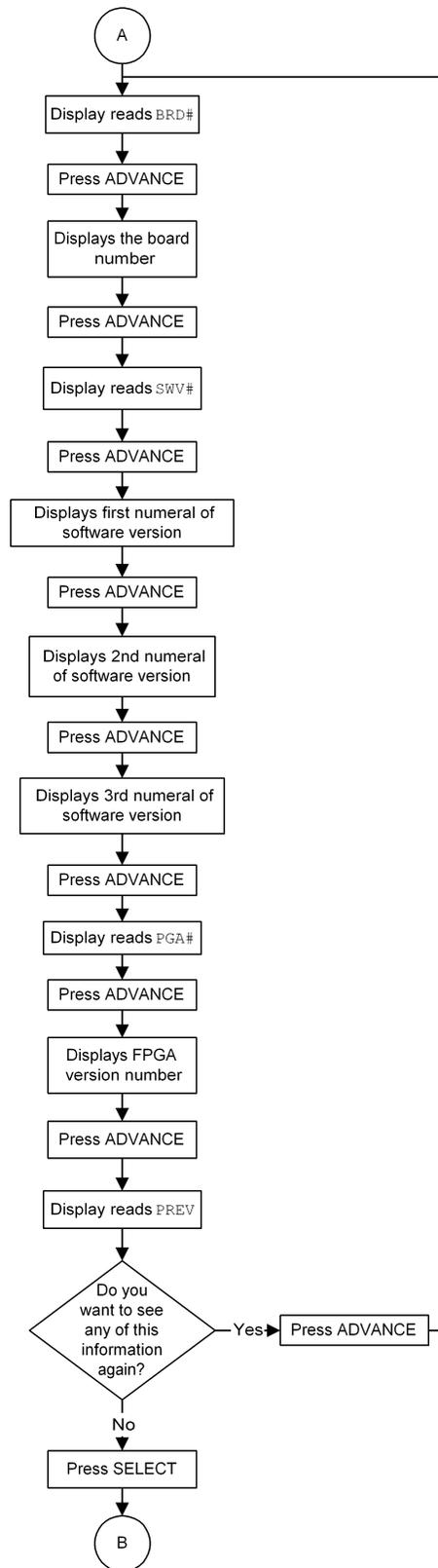


Figure 5. Optioning, page 2

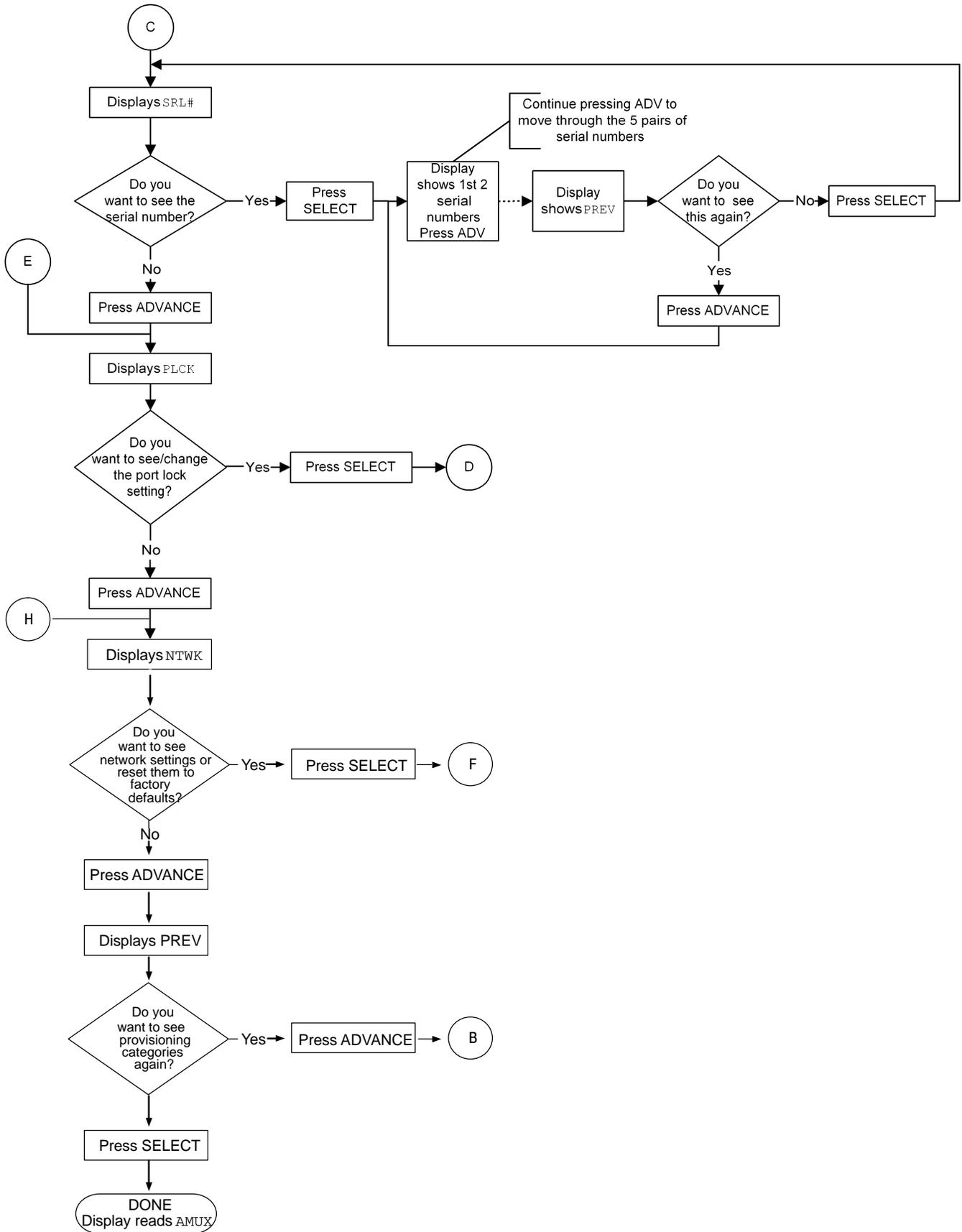


Figure 5. Optioning, page 3

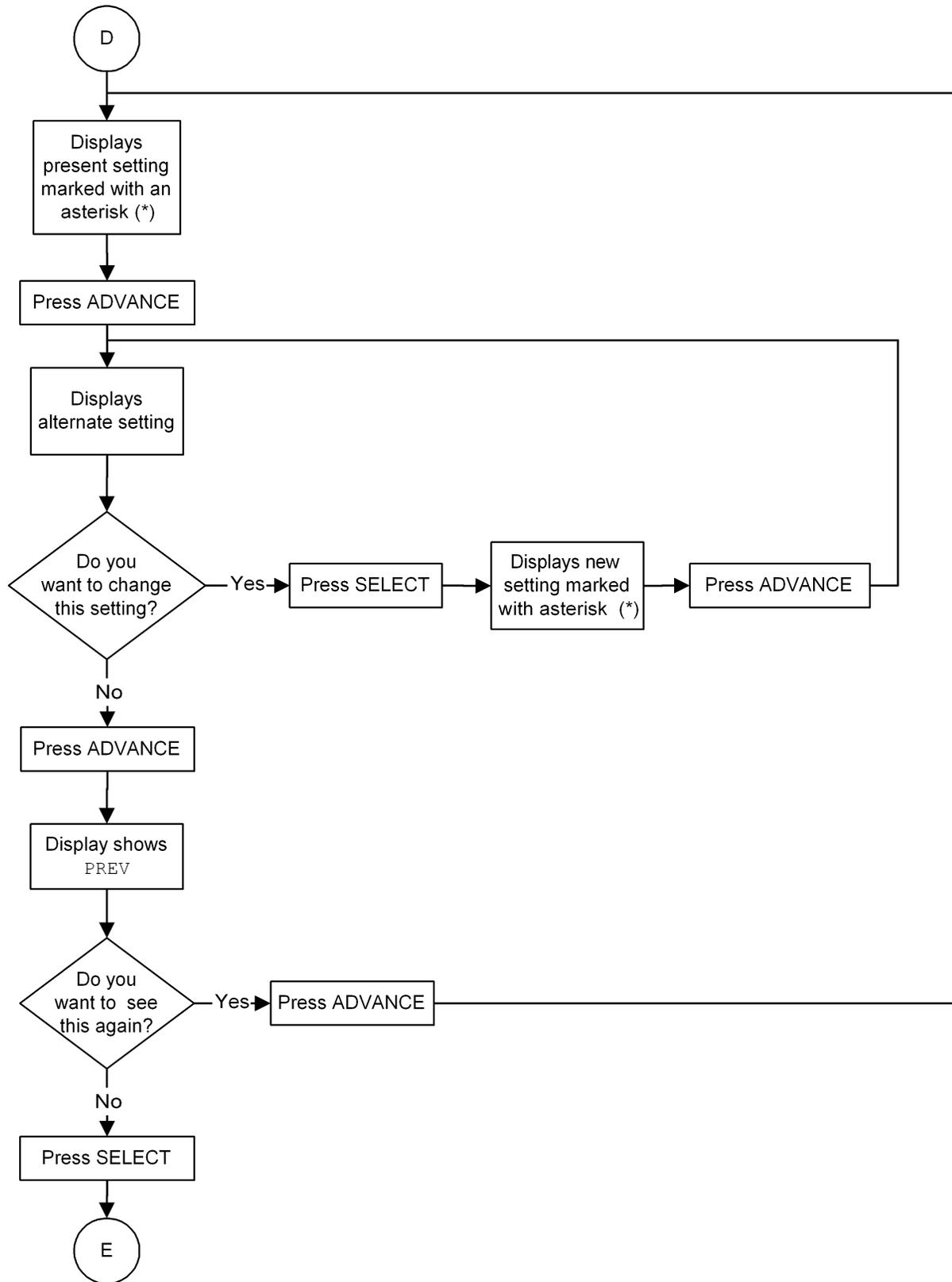


Figure 5. Optioning, page 4

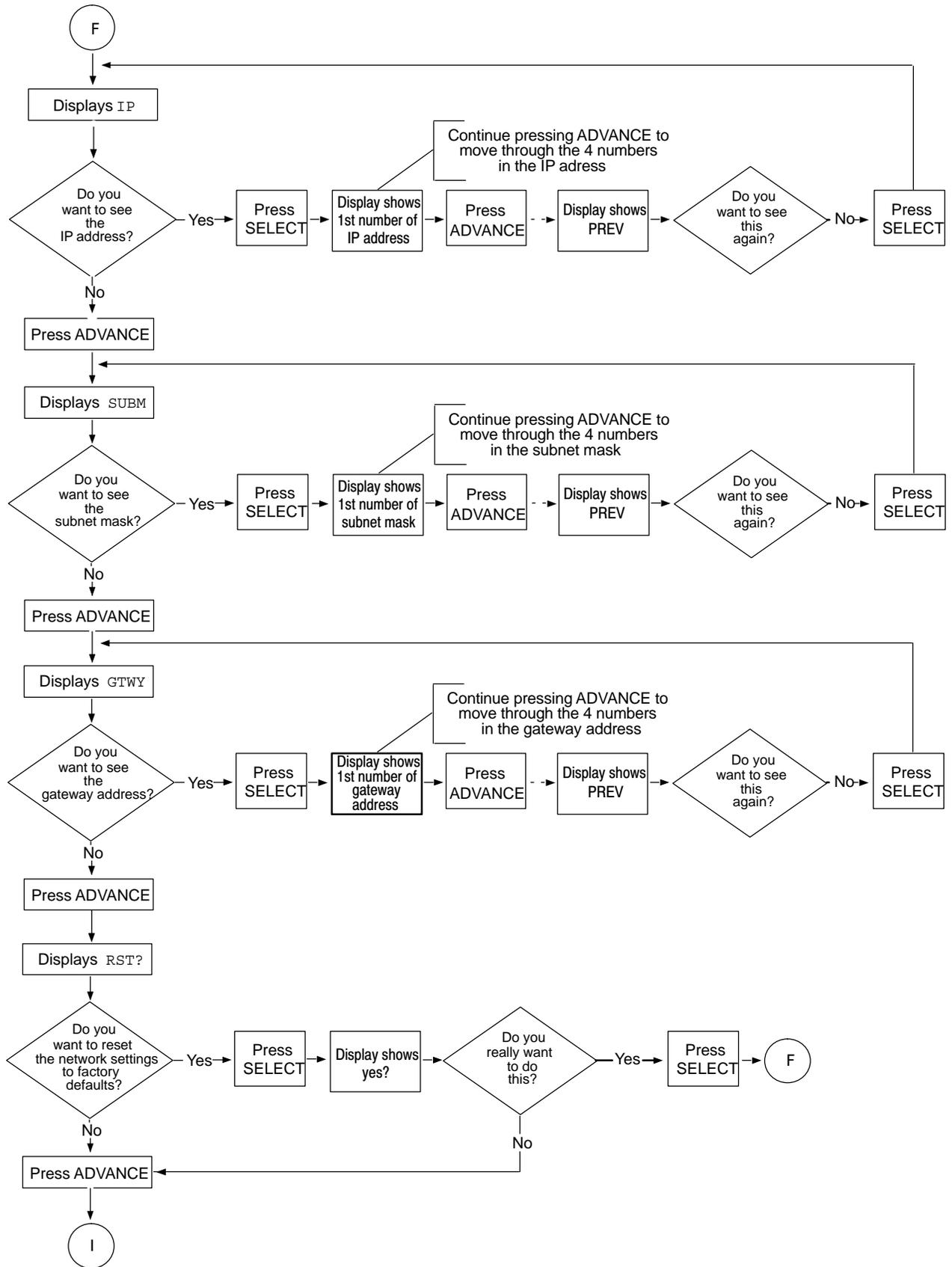


Figure 6. Optioning, page 5

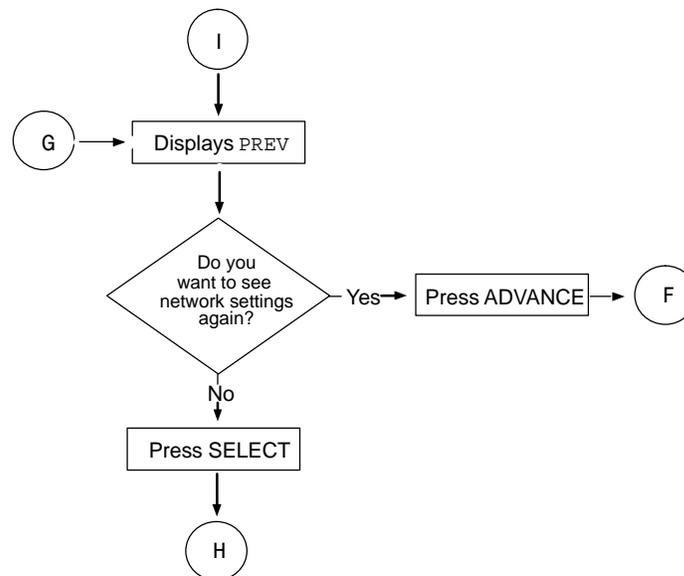


Figure 7. Optioning, page 6

## 6. ALARMS AND LEDS

### 6.1 Alarms

The access multiplexer performs the same functions as a DDL381 alarm card.

#### 6.1.1. Minor Alarms

When any one or more (but not all) of the COT LUs or the access multiplexer is in an alarm state, a MINOR alarm is reported. The front panel MN LED is lit, and the MNV, MNA, E2MN and SID contacts are closed.

#### 6.1.2. Major Alarms

When all of the COTs in a fully-populated shelf are in an alarm state, a MAJOR alarm is reported. The front panel MAJ LED is lit, and the MJV, MJA, E2MJ and SID contacts are closed.

#### 6.1.3. Audible Alarm Cut-off

During an alarm, the audible alarm can be turned off by pressing the ACO button. This only turns off the audible and remote notification of the alarm—the alarm itself is NOT cleared.

Pressing the ACO button opens the MNA, E2MN, MJA and E2MJ relay contacts for current alarms. MNV, MJV and SID relay contacts remain unchanged. Subsequent alarms will close the audible and remote relay contacts, restarting the audible and remote alarm notification.

Table 1. Alarm Summary

MINOR Alarms	System Response
1 to 13 COT alarms detected by the Access Multiplexer in a 19-inch shelf	The front panel MN LED is lit, and the MNV, MNA, E2MN and SID contacts are closed.
1 to 16 COT alarms are detected by the Access Multiplexer in a 23-inch shelf	
Access multiplexer failure	
100BaseTx uplink failure	
ACO pushbutton or remote ACO detected after MINOR alarm	ACO LED and MN LED are lit; MNV and SID contacts are closed.

MAJOR Alarms	System Response
14 COT alarms detected by the Access Multiplexer in a 19-inch shelf	The front panel MAJ LED is lit, and the MJV, MJA, E2MJ and SID contacts are closed.
17 COT alarms detected by the Access Multiplexer in a 23-inch shelf	
ACO pushbutton or remote ACO detected after MAJOR alarm	ACO LED and MJ LED are lit; MJV and SID contacts are closed.

## 6.2 LEDs

Table 2 describes the states of the AMUX LEDs.

**Table 2. LED States**

LED	Color	Indicates...
LINK	Green	<b>ON:</b> 100BaseTx Ethernet uplink connection established <b>OFF:</b> 100BaseTx Ethernet uplink connection not established or down
RCV	Green	<b>FLASHING:</b> Data traffic is being received from uplink connection <b>OFF:</b> Data traffic is not being received from uplink connection
XMT	Green	<b>FLASHING:</b> Data traffic is being transmitted to the uplink connection <b>OFF:</b> Data traffic is not being transmitted to the uplink connection
DATA ALARM	Red	<b>FLASHING:</b> Unit startup <b>ON:</b> Data aggregation function is not working <b>OFF:</b> Normal function (data aggregation operating)
PWR	Green	<b>ON:</b> AMUX receiving power <b>OFF:</b> AMUX not receiving power
MAJ	Red	<b>ON:</b> All COT units in a fully-populated shelf are in an alarm state <b>OFF:</b> Normal operation (no COT units in alarm, or not all COT units in alarm in a fully-populated shelf)
MN	Amber	<b>ON:</b> One or more units in the shelf are in an alarm state. <b>OFF:</b> Normal operation (no minor alarms)
ACO	Amber	<b>ON:</b> Audible alarm cut-off is active. <b>OFF:</b> Audible alarm cut-off is inactive.

## 7. TROUBLESHOOTING

Problem	Possible Causes	Solutions
PWR LED does not light when unit is installed	There is no power to the unit.	Check the power to the bay and shelf.
	The unit is not properly seated.	Ensure that the unit is properly and fully inserted into the correct slots.

Problem	Possible Causes	Solutions
AMUX does not appear on the status display	There is no power to the unit.	Check the power to the bay and shelf.
	Initialization is not complete.	Wait for 4 minutes. If AMUX does not appear in the status display, note what is displayed there and restart the unit by removing it from the shelf and reinserting it.
	Buttons on the front panel have been pushed and the status display is showing a function or result.	Wait for 5 seconds—the menu and functions time out and the display returns to AMUX.
	The unit is malfunctioning.	Replace the unit.
LINK LED does not light	There is no connection to 100BaseTX.	Verify the connection Check that the port on the Ethernet switch is configured for 100BaseTX full duplex or auto-negotiate operation, OR Verify that the cable between the uplink port and the expansion port in daisy-chained systems is OK.
	The external 100BaseTX communications equipment port is not operating correctly.	Verify that the hub, router or switch used for 100BaseTX communications is operating correctly.
	The unit is malfunctioning.	Replace the unit.
The RCV LED is not flashing	No data is being received from the 100BaseTX uplink.	See <i>Link LED does not light</i> .
	The unit is malfunctioning.	Replace the unit.
The XMT LED is not flashing or the COT's NEAR LED is not lit	No data is being transmitted from the COTs connected to the access multiplexer.	Check the connections from the COTs. Troubleshoot COTs according to their documentation.
	Uplink is not properly established.	See <i>Link LED does not light</i> .
	Data rate on the COT(s) is set to 0 kbps.	Set the data transfer rate above 0 kbps.
	The unit is malfunctioning.	Replace the unit.
The Data Alarm LED is lit	The unit did not initialize successfully.	See <i>AMUX does not appear on the status display</i> .
	The unit is malfunctioning.	Replace the unit.
No shelf-to-shelf communication	No communications cable in place.	Connect the shelves through the appropriate RJ-45 connectors.
	Bad cable between the shelves.	Verify that the cable connecting the shelves is good. Check the uplink LED on the expansion shelf. Check the ports by connecting to a switch, router or hub to verify that the port is good (establishes a 100BaseTX link).
	Incorrect cable being used.	Check the documentation for the correct cable to be used. Refer to the cable wiring information in this document.
	The unit is malfunctioning.	Replace the unit.

## 8. TECHNICAL ASSISTANCE

If technical assistance is required, contact Charles Industries' Technical Services Center at:

800-607-8500  
847-806-8500  
847-806-8556 (FAX)  
techserv@charlesindustries.com (e-mail)

## 9. WARRANTY & CUSTOMER SERVICE

### 9.1 Warranty

Charles Industries, Ltd. offers an industry-leading, 5-year warranty on products manufactured by Charles. Contact your local Sales Representative at the address or telephone numbers below for warranty details. The warranty provisions are subject to change without notice. The terms and conditions applicable to any specific sale of product shall be defined in the resulting sales contract.

Charles Industries, Ltd.  
5600 Apollo Drive  
Rolling Meadows, Illinois 60008-4049  
847-806-6300 (Main Office)  
847-806-6231 (FAX)

### 9.2 Field Repairs (In-Warranty Units)

Field repairs involving the replacement of components within a unit are not recommended and may void the warranty and compatibility with any applicable regulatory or agency requirements. If a unit needs repair, contact Charles Industries, Ltd. for replacement or repair instructions, or follow the *Repair Service Procedure* below.

### 9.3 Advanced Replacement Service (In-Warranty Units)

Charles Industries, Ltd. offers an "advanced replacement" service if a replacement unit is required as soon as possible. With this service, the unit will be shipped in the fastest manner consistent with the urgency of the situation. In most cases, there are no charges for in-warranty repairs, except for the transportation charges of the unit and for a testing and handling charge for units returned with no trouble found. Upon receipt of the advanced replacement unit, return the out-of-service unit in the carton in which the replacement was shipped, using the pre-addressed shipping label provided. Call your customer service representative at the telephone number above for more details.

### 9.4 Standard Repair and Replacement Service (Both In-Warranty and Out-Of-Warranty Units)

Charles Industries, Ltd. offers a standard repair or exchange service for units either in- or out-of-warranty. With this service, units may be shipped to Charles Industries, Ltd. for either repair and quality testing or exchanged for a replacement unit, as determined by Charles Industries, Ltd.. Follow the *Repair Service Procedure* below to return units and to secure a repair or replacement. A handling charge applies for equipment returned with no trouble found. To obtain more details of this service and a schedule of prices, contact the CI Service Center at 217-932-5288 (FAX 217-932-2943).

#### *Repair Service Procedure*

1. Prepare, complete, and enclose a purchase order in the box with the equipment to be returned.
2. Include the following information:
  - Company name and address
  - Contact name and phone number
  - Inventory of equipment being shipped
  - Particulars as to the nature of the failure
  - Return shipping address

3. Ship the equipment, purchase order, and above-listed information, transportation prepaid, to the service center address shown below.  
 CI Service Center  
 503 N.E. 15th St, P.O. Box 339  
 Casey, IL 62420-2054
4. Most repaired or replaced units will be returned within 30 or 45 days, depending on the product type and availability of repair parts. Repaired units are warranted for either 90 days from the date of repair or for the remaining unexpired portion of the original warranty, whichever is longer.

## 10. SPECIFICATIONS

### 10.1 Agency Compliance

FCC P.15 Class A

### 10.2 Electrical Characteristics

- (a) INPUT VOLTAGE: -42 to -56 VDC
- (b) INPUT CURRENT: 750 mA maximum
- (c) POWER DISSIPATION: 31 watts maximum

### 10.3 Front Panel Interfaces

Interface	Connector	Interface Standard
Uplink and expansion ports	RJ-45	IEEE 802.3 100BaseT

### 10.4 Physical Characteristics

The physical characteristics of the HVDL Access Multiplexer are in Table 3.

**Table 3. Physical Characteristics**

Feature	U.S.	Metric
Height	4.68 inches	11.88 centimeters
Width	1.87 inches	4.74 centimeters
Depth	8.99 inches	22.85 centimeters
Weight	1 pound, 8 ounces	680 grams
Temperature	0° to 140° F	0° to 60° C
Humidity	To 95% (no condensation)	

