tellabs®

257D 23-Inch Mounting Assembly

CLEI* code: ESMDAG0D

Contents

Revision Notice

This manual has been revised to add an important note to Section 3, *Shelf Cabling and Installation*, regarding the Velcro* connector hold-downs used for the telco connectors on Echo Canceller shelves.

Reference Documents

For additional information, see the following Tellabs documents, which can be obtained through your Tellabs representative.

1. Regulatory Information

FCC Warning Statement

Federal Communications Commission (FCC) Rules require that you be notified of the following:

- This equipment has been tested and found to comply with the limits for a Class A digital device pursuant to Part 15, Subpart B of the FCC Rules, which are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment, when properly installed and equipped only with Tellabs 255/257 T1 Echo Canceller Modules.
- This equipment generates, uses, and can radiate radio frequency energy, and if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications.
- Operation of this equipment in a residential area is likely to cause harmful interference, in which case users will be required to correct the interference at their own expense.
- Changes or modifications not expressly approved by Tellabs Operations, Inc. can void the user's authority to operate the equipment.

UL Recognition

The 81.0257D 23-Inch Mounting Assembly is Underwriters Laboratories (UL) recognized to the 1950 Telephone Equipment Standard (Third Edition), when equipped with Tellabs 255/257 T1 Echo Canceller Modules.

Canadian Recognition

The 81.0257D 23-Inch Mounting Assembly is recognized under Canadian Standards Association (CSA) C22.2 No. 950.95 by UL.

2. Description

This section includes:

- Shelf features
- Accessories
- System components
- Shelf comparison table

Shelf Features

Listed below are the primary features of the 257D Shelf:

- Accommodates 20 T1 Echo Canceller Modules
- Reversible mounting ears allow flush mounting for equipment cabinet installation or center mounting for relay racks
- Shorting contacts are provided for T1 facility continuity in unequipped module positions
- 50-pin female telco-style connectors for T1 Pulse Code Modulation (PCM) streams
- UL and CSA recognized
- FCC Part 15 (Class A) compliant when equipped with the 80.7248 Electromagnetic Interference (EMI) door assembly
- Front panel access to the Maintenance Serial Communications Port (SCP) via the 2555/A Alarm and Access Module

- 25-pin D-subminiature connectors for the RS-232D-compatible Control and Maintenance ports
- IN and OUT connectors for the Control and Maintenance SCPs eliminate the need for special daisy-chain cables; a total of up to 80 T1 Echo Canceller Modules can be placed onto the same link with straight-through cables
- Redundant –48VDC power inputs
- Individual Major and Minor alarm outputs for each Echo Canceller Module installed in the shelf via wire-wrapping pins
- Shelf Major and Minor alarm outputs via a single set of wire-wrapping pins

Accessories

Listed below are the 257D Shelf accessories:

- 25-pair ABAM cable (four required per 257D Shelf) 50.162XX
- 50-pin wire-wrap adapter for T1 ports (four required per 257D Shelf) 51.0102
- EMI door assembly (optional) 80.7248
- 23-inch heat baffle for installation between multiple 257D Shelves 80.7249

System Components

Listed in Table 2-1 are the Echo Canceller system components:

Model	Description	Application
255A	19-inch, 16-position shelf	T1 connections via wire-wrapping pins
255D	19-inch, 16-position shelf	T1 connections via four 50-pin female telco connectors
2555	Alarm and Access Module	Provides SCPs and shelf alarms
2555A	Alarm and Access Module	Provides SCPs, shelf alarms, and flash programming voltage
2557	T1 Test Access Module	Provides bantam jack access to Send and Receive T1 facilities
257D	23-inch, 20-position shelf	T1 connections via four 50-pin female telco connectors
2571	32ms Echo Canceller Module	For use in local, long distance, and private networks
2572	64ms Echo Canceller Module	

Table 2-1   Echo Canceller System Components

Shelf Comparison

Table 2-2 provides a comparison of features for the 255A, 255D, and 257D Shelves.

Feature	255A	255D	257D
Module slot positions	16	16	20
T1 connections with wire-wrapping pins	yes	no	no
T1 connections with 50-pin telco connectors	no	yes	yes
Accepts 2555A Alarm and Access Module (provides programming voltage for firmware updates)	yes	yes	yes
IN and OUT connectors for SCPs	yes	yes	yes
Individual Major and Minor alarm contacts for each Echo Canceller Module	yes	yes	yes
Shelf alarm contacts for Major and Minor alarms	yes	yes	yes
Redundant power inputs	yes	yes	yes
UL recognized	yes	yes	yes
FCC Part 15 (Class A) compliant (with optional EMI door assembly)	no	yes	yes
Accepts 80.2120 23-inch mounting ears	yes	yes	no

Table 2-2   Shelf Feature Comparison

3. Shelf Cabling and Installation

This section describes the 257D Shelf's:

* Relay rack configuration
* Power connections
* PCM (T1) connections
* Alarm connections
* SCP connections

Static Precautions and Inspection

This equipment is static sensitive and, therefore, is shipped in a protective anti-static bag. When you handle the equipment, be sure to wear a grounded wrist strap to protect it from possible static-discharge damage.

Inspect the equipment upon its arrival to detect any possible shipping damage. If damage is found, immediately file a claim with the carrier. If the equipment has been in storage, rein-spect it prior to installation.

Verify that the following items have been shipped with the 257D Shelf:

* Four 12-24 screws
* Two 10A GMT fuses
* 21 wire clamps and clamp screws

If any of the above items are missing, contact your Tellabs representative.

Relay Rack Configuration

Up to eight 257D Shelves can be installed in a standard 7-foot, 23-inch wide relay rack (see Figure 3-1). Contact your Tellabs representative for pre-wired relay rack configurations.

79.0653 Fuse Panel
257D
257D
80.7249 Heat Baffle
257D
257D
80.7249 Heat Baffle
257D
257D
80.7249 Heat Baffle
257D
257D

*Figure 3-1   Typical 7-Foot Rack Layout*

Power Connections

Note: See Figure 3-2 while performing the following input power connection instructions.

Input power connections to the 257D Product Rev B (and higher) shelf must be made with 14 to 18AWG wire. The shelf accepts two –48VDC feeds, both positive ground referenced. For complete redundancy, each feed must be capable of independently supplying sufficient current for the entire shelf. Power input terminals are located in the lower left and lower right corners of the shelf's backplane. To connect power to this shelf:

1. Ensure that the –48VDC supply is off, and route the A and B power feeds to the power input terminals labeled **A POWER** and **B POWER**.

2. Connect the positive battery connection of the **A POWER** feed to the **+BAT** connector of the right-hand terminal block. Connect the negative battery connection of the **A POWER** feed to the **–BAT** connector of the same terminal block.

3. Repeat step 2 for the **B POWER** feed at the left-hand terminal block.

4. Make connections to the frame ground connectors of the **A** and **B POWER** terminals in accordance with local procedures.

Note: Connect the equipment to a 48VDC supply source that is electrically isolated from the AC source. The 48VDC source is to be reliably connected to earth.
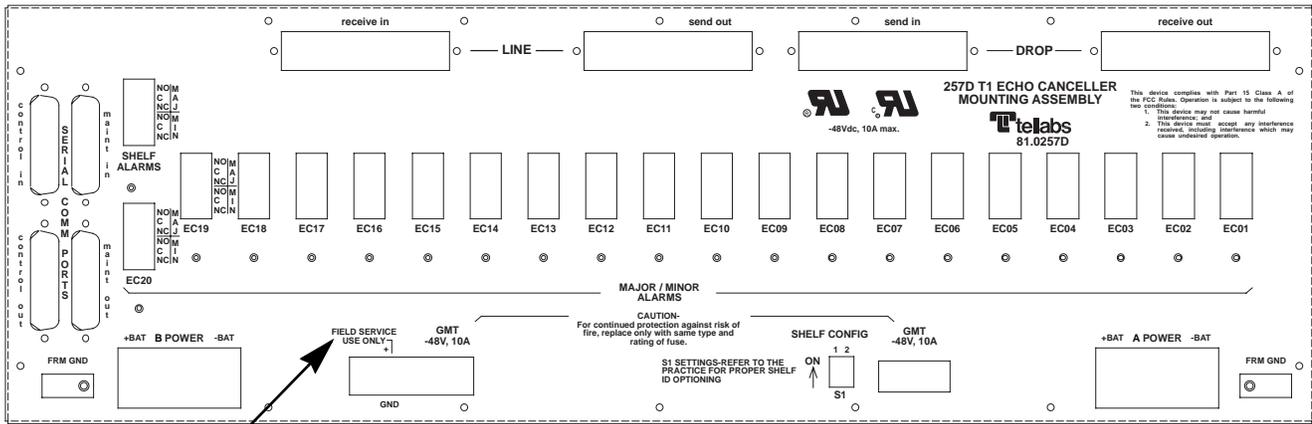
Note: Although the backplane silkscreen still references this terminal block, it is no longer provided on the 257D Shelf.

Figure 3-2   257D Product Rev B (and Higher) Backplane Cover

Fusing

Two GMT fuse holders are located on the 257D Shelf's backplane (one each for the **A** and **B POWER** feeds). Each fuse holder should be equipped with a 10A GMT fuse. If an external fuse panel is used, also equip each power feed with a 10A fuse for protection of intrabay power wiring.

Note: Two 10A GMT fuses are shipped with the 257D Shelf. The customer must insert the fuses prior to installation of the modules.

PCM (T1) Connections

PCM connections are made to the 257D Shelf via four 50-pin female telco connectors; one each for the Send-in, Send-out, Receive-in, and Receive-out signals. PCM connections between the 257D Shelf and Digital Cross-Connect (DSX) should be made with 22-24AWG shielded ABAM cable. Tellabs 50.162XX ABAM 25-pair cables are suitable for use with the 257D Shelf.

Line-side connections are made to the two 50-pin connectors labeled **receive in** and **send out** on the upper left side of the shelf (as viewed from the rear of the assembly). Cables for these two connectors should be dressed to the left side of the relay rack for ease of installation.

Drop-side connections are made to the two 50-pin connectors labeled **send in** and **receive out** on the upper right side of the shelf (also as viewed from the rear). Cables for these two connectors should be dressed to the right side of the relay rack for ease of installation.

IMPORTANT!   The Velcro connector hold-downs for the telco connectors must be securely fastened to ensure that the connectors do not vibrate loose and so that there is a reliable connection to the backplane mounted connector. To ensure that the connectors are securely fastened, the installer must first verify that the connectors are firmly seated across the entire width of the connector, then must pull the Velcro tight over the hood of the connector before fastening the Velcro back onto itself. The screw on the hood used to secure back-to-back connectors should NOT be screwed to the standoff adjacent to the backplane connector, as it will cause the cabled connector to seat incorrectly.

Tip and ring pin assignments for the **receive in**, **receive out**, **send in**, and **send out** connectors are listed in Table 3-1.

The 257D Shelf is not intended to be directly connected to telephone company facilities. In most cases, a channel service unit is required between the telephone company's facility and the 257D Shelf.

Position in Shelf	Tip	Ring	Position in Shelf	Tip	Ring
1	26	1	11	36	11
2	27	2	12	37	12
3	28	3	13	38	13
4	29	4	14	39	14
5	30	5	15	40	15
6	31	6	16	41	16
7	32	7	17	42	17
8	33	8	18	43	18
9	34	9	19	44	19
10	35	10	20	45	20
Note: Frame ground is present on pins 25 and 50 of each T1 connector. Shield connections can be made to pins 25 and 50, in accordance with local practice.					

Table 3-1   Pin Assignments for PCM Connectors

Major/Minor Alarm Connections

Major and Minor alarm connections can be made to the 257D Shelf in two ways; either by wire-wrapping to individual connectors provided for each Echo Canceller Module installed in the shelf, or by wire-wrapping to a single shelf alarm connector.

Individual Major/Minor Alarm Connections

Individual Major and Minor alarm connections for each Echo Canceller Module are provided at the connectors labeled **EC01** through **EC20**. As shown in Figure 3-3, each connector provides a Normally Open (NO), Normally Closed (NC), and Common (C) relay contact for both the Major and Minor alarms.
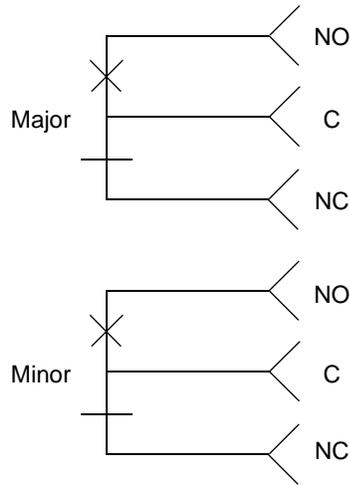
Figure 3-3   Major and Minor Alarm Contacts

Shelf Major and Minor Alarm Connections

Shelf Major and Minor alarms activate when any one of the individual Major and Minor alarms are active. Shelf Major and Minor alarm connections are made at the wire-wrapping connector labeled **SHELF ALARMS**. This connector provides a set of NO, NC, and C relay contacts for both the shelf Major and Minor alarms.

FCC Part 15, Subpart B, Class A Compliant Major and Minor Alarm Termination Method

Shielded wire connections for Major and Minor alarm connections must be used for FCC Part 15 compliance.

Figure 3-4 is an example of a wire-wrap connection. Strip the outer insulation back to expose the braided and individual insulated wires. The exposed shield braid goes under the wire clamp, as shown in the figure.
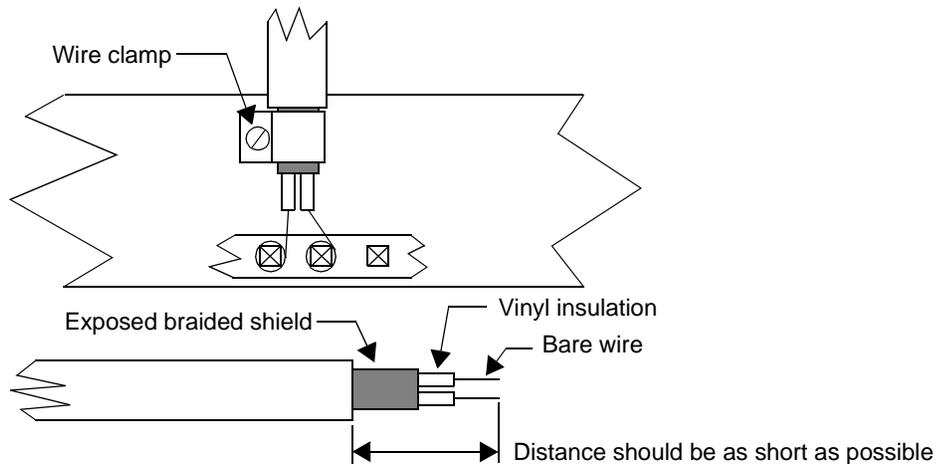

Figure 3-4   FCC Part 15, Subpart B, Class A Compliant Major and Minor Alarm Termination Method

Note: Wire clamps and clamp screws are provided in the cloth drawstring bag that is attached to the 257D Shelf.

SCP Connections

Control and Maintenance SCP connections are made at four 25-pin D-subminiature female connectors located on the far left-hand side of the 257D Shelf (as viewed from the rear). An IN jack and an OUT jack are provided for each SCP. Control and Maintenance SCPs are configured as Data Communication Equipment (DCE).

American Standard Code for Information Interchange (ASCII) commands and echo canceller menus can be accessed from both SCPs. However, the Echo Canceller Modules give higher priority to messages received at the Control SCP.
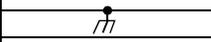
SCP Addressing

Prior to making connections to the SCPs, each 257D Shelf to be placed on the SCP link must be assigned a unique shelf ID. The shelf ID determines the SCP address of each Echo Canceller Module installed in the shelf. Table 3-2 lists DIP switch settings for shelf ID selection.

Shelf ID	S1-1	S1-2	255 SCP Addresses	257 SCP Addresses
1	off	off	1-10, 17-26	1-20
2	off	on	33-42, 49-58	21-40
3	on	off	65-74, 81-90	41-60
4	on	on	97-106, 113-122	61-80

Table 3-2   SCP Shelf IDs and Associated SCP Address Ranges

Cabling from a Video Terminal to a Single 257D Shelf

If a single 257D Shelf is to be cabled to an asynchronous video monitor (Data Terminal Equipment [DTE]), a straight-through cable must be used between the 257D Shelf's **maint in** or **control in** connector and the video terminal. A male 25-pin D-subminiature connector is required on the shelf end of the cable. See Table 3-3 for a description of a suitable straight-through cable.

DTE Side		Cable Wiring	Shelf Side (DCE)	
Signal	**Pin Number**		**Pin Number**	**Signal**
FRAME GND	1		1	FRAME GND
TXD	2		2	TXD
RXD	3		3	RXD
RTS	4		4	RTS
CTS	5		5	CTS
DSR	6		6	DSR
GND	7		7	GND
DCD	8		8	DCD
*DTR	20		20	*DTR
*This signal is only available on the Control port. It is a *no-connect* on the Maintenance port.				

Table 3-3   Video Terminal Cable Diagram

Cabling from a Modem to a Single 257D Shelf

If a single 257D Shelf is to be cabled to a modem (DCE), a null modem cable must be used between the 257D Shelf's **maint in** and/or **control in** connector and the modem. A male 25-pin D-subminiature connector is required on the shelf end of the cable. See Table 3-4 for a description of a suitable null modem cable.

DCE Side		Cable Wiring	Shelf Side (DCE)	
Signal	Pin Number		Pin Number	Signal
FRAME GND	1		1	FRAME GND
TXD	2		3	RXD
RXD	3		2	TXD
RTS	4		4	RTS
CTS	5		5	CTS
DSR	6		6	DSR
GND	7		7	GND
DCD	8		8	DCD
DTR	20		20	DTR

Table 3-4   Null Modem Cable Diagram

Cabling to Multiple 257D Shelves

Connection to the first 257D Shelf on the daisy chain should be made in the same manner as connecting a single 257D Shelf to DTE or DCE. The next 257D Shelf is cabled to the first by connecting a second straight-through cable from the **maint out** or **control out** connector of the first shelf to the **maint in** or **control in** connector of the second shelf. Subsequent shelves are cabled together in the same manner by connecting the **control out** or **maint out** connector of the previous shelf to the **maint in** or **control in** connector of the next shelf. Since four shelf ID assignments are available, up to four shelves can be linked together on the same daisy chain. Note that 257D-to-257D interconnecting cables require a 25-pin male D-subminiature connector on both ends of the cable. See Table 3-5 for a description of the interconnecting cable.

From Shelf's Daisy Chain (DCE)		Cable Wiring	To Shelf's Daisy Chain (DCE)	
Signal	Pin Number		Pin Number	Signal
FRAME GND	1		1	FRAME GND
TXD	2		2	TXD
RXD	3		3	RXD
GND	7		7	GND
*DTR	20		20	*DTR
*This signal is only available on the Control port. It is a *no-connect* on the Maintenance port.				

Table 3-5   Diagram For All Other Cables in Daisy Chain

The Maintenance SCP can also be accessed via an RJ-11 jack located on the front panel of the 2555/A Alarm and Access Module. Pin assignments for this jack are shown in Figure 3-5.
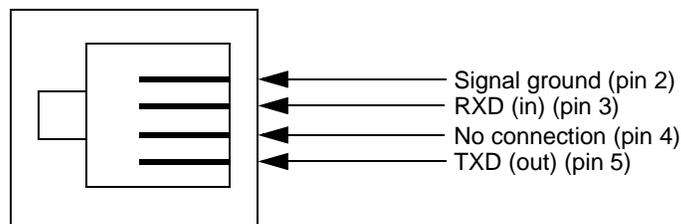

Signal ground (pin 2)
RXD (in) (pin 3)
No connection (pin 4)
TXD (out) (pin 5)

Figure 3-5   Pin Assignments for the 2555/A Module's Maintenance SCP RJ-11 Jack

4.   Module Installation

This section describes how to install an Echo Canceller Module into the 257D Shelf.

Static Precautions and Inspection

This equipment is static sensitive and, therefore, is shipped in a protective anti-static bag. When you remove a module from its protective bag, be sure to wear a grounded wrist strap to protect it from possible static-discharge damage.

Inspect the equipment upon its arrival to detect any possible shipping damage. If damage is found, immediately file a claim with the carrier. If the equipment has been in storage, rein-spect it prior to installation.

Installation Procedure

Echo Canceller Modules can be installed in slots 1 through 20 of the 257D Shelf (see Figure 4-1).

(Front View)

Echo Canceller Modules can be placed in slots 1 through 20

Slot 21 accepts only the 2555/A Alarm and Access Module
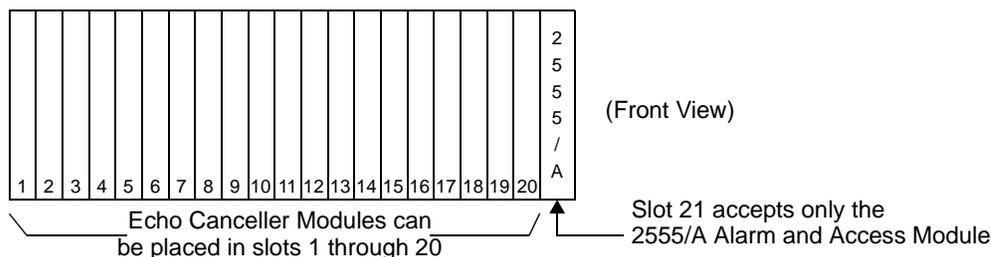
Figure 4-1   Module Placement in the 257D Shelf

To install a module into the 257D Shelf:

1. Apply power to the shelf.
2. Insert the module into the shelf and ensure that it is firmly seated in the edge connector.
3. Observe the front panel for the following:
    - The **power** LED illuminates.
    - A flashing bar is present in the **Mode** and **Option** displays (for about 40 seconds).
    - Verify that the **fault** LED is off.
4. If no Digital Signal Level 1 (DS1) is applied to the module, both the Send- and Receive-in local alarms will flash for 2.5 seconds and then glow steadily. If DS1 *is* applied to the module, only the **power** LED will be on.
5. If the module's **fault** LED illuminates, consider the module to be defective. Record the front panel display error code and return the module to Tellabs. See the appropriate Echo Canceller Module technical manual for further details.

5. 2555/A Alarm and Access Module Installation

This section describes:

- 2555/A Module features
- Installation procedures for installing the 2555/A Module into the 257D Shelf

Static Precautions and Inspection

This equipment is static sensitive and, therefore, is shipped in a protective anti-static bag. When you remove the module from its protective bag, be sure to wear a grounded wrist strap to protect it from possible static-discharge damage.

Inspect the equipment upon its arrival to detect possible shipping damage. If damage is found, immediately file a claim with the carrier. If the equipment has been in storage, rein-spect it prior to installation.

2555 Module Description

The 2555 Alarm and Access Module provides:

- An RS-232D-compatible interface between the 257D Shelf and Echo Canceller Modules
- Shelf Major and Minor alarm contacts and indications
- Access to the Maintenance SCP through a front panel mounted RJ11 jack
- A and B power indications

2555A Module Description

The 2555A Module is identical to the 2555 Module, but also provides +12V to the Echo Canceller Modules during firmware download. One 2555A Module per site is recommended for use during firmware downloads.

> **Note:** **The 2555/A Module can be removed from the shelf while the Echo Canceller Modules are in service without affecting traffic.**

Installation Procedure

Slot 21, the far right-hand slot (as viewed from the front of the shelf), is reserved for the 2555/A Module (see Figure 4-1). To install the 2555/A Module into the 257D Shelf:

1. Insert the module into the far right-hand slot and ensure that it is firmly seated in the edge connector.
2. Verify that the green **A POWER** and **B POWER** LEDs illuminate (assuming battery connections have been made to both the **A** and **B POWER** feeds).
3. Verify that the red **fault** LED is off.
4. If no Echo Canceller Modules have been installed, verify that the **major** and **minor** LEDs on the 2555/A Module are both off. If Echo Canceller Modules *have* been installed and all PCM alarms are off, verify that both the **major** and **minor** LEDs on the 2555/A Module are off.
5. If the module's **fault** LED illuminates, the module should be considered defective and returned to Tellabs, as directed in Section 8.

6. Specifications

Note: All product revs of 257D Shelves have the same specifications.

Physical

Dimensions	• Height: 7.5 inches (19.1cm) • Width: 23 inches (58.4cm) • Depth: 14.4 inches (36.6cm)
Weight	• 13 pounds, 7 ounces
Heat Dissipation	• Air convection

Electrical

Input Voltage	• –44 to –56VDC, positive ground referenced
Input Current	• 6.5A maximum, when fully loaded with twenty 64ms Echo Canceller Modules • 5A maximum, when fully loaded with twenty 32ms Echo Canceller Modules
Power Connections	• Via screw terminals that accept 14 to 18AWG wire
Major/Minor Alarms	• Via 0.045-inch square posts; connections can be made via wire-wrapping or Molex connector (part #09-50-3061) with crimp terminals (part #08-50-0106) or equivalent
SCP Connections	• Via female 25-pin D-subminiature connectors

Environmental

Operating Temperature	• +32° to +122°F (0° to +50°C) normal
Shipping and Storage Temperature	• –58° to +185°F (–50° to +85°C)
Relative Humidity	• 5 to 95 percent (no condensation)

Regulatory

Safety	• Recognized under UL 1950 • Recognized under CSA C22.2 No. 950.95 (by UL)
EMI	• Complies with FCC Part 15 (Class A) when equipped with an 80.7248 EMI door assembly

7. Acronyms

ASCII	American Standard Code for Information Interchange
C	Common
CSA	Canadian Standards Association
DCE	Data Communication Equipment
DS1	Digital Signal Level 1 — one entire 1.544Mbit/s T1 facility
DTE	Data Terminal Equipment
EMI	Electromagnetic Interference
FCC	Federal Communications Commission
NC	Normally Closed
NO	Normally Open
PCM	Pulse Code Modulation — the digital representation of the analog signal
SCP	Serial Communications Port
UL	Underwriters Laboratories

8. Testing, Technical Assistance, Repair and Return

The following procedure will aid in the localization of trouble to the specific equipment covered in this manual. If a situation arises that is not covered, contact Tellabs Technical Assistance — see page 15 for phone numbers.

If trouble is encountered with the 257D Shelf or a module installed in it, proceed as follows:

1. Inspect the shelf for physical damage or defects.
2. Ensure that all modules are properly seated in their positions.
3. Check for blown fuses (external fuse/alarm panel).
4. Verify proper voltages at the power input connections.
5. Ensure that battery and ground are properly connected to the shelf.
6. Ensure that the SCP cables (if used) are securely connected at all connection points.
7. Ensure that all other equipment connected to the suspect 257D Shelf via the SCP is operating properly.
8. If the problem still exists, perform the troubleshooting procedure in the appropriate Echo Canceller Module technical manual.

If none of the above suggestions locates the problem and the equipment seems to be defective, substitute a second 257D Shelf, if available. If the modules in the second shelf operate properly, consider the original shelf to be defective and return it to Tellabs for repair or replacement, as directed under **Repair and Return** on page 16. Please do not assume the unit is defective until it is determined that no problems exist either with the modules or with the shelf's external wiring.

We strongly recommend that no internal (component-level) testing or repairs be attempted on this equipment; unauthorized testing or repairs may void its warranty.

Technical Assistance

Contact Tellabs Technical Assistance as follows:

Location	Telephone	FAX
Argentina — Tellabs International, Inc., Sucursal Buenos Aires	+54.11.4345.9000	+54.11.4345.9601
Australia — Tellabs Pty Ltd., Milson's Point NSW, Sydney	+61.2.9966.1043	+61.2.9966.1038
Austria — Tellabs Austria, Vienna, Austria	+43.1.516.333.123 or .146	+43.1.516.333.037
Brazil — Tellabs International, Inc., Rio de Janeiro	+55.21.518.2224	+55.21.516.7063
Brazil — Tellabs International, Inc., Sao Paulo	+55.11.5505.3009	+55.11.5506.7175
Canada — Tellabs Comm. Canada Ltd., Mississauga, Ontario	905.858.2058	905.858.0418
China — Tellabs International, Inc., Beijing	+86.10.6510.1871	+86.10.6510.1872
China — Tellabs International, Inc., Shanghai	+86.21.6218.8660	+86.21.6218.8999
Colombia — Tellabs International, Santa Fe de Bogota	+571.623.3162 or .3216	+571.623.3047
Finland — Tellabs Oy, Espoo	+358.9.413.121-main #	+358.9.4131.2815
France — Tellabs SAS, Guyancourt	+33.1.345.20838	+33.1.309.60170
Germany — Tellabs GmbH, Munich	+49.89.54.90.05.+ext. or 0 (switchboard)	+49.89.54.90.05.44
Hong Kong — Tellabs H.K. Ltd.	+852.2821.9100	+852.2866.2965
Hungary — Tellabs GmbH Rep. Office, Budapest	+36.1.2681220	+36.1.2681222
India — Tellabs International, Inc., Bangalore	+91.80.2261807, .2266850, .2250456, or .2253373	+91.80.2262170
India — Tellabs International, Inc., New Delhi	+91.11.6859824, .6522417, or .6960702	+91.11.6526931
Ireland — Tellabs, Ltd., County Clare	+353.61.703000	+353.61.703333
Italy — Tellabs Italia SRL, Roma	+39.6.367.12335	+39.6.367.12502
Japan — Tellabs International, Inc., Tokyo	+81.03.5408.3721	+81.03.5401.0911
Lebanon — Tellabs Oy, Dbayeh	+961.4.525.929	+961.4.525.171
Malaysia — Tellabs Malaysia	+603.2169.6182	+603.2169.6168
Mexico — Tellabs de Mexico	+525.241.9800	+525.241.9801
Netherlands — Tellabs Netherlands b.v.	+31.30.6004070	+31.30.6004090
Philippines — Tellabs International, Inc., Sucat, Muntinlupa City	+63.917.530.86.56	+632.655.2610
Singapore — Tellabs Singapore Pte, Ltd.	+65.336.7611	+65.336.7622
Republic of South Africa — Tellabs Pty Ltd., Hennopsmeer	+27.12.672.8025	+27.12.672.8024
South Korea — Tellabs International, Inc., Seoul	+82.2.589.0667	+82.2.589.0669
Spain — Tellabs Southern Europe s.a., Madrid	+34.91.323.9920	+34.91.315.7770
Sweden — Tellabs AB, Stockholm	+46.8.440.4340	+46.8.440.4341
Thailand — Tellabs International, Inc., Bangkok	+662.642.7817	+662.642.7820
U.A.E. — Tellabs International, Dubai	+971.4.819608	+971.4.819606
U.K. — Tellabs U.K. Ltd., Bucks, England	+44.1494.555800	+44.1494.555801
USA and **Puerto Rico**	800.443.5555*	630.512.7097
*All other **Caribbean** and **South American** locations, or if the toll-free number is busy, telephone 630.378.8800		

4-6-00

Repair and Return

If equipment needs repair, contact Tellabs' Product Services Department with the equipment's model and issue numbers and warranty date code. You will be issued a Material Return Authorization (MRA) number and instructions on how and where to return the equipment.

Location	Telephone	FAX
Finland — Tellabs Oy, Espoo	+358.9.413.121-main #	+358.9.4131.2815
Canada — Tellabs Comm. Canada Ltd., Mississauga, Ontario	905.858.2058	905.858.0418
Ireland — Tellabs, Ltd., County Clare	+353.61.703000	+353.61.703333
Lisle, IL USA — Tellabs Operations, Inc.	800.443.5555 (USA and Puerto Rico only) 630.378.8800 (other International)	630.512.7097 (both)

4-6-00

Repair service includes an attempt to remove any permanent markings made by customers on Tellabs equipment. If equipment must be marked, it should be done with non-permanent materials and in a manner consistent with the correct handling of electrostatically sensitive devices.

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