258 E1 Echo Canceller System Release Notes

Contents

Revision Notice

This practice has been revised to add information about Feature Package 3.5, which includes the following new features:

- CLEARCALL Acoustic Coupling Elimination (ACE)
- CLEARCALL Long-Distance Processor (LDP)
- Timeslot 16 Signaling AND Function

1. Overview

1.1 This document provides a description of firmware releases and major feature options for the 258 E1 Echo Canceller system.

1.2 All features are available with the addition of 8X.25VX1/2/3/4 subassemblies (see Table 1-2 for a compatibility chart).

1.3 Table 1-1 provides a firmware revision history summary.

revision	release date	description
3.20	6.20.96	1. Initial release of 258 system — included CLEARCALL Automatic Level Control (ALC) feature
3.21	8.1.96	1. Changed ALC feature to disable during a FAX transmission for duration of call 2. Added a command to clear the error log 3. Fixed a minor menu problem
3.22	11.15.96	1. Enhanced the firmware installation program
3.23	1.30.97	1. Revised the firmware to permit second source part to be used in manufacturing
3.30	2.19.97	1. Added a modification to support two different hardware devices 2. Modifications added to support new European TBR-12 & 13 line interface requirements 3. Combined V.24 commands for signaling tone disabler and data tone disabler to match User Interface Document 4. Master canceller display/configuration fixed for 8X.25VX subassemblies 5. Added FLEXWARE™ engineering test commands 6. Added ability of failure LED to flash different nonresponsive fail codes — used in manufacturing
3.31	10.20.97	1. Separated V.24 commands for signaling tone disabler and data tone disabler — previously one command turned both on and off (reversed change #3 of revision 3.30 above back to original operation)
3.4	2.13.98	1. Enable/disable control per International Telecommunications Union — Telecommunications Sector (ITU-T) Q.931 D-channel messaging 2. Proprietary signaling control for one customer's network 3. V.24 command for High-Level Compensation (HLC) expanded to allow use of ALC with Ericsson switches 4. V.24 command revised for optional signaling tone disabler 5. ALC feature revised to lower threshold and gain adjustment range
3.5	5.26.98	1. CLEARCALL ACE designed for cellular telephone networks 2. CLEARCALL LDP for gateway/Public Switched Telephone Network (PSTN) applications 3. Timeslot 16 Signaling AND Function

Table 1-1 Firmware revision history

Compatibility

1.4 Table 1-2 lists the various subassembly issues/models and the features they provide.

ALC (1)		ACE (1,2,3)	ACE (1,2,3)		Q.931 (1,3)	Q.931 (1,3)	
one-way	two-way		ALC one-way	ALC two-way		ALC one-way	ALC two-way
81.25VX1 or 82.25VX1	81.25VX2 or 82.25VX2	82.25VX1	82.25VX2	82.25VX3	82.25VX2	82.25VX3	82.25VX4
Notes: 1. Only 83.256X and 81.258X echo cancellers are supported by the 8X.25VX subassemblies. 2. ACE also supports the LDP feature. 3. ACE and LDP are not compatible with the Q.931 feature.							

Table 1-2 8X.25VX compatibility chart

Reference Documentation

1.5 For a list of available Tellabs manuals, see the *258 E1 Echo Canceller System Overview and Regulatory Information* practice, #76.81258REG, which is a part of the *258 Documentation Set*, #80.4232. (The documentation set is shipped with each mounting assembly or can be obtained through your Tellabs representative.)

1.6 Other available documents that are not part of the documentation set are:

- 2561/A Echo Canceller practice 76.832561/A
- 2561C Echo Canceller practice 76.832561C
- 2561/A/C Echo Canceller User Interface Document 76.832561X
- E1 Echo Canceller Self-Study Training Manual A1.0258ECHOSS
- Echo Canceller Primer 74.0336
- 2500-Series Universal Firmware Download Program (UFDP) practice 76.812500UFDP

2. Feature Package 3.5

2.1 The CLEARCALL ACE and LDP features, plus the TS16 Signaling AND Function feature for the 81.258X and 83.2561X echo cancellers are included in Feature Package 3.5. The ACE and LDP features are implemented by adding an 82.25VX1 subassembly, and completing a system software upgrade using the 2500-Series Universal Firmware Download Program (UFDP). For information about UFDP, see its associated practice, #76.812500UFDP.

Note: The ACE and LDP features are not compatible with the ISDN (Q.931) feature.

CLEARCALL Acoustic Coupling Elimination

2.2 CLEARCALL ACE works with a variety of cellular technologies — e.g., Global System for Mobile Communications (GSM) and Time Division Multiple Access (TDMA). Figure 2-1 provides an illustration of echo canceller placement in a cellular network.

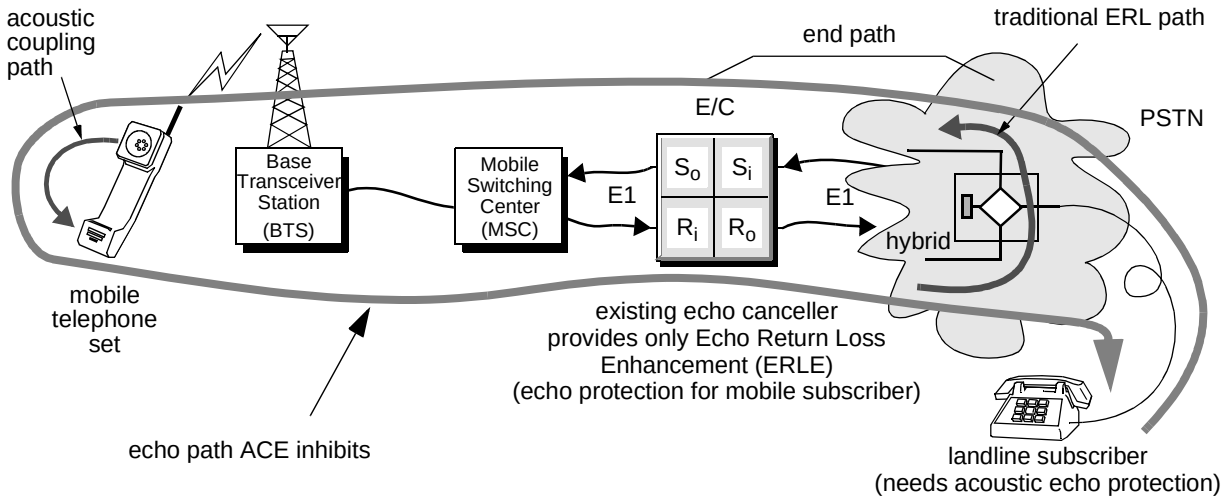

Figure 2-1 Traditional echo canceller placement in cellular network (protects only landline)

Product Description

2.3 ACE was developed for cellular telephone networks where a landline subscriber hears echo from a mobile set. Single-ended echo canceller placement in a cellular network traditionally has the landline in the end path. This protects the mobile set user from echo originating at the landline's hybrid. With this arrangement, however, the landline user is still exposed to echo from the mobile set — ACE eliminates that echo from the mobile set.

2.4 Acoustic coupling, combined with a low Acoustic Echo Path Loss (AEPL) at the cellular telephone, can create echo. ACE eliminates echo caused by a mobile set's acoustic coupling and improves perceived audio quality for the landline subscriber. Figure 2-2 provides an illustration of ACE and its relation to echo canceller orientation.

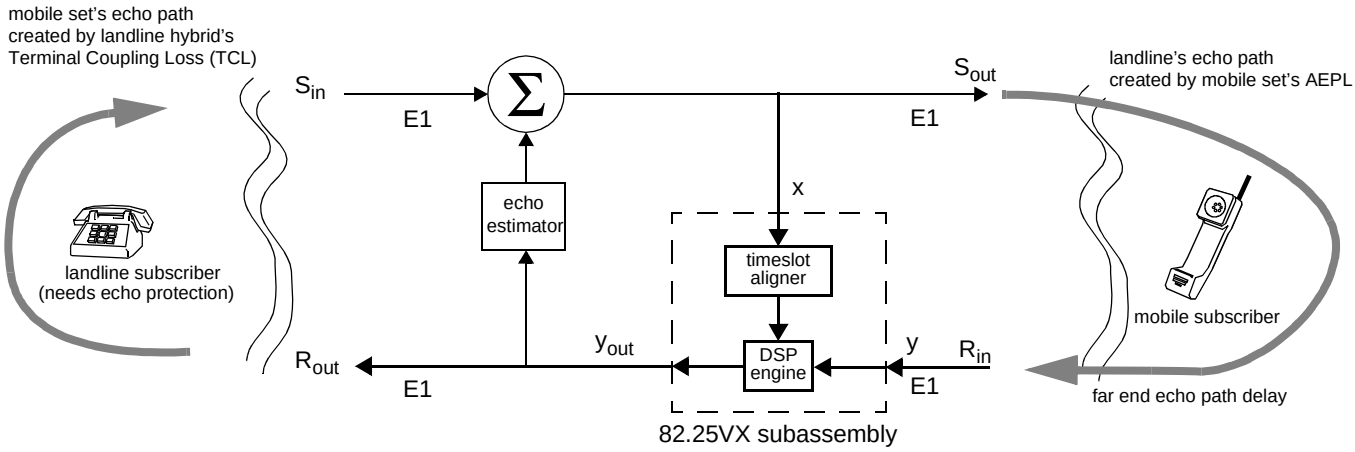

Figure 2-2 ACE and its relation to echo canceller orientation

Nonlinear Echo Processing

2.5 Although mobile telephones in a cellular telephone network offer some degree of echo control, which provides Echo Return Loss Enhancement (ERLE), this coupling suppression may not be sufficient to eliminate all echo. Mobile set echo can be nonlinear, which makes it relatively immune to standard echo cancellation techniques that use a linear process. The landline customer can still hear a delayed and decayed version of their own voice (echo). ACE, a digital signal processor in the receive path, resolves this problem.

Operating Environments

2.6 ACE operates in a digital or analog cellular network. Figure 2-3 illustrates ACE operating with a typical cellular telephone network and the public switched telephone network. Echo control occurs in the receive leg of the echo canceller. In the figure, the landline's echo path is shown as a dashed arrow past the receive out port to indicate echo control.

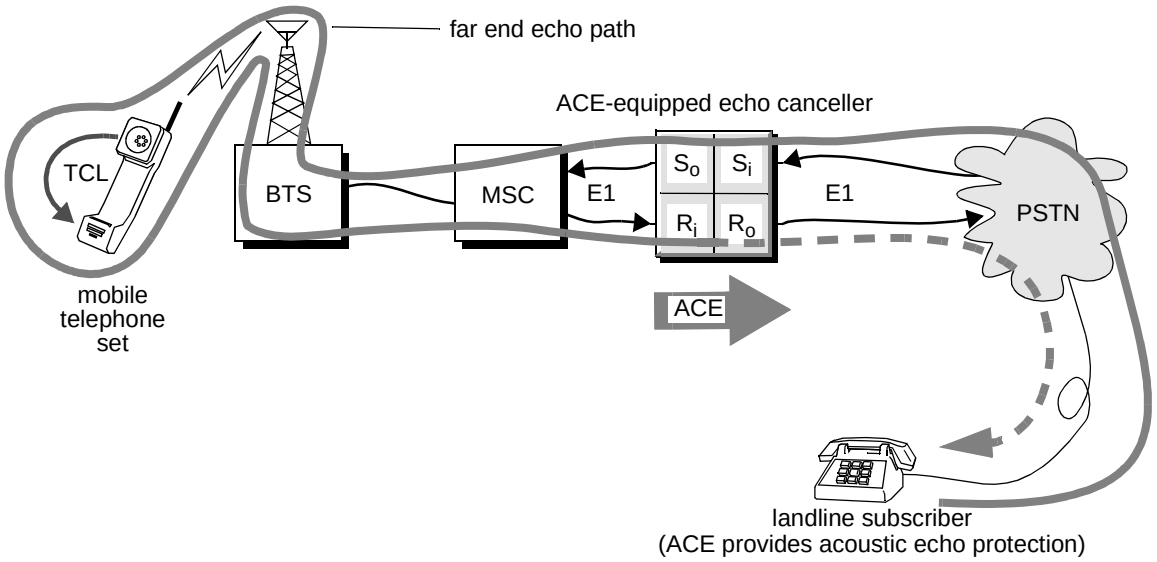

Figure 2-3 ACE eliminating echo in echo canceller's receive path

Mobile Set Delay

2.7 Due to voice processing in digital cellular networks, echo delay can be several hundred milliseconds. ACE processing handles the delay through any mobile set, including hands-free mobile sets.

Echo Level Reductions

2.8 ACE reduces echo signals at the receive side input port transmitted from the receive side output port to a maximum level of –59dBm when the mobile set attenuates the landline speaker's voice by at least 35dB, or to a maximum level of –55dBm when the mobile set attenuates the landline speaker's voice by at least 25dB.

Doubletalk Clarity

2.9 ACE doubletalk clarity allows the landline user to hear the mobile set speaker clearly at all times, with or without doubletalk.

Background Audio Transparency

2.10 ACE background audio transparency allows the landline user to hear background sounds (music, road noise, etc.) from the mobile set's environment to assure them that the call is still active and that they have not been disconnected. The sounds are heard clearly whether the landline or mobile set users are talking or quiet.

User-Selectable Configurations

2.11 ACE is enabled and disabled via the echo canceller's front panel pushbuttons, dot matrix displays (master canceller only), or from a remote terminal via menus or American Standard Code for Information Interchange (ASCII) commands.

2.12 All customer-selectable options are selectable only via remote terminal access (TEAM™, echo canceller menus, and ASCII commands). These options are not selectable via front panel controls. (For information about the TEAM program, see its associated practice, #76.81258TEAM.)

2.13 If the echo canceller is not equipped with an ACE subassembly, `Not Available` is displayed in the remote terminal ACE menus when they are accessed and no ACE options are displayed on the canceller's front panel.

2.14 Remote terminal menus and ASCII commands for selecting AEPL thresholds can be found in the *258 E1 Echo Canceller User Interface Document*.

Long-Distance Processor

2.15 The near end customer's perception of long-distance call quality is largely dependent on the quality of echo cancellation at the far end of the line. Generally, long-distance service providers have little control over the far end, since that part of the circuit is usually owned and administered by a different operator.

2.16 The LDP feature eliminates far end residual echo for circuits with delays of up to 600ms, allowing a gateway operator to inexpensively improve call quality on calls connecting to another service provider. LDP works on terrestrial, undersea cable, and satellite calls.

2.17 The LDP feature is implemented by using the ACE menus and selecting the appropriate far end echo path delay.

2.18 Figure 2-4 illustrates the location of an echo canceller equipped with LDP in a long-distance network.

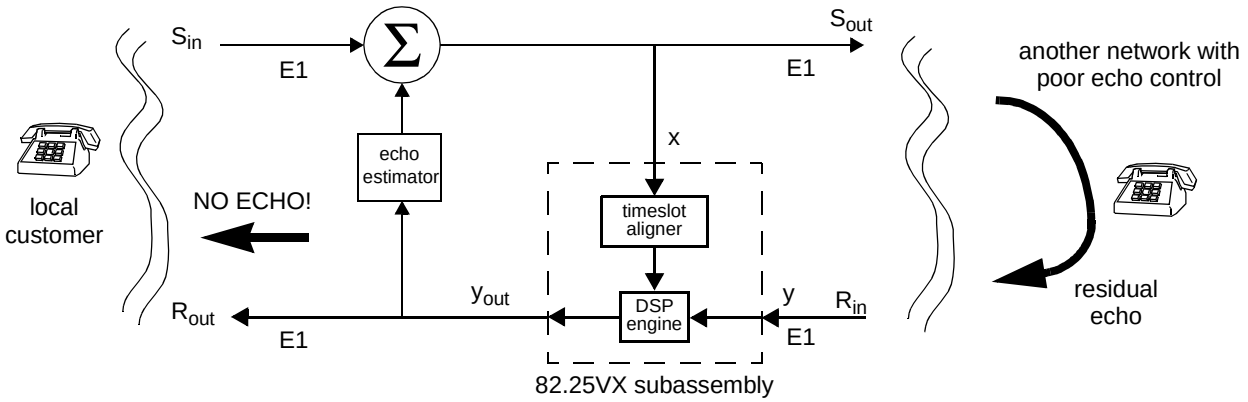

Figure 2-4 LDP and its relation to echo canceller orientation

Timeslot 16 Signaling AND Function Detection for Send/Receive Signaling

Note: This feature has been implemented for the revision B echo canceller only; it is not supported on the revision A echo canceller.

2.19 AND signaling determines the trunk idle state from Timeslot 16 Channel Associated Signaling (CAS) bits a, b, c, or d, as defined by the user. The user can only define idle states using one set of CAS bits. This CAS definition is then used to detect idle states on both the send and receive sides. The user does not have the ability to select a unique idle state CAS bit definition for each Pulse Code Modulation (PCM) direction.

2.20 AND signaling works on CAS bits only, and does not use in-band idle codes. Figure 2-5 illustrates AND signaling mode timing.

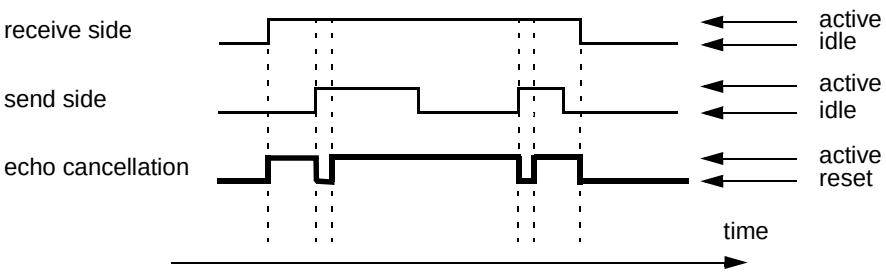

Figure 2-5 AND signaling mode timing

2.21 Echo cancellation is activated when either side of a call (send or receive side) goes active. When the other side goes active (now both sides are active), a channel reset to initialize the convolution processor is performed, which lasts at least three E1 frames. After this reset echo cancellation is active.

2.22 If either side, but not both sides, goes idle during a call, a channel reset is again performed, which lasts at least three E1 frames, after which activation of echo cancellation again resumes.

2.23 When both sides of a call go idle, echo cancellation is bypassed (held in reset).

3. Feature Package 3.4 — Integrated Services Digital Network (ISDN) (Q.931) Control

Product Description

3.1 The ISDN feature for E1 echo cancellers provides a software and subassembly upgrade to allow enabling and disabling of echo cancellation via ITU-T (Q.931) D-channel messaging. This feature is available on new orders or can be ordered as an upgrade to existing 83.256X, 81.258X, or 81.258XMC cancellers.

3.2 The Q.931 control specification applies to a Primary Rate Interface (PRI) (30B+D) network. The message structure permits the echo canceller to determine the busy/idle state of each DS0 in the 2.048Mbps stream.

Network Description

3.3 Figure 3-1 shows an example of an ISDN network. Echo Canceller 1 (EC1) protects either A-law voice caller (B) or (C) from hearing echo. Traditionally, ISDN (or other) voice calls are switched through the network where echo cancellation occurs. However, with dedicated lines that are cross-connected through a data overlay network, echo cancellation may not be available; therefore, an ISDN echo canceller is necessary to provide echo cancellation protection to A-law voice callers into the ISDN user.

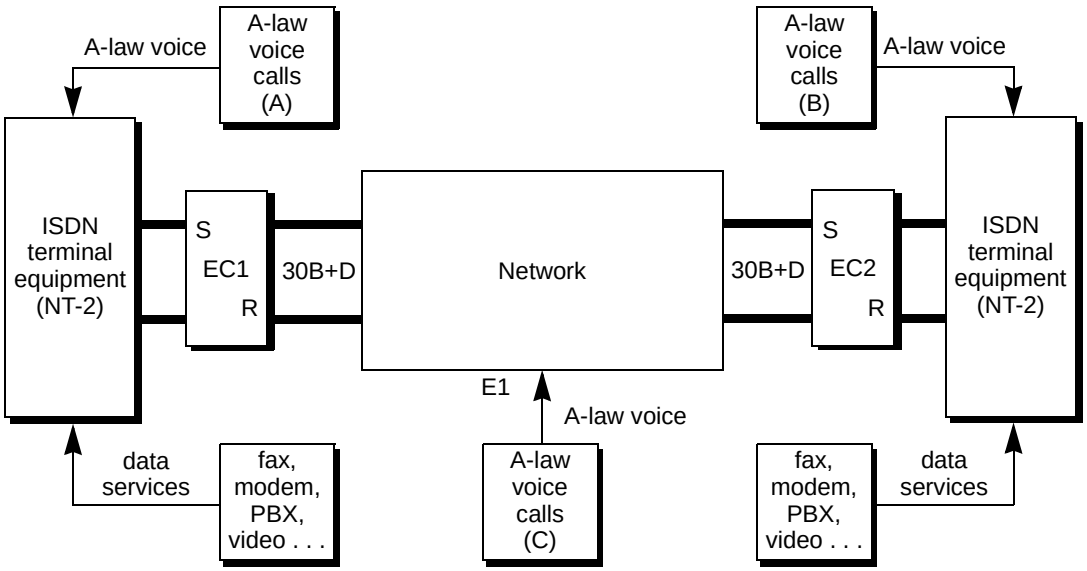

Figure 3-1 ISDN in the network

3.4 By keeping data services out of the main switch, a telecom provider better utilizes the switch matrix for switched services only. However, this configuration requires echo cancellers to be controlled via ISDN messaging.

Speech Call Set-Up/Tear-Down Recommendation

3.5 Figure 3-2 shows the messages sent for a voice call set-up. The echo canceller is in clear channel (bypass) until CONNECT or CONNECT ACK messages are received with the correct parameters. Echo cancellation is enabled upon receipt of a CONNECT or CONNECT ACK message when the call is voice or A-law, and only uses a 64kbps DS0. The echo canceller stays active until a DISCONNECT, RELEASE, or RELEASE COMPLETE message is received. (The default setting for echo cancellation is **off**.)

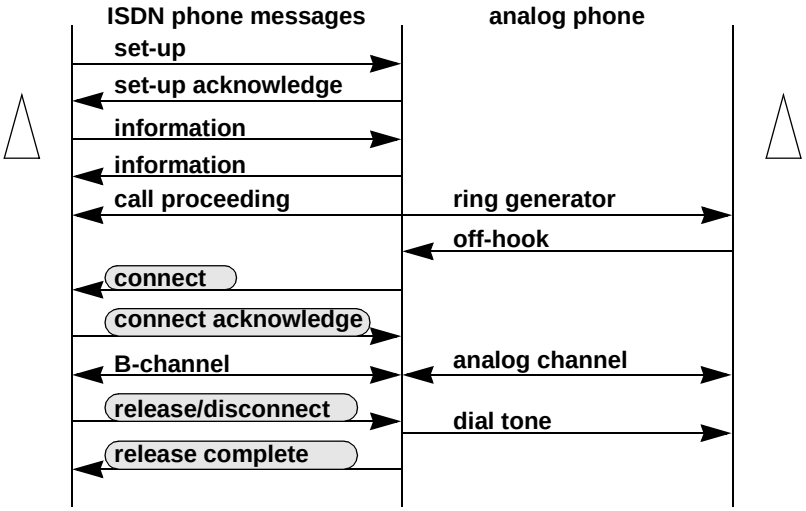

Figure 3-2 ISDN call set-up/tear-down messages

3.6 Most messages sent over the D-channel are not applicable for the echo canceller; however, messages that deal with 3.1kHz audio speech calls being set up and torn down are relevant.

ISDN (Q.931) Feature Overview

3.7 The ISDN capability is provided through the use of the 82.25VX2/3/4 subassemblies, which are plug-compatible to the 83.256X and 81.258X product platform. The feature monitors the D-channel messages on both the send and receive sides.

3.8 The ISDN enable/disable feature is available in all three user interfaces — menus, ASCII commands, and front panel.

3.9 Two new user-programmable options accessible with a 8X.25VX subassembly installed are:

- ISDN enable/disable (B-channel to timeslot mapping is as shown in Table 3-1)
- cancellation on 3.1kHz call (default setting is **enable**)

Note: See the *258 E1 Echo Canceller User Interface Document* for a description of these options.

B-channel	timeslot number	B-channel	timeslot number
1	1	16	17
2	2	17	18
:	:	:	:
15	15	29	30
D-channel	16	30	31

Table 3-1 B-channel to timeslot mapping

3.10 The option settings are stored in nonvolatile memory.

3.11 The all- and single-channel status menus are used to determine ISDN signaling status.

3.12 ISDN per-channel selection (enable/disable) capability is not supported.

3.13 Two new front panel options (ISDN, ISD3) have been added to the front panel mode under Busy/Idle Control (PCM on front panel). These options are only accessible with a 82.25VX2/3/4 subassembly installed.

3.14 The ASCII command (<sun>#2Z) has two ISDN-specific responses; C and D.

3.15 The system software allows the CLEARCALL ALC option to operate with ISDN if a 82.25VX3/4 subassembly is used.

3.16 ISDN status is the lowest priority in the active/bypass hierarchy, along with idle codes and Timeslot 16 detection. This allows the Common Channel Signaling (CCS) active serial port command and forced active command to override a detection by the 82.25VX signaling detector.

3.17 The detection firmware *syncs up* to the D-channel within 250msec (when the feature has been turned on).

Firmware Requirements

3.18 The maximum time to read D-channel information and configure the DS0 accordingly is 50msec.

3.19 Table 3-2 lists ISDN commands that the echo canceller responds to and the associated action (circuit-only messages).

category	Q.931 command	side	canceller response	comments
call set-up	alerting	either	nothing	• extract call reference • extract B-channel (if present) • extract echo canceller status (if present)
	call proceeding	either	nothing	• extract call reference • extract B-channel (if present) • extract echo canceller status (if present)
	connect	either	activate echo canceller	• extract call reference • extract B-channel (if present) • extract echo canceller status (if present) • map all three together in *calls connected* array • activate echo canceller on this channel (if called for)
	connect ACK	either	activate echo canceller	• same as *connect* (if already done, do nothing)
	progress	either	nothing	•
	set-up	either	collect call set-up information	• extract call reference • extract B-channel (if present) • extract echo canceller status • put any items extracted into *calls pending* array
	set-up ACK	either	nothing	• same as *set-up*
call information	resume	either	nothing	•
	resume ACK	either	nothing	•
	resume reject	either	nothing	•
	suspend	either	nothing	•
	suspend ACK	either	nothing	•
	suspend reject	either	nothing	•
	informational	either	nothing	•
call tear-down	disconnect	either	disable echo canceller	• extract call reference • de-activate echo canceller on this channel (if active) • remove pertinent items from *calls connected* array
	release	either	disable echo canceller	• same as *disconnect* (if already done, do nothing)
	release complete	either	disable echo canceller	• same as *disconnect* (if already done, do nothing)
other	segment/ congestion/ facility/ notify/ status/ status inquiry	either	nothing	•

Table 3-2 ISDN commands and echo canceller actions

4. Feature Package 3.2 — CLEARCALL Automatic Level Control (ALC)

Product Description

4.1 The CLEARCALL Automatic Level Control (ALC) feature enhances the audio quality of landline and wireless telephone calls by automatically compensating for unfavorable audio levels on a call-by-call basis. CLEARCALL ALC makes it easier for callers to communicate by improving the clarity and intelligibility of speech.

4.2 The ALC feature can be activated in the send and/or receive paths of the 256/258 echo canceller, where it can reduce or increase speech levels to correct for network level problems. The level control makes adjustments in incremental steps based on the measured average speech level.

4.3 The echo canceller monitors the beginning and ending of calls. At the end of each call, the levels are reset to no gain or loss. After a call is initiated, the echo canceller starts monitoring the average speech level. The average target levels are –15, –18, –21, and –24dBm. These levels are selectable.

4.4 If the speech is loud (between 3dBm above the target level and 0dBm), the echo canceller starts attenuating the output. This continues until the level is close to the target audio level. If the speech is low (between 3dBm below the target level and –35dBm), the echo canceller adds gain to the output. This also continues until the output level is close to the target audio level.

4.5 Data detectors inhibit level adjustments during data calls.

4.6 ALC offers the following features . . .

- per-channel selection
- support on all 31 DS0s of an E1 echo canceller
- idlecode transparency — ALC features are bypassed and reset upon the presence of idlecode
- transparency of signaling, framing, and network alarms
- field downloadable software

5. 8X.25VX1/2/3/4 Subassemblies

Equipment Inspection

Caution: **258 system equipment is static sensitive and is therefore shipped in a protective box. When handling the equipment, be sure to wear a grounded wrist strap to protect it from possible electrostatic-discharge damage.**

5.1 Inspect all equipment upon its arrival to determine possible shipping damage. If damage is found, immediately file a claim with the carrier. If the equipment has been in storage, reinspect it prior to installation.

Hardware Installation

5.2 If you have purchased a 256/258 E1 Echo Canceller with a pre-installed 8X.25VX subassembly, no additional hardware installation is required. An echo canceller with a pre-installed 8X.25VX subassembly has a sticker labeled *CLEARCALL equipped* affixed to the flat side of the handle of its front panel.

5.3 If you are adding CLEARCALL ALC to an existing 256/258 E1 Echo Canceller, you must install the 8X.25VX subassembly and affix the *CLEARCALL equipped* sticker to the flat side of the handle of the echo canceller's front panel.

5.4 Figure 5-1 illustrates the location of the sticker on the handle of the echo canceller's front panel.

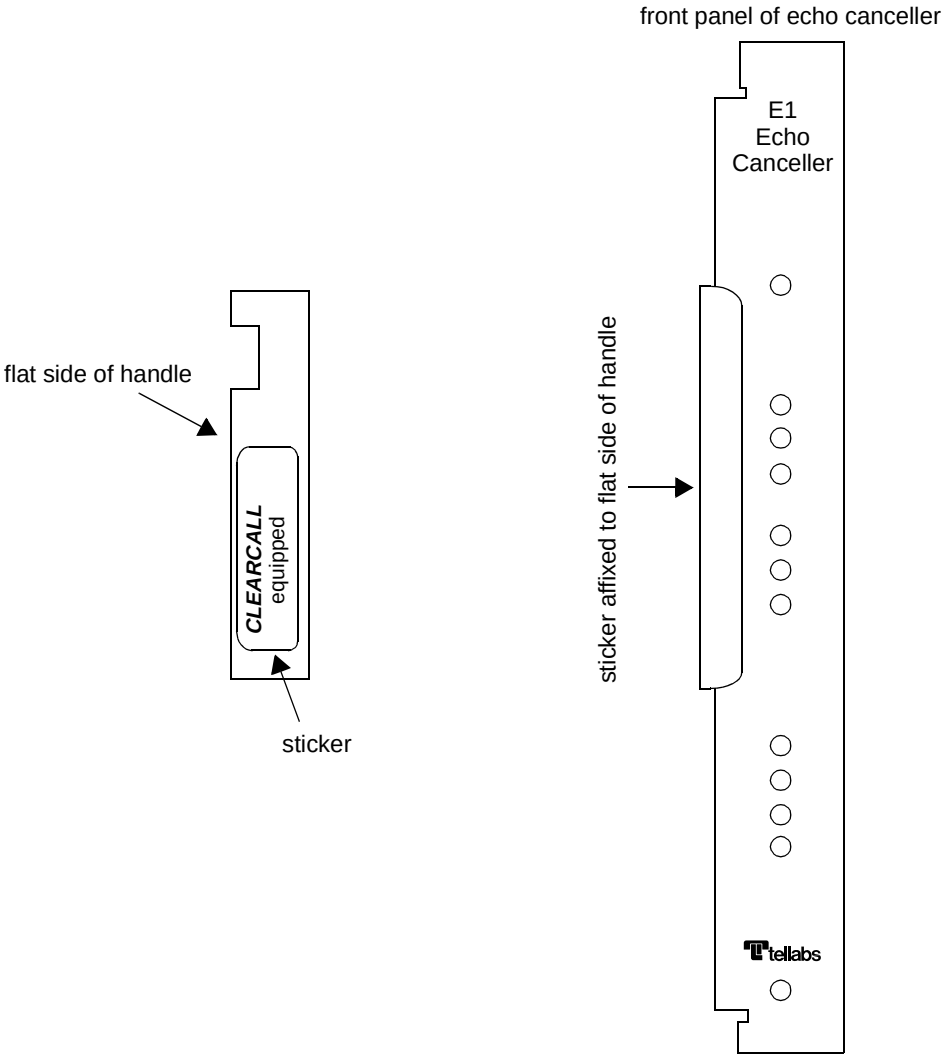

Figure 5-1 CLEARCALL sticker placement on front panel handle of echo canceller

Mounting

5.5 The 8X.25VX subassembly mounts on the 2561/A/C and 2581/2/MC echo cancellers, as shown in Figure 5-2.

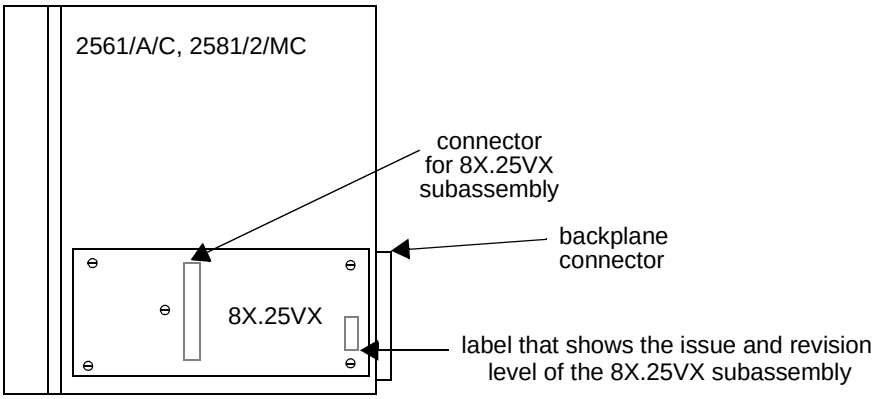

Figure 5-2 8X.25VX subassembly mounting on the 2561/A/C and 2581/2/MC

5.6 Firmly insert the 8X.25VX subassembly pins into the connector on the 2561/A/C or 2581/2/MC and screw down the five standoffs.

Software Installation

5.7 If you are adding CLEARCALL ALC to an existing **256** echo canceller, you must use the 2500-Series Universal Firmware Download Program (UFDP) to load the new **256FP3.2** firmware onto the canceller. (For information about the UFDP, see its associated practice, #76.812500UFDP.)

5.8 If you are adding CLEARCALL ALC to an existing **258** echo canceller, no software installation is required.

Note: For information on front panel modes and maintenance menus, see the *258 E1 Echo Canceller User Interface Document*.

Specifications

dimensions	• height: 2.70 inches • width: 6.38 inches • depth: 0.72 inches
weight	• 3.0 ounces (max)
operating temperature	• +32° to +122° F (0° to +50° C)
storage temperature	• –58° to +185° F (–50° to +85° C)
typical power consumption	• 8X.25VX1 — 1.4 watts • 8X.25VX2 — 1.7 watts • 8X.25VX3 — 2.0 watts • 8X.25VX4 — 2.4 watts

6. Technical Assistance; Repair and Return

6.1 Contact Tellabs Technical Assistance as follows . . .

location	telephone	FAX
Argentina — Tellabs International, Inc., Sucursal Buenos Aires	+541.393.0764, .0892, or .0835	+541.393.0732
Australia — Tellabs Pty Ltd., Milson's Point NSW, Sydney	+61.2.9966.1043	+61.2.9966.1038
Brazil — Tellabs International, Inc., Rio de Janeiro	+5521.518.2224	+5521.516.7063
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
Colombia — Tellabs International, Santa Fe de Bogota	+571.623.3162 or .3216	+571.623.3047
England — Tellabs U.K. Ltd., Bucks	+44.1494.555800	+44.1494.555801
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.	+852.2866.2983	+852.2866.2965
Hungary — Tellabs GmbH Rep. Office, Budapest	+36.1.2681220	+36.1.2681222
India — Tellabs International, Inc., Bangalore	+91.80.2261807 or .2266850	+91.80.2262170
India — Tellabs International, Inc., New Delhi	+91.11.6859824	+91.11.6859824
Ireland — Tellabs, Ltd., County Clare	+353.61.703000	+353.61.703333
Italy — Tellabs Italia SRL, Roma	+39.6.52207.205	+39.6.52207.206
Japan — Tellabs International, Inc., Tokyo	+81.3.5322.2977	+81.3.5322.2929
Lebanon — Tellabs Oy, Dbayeh	+961.4.525.929	+961.4.525.171
Mexico — Tellabs de Mexico	+525.255.0057	+525.255.0061
Netherlands — Tellabs Netherlands b.v.	+31.30.6004070	+31.30.6004090
Philippines — Tellabs International, Inc., Sucat, Muntinlupa City	+63.2.838.0970	———
Singapore — Tellabs Singapore Pte, Ltd.	+65.3367.611	+65.3367.622
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	+34.91.315.48.56	+34.91.315.77.70
Sweden — Tellabs AB, Stockholm	+46.8.440.4340	+46.8.440.4341
Thailand — Tellabs International, Inc., Bangkok	+662.642.7817	+662.642.7820
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		

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Repair and Return

6.2 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)

5.28.98

6.3 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 nonpermanent materials and in a manner consistent with the correct handling of electrostatically sensitive devices.

Tellabs Operations, Inc. 4951 Indiana Avenue, Lisle, IL 60532 TEL 630.378.8800 FAX 630.512.7097