Cerato

System Specifications

TELTRONICS

Cerato

System Specifications

Part Number: 955481-01 Rev B

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TELTRONICS PRODUCTS FOR VOIP COMMUNICATIONS
911 EMERGENCY CALLING LIMITATIONS AND OBLIGATIONS

(a) Customer, at Customer's cost, shall be responsible for procuring the supply, implementation, connection and support of any required telephone service including emergency 911 call service over the Internet and/or public switched telephone network ("PSTN") from one or more third party service providers as required for use of Products including without limitation, VOIP phone and Soft Phone software and hardware furnished by Teltronics or its distributors or resellers ("Products") for voice over internet protocol ("VOIP") communications.

(b) Customer are responsible for complying with all laws, rules and regulations applicable to the installation and use of Products (collectively, "Laws") including without limitation all Laws relating to 911 dialing for emergency service.

(c) 911 dialing to an appropriate public safety answering point ("PSAP") for emergency service is limited when using a VOIP phone and Soft Phone Product co-located with and connected to the switch Product at Customer's enterprise location because VOIP communication service may be interrupted, delayed, lost or terminated due to various causes including but not limited to power outage, excessive bandwidth consumption, termination of service with or by the network service provider and/ or other T1 provider, product, equipment, software, system and/or network failures or computer viruses. It is strongly recommended that Customer make alternative 911 dialing available to employees and other individuals at Customer's enterprise via traditional wire line service over the PSTN.

(d) Prior to initiating the use of Products in conjunction with any IP network including Internet telephone service for VOIP communications, Customer shall notify, in writing, each employee and any other person authorized to use the Products for such VOIP communications (individually and collectively "User(s))" of the following limitations:

911 DIALING TO AN APPROPRIATE PUBLIC SAFETY ANSWERING POINT ("PSAP") FOR EMERGENCY SERVICE IS NOT AVAILABLE WHEN USING ANY PORTABLE VOIP PHONE OR SOFTPHONE PRODUCT AT A STREET ADDRESS THAT IS DIFFERENT FROM THE STREET ADDRESS OF THE END USER'S ENTERPRISE WHERE ITS SWITCH IS LOCATED AND CONNECTED VIA AN IP NETWORK CONNECTION TO THAT REMOTE LOCATION. DO NOT USE SUCH PORTABLE VOIP PHONE OR SOFT PHONE PRODUCT AT THE REMOTE LOCATION TO PLACE 911 EMERGENCY CALLS BECAUSE SUCH PORTABLE VOIP PHONE OR SOFT PHONE IS NOT CAPABLE OF COMMUNICATING THE STREET ADDRESS OF THE REMOTE LOCATION.

EMERGENCY 911 CALLS SHOULD BE PLACED OVER A WIRE LINE PHONE AT THE REMOTE LOCATION WHICH IS CONNECTED TO TRADITIONAL PUBLIC SWITCHED TELEPHONE NETWORK ("PSTN") FOR LOCAL SERVICE OR OTHER PHONE THAT IS CAPABLE OF COMMUNICATING THE STREET ADDRESS OF THE REMOTE LOCATION TO HELP INSURE THAT SUCH EMERGENCY 911 CALLS ARE ROUTED TO THE APPROPRIATE PSAP OPERATOR RESPONSIBLE FOR RESPONDING TO EMERGENCIES AT THE REMOTE LOCATION.

USERS MUST WARN ALL INDIVIDUALS AT THE REMOTE LOCATION THAT SUCH PORTABLE VOIP PHONE OR SOFT PHONE PRODUCT CAN NOT BE USED TO PLACE ANY SUCH EMERGENCY 911 CALLS FROM THE REMOTE LOCATION BECAUSE OF THIS LIMITATION. USERS MUST INSTRUCT ALL INDIVIDUALS AT THE REMOTE LOCATION TO PLACE ANY 911 CALLS FOR EMERGENCY RESPONSE TO THE REMOTE LOCATION FROM A WIRE LINE PHONE AT THE REMOTE LOCATION WHICH IS CONNECTED TO THE TRADITIONAL PSTN FOR LOCAL SERVICE OR OTHER PHONE THAT IS CAPABLE OF COMMUNICATING THE STREET ADDRESS OF THE REMOTE LOCATION TO

HELP INSURE THAT SUCH EMERGENCY 911 CALLS ARE ROUTED TO THE APPROPRIATE PSAP RESPONSIBLE FOR RESPONDING TO EMERGENCIES AT THE REMOTE LOCATION.

(e) If Customer permits any User to use the VOIP phone or Soft Phone Product at a remote location connected to the switch at Customer's enterprise location, it is strongly recommended that Customer affix a non removable label on the hand set of each VOIP phone or Soft Phone Product, prior to any such use that displays the following clear and conspicuous warning.
DO NOT USE THIS PHONE TO DIAL 911 EMERGENCY SERVICE CALLS UNLESS USER IS PHYSICALLY LOCATED AT THE FOLLOWING ADDRESS: (INSERT CUSTOMER'S ENTERPRISE ADDRESS WHERE THE PSAP WILL RESPOND TO 911 EMERGENCY CALLS DIALED THROUGH THE SWITCH).

(f) Customer agrees to defend, indemnify and hold harmless Teltronics, its subsidiaries, affiliates and their respective officers, directors, employees, distributor, agents and suppliers from any obligations, claims, suits, demands, causes of action, losses, liabilities, fines, penalties, damages, costs, or expenses, (including without limitation, attorneys fees), arising on account of any injury or death of persons, or damage to property asserted or incurred by or on behalf of any User, governmental entity or any other party arising out of or resulting from (i) any of Customer acts or omissions including without limitation, any failure of Customer to comply with any Laws; or (ii) any use, inability to use, removal, failure, delay, error, breakdown, absence, outage or interruption of any telephone service including emergency 911 call service over the Internet and/or PSTN or any software, hardware or Product including without limitation, any VOIP phone or Soft Phone Product.

Summary of Changes

Revision A, February 2010

- Initial Release

Revision B, November 2010

- Added information pertaining to new 1.7 GHz CPU (P/N 763 619)

1

System Overview

This manual describes the Teltronics Cerato ME digital switching system.

The Cerato ME provides features and interfaces specifically for PBX and enterprising switching applications. The Cerato ME also serves as a switching platform for Teltronics applications. The Cerato ME is available in non-redundant and redundant configurations, and supports a maximum of 2,048 ports using a single High-Density/Mid-Density Control (HDC/MDC) shelf and any combination of High Density Expansion (HDX), Mid Density Expansion (MDX) and Low Density Expansion (LDX) shelves, to meet precise customer requirements. The Cerato ME is is designed for installation in Universal EIA RS310-D 19-inch racks.

General Information

All standard Teltronics telephony units function in the Cerato ME.

- In many of the redundant configurations, crossover power feeds protect each common equipment shelf.
- Control information is exchanged between common equipment shelves in order to maintain call processing during transfer operations.

The Cerato ME is microprocessor based, time division multiplexed switching networks in which voice or analog (modem) data signals are first encoded into standard digital format Pulse Code Modulation (PCM), routed as required, and then decoded back to their original analog form. Asynchronous data are transmitted via an RS-232/Asynchronous or Synchronous Data Communications Adapter (DCA or SDCA) interface to a Digital Line Unit at 300-19,200 bps. Synchronous data can be transmitted at 64 kbps, 56 kbps, and 300-19,200 bps.

The Cerato ME is software controlled. Source code is loaded from the system hard disk into internal Random Access Memory (RAM). System configuration is managed with the Teltronics Database Configuration Editor.

The Cerato ME is a fully featured digital switch, using state-of-the-art technology in the most advanced non-blocking architecture available.

Rules, Regulations, and Installation Warnings

This section describes Federal Communications Commission (FCC) rules and regulations, Canadian government rules and regulations, UL Compliance, and warnings when installing telephone wiring and equipment.

Federal Communications Commission (FCC) Registration

The Teltronics Cerato ME qualifies as fully protected under Parts 15 and 68, of the FCC Regulations.

The FCC Registration numbers are:

EH2586-14676-PF-E for PBX systems,

EH2586-10995-KF-E for multi-functional systems,

EH2586-60004-MF-E for Key systems.

The Ringer Equivalence number is specified as 2.2A.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment.

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 the user will be required to correct the interference at his own expense. (Part 15)

UL1950 Safety Compliance

The Teltronics Cerato ME has been tested against UL1950: “Telecommunications Systems” and is listed by an accredited compliance lab.

To ensure that installations are fully protected from fire hazards, Underwriters Laboratories specification UL1950 specifies primary and secondary protectors for circuits that interconnect to the telephone network, or for cables that exit/enter buildings. Locations for primary and secondary protectors are shown in Figure 1-1. The A and B protectors are provided by the installer, C protectors are provided by the telephone company.

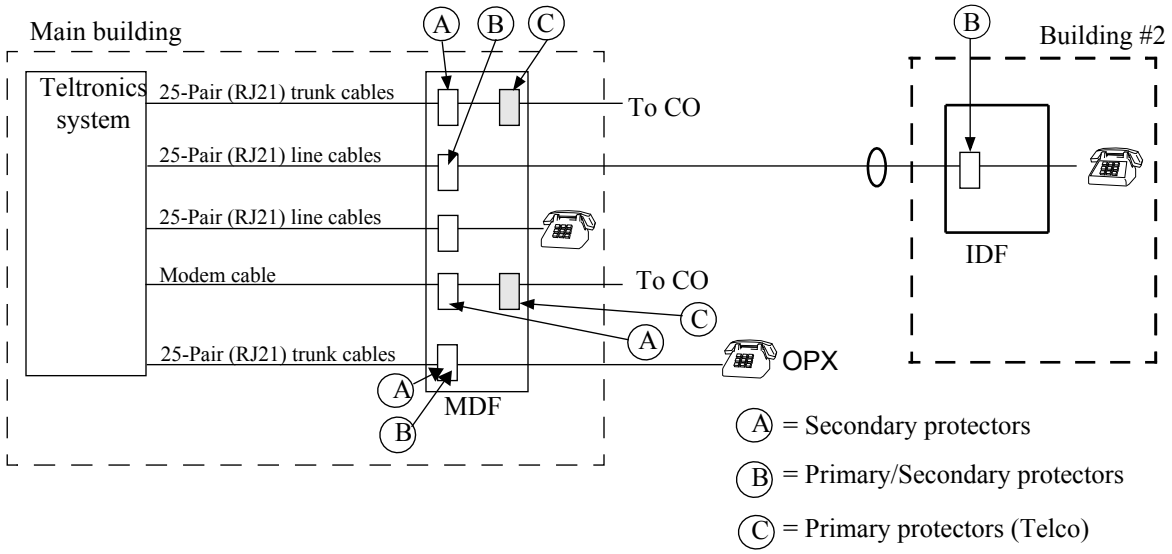


Figure 1-1. Primary and Secondary Protectors

European Community Compliance (CE Marking)

The Teltronics Cerato ME complies with both the EMC Directive (89/336/EEC) and the Low Voltage Directive (73/23/EEC) issued by the Commission of the European Community.

Compliance with these directives implies conformity to the following European norms:

- EN55022 (CISPR 22) - Radio Frequency Interference
- EN50082-1, (IEC801-2, IEC801-3, IEC801-4) - Electromagnetic Immunity
- EN60950 (IEC950) - Product Safety

This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

Canadian Certification

Type Approval

The Teltronics Cerato ME telephony network connection is certified by the Government of Canada, Department of Communications, in accordance with CS03, Issue 6, and CS03, Supplement B. The Certification number is 62-2669.

Safety

The Teltronics Cerato ME complies with CSA 950 (C22.2).

Conventions Used in This Manual

This manual uses the following conventions:

Indicates the possibility of damage to the system or component.

Indicates the possibility of bodily injury. (Voltage above 60 volts)

2

System Configuration

This chapter provides details on the system configuration of the Cerato ME.

The Cerato ME uses an High Density Controller (HDC-512)/Mid Density Controller (MDC) in its control shelf and any combination of the High Density Expansion (HDX-512), Mid Density Expansion (MDX-512) or Low Density Expansion (LDX-256) chassis, up to the system maximum can be used in its expansion shelves. The Cerato ME can be configured to be redundant or non-redundant.

The Controller shelf (HDC-512)/(MDC-512) consists of an HDX/MDC-512, a Central Processor (CPU), and System Time Switch Array (TSA).

The Cerato ME can be expanded to up to 2048 ports of non-blocking telephony matrix using expansion shelves with any combination of expansion chassis listed in Table 2-A. The controller and expansion shelves are mounted in a Universal EIA RS310-D 48.26 cm [19-in.] rack. A high density example is shown in Figure 2-1.

With the addition of the LE Common Control Cabinet, the Cerato ME can support up to 9,216 ports.

Table 2-A. Cerato ME Expansion Shelves

Chassis	Ports	Slots
HDX-512	512	4 HD
MDX-512	512	16 MD
LDX-256	256	16 LD

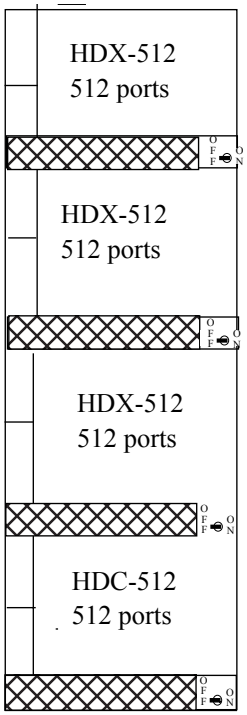


Figure 2-1. Cerato ME HD-EXP-512 Configuration option

LDX Shelves

Two-shelf systems consist of one LDX pair. In systems with more than two shelves, the shelves or shelf pairs are mounted in Universal EIA RS310-D 48.26 cm (19-inch) racks. For redundant operation, both Compact Control Shelves must contain common equipment units.

Figure 2-2 shows the shelf arrangement of a rackmounted eight-shelf system. In this system, the second through eighth shelves are Low Density Expansion (LDX) shelves.

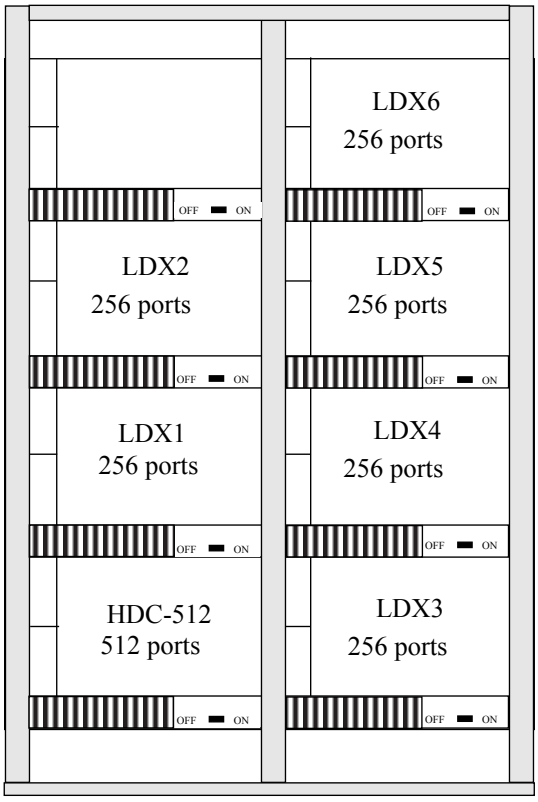
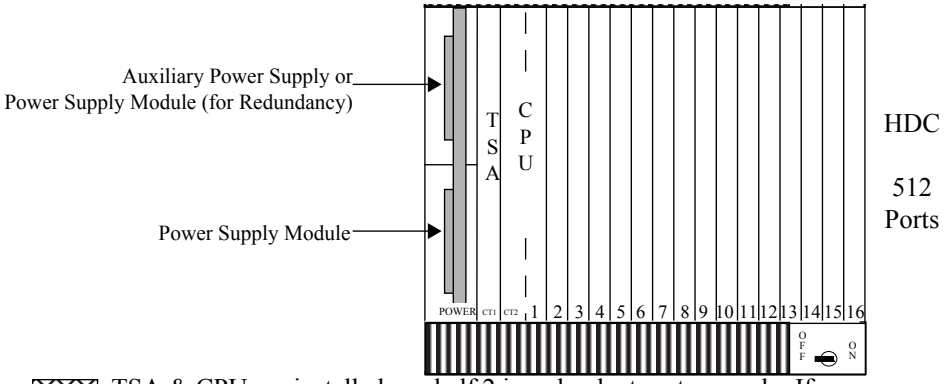


Figure 2-2. Cerato ME Rackmount System

Figure 2-3 shows an HDC-512; Figure 2-4 shows an LDX pair.



TSA & CPU are installed on shelf 2 in redundant systems only. If non-redundant, slot 1 may be used for an interface unit.

Figure 2-3. Cerato ME High Density Controller (Front View)

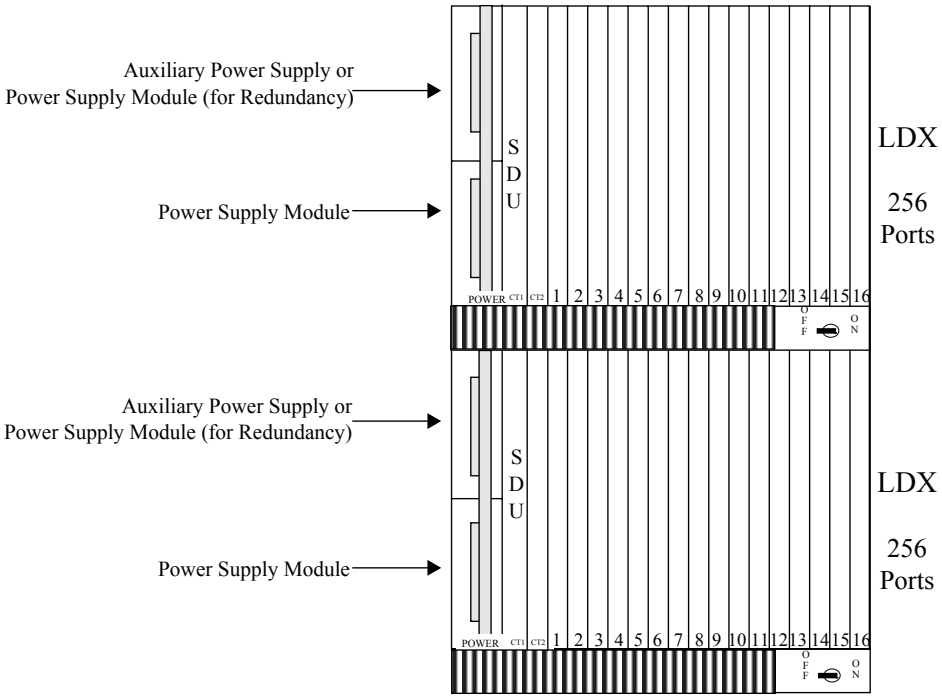


Figure 2-4. Cerato ME Low Density Expansion (LDX) Shelves

The LDX shelves or shelf pairs are always rack mounted. One LDX pair can be installed above the HDC as shown in Figure 2-2. If more shelves are added, they are installed in a second rack.

All shelves either have two Power Supply Modules for power supply redundancy or one Power Supply Module in the lower slot and an Auxiliary Power Supply (AUX PS) in the top slot.

Table 2-B. Cerato ME: Slots, Circuits, Port Groups, And Power

Shelf/ Backplane	Number of Slots per Shelf	Number of Circuits/ Ports per Shelf	Number of Port Groups per Shelf	Power
HDC (High Density Controller)	20	512	16 (2 slots per port group)	• Two Power Supply Modules for power supply redundancy *or* • One Power Supply Module in either of the power supply slots for non-redundant power • AC Power Supply (AC Systems only)

Table 2-B. Cerato ME: Slots, Circuits, Port Groups, And Power

Shelf/ Backplane	Number of Slots per Shelf	Number of Circuits/ Ports per Shelf	Number of Port Groups per Shelf	Power
HDX (High Density Expansion) Shelf	4 HD	512	16	• Two Power Supply Modules for power supply redundancy *or* • One Power Supply Module in either of the power supply slots for non-redundant power • AC Power Supply (AC Systems only)
LDX (Low-Density Expansion) Shelf	20	256	8 (2 slots per port group)	• Two Power Supply Modules for power supply redundancy or • One Power Supply Module in the Power Supply slots for non-redundant power. • AC Power Supply (AC Systems only)

3

System Specifications

This chapter describes:

- Transmission/switching
- System Architecture
- System Processor Data
- System Performance
- Primary Rate Interfaces
- SS7
- System Modem
- Maintenance Port Interface Unit (MPI)
- The Serial Interface Unit
- Disk Drives
- Local Area Networks
- Available diagnostics

Transmission/Switching

Network Compatibility

Teltronics Cerato ME is compatible with North American T1, ITU-T G.733, and ITU-T G.732 digital networks. It meets Bell Stratum IV timing precision requirements for synchronization and clock stability, according to Bellcore SR-TSV-002275 "BOC Notes on the LEC Network-1990". Those requirements are shown in Table 3-A and *Network Timing* on page 3-3.

Table 3-A. Clock Strata Requirements

Strata	Minimum Accuracy ***Note*** 1	Minimum Stability ***Note*** 2	Pull-In Range ***Note*** 3
I	$\pm$ 1 x 10^{-11}	Not applicable	None
II	$\pm$ 1.6 x 10^{-8} ($\pm$ 0.025 Hz @ 1.544 MHz)	$\pm$ 1 x 10^{-10}/day	Must be capable of synchronizing to clock with accuracy of $\pm$ 1.6 x 10^{-8}
III	$\pm$ 4.6 x 10^{-6} ($\pm$ 7 Hz @ 1.544 MHz)	<255 slips on any connecting link during the initial 24 hours of Holdover	Must be capable of synchronizing to clock with accuracy of $\pm$ 4.6 x 10^{-6}
IV	+ 32 x 10^{-6} (+ 50 Hz @1.544 MHz)	Not applicable	Must be capable of synchronizing to clock with accuracy of $\pm$ 32 x 10^{-6}

Notes

1 Minimum accuracy represents the maximum long-term (20-year) deviation from the nominal frequency with no external frequency reference (Free-Run Mode).

2 Minimum stability represents the maximum rate of change of the clock frequency with respect to time upon loss of all frequency references (Holdover Mode).

3 Pull-range is a measure of the maximum input frequency deviation from the nominal clock rate that can be overcome by a clock to pull itself into synchronization with a reference signal.

Network Timing

The Reference Timing Unit (RTU) (P/N 763 340-01), when used in the Cerato ME, provides an external input to allow a customer-provided reference source to which the system master oscillator can be locked. External input sources for the RTU may have a 1, 2, 5, or 10 Mhz frequency. When the RTU is locked to the external reference source, the switch will have the accuracy of that source. This allows both systems to achieve up to Stratum I accuracy depending on the external source.

The Reference Timing Unit provides a stable frequency track and hold mechanism and Ovenized Crystal Oscillator which allows system clocking to meet the free run frequency, maximum initial frequency offset, and maximum frequency drift rate required by ITU-T G.812 Stratum III. This also meets the Bellcore Stratum III.

System Architecture

Port Switching Cerato LE:	10,240 non-blocking switching ports total
	256 ports internal for tones (or conferences)
	768 total ports internal for conferences
	Up to 9,216 user ports
Port Switching: Cerato ME	2,048 non-blocking switching ports total
	512 ports internal for tones (or conferences)
	512 total ports internal for conferences
	Up to 2,048 user ports
Transmission:	64 kbps, ITU-T G.703 Pulse Code Modulation (PCM). The Cerato ME transmit from 64 kbps to 2.048 Mbps.
Signaling:	8 kbps per port
Switching:	64 kbps-2.048Mbits
Voice Encoding:	ITU-T G.711 A-law or μ-law on a system basis

System Processor Data

Central Processing Unit Type

Table 3-B. CPU Type

Name	CPU Type	Bus Width	CPU Clock Rate	System Type	System Software Requirements
Integrated CPU (ICPU) (P/N 763 443)	i486	32	100 MHz	Cerato ME	Rel 4.1 & later
TCPU (P/N 763 689 with FDD, P/N 763 690 w/o FDD)	Pentium	32	800 MHz	Cerato ME	Rel 4.1 & later
VME CPU, (P/N 763 618)	Pentium	32	1.2 Ghz	Cerato LE	Rel 4.1 & later
VME CPU, (P/N 763 619)	Pentium	32	1.7 Ghz	Cerato LE	Rel 4.3 & later

CPU Program Memory Capacity (RAM)

Table 3-C. CPU Program Memory Capacity (RAM)

Name	RAM
Integrated CPU Premium (ICPU-B2R) (P/N 763 443)	32 MByte
TCPU (P/N 763 689 with FDD, P/N 763 690 w/o FDD)	32 MByte
VME CPU, (P/N 763 618)	256 MByte
VME CPU, (P/N 763 619)	256 MByte

System Performance

System Call Processing Rates Guide Line

The call data provided in the Table 3-D is presented as a general guideline for the Cerato ME through-put capacities. The data was measured using laboratory test systems and specific call setup parameters; your performance results may be different, depending on applications and system conditions. Throughput is measured in Busy Hour Call Attempts (BHCAs) with 100% call completion at 80% CPU occupancy.

Table 3-D. Call Completions Per Hour (Cerato ME)

CPU Rate	# of CPUs	Station to Station	E&M FGD	SS7 ISUP	PRI	HIL-E&M	ACD
100 MHz	1	85,000	60,000	35,000	22,000	55,000	38,000
800 MHz	1						

Table 3-E. Call Completions Per Hour (Cerato LE)

CPU Rate	# of CPUs	Station to Station	E&M FGD	SS7 ISUP	PRI	HIL-E&M	ACD
1.2 Ghz	1						
1.7 Ghz	1						

Data Transmission Rates per Port

Synchronous: (clocked)	300 to 64 kbps
Asynchronous: (non-clocked)	300 to 19.2 kbps
Speed Independence:	Using XON/XOFF protocol, allows devices operating at different speeds to communicate.

Primary Rate Interfaces

AT&T Primary Rate Interface

Transmission Rate:	1.544 or 2.048 Mbps
Bearer Channels:	23B+D or 30B+D
Call Control Procedures:	User, Symmetric User, or Network
	Enbloc Sending/Receiving
	B-Channel Negotiation (Selection)
	Restart
	Status Enquiry
	Code Set 0, 6, and 7 (Teltronics defined network)
	Message-Associated User-to-User
	Non-Call Associated Signaling Connection
Standards Reference:	AT&T Primary Rate Interface, TR 41449, Issue 2.2, May 1992

Primary Rate Interface (PRI) is based on AT&T' Primary Rate Interface Specifications 41449 and 41459, and ITU-T Fascicle VI.10 - Recommendations Q.921 and Q.931. It complies with AT&T Technical Advisory No. 34 and functions as an NT2 termination. The message oriented D-channel uses a layered protocol structure specified by ITU-T Open Systems Interconnection (OSI) Layers 1, 2, and 3.

NTI (Northern Telecom, Inc.) Primary Rate Interface

Transmission Rate:	1.544 or 2.048 Mbps
Bearer Channels:	23B+D or 30B+D
Call Control Procedures:	User or Network
	Enbloc Sending/Receiving
	Restart
	Code Set 0

Transmission Rate:	1.544 or 2.048 Mbps
Standards References:	Northern Telecom User-Network Interface Specifications NIS A211-1 Release 3.0 (BCS 33) and NIS A211-4 Release 1.0 (BCS 32)

Euro-ISDN Primary Rate Interface

Transmission Rate:	1.544 or 2.048 Mbps
Bearer Channels:	23B+D or 30B+D
Call Control Procedures:	User Side, Subset of Network Side
	Enblock Sending/Receiving
	Overlap Receiving
	B-Channel Negotiation (Selection)
	Restart
	Status Enquiry
	2Mb cyclic redundancy check (CRC4)
	Code Set 0
Supplementary Services:	Direct Dial Inward (DDI)
	Netherlands country-specific Advice of Charge - End of Call
	Portugal country-specific Advice of Charge - End of Call
Standards Reference:	European Telecommunications Standards (ETS) Basic Call:
	ETS 300-102 (12/90), ETS 300-125 (12/91), ETS 300-011, and DDI: ETS 300-062, ETS 300-063, ETS 300-064 (10/91).
	AOC-E, NETHERLANDS: Netherlands PTT specifications.
	AOC-E, PORTUGAL: Portugal PTT specifications.

Type Certification:	Denmark National Telecom Agency Type Certification No. 95.5222-10 based on Commission Decision of 18 November 1994 on a Common Technical Regulation for the pan-European Integrated Services Digital Network (ISDN), Primary Rate Access (CTR4)

Signal System #7 (SS7)

Transmission Rate:	1.544 or 2.048 Mbps
Bearer Channels:	23B, 24B, or 30B
Call Control Procedures:	SS7 Protocol via the Signaling Point (SP) entity using ISUP and MTP software protocol modules
Message Information Elements:	The control oriented data is channel-wide and uses a layered protocol structure based on a ITU-T OSI like software model which is now contained in ISUP and MTP Layers 1, 2, and 3. The Teltronics switch Signaling System 7 (SS7) call processing is based on: • North America - ANSI T1.111, T1.113 (1992) as well as Bellcore TR-246, TR-905, and (partial TR-317, and TR-394) • Most other countries - ITU-T (CCITT) Whitebook Q.701-704, Q.706-707, and Q.781-782, Q.761-764, and Q.766

Modem (System)

Modems are optionally available. Capabilities are subject to change without notice.

System Disk Drives

Cerato ME CPU Hard Drives:

Hard Disk Drive:	The hard disk drive is integrated into the CPU unit, e.g., ICPU, TCPU). Its size depends what is available at the time and is subject to change without notice.

System Local Area Networks

OpenLAN

OpenLAN® is a Local Area Network system that connects a Teltronics proprietary network with a TCP/IP network. Because OpenLAN is based on open standards, you can write custom application programs for your computers that communicate with your Teltronics system—without needing to use proprietary Teltronics protocols. The Ethernet Control Unit (ECU) provides TCP/IP access to the Teltronics Cerato ME switch.

ECU

The ECU provides basic OpenLAN service and supports four logical LAN Links (such as HIL). The external LAN uses Ethernet Thin-net cabling (10-Base-2, RG 58).

LAN Gateway

The LAN Gateway is a Computer Telephone Integration (CTI) server that uses Integrated Network Server (IN Server) technology. It is a single board assembly that includes the Windows NT workstation operating system and special infrastructure software that allows it to interface very tightly with the Teltronics Cerato ME (see the LAN Gateway Application manual, P/N 955 775).

The external LAN uses Ethernet Thin-net cabling (10-Base-2, RG 58) and supports:

- Ethernet Controller for OpenLAN, including PCMCIA 10 Mbps ethernet LAN card, which provides 650% more information than the existing ECU (P/N 763 393).
- Seven logical LAN Links (such as HIL) plus one LAN Gateway diagnostic service link.

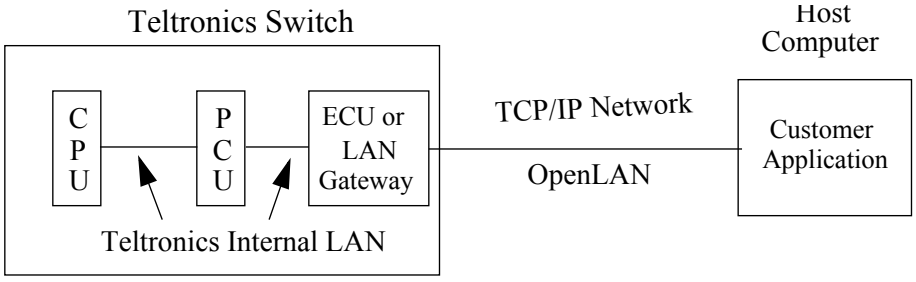


Figure 3-1. Components in an OpenLAN Network

Internal (Closed) LAN

Teltronics uses a special, proprietary LAN protocol stack called the Message Handler for our internal telecommunication applications. The interface description is as follows:

Compliance:	IEEE 802.3 (10Base2), FCC Class A EMC
Connection Type:	BNC (Thin coaxial)
Network Interface Controller Type:	Depeends on availability and subject to change without notice.
Terminators:	50 ohm
Segment Length:	185 m [600 ft] maximum 2 m [6 ft] minimum
Network Length: Cerato LAN:	925 m [3000 ft] maximum, with up to four repeaters
Maximum # Coax Segments: Cerato LAN:	5

System Diagnostics

Alarm Reporting

The five types of alarms:

Critical:	Total system outage, when call processing ceases, on system reboot, or trunk bypass.
Major:	Failure of several interface circuits, shelf power, fan, blown fuse, either a Time Switch Unit or Scan and Signal Unit, etc.
Minor:	Failure of any single telephony board.
Info:	Messages that may help avoid pending events or problems.
Diagnostics:	Event messages that can be used by Teltronics Technical Support to diagnose service problems.

For further information, see *Alarms Administration Program* in the Software Reference Manual (P/N 955 086) and the Service Manual or Maintenance manual for your system.

Telephony Device Diagnostics (TDD) Program

TDD performs diagnostics on hardware devices connected in the system. See *Telephony Device Diagnostics* in the Software Reference Manual (P/N 955 086).

4

Site Preparation

This chapter details physical and environmental properties and requirements for input power information that is needed to prepare your site for installation of the Cerato.

Physical

Dimensions

Cerato ME

Doorway Access

If you have more than two shelves, the shelves are mounted in a customer-provided 483 mm [19-inch] universal self-supporting rack, EIA RS310-D standard aluminum channel uprights with 5/8-5/8-1/2 spaced 12-24 tapped holes (HDTS P/N 431 051). The four shelves measure 1.6 meters [63 in.] when assembled. P/N 431 051 is seven feet tall.

Equipment Room Size

Rack measurements are shown in Figure 4-1. Access needed for clearance is shown in Figure 4-2. The cables can exit the rack from the bottom or top. Allow enough room around the shelves or rack for working space.

This system is expandable to 2 racks (4 shelves each). If remote location(s) are desired, LDX shelves can be situated in separate racks up

to 100 meters [328.1 feet] from the HDC/MDC shelves. Usually the shelves are in pairs, but except for the HDC/MDC shelves, it is not necessary.

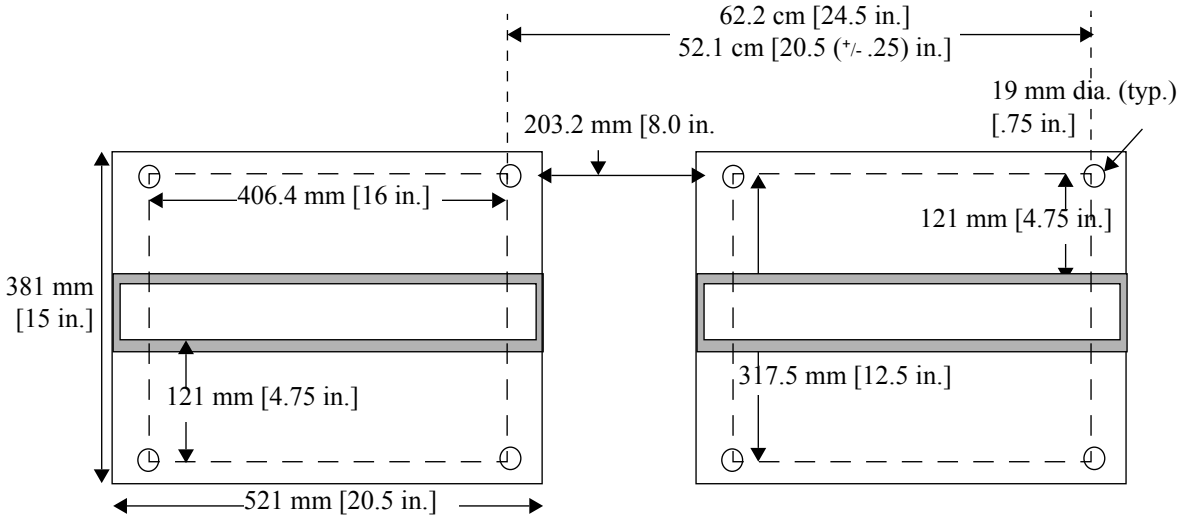
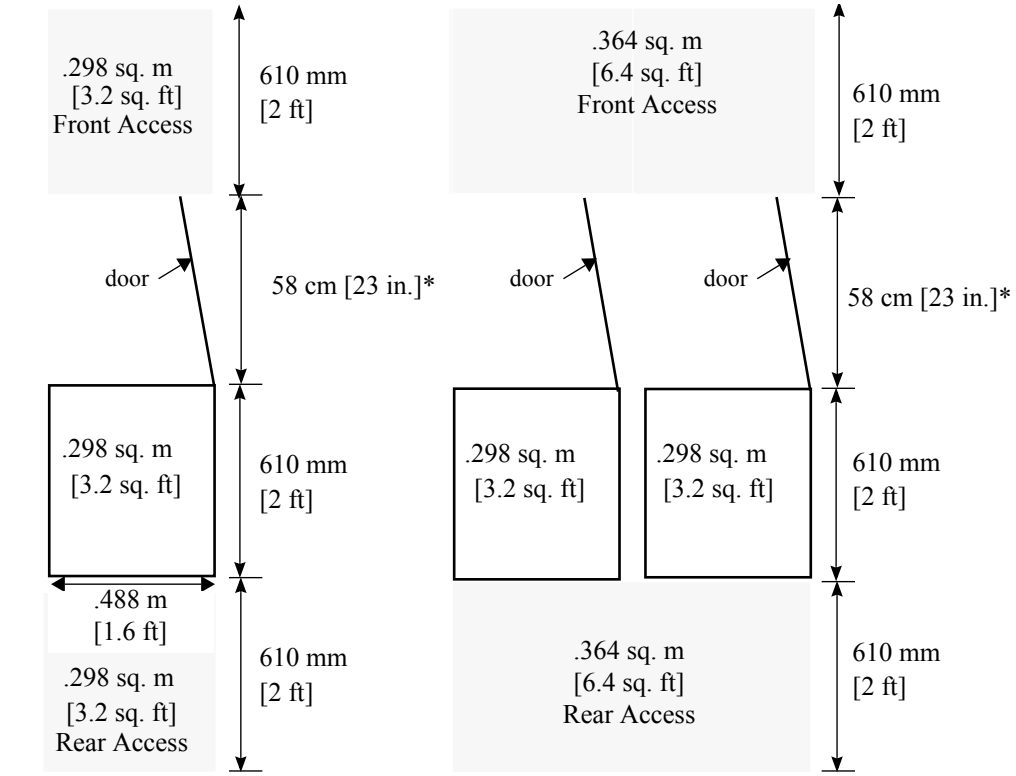
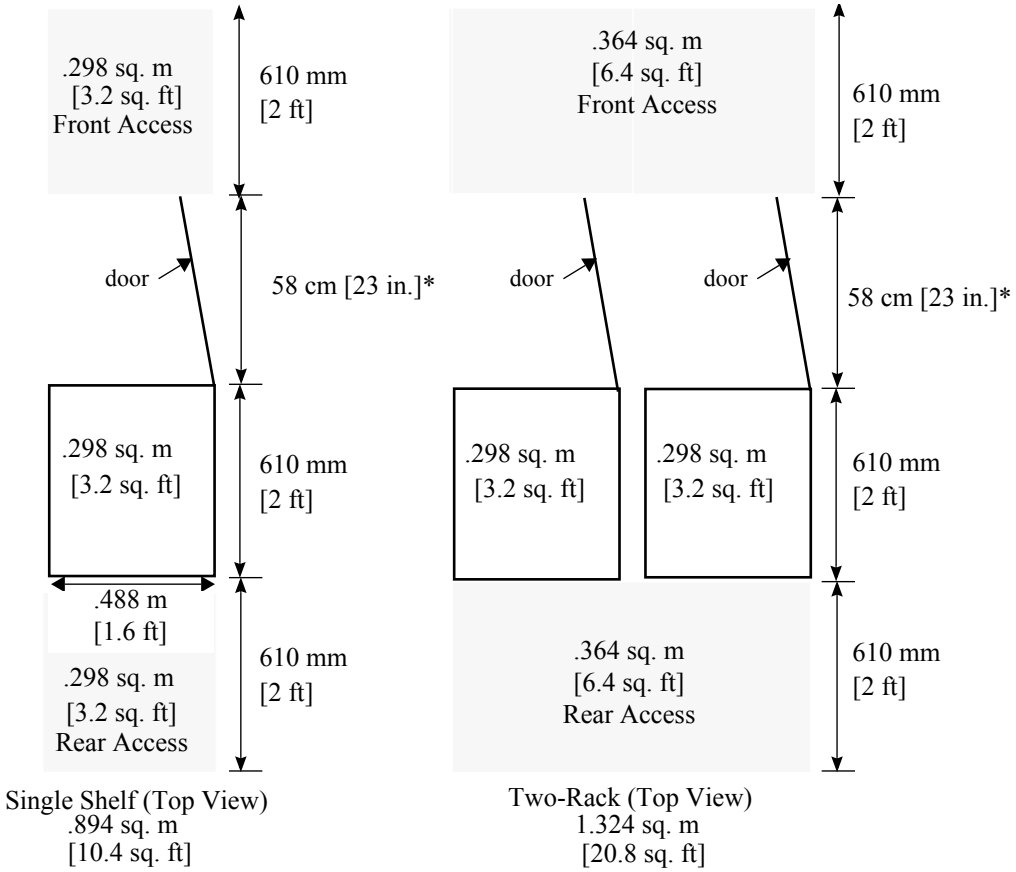


Figure 4-1. 48.3 cm [19 in.] Rack Measurements



*Cerato ME has enclosure pkg. front door

Figure 4-2. Cerato ME (MDC, MDX, LDX) Space Requirements (Top View)



*Cerato ME has enclosure pkg. front door

Figure 4-3. Cerato ME (HDC, HDX) Space Requirements (Top View)

Cerato LE

Single Common Equipment Cabinet

Height:	179 cm [70.5 in.], including wheels
Width:	58.9 cm [23.2 in.]
Depth:	72.4 cm [28.5 in.]

Dual Common Equipment Cabinet

Height:	179 cm [70.5 in.]
Width:	117.8 cm [46.4 in.]
Depth:	72.4 cm [28.5 in.]

Figure 4-1 shows LE cabinets with front and back doors with access needed. The cables enter the cabinet from the bottom and top. Allow enough room around the cabinet for working space.

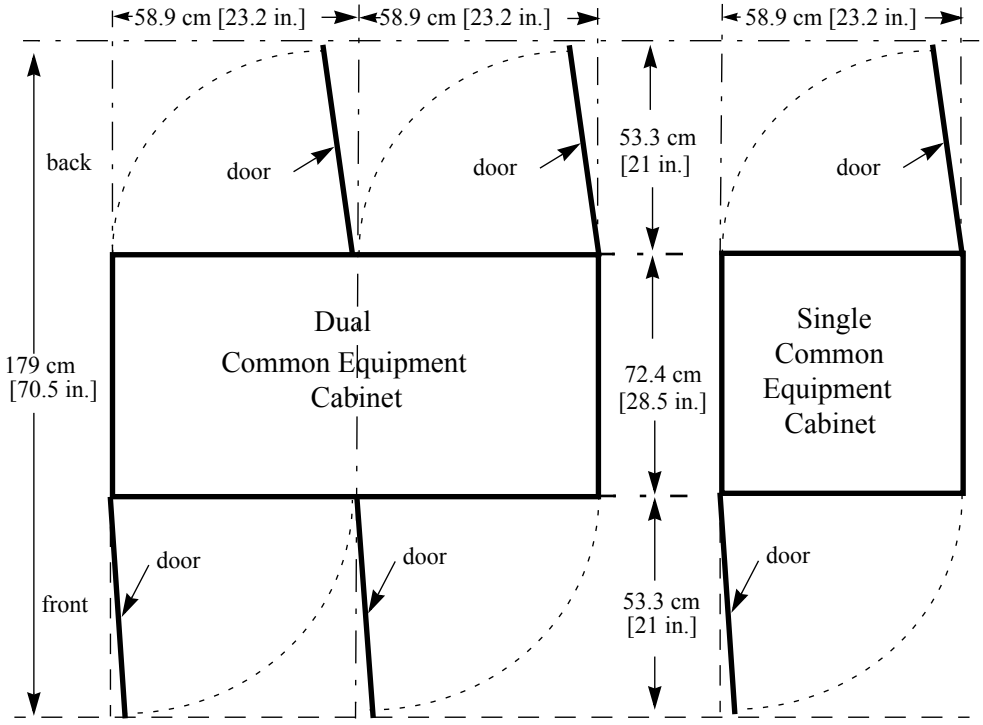
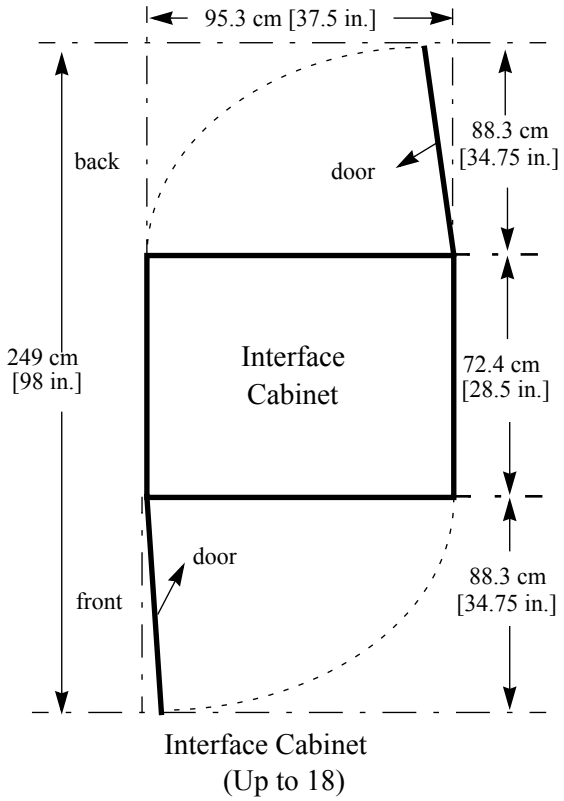


Figure 4-1. Space Requirements: LE Common Equipment Cabinet



Space Requirements for Interface Cabinet

Weight

Cerato LE

Each Single CE Cabinet:	Approximately 227 kg [500 lbs] maximum
Each Dual CE Cabinet:	Approximately 363 kg [800 lbs] maximum

Cerato ME

The following weights represent a fully loaded cabinet which may vary, depending on unit configurations.

DC Systems

1 shelf stack: 38.6 kg [85 lbs]
2 shelf stack: 77.3 kg [170 lbs]

1 shelf in rack: 60.9 kg [124 lbs] maximum
2 shelves in rack: 104.1 kg [209 lbs] maximum
3 shelves in rack: 147.3 kg [294 lbs] maximum
4 shelves in rack: 190.5 kg [379 lbs] maximum

Note Cabinet or shelf weight may vary depending on the number of boards in the cabinet.

Floor Loading

The following data assumes cabinet fully loaded, (installer cables not included).

Cerato LE

Each Single CE Cabinet:	533 kg/sq m maximum, [109 lbs/sq ft]

Cerato ME

Note Includes Units, Enclosure Package, and Rack, if applicable.

DC Systems:

1 shelf stack: approx. 153 kg/sq m max. [31 lbs/sq ft]
2 shelf stack: approx. 306 kg/sq m max. [66 lbs/sq ft]

1 shelf in rack: approx. 288 kg/sq m max. [59 lbs/sq ft]
2 shelves in rack: approx. 575 kg/sq m max. [104 lbs/sq ft]
3 shelves in rack: approx. 863 kg/sq m max. [149 lbs/sq ft]
4 shelves in rack: approx. 1151 kg/sq m max. [194 lbs/sq ft]

Note Cabinet or shelf weight may vary depending on the number of boards in the cabinet.

Environmental

Temperature

Operating Range per cabinet:	
Cerato ME:	0° to 40°C [32° to 104°F]
Cerato LE:	50° to 104°F
Cerato LE -Common Equip. Units:	permitted rise of 20°C [45°F]
Disk Drives:	permitted rise of 5°C [9°F]
Storage Range:	-20° to 51°C [-4° to 125°F]

Note Prolonged operation at the upper limits of the temperature operating range may reduce system reliability.

Relative Humidity

Operating Range:	
Cerato ME:	10 to 80%, non-condensing
Cerato LE	20 to 80%, non-condensing

Altitude

Operating Maximum:	1500 meters [4920 feet]. Systems operating above 1500 meters in low humidity areas may require additional cooling.
Storage Range:	-300 meters [-940 feet] to 3000 meters [9400 feet]

Heat Dissipation

HDC/MDC and xDX (each shelf)

DC:	685 BTUs

Shock

Maximum:	12 G [5-200Hz], during shipment (tested against NSTA specifications)

Vibration

Maximum	3.0 G [5-200Hz], during operation

Input Power

Cerato ME

The input power for the Cerato ME (fully loaded @ 50% busy/idle) is shown next.

Cerato ME - HDC /MDC or expansion shelfs:	7.7A@90 to 132 VAC (115 nominal)
110 VAC, 50/60 Hz:	3.8A@180 to 264 VAC (230 nominal)
220 VAC, 50/60 Hz:	16A@-42 to -56 VDC, <20dBrn C
-48 VDC:	
Minimum cable to ground:	4.12 mm [6 AWG] (or 2.5 ohms from master ground bus to earth group)
Cerato LE - Common Equipment Cabinet: (-48 Volt source)	6 VDC

Cerato LE

The input power for the Cerato LE (fully loaded @ 50% busy/idle) is shown next.

5

Power and Alarms

Cerato ME

Power Source Specifications

110 VAC, 50/60 Hz:	7.7A@90 to 132 VAC (115 nominal)
220 VAC, 50/60 Hz:	3.8A@180 to 264 VAC (230 nominal)
-48 VDC:	16A@-42 to -56 VDC, <20dBrn C

HDC/MDC/Expansion Shelves Power Supply Modules

Purpose:	Either two Power Supply Modules for power supply redundancy. or one Power Supply Module in one slot and an Auxiliary Power Supply in the other slot.	
Shelf DC Input:	Voltage:	-48 VDC
	Current:	16A@-42 to -56 VDC, <20dBrn C
Power Supply Module DC Outputs:	+5VDC@30 Amps / 150 Watts	
	±12VDC@6.25 Amps / 75 Watts	
	-5VDC@15 Amps / 75Watts	

Alarm Interface Assembly (AIA) with Ringing Generator

Purpose: Provides a gathering point for external alarm devices (customer provided alarms) and an alarm signal junction for the switch.

Indicators: Critical Alarms: Alarm board LEDs and optional customer alarm output.

Major Alarms: Alarms (ALM) administration program, LEDs on the Power Supply Board, optional customer alarm output, and Enhanced Attendant Workstation messages from the Common Control Board.

Minor Alarms: Alarms (ALM) administration program, LEDs on the Power Supply Board, optional customer alarm output, and Enhanced Attendant Workstation messages from the Common Control Board.

Alarm Cutoff: Alarm Bypass toggle switches allow manual bypass of alarm conditions and inputs for customer supplied alarm equipment.

AIA Output: 10 Watts

Message Waiting Power Supply

All shelves either have two Power Supply Modules for power supply redundancy, or one Power Supply Module in one slot and an Auxiliary Power Supply in the other slot.

Purpose: Provides a static +48VDC level to light a 90VDC neon lamp residing at a user's station.

Input Voltage: 48VDC

Output Voltage: 48VDC or Universal AC (110 or 220VAC, 50/60Hz)

Current: 1.2 Amps maximum continuous load. (100% of the lines within one cabinet in a broadcast message waiting mode.)

Peak loading will occur during the broadcast message waiting mode when a station goes “off-hook”. At this point, the neon within the station is paralleled by approximately 200 ohms. The time taken to detect the “off-key” state and remove the message waiting supply from this load is 100 ms. One “off-hook” can be expected every 2 seconds.

Noise at output: Maximum output noise and ripple will be less than 1 volt peak to peak throughout the entire load range.

Power Source Specifications

DC Power: Standard; Must provide for a load of 35 Amps (maximum) per Interface or Common Equipment Cabinet @ -44 to -56 VDC
DC power plant provided by the customer.

Dual Cabinet Common Control Power Supply

Purpose:	Provides power to the common equipment backplane, the Power Alarm Board, and the floppy / hard disk drives.	
DC Input:	Voltage:	-44 to -56 VDC
	Current:	17.9 Amps Max @ -48 VDC
	Inrush Current:	Limited to 80 Amps peak
DC Outputs:	+5.0 ± 10%; 0.1 Amp minimum; 80.0 Amps maximum.	
	+12.0 ± 10%; 0.0 Amp minimum; 10.0 Amps maximum.	
	-12.0 ± 10%; 0.0 Amp minimum; 10.0 Amps maximum.	

Dual Cabinet Telephony Control Power Supply

Purpose:	Provides power to the telephony shelf backplane.	
DC Input:	Voltage:	-44 to -56 VDC
	Current:	17.9 Amps maximum
	Inrush Current:	Limited to 80 Amps peak
DC Outputs:	+ 5.0 ± 10%; 0.1 Amp minimum; 100.0 Amps maximum.	

Single Cabinet Common Equipment Power Supply

(661 618 or 661 619)

Purpose:	Provides power to the common control and telephony control backplanes.	
DC Input:	Voltage:	-42 to -56 VDC, -48VDC nominal
	(max surge)	<40VDC or >60VDC for 250 ms
	Current:	22 Amp max. @ -48 VDC 16.6 Amp nominal full load
	(max surge)	80 Amp @ 56VDC thru 1 Ohm for 100 ms.
DC Outputs:	+5 VDC ±5% @ 110 Amps max 5.10VDC ± 2% setpoint 11.0 Amps min load	
	+12VDC ±5% @ 5 Amps max 12.05VDC ± 2% setpoint 0.20 Amps min load	
	-12VDC ±5% @ 5 Amps max -12.05VDC ± 2% setpoint 0.20 Amps min load	

Talk Battery Filter

Purpose:	Provides filtered -48 VDC talk Battery to a telephony shelf via the Cabinet Interface Board.
Voltage:	-44 VDC to -56 VDC
Current:	17.5 Amps maximum
Inrush Current:	175 Amps maximum
Voltage Drop:	1 volt maximum @ maximum current flow
Output Impedance:	50 milliohms, 200 to 3400Hz
Noise at output (voice-band):	7 dBrnC in AC powered systems. In DC powered systems, source is allowed maximum noise of 35dBrnC (TBF loss < 28dB at 1 khz).

Ringing Generator

Purpose:		Provides ringing voltage to telephony shelves via the Cabinet Interface Board (adjustable).
DC Input:	Voltage:	-44 to -56VDC
	Current:	1 Amp maximum
	Inrush Current:	30 Amps maximum
AC Output:	Voltage:	90 VAC (nominal) superimposed on -48 VDC
	Frequency:	20 ± 3Hz, 25Hz optional (selectable)
	Ringing Power:	15 Watts maximum
Total Harmonic Distortion:		15% maximum

Message Waiting Power Supply

Purpose:	Provides a static +48VDC level to light a 90VDC neon lamp residing at a user's station.
Input Voltage:	-44 to -56VDC
Output Voltage:	+48VDC ± 5%
Current:	1.2 Amps maximum continuous load. (100% of the lines within one cabinet in a broadcast message waiting mode.) Peak loading will occur during the broadcast message waiting mode when a station goes “off-hook”. At this point, the neon within the station is paralleled by approximately 200 ohms. The time taken to detect the “off-key” state and remove the message waiting supply from this load is 100 ms. One “off-hook” can be expected every 2 seconds.
Noise at output:	Maximum output noise and ripple will be less than 1 volt peak to peak throughout the entire load range.

Cabinet Alarm Unit (CAU)

Purpose:	It serves as a gathering point for cabinet alarms, a distribution point for Peripheral Shelf Link Interface (PSLI) power, an interface point for Minor, Major, and Critical Alarm outputs, 4 customer alarm inputs and 3 drivers for cabinet Trunk Bypass units.
Indicators:	LEDs indicate Critical, Major or Minor alarm conditions. (Major and minor alarms are also reported at the Attendant Workstation.)
Alarm Cutoff:	8 switches are provided to control alarm cutoff, ringing cutoff per cabinet, and trunk bypass operation per cabinet.
CAU Output:	3 relay contacts drive trunk bypass outputs; 1 PSLI power output connector

6

Line and Trunk Unit Specifications

Transmission Losses

Table 6-A. Analog Losses

Unit	Loss (dB)
Line Unit	3.0 + 0.25 dB
E & M Unit	0.25 + 0.20 dB
GS/LS, DID	-2.5 + 0.20 dB

Table 6-B. Average Loss Tolerances

Path	Tolerances (dB)
Station to Station	+ 0.5 dB
Station to Trunk	+ 0.45 dB
Trunk to Trunk	+ 0.40 dB

The transmission plan for the systems is as specified by EIA/TIA Specification RS464-A. The commonly used values are listed below. All positive values are loss values; all negative values are gain values.

Table 6-C. Transmission Level Plan

Path	Gain/Loss
Station to Station	6.0 dB in both directions
Station to OPX	3.25 dB in both directions
OPX to OPX	0.5 dB in both directions
Station to Analog Tie Trunk	3.25 dB in both directions
Analog Tie Trunk to Analog Tie Trunk	0.5 dB in both directions
Station to Analog CO Trunk	0.5 dB in both directions
Analog CO Trunk to Analog Tie Trunk	0.45 dB in both directions
Station to Analog Toll Trunk	6.25 dB in both directions
Analog Toll Trunk to Analog Tie Trunk	0.5 dB in both directions
Station toward Digital Tie Trunk Digital Tie Trunk toward Station	3 dB 9 dB
Station to Digital CO Trunk	3 dB in both directions
Station toward Digital Toll Trunk Digital Toll Trunk toward Station	3 dB 9 dB
Digital Toll Trunk to Digital Tie Trunk	0 dB in both directions
Digital CO Trunk toward Digital Tie Trunk Digital Tie Trunk toward Digital CO	0 dB 6 dB
Digital Tie Trunk to Digital Tie Trunk	0 dB in both directions
Analog Tie Trunk toward Digital Tie Trunk Digital Tie Trunk toward Analog Tie Trunk	-2.75 dB 3.25 dB
Analog CO Trunk toward Digital Tie Trunk Digital Tie Trunk toward Analog CO Trunk	-2.5 dB 3.5 dB
Analog Toll Trunk toward Digital Tie Trunk Digital Tie Trunk toward Analog Toll Trunk	-2.75 dB 3.25 dB

Note Document 955 612, Adjustable Loss Plan explains the transmission level plan in detail.

Table 6-D. Trunk Type Definitions

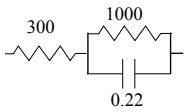
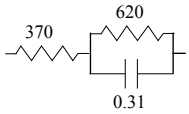
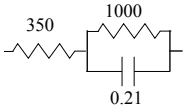
Trunk Type	Definitions
Digital CO Trunk (D/CO)	A digital trunk that connects a Class 5 End Office Switch in a network to the Teltronics switch via T1 or 2MB DTU peripherals.
Analog CO Trunk (A/CO)	An analog trunk that connects a Class 5 End Office Switch in a network to the Teltronics switch via analog GS/LS or DID trunks.
Digital Tie Trunk (D/TT)	A digital trunk that connects two Teltronics switches together, via T1 or 2MB DTU peripherals.
Analog Tie Trunk (A/TT)	An analog trunk that connects two Teltronics switches together, via analog E&M trunks.
Digital Toll Trunk (DITO)	A digital trunk that connects a Class 4 Toll Switch in a network to the Teltronics switch, via T1 or 2MB DTU peripherals.
Analog Toll Trunk (A/TO)	An analog trunk that connects a Class 4 Toll Switch in a network to the Teltronics switch, via analog E&M trunks.

Loop Performance - Line Units

Analog Long Loop Line Units (16 OPX, 16 2K LU, CILU)

Part No.	Acronym	Type	Loop Impedance	μ/A	Circuits
764 338	16 OPX	Analog Line Unit (ALU), Off Premise	Complex	μ-Law	16
764 339	16 2K LU	Analog Line Unit (ALU)	2K	A-Law	16
764 340	CILU	Analog Line Unit (ALU)	Complex	A-Law	16

Impedances: EIA Specification RS-464 Compromise Network as specified below.

	2-Wire (Input)	4-Wire (Balance)
764 340 A-Law Complex		
764 339 A-Law	600Ω	600Ω
764 338 μ-Law OPX	600Ω + 2μF	

Frequency Response: (loss, referred to 1004 Hz)	Frequency	Minimum	Maximum
	@60 Hz	20.0	
	@200 Hz	00.0	+5.0
	@300 Hz	-0.5	+1.0
	@3000 Hz	-0.5	+1.0
	@3200 Hz	-0.5	+1.5
	@3400 Hz	00.0	+3.0

Digital mW Response: 0.25dB Loss (μ-Law OPX)
3dB Loss (A-Law and Complex)

Return Loss: (Zt=600 ohm)	ERL; 22dB minimum, 30 dB typical SFRL; 20dB minimum, for 200 Hz < f < 3200 Hz SFRL; 26dB minimum, for 500 Hz < f < 3400 Hz
Idle Channel Noise: (C-msg weighted response) (3 kHz flat response)	 13 dBm C typical, < 16dBm C maximum 30 dBm typical, < 36dBm maximum
Longitudinal Balance: (200Hz <f <3400Hz)	 58 dB minimum
Crosstalk Loss: (200Hz <f <3200Hz)	 75 dB minimum
Maximum Loop Resistance:	Up to 2000 Ohms Loop current, including telephone (20mA at -48 VDC)
Maximum Loop Length:	16.9 km [10.5 Miles], using twisted pair .64 mm [22 AWG] 10.6 km [6.6 Miles], using twisted pair .51 mm [24 AWG] 6.6 km [4.1 Miles], using twisted pair .4 mm [26 AWG]
Envelope Delay Distortion: (relative)	Better than Limit B of EIA-464-A figure 60 (Feb. 1989) for frequency range 500 Hz through 3000 Hz.
Signal Distortion Ratio: (C weighted, 1020 Hz)	>33dB,for +0 to-30dBm >27 dB, for -30 to -40 dBm >22 dB, for -40 to -50 dBm
Harmonic Distortion: (C weighted, 0 <f <12kHz) (C weighted, 0 <f <4000Hz)	 <34 dB, for + 3dBm input <43 dB, for + 3dBm input
Facility Interface Codes (Off Premise Line Unit only):	 OL13B or OL13C
Maximum Ringers:	Analog Line Unit: 5 Off Premise Line Unit: 2
Message Waiting:	Voltage applied to Tip lead lights one neon lamp per line at 90 VDC from Tip to Ring (60 VDC sustaining with 56kohm series resistor per line).

Busy Lead Drive Circuit:	In Busy State: It provides a current sourcing connection to battery ground for negative voltage referenced loads ranging up to 60 mA DC. 1.2 V drop. Thermal overcurrent protection. Negative voltage must not exceed 60VDC. In Idle State: It provides open circuit to ground with 47 Kohm pulldown resistor to system battery. In Idle State: 48 Volts nominal through 47kohms (-56 volts maximum).
Transient Protection: (Tip, Ring, Busy leads)	± 800 Volts peak, 10 µS rise, 560 µS decay to 1/2 Value ± 1500 Volts peak, 10 µS rise, 160 µS decay to 1/2 Value

Standard Analog Line Units (16LU/F, 8LU/F)

Part No.	Acronym	Type	Impedance	µ/A	Circuits
764 311	16LU/F	ALU w/C-Lead & Test Message	600	µ-Law	16
764 313	ALU/16 XA	ALU w/C-Lead & Test Message	200	A-Law	16
764 314	16LU/F	ALU w/C-Lead & Test Message	600	A-Law	16
764 321	8LU/F	ALU w/C-Lead, Test Message, Milliwatt	600	µ-Law	8
764 323	ALU/8 XA	ALU w/C-Lead, Test Message, Milliwatt	200	A-Law	8
764 324	8LU/F	ALU w/C-Lead, Test Message, Milliwatt	600	A-Law	8

Input Impedance: (764 313, 764 323) (764 311, 764 314, 764 321, 764 324)	200Ω + (560Ω +0.1 µF) 600Ω + 2.15 µF
Digital mW Response:	3dB (Loss) ± 0.25 dB
Maximum Analog Input Level:	-6.0 dBm (Loss)
Overload Compression: (ref level: + 0 dB m, 1.02 kHz)	0.4 @ + 3 dBm 2.2 @ + 6 dBm
IM Distortion (4 tone): (-l0 dBm composite input)	second order > 43dB third order > 44dB

Frequency Response (loss, referred to 1004 Hz):

Frequency	Minimum	Maximum
@60 Hz	20.0	
@200 Hz	00.0	+5.0
@300 Hz	-0.5	+1.0
@3000 Hz	-0.5	+1.0
@3200 Hz	-0.5	+1.5
@3400 Hz	00.0	+3.0

Envelope Delay Distortion: (relative)	Better than Limit B of EIA-464-A figure 60 (Feb. 1989) for frequency range 500 Hz through 3000 Hz.
Return Loss: (764 313, 764 323) (Zt = 200Ω + (560Ω + 0.1μF)) (764 311, 764 314, 764 321, 764 324) (Zt = 600Ω)	ERL; 22dB minimum, 30 dB typical SFRL; 20dB minimum, for 200 Hz < f < 3200 Hz SFRL; 26dB minimum, for 500 Hz< f < 3400 Hz
Peak to Average Ratio (PAR):	> 90, for - 30dBm > levels > 0dBm, typical
Idle Channel Noise: (C-msg weighted response) (3 kHz flat response)	 13 dBmC typical, 16 dBmC maximum 30 dBm typical, 36 dBm maximum
Signal Distortion Ratio: (C weighted, 1020 Hz)	>33 dB, for + 0 to - 30 dBm >27 dB, for - 30 to - 40 dBm >22 dB, for - 40 to - 50 dBm
Harmonic Distortion: (C weighted, 0 < f <12k Hz) (C weighted, 0 < f <4000 Hz)	 < 34 dB, for + 3dBm in < 43 dB, for + 3dBm in
Longitudinal Balance: (200 Hz < f < 3400 Hz)	 > 58 dB minimum
Crosstalk: (200Hz <f <3400 Hz)	75 dB minimum
Loop Resistance: (20 mA @ 42 V battery)	900 ohms maximum, including telephone instrument
Maximum Ringers:	5 Ringer Equivalency Number (REN)
Message Waiting Indication: (optional)	Applies pulsating +48 VDC through 20K ohms to Tip lead (powers one 90 VDC neon lamp with 56K ohm resistor in station set, bridged across Tip and Ring leads).
Busy Lead Drive Circuit:	In busy state, provides a current sourcing connection to battery ground for negative voltage referenced loads ranging up to 60 mA DC. 1.2V drop. Thermal overcurrent protection. Negative voltage must not exceed 60VDC. In idle state, provides open circuit to ground with 47 Kohm pulldown resistor to system battery. Idle: -48 Volts nominal through 47 Kohms (-56 volts maximum).

Transient Protection:	± 800 Volts peak, 10 µS rise, 560 µS decay to 1/2 Value ± 1500 Volts peak, 10 µS rise, 160 µS decay to 1/2 Value

Standard Digital Line Units (16 DLU, DLU, HDLU 2)

Part No.	Acronym	Type	Impedance	μ/A	Circuits
764 308	16DLU	Digital Line Unit (HDLU)	-	both	16
764 309	8DLU	Digital Line Unit (DLU)	-	both	8
764 333	HDLU 2	Digital Line Unit (HDLU 2)	-	both	16

Loop Length
HDLU/DLU: Up to 1.53 km [5000 ft.], using twisted pair 0.511 mm [24 AWG] wire.
HDLU 2: Up to 1 km [3281 ft.], using twisted pair 0.409 mm [26 AWG] wire.

Channel Rate
HDLU/DLU: 256 kbps burst rate (Time Compression Multiplexing)
HDLU 2: 512 kbps burst rate (DPSK modulation)
The burst modulation is 20 bits long, composed of two 8 bit B channels and two 2 bit D channels.

Effective Rate: 80 kbps Full Duplex
64 kbps voice plus 16 kbps signaling

Bit Error Rate
HDLU/DLU 10^{-7} (at 1.53 km [5000 ft] loop length.)
HDLU 2: N/A

Simultaneous Voice Data Digital Line Unit (SVDDLU)

Part No.	Acronym	Type	Impedance	μ/A	Circuits
764 330	SVD DLU	Digital Line Unit, SVD	-	both	16

Loop Length: Up to 1.00 km [3300 ft.], using twisted pair 0.4049 mm [26 AWG] wire.

Channel Rate: 512 kbps burst rate (DPSK modulation)
The burst modulation is 20 bits long, composed of two 8 bit B channels and two 2 bit D channels.

Effective Rate: 160 kbps Full Duplex (to Optic X)
2 B-channels at 64 kbps voice plus
2 D-channels at 16 kbps.

Bit Error Rate: 10^{-7} at 1.00 km [3300 ft]

Basic Rate Interface S Hex Line Unit (BRI 8 S)

Part No.	Acronym	Type	Impedance	μ/A	Circuits
764 380	BRI 8 S	Digital Line Unit, Basic Rate S I/F, Hex	100	A	8

Interface Standards:	NI-1 and ETSI, S-interface of ITU-T I.430 and ANS T1 605.
Circuits/Card:	8 (each with 2B+D channels).
Channel Rate:	192 Kb/s (64 Kb/s over each B-channel
Transmission Medium:	Balanced metallic twisted-wire pair for transmit and receive on B-channels.
Transmission Mode:	Full duplex transmission from Point to Point
Line-Coding	Alternate Mark Inversion (AMI)
Loop Length:	Up to 1 km [~3000 ft.], using twisted pair 0.5105 mm [24 AWG] wire.
Power Feeding:	A maximum of 2.5 W per interface
Extension Number per BRI-Interface:	2 (only one terminal per BRI-interface is supported at this time)
Impedance:	100 Ohms

Loop Performance - Trunk Units

T1 Digital Trunk Units (T1 DTU, T1 DTU EX)

Part No.	Acronym	Type	Impedance	μ/A	Circuits
761 301	T1 DTU	T1 Digital Trunk Unit	100	μ	25
761 319	T1 DTU EX	T1 Digital Trunk Unit, Extended	100	μ	25
761 365	T1 DSP	T1 Digital Signal Processing	100	μ	25

Transmission Rate:	1.544 Mbps
Frame Format:	AT&T Accunet® T1.5 Service D4 or ESF ANSI T1.403, T1.408 D4/ESF ITU-T G.704 12 frame (D3/D4) or ESF
Transmission Channels:	24 DSO voice or data trunks
Port Consumption:	25 ports; 24 transmission channels, 1 system control port
Impedance:	100 Ohm
Error Rate Monitoring:	Bipolar violation, CRC4 (using DTUEX ESF)
Recommended Cable Types:	General Cable 4162 or 4503 WECOABAM
Synchronization (provided by system software):	Up to four prioritized DS1 master digital trunks can be selected per node. Stratum IV compatible system clock standard; For Teltronics systems: Stratum III using Reference Timing Unit, Stratum I & II with external source and RTU.
Software Options:	DTU EX supports 64kbps clear channel capability using B8ZS.
Channel Interface Codes:	1.544 Super Frame = 04DU9-B

It includes the following features:

- Extensive front panel LED status and mode indicators.
- Incoming and Outgoing Electrical Interface comply with Bell Technical Advisories #32 and #34.
- PCM inputs and outputs withstand 600 volts, applied between either, or both sides, of the pair and ground.

Note The unit will not withstand more than ± 7 volts between the leads of a PCM pair.

2 MB Digital Trunk Units (2MB DTU), (E1 DTU EX)

Part No.	Acronym	Type	Impedance	μ/A	Circuits
762 307	2MB DTU	2 Megabit Digital Trunk Unit	75	A	32
761 318-07 (& lower)	E1 DTU EX	E1 Digital Trunk Unit Extended	75	A	32
761 318-08 (& up)	E1 DTU EX	E1 Digital Trunk Unit Extended	75/120	A	32
761 347	E1 DTU EX	E1 120Ω Digital Trunk Unit Extended	120	A	32
761 366	E1 DSP	E1 Digital Signal Processing	75/120	A	32

Transmission Rate:	2.048 Mbps
Frame Format:	ITU-T G.703
Transmission Channels:	30 DSO voice or data trunks
Port Consumption:	32 ports
Error Rate Monitoring:	Frame alignment signal
Recommended Cable Types:	Per ITU-T G.703, 75 ohm coaxial pair
Impedance:	75 ohm and 120 ohm (optional)
Synchronization (provided by system software):	Up to four prioritized DS1 master digital trunks can be selected per node.
Software Options:	DTU supports 64kbps clear channel capability using HDB3 encoding, and Channel Associated Signaling (CAS), (ITU-T III.3 G.704)

It includes the following features:

- Extensive front panel LED status and mode indicators.
- Incoming and Outgoing Electrical Interfaces comply with ITU-T G.703.
- PCM inputs and outputs withstand 600 volts, applied between either, or both sides, of the pair and ground.

Note The unit will not withstand more than ± 7 volts between the leads of a PCM pair.

Digital Juncture [Trunk] Unit (DJU)

Part No.	Acronym	Type	Impedance	μ/A	Circuits
761 322	DJU	Digital Trunk Unit, Controlled CEPT	75	both	32

Transmission Rate:	2.048 Mbps
Transmission:	30.5 m [100 ft]
Frame Format:	ITU-T G.703
Transmission Channels:	30 DSO voice or data trunks
Port Consumption:	32 ports
Error Rate Monitoring:	Frame alignment signal
Recommended Cable Types:	E1
Synchronization (provided by system software):	Up to four prioritized master digital trunks can be selected per node.
Software Options:	DTU supports 64kbps clear channel capability using HDB3 encoding, and Channel Associated Signaling (CAS), ITU-T III.3 G704)

2-Wire and 4-Wire E&M Analog Trunk Units (2WE&M, 4WE&M)

Part No.	Acronym	Type	Impedance	μ/A	Circuits
761 302	2WE&M	2-Wire E&M Trunk Unit	complex	μ-Law	8
761 303	2WE&M	2-Wire E&M Trunk Unit	complex	A-Law	8
761 304	4WE&M	4-Wire E&M Trunk Unit	complex	μ-Law	8
761 305	4WE&M	4-Wire E&M Trunk Unit	600	A-Law	8
761 309	4WE&M UK	4-Wire E&M Trunk Unit, UK Standard	600	A-Law	8

8 circuit 2 or 4-Wire trunk unit with D.C. E&M signaling leads.

Input Impedance	
761 302, 761 303, 761 304, 761 305	2-Wire 600/900 Ω (user selectable) + 2.15 μF 4-Wire 600/900 Ω (user selectable) + 2.15 μF
761 309	4-Wire 600 Ω resistive
Frequency Response:	2-Wire E & M: > 12 dB @ 600 or 900 Ohms 4-Wire E & M: > 20 dB @ 600 or 900 Ohms
Echo Return Loss:	(2-Wire) ITU-T Q.552 sec. 2.1.1.2 (see Figure 1/ Q.552) (4-Wire) to be provided.
Idle Channel Noise: (μ-Law)	< 19dBrnC
Impulse Noise:	<10 Counts/hour @ 40 dBrnC
Longitudinal Balance:	>58 dB minimum, 200 to 3400 Hz
Crosstalk Loss:	> 75 dB, 200 to 3400 Hz
Group Delay:	ITU-T Q.552 Section 3.1.2.2 (see Figure 6/Q.552)
Facility Interface Codes:	TL11E (2-W) or TL31E (4-W)
Transient Protection: (T/R, T1/R1, E&M leads)	± 800 volts peak, 10 μS rise, 560 μS decay to 1/2 value ± 1500 volts peak, 10 μS rise, 160 μS decay to 1/2 value
E Lead:	No detect: >20 Kohms to Ground Detect: <150 Ohms to ground Minimum pulse duration 35 mS
M Lead Type I:	Idle = Ground Seized = -48 volts
Type V:	Idle = Open Seized = Ground
M Lead Current Limit:	2 Amps for 100 mS (PTC protector will trip at loads exceeding 100 mA)

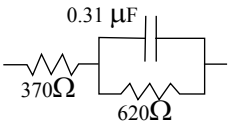
Earth Calling/Loop Calling (ECLC) and Loop Start China (8LS XA)

Part No.	Acronym	Type	Impedance	μ/A	Circuits
761 333	ECLC	Earth Calling/Loop Calling Trunk	complex	A-Law	8
761 348	8LS XA	Loop Start Trunk, China	complex	A-Law	8

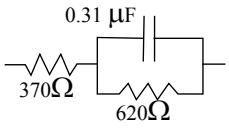
These assemblies use loop and ground signaling that conform to U.K B.A.B.T. standards. It has a complex 2-Wire impedance and a complex 4-Wire balance impedance.

Impedance: (Complex)

2-Wire



4-Wire



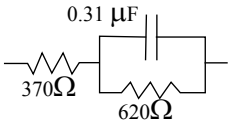
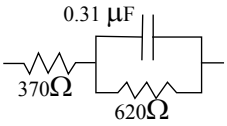
Idle Impedance @20 Hz:	1.75 uF in series with 8200 Ohms.
Frequency Response:	(2-Wire) ITU-T Q.552 Section 3.1.1.5 (see Figure 6/Q.552)
Return Loss: (SFRL 200 to 3400 Hz)	ITU-T Q.552 Section 2.1.1.2 (see Figure 1/Q.552) >16 dB Line to Trunk >18 dB Trunk to Trunk
Idle Channel Noise:	<74 dBmP
Impulse Noise:	<10 Counts per hour @ 40 dBrnC
Longitudinal Balance:	>58 dB minimum, 200 to 3400 Hz
Crosstalk Loss:	>75 dB, 200 to 3400 Hz.
Loop Resistance: (Maximum)	Unit will function with loop currents >18 mA and with Central Office line supply Voltages of -24 to -104 VDC.
Tip/Ring Ground Detection:	Unit will detect ground through 3500 Ohms or less with a ground differential of up to ± 3 Volts.
Ground Immunity:	Unit will not detect grounds of 11,000 Ohms or more.
Ringing Detector:	Unit will detect ringing of 40 to 125 volts rms, 16 to 33 Hz. Total Voltage, AC plus bias must not exceed 240 volts peak.
Group Delay:	ITU-T Q.552 Section 3.1.2.2 (see Figure 7/Q.552)
Transient Protection: (Tip & Ring leads)	±800 Volts peak, 10 μS rise, 560 μS decay to 1/2 Value ±1500 Volts peak, 10 μS rise, 160 μS decay to 1/2 Value

Idle DC Current: EC - < 0.1 mA at -48 VDC, Ring to ground
LC - < 1 mA, Tip to Ring

Loop Start/Loop Calling Trunk Units w/Pulse Metering (LSM, LCM)

Part No.	Acronym	Type	Impedance	μ/A	Circuits
761 334	LSM50	Loop Start Trunk, w/50Hz PM	600	A-Law	8
761 335	LSM12	Loop Start Trunk, w/12 KHz PM	600	A-Law	8
761 336	LSM16	Loop Start Trunk, w/16 KHz PM	600	A-Law	8
761 341	LSM50	Loop Start Trunk, w/50Hz PM	600	μ-Law	8
761 342	LSM12	Loop Start Trunk, w/12 KHz PM	600	μ-Law	8
761 343	LSM16	Loop Start Trunk, w/16 KHz PM	600	μ-Law	8
761 344	LCM50	Loop Calling Metering Trunk, w/50 HZ	complex	A-Law	8
761 345	LCM12	Loop Calling Metering Trunk, w/12KHZ	complex	A-Law	8
761 346	LCM16	Loop Calling Metering Trunk, w/16KHZ	complex	A-Law	8

This assembly uses pulse burst signaling for toll impulse registration. The 50 Hertz assembly accepts common mode (longitudinal) signals. The 12 Khz and 16 Khz units accept differential (metallic) signals.

Impedance:	2-Wire	4-Wire
(761 334, 761 335, 761 336, 761 341, 761 342, 761 343)	600 Ω (resistive)	600 Ω (resistive)
(761 344, 761 345, 761 346)		

Frequency Response: (2-Wire) Figure 6-1 ITU-T Q.522

Return Loss: ITU-T Q.552 Section 2.1.1.2 (see Figure 1/ Q.552)

Idle Channel Noise: <74 dBmP

Impulse Noise: <10 Counts per hour @ 40 dBrnC

Longitudinal Balance: >58 dB minimum, 200 to 3400 Hz

Crosstalk Loss: >75 dB, 200 to 3400 Hz.

Metering Pulses: 50 Hz ±10% 36 to 150 V. rms (761 334)
12 KHz ±1% 50 mV to 100 mV rms (761 335)
16 KHz ±1% 25 mV to 50 mV rms (761 336)

Metering Pulse Duration:	70 mS min. must detect (761 334 - 50 Hz) 50 mS min. must detect (761 335 - 12khz) 50 mS min. must detect (761 336 - 16khz)
Loop Resistance: (Maximum)	Units will function with loop currents >18 mA and with Central Office line supply Voltages of -24 to -104 VDC
Ringing Detector:	Unit will detect ringing of 40 to 125 volts.rms, 16 to 33 Hz. Total Voltage AC plus bias must not exceed 240 volts peak
Group Delay:	ITU-T Q.552 Section 3.1.2.2 (see Figure 7/ Q.552)
Transient Protection: (Tip & Ring leads)	± 800 Volts peak, 10 µS rise, 560 µS decay to 1/2 Value ± 1500 Volts peak, 10 µS rise, 160 µS decay to 1/2 Value
Idle DC Current:	< 1 mA, Tip to Ring

Ground Start/Loop Start/Alternate Analog Trunk Units (GS/LS, ALS)

Part No.	Acronym	Type	Impedance	µ/A	Circuits
761 329	GS/LS	Ground-Start/Loop-Start, Russia	600	A-Law	8
761 330	GS/LS	Ground-Start/Loop-Start	900	µ-Law	8
761 331	GS/LS	Ground-Start/Loop-Start	600	A-Law	8
761 337	GS/LS	Ground-Start/Loop-Start, w/Busy Leads	900	µ-Law	8
761 338	ALS	Alternate Loop-Start Trunk	600	A-Law	8
761 339	ALS ALS PM	Alternate Loop-Start Trunk, w/50 Hz PM	600	A-Law	8

Input Impedance: (761 330, 761 337)	(2- or 4-Wire) 900 Ω plus 2.15 µF
(761 331, 761 329, 761 338, 761 329)	(2- or 4-Wire) 600 Ω resistive
Frequency Response:	(2-Wire) ITU-T Q.552 Section 3.1.1.5 (see Figure 6/Q.552)
Return Loss:	ITU-T Q.552 Section 2.1.1.2 (see Figure 1/Q.552)
(SFRL 200 to 3400 Hz)	>16 dB Line to Trunk >18 dB Trunk to Trunk

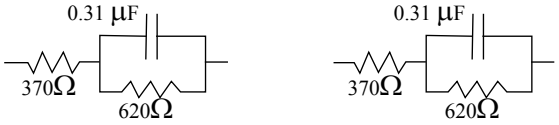
Idle Channel Noise: (761330, 761337)	< 19 dBrnC
(761331, 761329, 761338, 761 339)	> 74 dBmP
Impulse Noise:	< 10 Counts per hour @ 40 dBrnC
Longitudinal Balance:	> 58 dB minimum, 200 to 3400 Hz
Crosstalk Loss:	> 75 dB, 200 to 3400 Hz
Loop Resistance: (Maximum)	Unit will function with loop currents >18 mA and with Central Office line supply Voltages of -24 to -104 VDC.
Tip Ground Detection:	Unit will detect ground through 3500 Ohms or less with a ground differential of up to ± 3 Volts.
Ground Immunity:	Unit will not detect grounds of 11,000 Ohms or more.
Ringing Detector:	Unit will detect ringing of 40 to 125 volts rms, 16 to 33 Hz. Total Voltage, AC plus bias must not exceed 240 volts peak.
Group Delay:	Q.552 Section 3.1.2.2 (see Figure 7/Q.552)
Transient Protection: (Tip, Ring leads)	± 800 Volts peak, 10 μS rise, 560 μS decay to 1/2 Value. ± 1500 Volts peak, 10 μS rise, 160 μS decay to 1/2 Value.
Idle DC Current:	GS - < 0.1 mA at -48 VDC, Ring to ground LS - < 1 mA, Tip to Ring

Ground Start/Alternate Loop Start Trunks (761 338 and 761 339) have an alternate loop start trunk assembly for incoming loop direct inward dial applications.

P/N 761 339 has additional pulse metering capabilities.

Direct Inward Dial Analog Trunk Units (DID, DDIC)

Part No.	Acronym	Type	Impedance	μ/A	Circuits
761 300	DID	Direct Inward Dialing Trunk	option	μ-Law	8
761 306	DID	Direct Inward Dialing Trunk	option	A-Law	8
761 308	DDIC	Direct Dialing Inward Trunk	complex	A-Law	8
761 325	DID HK	Direct Inward Dialing Trunk	option	μ-Law	8

Input Impedance:	2-Wire 4-Wire
(761 300, 761 306, 761 325)	900 Ohms in series with 2.0 μF, or 600 Ohms in series with 2.0 μF, or 900 or 600 Ohms resistive (option)
(761 308)	
Frequency Response:	200 to 3400 Hz (referred to loss @ lkhz). 60Hz: +20 dB maximum 200Hz: -0.0 dB Typical; + 4.0 dB maximum 300Hz: -0.4 dB Typical; + 0.65 dB maximum 300 Hz: -0.4 dB Typical; + 1.65 dB maximum 3200 Hz: -1.4 dB Typical; + 1.5 dB maximum 3400 Hz: -1.0 dB Typical; + 3.0 dB maximum
Echo Return Loss:	> 18 dB with the appropriate impedance
Single Frequency Return Loss:	> 12 dB, Trunk to Line @ 200 to 3400 Hz
Idle Channel Noise:	< 18.5 dBrn C
Longitudinal Balance:	> 58 dB minimum, 200 to 3400 Hz
Crosstalk Loss:	> 75 dB, 200 to 3400 Hz
Loop Resistance: (Maximum)	1200 Ohms for minimum 18 mA loop current at -48 VDC
Relative Envelope Delay:	< 102 msecs @ 1100 - 2500 Hz < 150 msecs @ 800 - 2700 Hz < 280 msecs @ 500 - 3000 Hz
Transient Protection: (Tip, Ring leads)	± 800 Volts peak, 10 μS rise, 560 μS decay to 1/2 Value. ± 1500 Volts peak, 10 μS rise, 160 μS decay to 1/2 Value.

2100 and 2600 Hz In-Band Signaling 4-Wire Trunks (4WSF A, S ACTK)

Part No.	Acronym	Type	Impedance	μ/A	Circuits
761 357	4WSF A	Single Frequency Trunk, 2600Hz Sig.	600	A-Law	8
761 358	4WSF A	Single Frequency Trunk, 2600Hz Sig.	600	A-Law	8
761 368	S ACTK	AC Sig. Trunk, 2100Hz, 600/750Hz	600	A-Law	8

Impedance:	2-Wire, 600W resistive
Digital mW 1004 Hz Response: -13.0 TLP (761 357, 761 358) +0.0 TLP (761 357, 761 358)	 -13.0 dBm, ± 0.4 dBm -0.25 dBm, ± 0.4 dBm
(761 368)	0 dBm, -13 dBm, -16dBm, or -10dBm ***Note*** These output level options are paired with the input (Transmit Gain) options below
Transmit Gain (1004 Hz, encode): +4.3 TLP (761 357, 761 358) +0.0 TLP (761 357, 761 358)	 +4.3 dBm, ± 0.4 dBm +0.0 dBm, ± 0.4 dBm
(761 368)	0 dBm, -4.3dBm, -7dBm, or -10dBm
Frequency response:	(4-Wire) Figure 6-2 ITU-T Q522, to be provided. During call set-up a 2600 Hz notch filter is inserted into the transmit speech path.
Return Loss:	ITU-T Q.552 Section 2.1.1.2 (see Figure 1/Q.552)
Idle Channel Noise: (Gains at 0/0) (C-message) (3 KHz Flat) (Psophmetric)	 < 19 dBrnC0 < 30 dBrn < 74 dBmP
Group Delay:	ITU-T Q.552 Section 3.1.2.2 (see Figure 7/Q.552)
Transient Protection: (Tip/Ring T1/R1 leads):	±800 Volts peak, 10 μS rise, 560 μS decay to 1/2 Value. ±1500 Volts peak, 10 μS rise, 160 μS decay to 1/2 Value

Out of Band Energy:	
(3Khz detection bandwidth)	
(4k - 10k Hz)	-12 dBm
(10k - 25k Hz)	-18 dBm
(25k - 40k Hz)	-24 dBm
Above 40k Hz	-28 dBm
Gain Tracking Linearity:	
(0 to -37 dBm)	± .25 dBm
(-37 to -50 dBm)	± .50 dBm
Inter-Modulation Distortion:	
(4 tones: 856, 863, 1374, &	
1385 Hz @ -13 dBm)	
(R2)	> 50 dB
(R3)	> 52 dB
Impulse Noise:	
(0 hits in 5 minutes)	47 dBrnC
Crosstalk Attenuation:	
(two paths: 200-3200 Hz)	> 75 dB
Longitudinal Balance:	
(300,500,1k Hz)	> 58 dB
(3k Hz)	> 53 dB
2600 Hz Voice Path Notch Filter:	
Depth	> 35 dB
Width at -35 dB	> ± 15 Hz
Ripple Exclusive	
2600 Hz ± 400 Hz:	< 0.5 dB
Ripple Exclusive	
2600 Hz ± 200 Hz:	< 1.0 dB
Notch Hold Time After	
Valid Tone:	250 mS.
Signaling Interface:	
(2600 Hz Tone Output)	
(761 357)	-9.5 dBm0 ± 0.5 dB
(761 358)	-8 dBm0 ± 0.5 dB
(Frequency Accuracy)	2600 Hz ± 2 Hz
(2600 Hz Detector	
Frequency Window)	2585 Hz to 2615 Hz
(Must Detect Level)	
(761 357)	> -30 dBm0 and 10 dB above any other in-band signal
(761 358)	> -26 dBm0
(No Detect Level)	
(761 357)	< -35 dBm0
(761 358)	< -31 dBm0
Loop Back Test:	-0.5 dB ± 1.0 dB

Analog Signal Generator (ASG)

Part No.	Acronym	Type	µ/A	Circuits
763 394	ASG	Analog Signal Generator	µ/A	8

Modulation Type:	Continuous-Phase Binary Frequency-Shift-Keying (BFSK)
Mark (Logic 1):	1200 ± 12 Hz
Space (Logic 0):	2200 ± 22 Hz
Carrier Level:	-13.5 dBm ± 1.5 dB at the point of application to the loop facility into a standard 900 ohm test termination.
Carrier Purity:	Total power of all extraneous signals in the voiceband (0-4 KHz), including products of nonlinear or quantizing distortion, shall be at least 30 dB below the power of each carrier frequency, measured at the point of application to the loop facility into a 900 ohm test termination.
Source Impedance:	900 ohms +2.16 µF nominal, with a return loss that satisfies the requirements for voice transmission input impedance as described in TR-NWT-000507, Table 7.4.2.
Longitudinal Balance:	Impedance balance to ground shall conform to the requirements in TR-NWT-000507, Section 7.4.9, for voice transmission.
Transmission Rate:	1200 ± 12 baud
Application of Data	Serial, binary, asynchronous

Multi-Frequency Receiver Unit with Type R1 Protocol (MFR1)

Part No.	Acronym	Type	µ/A	Circuits
763 346	MF/2	Multi-Frequency Receiver, w/Protocol R1	µ-Law	2
763 347	MF/4	Multi-Frequency Receiver, w/Protocol R1	µ-Law	4
763 348	MF/8	Multi-Frequency Receiver, w/Protocol R1	µ-Law	8
763 396	2MFR1A	Multi-Frequency Receiver, w/Protocol R1	A-Law	2
763 397	4MFR1A	Multi-Frequency Receiver, w/Protocol R1	A-Law	4
763 398	8MFR1A	Multi-Frequency Receiver, w/Protocol R1	A-Law	8

Number of Decoders per Module:	2, 4, 8
LED Indicators:	Busy - GREEN Alarm - RED
Signal Detect Level (Input):	0 to -25 dBm per frequency
Signal Reject Level:	< -35 dBm per frequency
Twist (Attenuation Distortion):	< 6 dB
Frequency Deviation:	Signal Detection Bandwidth: ± 1.5% +5 Hz
Registration Timing:	Signal Detection: > 30 ms Signal Rejection: < 10 ms Inter-digital Pause Delay > 20 ms Inter-digital Pause Reject < 10 ms

The two frequencies in an MF tone pair must be applied to the MF decoder input within 4ms of each other. Table 6-E shows the MF tones.

Table 6-E. MF Tones

Tone #	Frequencies in Hertz	Digit & Control	ITU-T System5
1	700 + 900	1	
2	700 + 1100	2	
4	700 + 1300	4	
7	700 + 1500	7	
14	700 + 1700	ST3P	Code 11
3	900 + 1100	3	
5	900 + 1300	5	
8	900 + 1500	8	

Table 6-E. MF Tones

13	900 + 1700	STP	Code 12
6	1100 + 1300	6	
9	1100 + 1500	9	
12	1100 + 1700	KP	KP1
10	1300 + 1500	0	
15	1300 + 1700	ST2P	KP2
11	1500 + 1700	ST	

Multi-Frequency Receiver Unit R2 (MFR2)

Part No.	Acronym	Type	µ/A	Circuits
763 350	MFR2FF	MF Rcvr., R2 Prot., w/Fwd-Fwd	A-Law	2
763 351	MFR2FB	MF Rcvr., R2 Prot., w/Fwd-Bwd	A-Law	2
763 352	MFR2FF	MF Rcvr., R2 Prot., w/Fwd-Fwd	µ-Law	2
763 353	MFR2FB	MF Rcvr., R2 Prot., w/Fwd-Bwd	µ-Law	2
763 358	8MFR2FF	MF Rcvr., R2 Prot., w/Fwd-Fwd	A-Law	8
763 359	8MFR2FB	MF Rcvr., R2 Prot., w/Fwd-Bwd	A-Law	8
763 360	8MFR2FF	MF Rcvr., R2 Prot., w/Fwd-Fwd	µ-Law	8
763 361	8MFR2FB	MF Rcvr., R2 Prot., w/Fwd-Bwd	µ-Law	8
763 368	8MFR2BB	MF Rcvr., R2 Prot., w/Bwd-Bwd	A-Law	8

Number of Decoders per Module:	2, 8
LED Indicators:	Busy - GREEN Alarm - RED
Signal Detect Level (Input):	-5 to -35 dBm per frequency
Signal Reject Level:	< -42 dBm per frequency
Twist (Attenuation Distortion):	< 5dB
Frequency Deviation:	Signal Detection Bandwidth: ± 10 Hz per frequency
Registration Timing:	Signal Detection: >35ms Signal Rejection: <7ms Inter-digital Pause Delay > 30ms Inter-digital Pause Reject < 25ms

Table 6-F shows the MF tones.

Table 6-F. MFR2 Frequency

Digit (Forward)	Frequency 1 (Hz)	Frequency 2 (Hz)	Digit (Backward)	Frequency 1 (Hz)	Frequency 2 (Hz)
1	1380	1500	1	1140	1020
2	1380	1620	2	1140	900
3	1500	1620	3	1020	900
4	1380	1740	4	1140	780
5	1500	1740	5	1020	780
6	1620	1740	6	900	780
7	1380	1860	7	1140	660
8	1500	1860	8	1020	660
9	1620	1860	9	900	660
10	1740	1980	10	780	660
11	1380	1980	11	1140	540
12	1500	1980	12	1020	540
13	1620	1980	13	900	540
14	1740	1980	14	780	540
15	1860	1980	15	660	540

Unit Performance - Detector Units

Call Progress Detector (CPD)

Part No.	Acronym	Type	Circuits
763 334	CPD	Call Progress Detector	8

Number of Detectors per Module: 8

Precise Tone Detector

Frequency Limits:

Tone	Lower Limit	Upper Limit
350 Hz	346.5 Hz	353.5 Hz
440 Hz	435.6 Hz	444.4 Hz
480 Hz	475.2 Hz	484.8 Hz
620 Hz	613.8 Hz	626.2 Hz

Level Limits: -30 dBm0 to 0 dBm0

Special Information Tone (SIT) Detector:

Frequency Limits:

SIT	Lower Limit	Upper Limit
1	845 Hz	1005 Hz
2	1343 Hz	1457 Hz
3	1741 Hz	1812 Hz

Level Limits: -28 dBm0 to 0 dBm0

Debounce Interval:

Ringback Tone:	50 ms
Busy Tone:	100 ms
Dial Tone:	100 ms
SIT:	150 ms
Broadband Energy:	200 ms

Ringback Cadence Time-out Interval: 5 sec.

The Call Progress Detector validates answer/no answer status according to the signaling conditions in Table 6-G.

Table 6-G. CPD Answer/No Answer Conditions

Declaration of Answer	Declaration of No Answer
1. Pause for answer in Facility is exceeded, and no signals (including ringback) have been seen by CPD.	1. Wait for answer in Facility is exceeded.
2. Ringback followed by 5 seconds of no ringback.	2. Busy tone.
3. CPD Facility time-out (no ringback detected) followed by broadband energy.	3. Ringback followed by busy tone.
4. Dial tone.	4. Special information tone.
5. Ringback followed by dial tone.	5. Ringback followed by SIT.
	6. Call abandoned before answer determination is made.

Domestic Precise Tone Frequency Reference

Some tone combinations (particularly ringback) can vary from area to area (See AT&T® 61100 for more detail.). Table 6-H is provided for reference only. The CPD will decode the meaning of these frequencies into domestic precise tone indications for use in determining the state of a call. Other (perhaps spurious) frequency combinations may occur but will not be reported by the CPD.

Table 6-H. Domestic Precise Tone Frequency Reference

Purpose	Frequencies (Hz)						
	350	440	480	620	950	1400	1777
Dial Tone	x	x					
Busy Tone			x	x			
Reorder Tone			x	x			
Ringback Tone		x	x				
Low Tone			x	x			
High Tone			x				
Preemption Tone		x		x			
Camp-On Tone		x					
Special Information Tone (SIT) 1					x		
Special Information Tone (SIT) 2						x	
Special Information Tone (SIT) 3							x

Broadband Dial Tone Detector Unit (BDTD)

Part No.	Acronym	Type	Circuits
763 335	BDTD	Broadband Dial Tone Detector	8

Number of Detectors per Module: 8

Frequency Limits: Lower: 340 Hz
Higher: 640 Hz

Level Limits: -36 dBm0 to 0 dBm0

Unit Performance - Trunk Bypass Unit

Purpose:	The Trunk Bypass Unit provides signaling circuitry appropriate to bypass the C.O. ground start/loop start trunk to loop around the switch in the event of a total failure.
Mounting:	Mounts in a 48.3 cm [19 inch] Auxiliary Shelf (rack or wall mount versions).
Size:	11.4 by 14.0 by 1.3 cm [4 1/2 X 5 1/2 X 1/2 inches]
Number of Circuits per Unit:	Four circuits provide bypass capability for four trunk loops to four station loops.
Electrical:	Each Trunk Bypass Unit requires -48 VDC @ approximately 80 mA current.
FCC Registration:	Stand Alone Partially Protected: B988K-69828-TP-E Ringer Equivalence 0.0B Fully Protected: BB988K-62939-PF-E Ringer Equivalence 0.0B
Precautionary Note:	DTMF central office trunks require DTMF station sets. Dial Pulse central office trunks require dial pulse station sets for proper operation during the bypassed condition. GS trunks require grounding sets for outgoing calls.

Unit Performance - Subscriber Line Units

Part No.	Acronym	µ/A	Type and Features	Impedance	Circuits
764 354	COLU A	A	Central Office Line Unit, China, Test Out, D-A -3.5dB, A-D 0dB.	Complex Impedance (200+680// 0.1µF)	16
764 355	COLU A	A	Central Office Line Unit, China, 16 KHz Pulse Metering, Reverse Battery, Test Out, D-A -3.5dB, A-D 0dB.	Complex Impedance (200+680// 0.1µF)	16
764 356	COLU A	A	Central Office Line Unit, China, Reverse Battery, Test Out, D-A –3.5dB, A–D 0dB.	Complex Impedance (200+680// 0.1µF)	16
764 357	COLU A	A	Central Office Line Unit, Test Out, D–A 0dB, A-D 0dB.	600 Ohm	16
764 358	COLU A	A	Central Office Line Unit, 12 KHz Pulse Metering, Reverse Battery, Test Out, D-A 0dB, A-D 0dB.	600 Ohm,	16
764 359	COLU A	A	Central Office Line Unit, Test Out, D–A –7.0dB, A-D 0dB.	600 Ohm,	16
764 360	COLU A	A	Central Office Line Unit, 16 KHz Pulse Metering, Reverse Battery, Test Out, D-A -7.0dB, A-D 0dB.	600 Ohm,	16

2-Wire Line Interface:	Provides DC current to the line, sends voice signals to the telephone apparatus, and receives voice signals from the telephone transmitter.
2-Wire Input Impedance:	Set by external resistors and capacitors. Exact component values are determined by the country specific requirements.
Minimum Loop Current Detection Threshold:	Power-down mode: 2000 ohms @48 Volt Battery
Constant Current Feed:	29ma 25%
Ring Trip Detection Threshold:	2000 ohms

Return Loss:	ITU-T Q.552 Section 2.1.1.2 (see Figure 6/Q.552)
Periodic Pulse Metering	
• Periodic Pulse Metering:	12 or 16 kHz
• Pulse Duration:	Under system software control, with a range from 60 to 300 ms
• Minimum Time Between Pulses:	60 ms
• Metering Source Frequency:	Derived from the 2.048 MHz master clock and shared by all line circuits; the signal is inputted on the 4-Wire receive side of the line interface.; a notch filter is required on the transmit side (A-D) between the CLIC and the Codec.
• Frequency:	12/16 kHz 1%
• Level:	V RMS 20% into 200 W load
• Distortion:	£ 2%

Performance Illustrations

Line and Trunk performance conforms, as noted in the illustrations and categories sited below, to ITU-T Fascicle VI.5 - Q.552 recommendations. ITU-T conformance is also referred to throughout this chapter (see index heading “ITU-T”).

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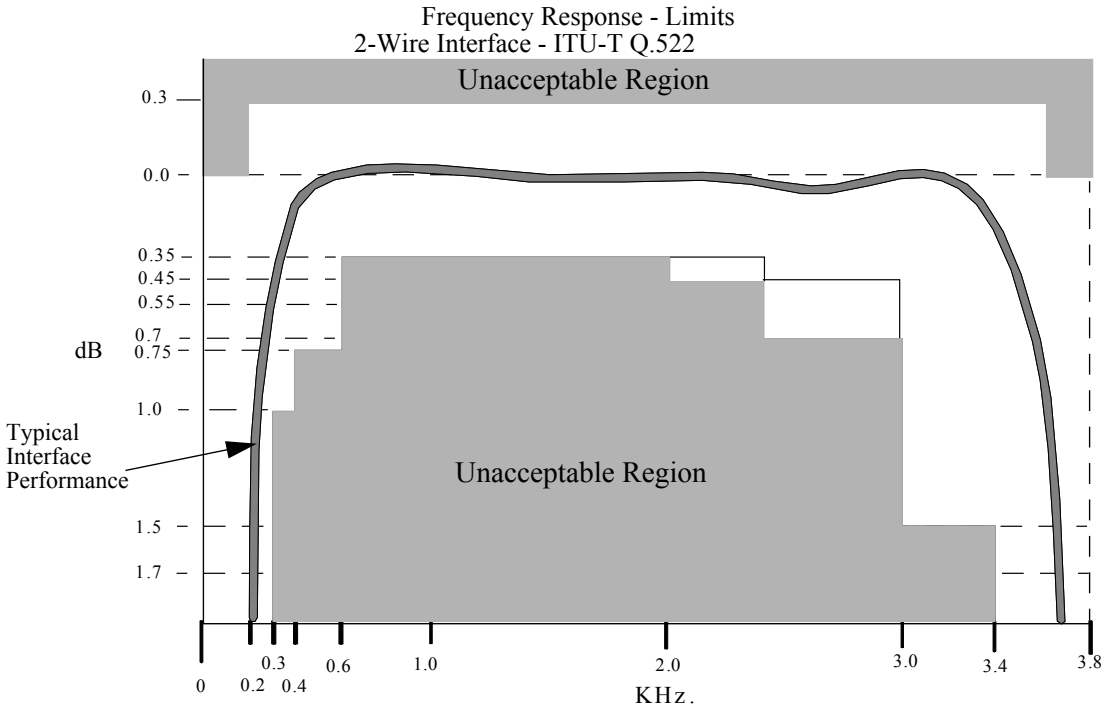

Figure 6-1. Frequency Response Limits, 2-Wire

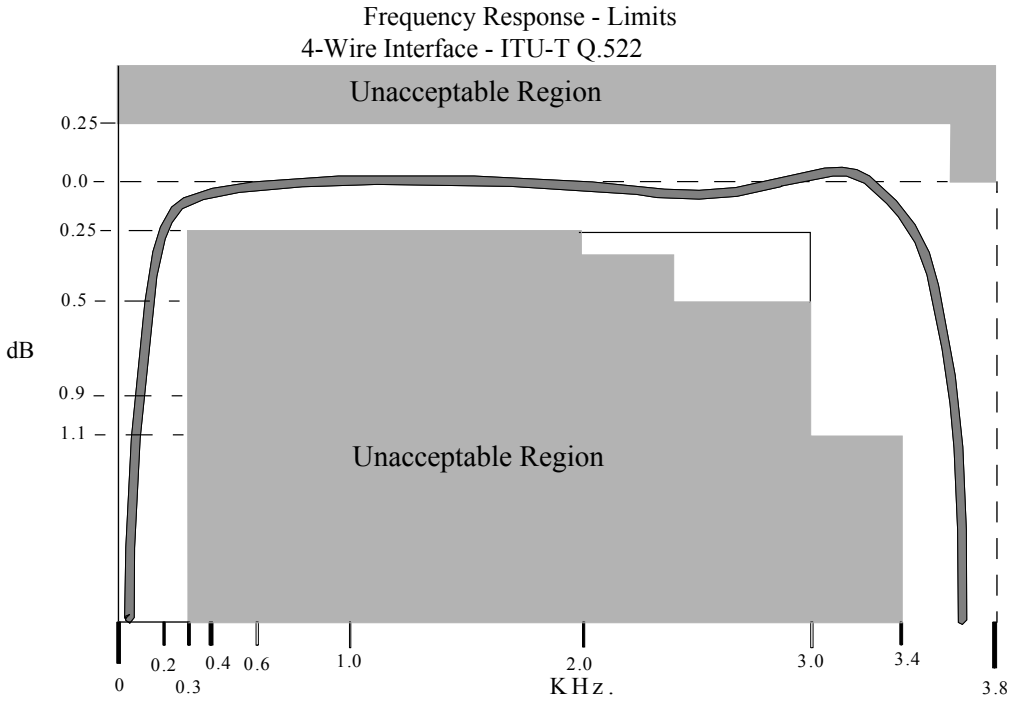

Figure 6-2. Frequency Response Limits, 4-Wire

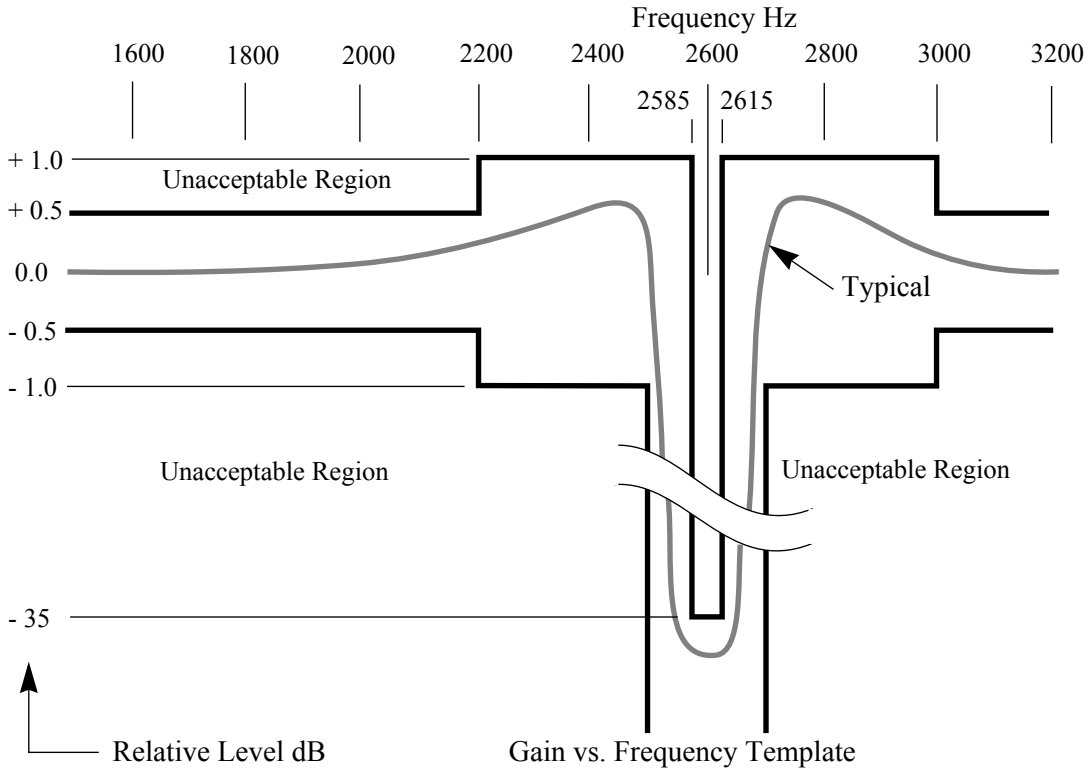

Figure 6-3. 2600 Hz Voice Path Notch Filter

2-Wire Return Loss

This satisfies the recommendation Q.552, section 2.1.1.2 (see Figure 1/ Q.552).

Unbalance About Earth (Longitudinal Conversion Loss)

This satisfies the recommendation Q.552, section 2.1.2 (see Figure 2/ Q.552).

Relative Levels

Comprised of:

- Hardware built-in loss on board.
- System digital pad attached to the subscriber line.

Note The CO line unit complies to ITU-T Q.552 loss recommendation for interface Z.

With digital pads set to zero in both the transmit and receive direction, the following is the board design absolute Gain levels and the 2-Wire and balance impedance networks:

Table 6-I. Transmit/Receive Absolute Gain w/Pads=0

Board Number	2-Wire Impedance	Balance Network	RX (D-A) Output Level	TX (A-D) Input Level
764 354	200 + 680 // 0.1 uF	200 + 680 // 0.1 uF	-3.75	-0.25
764 355	200 + 680 // 0.1 uF	200 + 680 // 0.1 uF	-3.75	-0.25
764 356	200 + 680 // 0.1 uF	200 + 680 // 0.1 uF	-3.75	-0.25
764 357	600	600	-0.25	-0.25
764 358	600	600	-0.25	-0.25
764 359	600	600	-7.25	-0.25
764 360	600	600	-7.25	-0.25

Short-Term Variation of Loss with Time

This satisfies the recommendation Q.552, section 3.1.1.3.

Echo and Stability (4-Wire Return Loss)

4-Wire Return Loss

(4-Wire) Figure 6-2 ITU-T Q.522, to be provided.

Stability Loss

The stability measurement measures the 4-Wire return loss under the worse terminating conditions.

- Different country administrations may specify a different terminating network for this measurement, while some administrations may find that open and short circuit terminations are sufficiently representative of worse case conditions.
- Please refer to Appendices for further information.

Loss Distortion with Frequency

This satisfies the recommendation Q.552, section 3.1.1.5 (see Figures 6A and 6B /Q.552 for input and output connections, respectively).

Variation of Gain with Input Level

This satisfies the recommendation Q.552, section 3.1.1.4 (see Figure 5/ Q.552).

Group Delay and Group Delay Distortion

Absolute Group Delay

Refers to the minimum group delay measured in the frequency band 500-2800 Hz.

Different country administrations may have different requirements on this measurement.

Group Delay Distortion with Frequency

This satisfies the recommendation Q.552, section 3.1.2.2 (see Figure 7/ Q.552).

Crosstalk

Input Crosstalk

This satisfies the recommendation Q.552, section 3.1.4.1 (see Figure 8/ Q.552).

Output Crosstalk

This satisfies the recommendation Q.552, section 3.1.4.2 (see Figure 9/ Q.552).

7

Tones

Teltronics 16 and 32 Bit Tone Sets

Table 7-A lists the tone sets for the Teltronics 16 and 32 Bit Systems.

Table 7-A. Teltronics 16 and 32 Bit System Tone Sets

International Feature Set Number	Tone Set	A-Law/μ-Law	Tables
0	USA	μ-Law	Table 7-B on page 7-3
1	Malaysia	A-Law	Table 7-F on page 7-7
2	China	A-Law	Table 7-J on page 7-11
3	Taiwan	A-Law	Table 7-N on page 7-15
4	Chile	A-Law	Table 7-R on page 7-19
5	Default A-Law	A-Law	Table 7-AQ on page 7-45
6	Japan	μ-Law	Table 7-Z on page 7-27
7	United Kingdom	A-Law	Table 7-AD on page 7-31
8	Hong Kong	μ-Law	Table 7-AH on page 7-35
9	Netherlands	A-Law	Table 7-AL on page 7-39
10	Finland	A-Law	Table 7-AP on page 7-43
11	Russia	A-Law	Table 7-AS on page 7-47
12	Czech Republic	A-Law	Table 7-AW on page 7-51
13	Hungary	A-Law	Table 7-BA on page 7-55

Table 7-A. Teltronics 16 and 32 Bit System Tone Sets

International Feature Set Number	Tone Set	A-Law/μ-Law	Tables
14	Singapore	A-Law	Table 7-BE on page 7-59
15	reserved		
16	NAPN_USA	μ-Law	Table 7-BI on page 7-63
17	Domestic Customer	μ-Law	Table 7-BM on page 7-67
19	Spain	A-Law	Table 7-BQ on page 7-71

USA Tone Set (International Feature Set 0)

Continuous Tones

Table 7-B. Continuous Tones, USA Tone Set

Tone #	Tone	Frequency (Hz)	Level (dB)	Freq. Tol.
0	silence	-	-	-
1	dial tone RS464	350; 440	-16	0.5
2	busy tone RS464	480; 620	-27	0.5
3	ringback tone RS464	440; 480	-22	0.5
4	camp-on tone RS464	440	-16	0.5
5	high tone	480	-17	0.5
6	preemption tone RS464	440; 620	-20	0.5
7	intercept tone RS464	620	-20	1.0
8	howler	2060; 2450	0	2.0
9	carrier dial tone	400	-10	0.5
10	que tone 1 (C)	262	-24	0.5
11	que tone 2 (D)	294	-24	0.5
12	que tone 3 (E)	330	-24	0.5
13	carrier milliwatt	1004	0	0.05
14	DTMF 1	697; 1209	-5	0.5
15	DTMF 2	697; 1336	-5	0.5
16	DTMF 3	697; 1477	-5	0.5
17	DTMF 4	770; 1209	-5	0.5
18	DTMF 5	770; 1336	-5	0.5
19	DTMF 6	770; 1477	-5	0.5
20	DTMF 7	852; 1209	-5	0.5
21	DTMF 8	852; 1336	-5	0.5
22	DTMF 9	852; 1477	-5	0.5
23	DTMF 0	941; 1336	-5	0.5
24	DTMF #	941; 1477	-5	0.5
25	DTMF *	941; 1209	-5	0.5
26	DTMF A	697; 1633	-5	0.5

Table 7-B. Continuous Tones, USA Tone Set **(continued)**

Tone #	Tone	Frequency (Hz)	Level (dB)	Freq. Tol.
27	DTMF B	770; 1633	-5	0.5
35	DTMF C	852; 1633	-5	0.5
36	DTMF D	941; 1633	-5	0.5
37	1000 Hz reference		-	-
38	MF1	700; 900	-7	0.5
39	MF2	700; 1100	-7	0.5
40	MF3	900; 1100	-7	0.5
41	MF4	700; 1300	-7	0.5
42	MF5	900; 1300	-7	0.5
43	MF6	1100; 1300	-7	0.5
44	MF7	700; 1500	-7	0.5
45	MF8	900; 1500	-7	0.5
46	MF9	1100; 1500	-7	0.5
47	MFO	1300; 1500	-7	0.5
48	MF ST3P	700; 1700	-7	0.5
49	MF STP	900; 1700	-7	0.5
50	MF KP	1100; 1700	-7	0.5
51	MF ST2P	1300; 1700	-7	0.5
52	MFST	1500; 1700	-7	0.5
53	DMI Flags Tone	-	-	-
54	DMI Hold Tone	-	-	-
55	Splash	1750	-5	0.5
56	dial tone Domestic Customer	350; 440	-5	0.5
57	SS7 4W COT test	2010	-12	0.35

Ringback Cadences

Table 7-C. Ringback Cadences, USA Tone Set

Ringback	Tone	Duration	Freq. (Hz)	Level (dB)
ringback 1	ringback tone RS464 silence	1000 ms 3000 ms	440; 480 -	- 22 -
ringback 2	ringback tone RS464 silence ringback tone RS464 silence	400 ms 200 ms 400 ms 3000 ms	440; 480 - 440; 480 -	-22 - -22 -
ringback 3	ringback tone RS464 silence ringback tone RS464 silence ringback tone RS464 silence	400 ms 200 ms 400 ms 200 ms 400 ms 2400 ms	440; 480 - 440; 480 - 440; 480 -	-22 - -22 - -22 -
ringback 4	ringback tone RS464 silence	1000 ms 1000 ms	440; 480 -	-22 -

Cadenced Tones

Table 7-D. Cadenced Tones, USA Tone Set

Name	Tones	Duration I	Freq. (Hz)	Level (dB)	Freq. Tol.
busy	busy tone RS464 silence	500 ms 500 ms	480; 620 -	-27 -	0.5 -
fast busy	busy tone RS464 silence	250 ms 250 ms	480; 620 -	-27 -	0.5 -
intercept	camp-on tone RS464 intercept tone	250 ms 250 ms	440 620	-16 -17	0.5 1.0
error	intercept tone camp-on tone RS464	500 ms 500 ms	620 440	-17 -16	1.0 0.5
queue	que tone 1 (C) que tone 2 (D) que tone 3 (E)	500 ms 500 ms 500 ms	262 294 330	-24 -24 -24	0.5 0.5 0.5
premium	high tone silence	100 ms 100 ms	480 -	-17 -	0.5 -
receiver off hook	howler silence	120 ms 130 ms	2060; 2450 -	0 -	2.0 -

Table 7-D. Cadenced Tones, USA Tone Set **(continued)**

Name	Tones	Duration I	Freq. (Hz)	Level (dB)	Freq. Tol.
lock out	high tone silence	10 ms 490 ms	480 -	-17 -	0.5 -
high tick	high tone silence	10 ms 990 ms	480 -	-17 -	0.5 -
ringback queue	ringback tone silence	1000 ms 2000 ms	440; 480 -	-22 -	0.5 -
slow ringback queue	ringback tone silence	2000 ms 4000 ms	440; 480 -	-22 -	0.5 -

Ringing Cadences

Table 7-E. Ringing Cadences, USA Tone Set

Ring	Cadence
Ring 1	Ring On 1000 ms; Ring Off 3000 ms
Ring 2	Ring On 400 ms; Ring Off 200 ms Ring On 400 ms; Ring Off 3000 ms
Ring 3	Ring On 400 ms; Ring Off 200 ms Ring On 400 ms; Ring Off 200 ms Ring On 400 ms; Ring Off 2400 ms
Ring 4	Ring On 1000 ms; Ring Off 1000 ms

Malaysia Tone Set (International Feature Set 1)

Continuous Tones

Table 7-F. Continuous Tones, Malaysia Tone Set

Tone #	Tone	Frequency (Hz)	ME/LE Level (dB)	ME/LE Freq. Tol.
0	silence	-		-
1	dial tone	425	-9	0.5
2	busy tone	425	-12	0.5
3	ringback tone	425	-12	0.5
4	camp-on tone RS464	440	-16	0.5
5	high tone	480	-17	0.5
6	preemption tone RS464	440; 620	-20	0.5
7	intercept tone ME/LE	425	-12	0.5
8	howler	2060; 2450	0	2.0
9	carrier dial tone	400	-10	0.5
10	que tone 1 (C)	262	-24	0.5
11	que tone 2 (D)	294	-24	0.5
12	que tone 3 (E)	330	-24	0.5
13	carrier milliwatt	1004	0	0.05
14	DTMF 1	697; 1209	-11; -9	0.5
15	DTMF 2	697; 1336	-11; -9	0.5
16	DTMF 3	697; 1477	-11; -9	0.5
17	DTMF 4	770; 1209	-11; -9	0.5
18	DTMF 5	770; 1336	-11; -9	0.5
19	DTMF 6	770; 1477	-11; -9	0.5
20	DTMF 7	852; 1209	-11; -9	0.5
21	DTMF 8	852; 1336	-11; -9	0.5
22	DTMF 9	852; 1477	-11; -9	0.5
23	DTMF 0	941; 1336	-11; -9	0.5
24	DTMF #	941; 1477	-11; -9	0.5
25	DTMF *	941; 1209	-11; -9	0.5

Table 7-F. Continuous Tones, Malaysia Tone Set **(continued)**

Tone #	Tone	Frequency (Hz)	ME/LE Level (dB)	ME/LE Freq. Tol.
26	1000 Hz reference	-	-	-
27	MFC ITU-T B1	1140; 1020	-8	0.35
28	MFC ITU-T B2	1140; 900	-8	0.35
29	MFC ITU-T B3	1020; 900	-8	0.35
30	MFC ITU-T B4	1140; 780	-8	0.35
31	MFC ITU-T B5	1020; 780	-8	0.35
32	MFC ITU-T B6	900; 780	-8	0.35
33	MFC ITU-T B7	1140; 660	-8	0.35
34	MFC ITU-T B8	1020; 660	-8	0.35
35	MFC ITU-T B9	900; 660	-8	0.35
36	MFC ITU-T B0	780; 660	-8	0.2
37	MFC ITU-T Fl	1380; 1500	-8	0.2
38	MFC ITU-T F2	1380; 1620	-8	0.2
39	MFC ITU-T F3	1500; 1620	-8	0.2
40	MFC ITU-T F4	1380; 1740	-8	0.2
41	MFC ITU-T F5	1500; 1740	-8	0.2
42	MFC ITU-T F6	1620; 1740	-8	0.2
43	MFC ITU-T F7	1380; 1860	-8	0.2
44	MFC ITU-T F8	1500; 1860	-8	0.2
45	MFC ITU-T F9	1620; 1860	-8	0.2
46	MFC ITU-T F0	1740; 1860	-8	0.2
47	MFC ITU-T F11	1380; 1980	-8	0.2
48	MFC ITU-T F12	1620; 1980	-8	0.2
49	MFC ITU-T F13	1620; 1980	-8	0.2
50	MFC ITU-T F14	1740; 1980	-8	0.2
51	MFC ITU-T F15	1860; 1980	-8	0.2
52	DMI Flags Tone	-	-	-
53	DMI Hold Tone	-	-	-

Ringback Cadences

Table 7-G. Ringback Cadences, Malaysia Tone Set

Ringback	ME/LE Tone	ME/LE Duration	Freq. (Hz)	ME/LE Level (dB)
ringback 1	ringback tone silence ringback tone silence	400 ms 200 ms 400 ms 2000 ms	425 - 425 -	-12 - -12 -
ringback 2	ringback tone silence ringback tone silence	400 ms 200 ms 400 ms 2000 ms	425 - 425 -	-12 - -12 -
ringback 3	ringback tone silence ringback tone silence ringback tone silence	400 ms 200 ms 400 ms 200 ms 400 ms 2400 ms	425 - 425 - 425 -	-12 - -12 - -12 -
ringback 4	ringback tone silence	1000 ms 1000 ms	425 -	-12 -

Cadenced Tones

Table 7-H. Cadenced Tones, Malaysia Tone Set

Name	Tones	Duration	Freq. (Hz)	ME/LE Level (dB)	ME/LE Freq. Tol.
busy	busy tone silence	500 ms 500 ms	425 -	-12 -	0.5 -
fast busy	busy tone silence	250 ms 250 ms	425 -	-12	0.5 -
intercept	camp-on tone RS464 intercept tone	250 ms 250 ms	440 620	-16 -20	0.5 0.5
error	busy tone silence	2500 ms 500 ms	425 -	-12 -	0.5 -
queue	que tone 1 (C) que tone 2 (D) que tone 3 (E)	500 ms 500 ms 500 ms	262 294 330	-24 -24 -24	0.5 0.5 0.5
premium	high tone silence	100 ms 100 ms	480 -	-17 -	0.5 -

Table 7-H. Cadenced Tones, Malaysia Tone Set

Name	Tones	Duration	Freq. (Hz)	ME/LE Level (dB)	ME/LE Freq. Tol.
receiver off hook	howler silence	120 ms 130 ms	2060;2450 -	0 -	2.0 -
lock out	high tone silence	10 ms 490 ms	480 -	-17 -	0.5 -
high tick	high tone silence	10 ms 990 ms	480 -	-17 -	0.5 -
ringback queue	ringback tone silence	1000 ms 2000 ms	425 -	-12 -	0.5 -

Ringing Cadences

Table 7-I. Ringing Cadences, Malaysia Tone Set

Ring	ME/LE Cadence
ring 1	ring on 1000 ms; ring off 4000 ms ring on 1000 ms; ring off 4000 ms
ring 2	ring on 400 ms; ring off 200 ms ring on 400 ms; ring off 2000 ms
ring 3	ring on 400 ms; ring off 200 ms ring on 400 ms; ring off 200 ms ring on 400 ms; ring off 2400 ms
ring 4	ring on 1000 ms; ring off 1000 ms

China Tone Set (International Feature Set 2)

Continuous Tones

Table 7-J. Continuous Tones, China Tone Set

Tone#	Tone	Frequency (Hz)	Level (dB)	Freq. Tol.
0	silence	-		-
1	dial tone	450	-10	0.5
2	busy tone	450	-10	0.5
3	ringback tone	450	-10	0.5
4	camp-on tone RS464	440	-16	0.5
5	high tone	480	-17	0.5
6	preemption tone RS464	440; 620	-20	0.5
7	intercept tone RS464	620	-20	1.0
8	howler	2060; 2450	0	2.0
9	carrier dial tone	400	-10	0.5
10	que tone 1 (C)	262	-24	0.5
11	que tone 2 (D)	294	-24	0.5
12	que tone 3 (E)	330	-24	0.5
13	carrier milliwatt	1004	0	0.05
14	DTMF 1	697; 1209	-11; -9	0.5
15	DTMF 2	697; 1336	-11; -9	0.5
16	DTMF 3	697; 1477	-11; -9	0.5
17	DTMF 4	770; 1209	-11; -9	0.5
18	DTMF 5	770; 1336	-11; -9	0.5
19	DTMF 6	770; 1477	-11; -9	0.5
20	DTMF 7	852; 1209	-11; -9	0.5
21	DTMF 8	852; 1336	-11; -9	0.5
22	DTMF 9	852; 1477	-11; -9	0.5
23	DTMF 0	941; 1336	-11; -9	0.5
24	DTMF #	941; 1477	-11; -9	0.5
25	DTMF *	941; 1209	-11; -9	0.5
26	1000 Hz reference	-	-	-

Table 7-J. Continuous Tones, China Tone Set **(continued)**

Tone#	Tone	Frequency (Hz)	Level (dB)	Freq. Tol.
27	MFC UTI-T B1	1140;1020	-8	0.35
28	MFC ITU-T B2	1140;900	-8	0.35
29	MFC ITU-T B3	1020;900	-8	0.35
30	MFC ITU-T B4	1140;780	-8	0.35
31	MFC ITU-T B5	1020; 780	-8	0.35
32	MFC ITU-T B6	900; 780	-8	0.35
33	MFC ITU-T B7	1140; 660	-8	0.35
34	MFC ITU-T B8	1020; 660	-8	0.35
35	MFC ITU-T B9	900; 660	-8	0.35
36	MFC ITU-T BO	780; 660	-8	0.35
37	MFC ITU-T F1	1380; 1500	-8	0.2
38	MFC ITU-T F2	1380; 1620	-8	0.2
39	MFC ITU-T F3	1500; 1620	-8	0.2
40	MFC ITU-T F4	1380; 1740	-8	0.2
41	MFC ITU-T F5	1500; 1740	-8	0.2
42	MFC ITU-T F6	1620; 1740	-8	0.2
43	MFC ITU-T F7	1380; 1860	-8	0.2
44	MFC ITU-T F8	1500; 1860	-8	0.2
45	MFC ITU-T F9	1620; 1860	-8	0.2
46	MFC ITU-T F0	1740; 1860	-8	0.2
47	MFC ITU-T F11	1380; 1980	-8	0.2
48	MFC ITU-T F12	1500; 1980	-8	0.2
49	MFC ITU-T F13	1620; 1980	-8	0.2
50	MFC ITU-T F14	1740; 1980	-8	0.2
51	MFC ITU-T F15	1860; 1980	-8	0.2
52	China S F 2600 Hz	2600	-13	0.5
53	DMI Flags Tone	-	-	-
54	DMI Hold Tone	-	-	-
55	Chinese Dial Tone	425	-10	0.5

Ringback Cadences

Table 7-K. Ringback Cadences, China Tone Set

Ringback	Tone	Duration	Freq. (Hz)	Level (dB)
ringback 1	ringback tone silence	1000 ms 4000 ms	450 -	-10 -
ringback 2	ringback tone silence	1000 ms 4000 ms	450 -	-10 -
ringback 3	ringback tone silence ringback tone silence ringback tone silence	400 ms 200 ms 400 ms 200 ms 400 ms 3400 ms	450 - 450 - 450 -	-10 - -10 - -10 -
ringback 4	ringback tone silence ringback tone silence	1000 ms 1000 ms 1000 ms 1000 ms	450 - 450 -	-10 - -10 -

Cadenced Tones

Table 7-L. Cadenced Tones, China Tone Set

Name	Tones	Duration	Freq. (Hz)	Level (dB)	Freq. Tol.
busy	busy tone silence	350 ms 350 ms	450 -	-10 -	0.5 -
fast busy	busy tone silence	250 ms 250 ms	450 -	-10 -	0.5 -
intercept	camp-on tone RS464 intercept tone	250 ms 250 ms	440 620	-16 -17	0.5 1.0
error	intercept tone camp-on tone RS464	500 ms 500 ms	620 440	-17 -16	1.0 0.5
queue	que tone 1 (C) que tone 2 (D) que tone 3 (E)	460 ms 470 ms 470 ms	262 294 330	-24 -24 -24	0.5 0.5 0.5
premium	high tone silence	100 ms 100 ms	480 -	-17 -	0.5 -
receiver off hook	howler silence	120 ms 130 ms	2060; 2450 -	0 -	2.0 -

Table 7-L. Cadenced Tones, China Tone Set

Name	Tones	Duration	Freq. (Hz)	Level (dB)	Freq. Tol.
lock out	high tone silence	10 ms 490 ms	480 -	-17 -	0.5 -
high tick	high tone silence	10 ms 990 ms	480 -	-17 -	0.5 -
ringback queue	ringback tone silence	1000 ms 2500 ms	450 -	-10 -	0.5 -

Ringing Cadences

Table 7-M. Ringing Cadences, China Tone Set

Ring	Cadence
ring 1	ring on 1000 ms; ring off 4000 ms
ring 2	ring on 1000 ms; ring off 4000 ms
ring 3	ring on 400 ms; ring off 200 ms ring on 400 ms; ring off 200 ms ring on 400 ms; ring off 3400 ms
ring 4	ring on 1000 ms; ring off 1000 ms ring on 1000 ms; ring off 1000 ms

Taiwan Tone Set (International Feature Set 3)

Continuous Tones

Table 7-N. Continuous Tones, Taiwan Tone Set

Tone #	Tone	Frequency (Hz)	Level (dB)	Freq. Tol.
0	silence	-	-	-
1	dial tone RS464	350; 440	-16	0.5
2	busy tone RS464	480; 620	-27	0.5
3	ringback tone RS464	440; 480	-22	0.5
4	camp-on tone RS464	440	-16	0.5
5	high tone	480	-17	0.5
6	preemption tone RS464	440; 620	-20	0.5
7	intercept tone RS464	620	-20	1.0
8	howler	2060; 2450	0	2.0
9	carrier dial tone	400	-10	0.5
10	que tone 1 (C)	262	-24	0.5
11	que tone 2 (D)	294	-24	0.5
12	que tone 3 (E)	330	-24	0.5
13	carrier milliwatt	1004	0	0.05
14	DTMF 1	697; 1209	-11; -9	0.5
15	DTMF 2	697; 1336	-11; -9	0.5
16	DTMF 3	697; 1477	-11; -9	0.5
17	DTMF 4	770; 1209	-11; -9	0.5
18	DTMF 5	770; 1336	-11; -9	0.5
19	DTMF 6	770; 1477	-11; -9	0.5
20	DTMF 7	852; 1209	-11; -9	0.5
21	DTMF 8	852; 1336	-11; -9	0.5
22	DTMF 9	852; 1477	-11; -9	0.5
23	DTMF 0	941; 1336	-11; -9	0.5
24	DTMF #	941; 1477	-11; -9	0.5
25	DTMF *	941; 1209	-11; -9	0.5

Table 7-N. Continuous Tones, Taiwan Tone Set

Tone #	Tone	Frequency (Hz)	Level (dB)	Freq. Tol.
26	1000Hz reference	-	-	-
27	MFC ITU-T B1	1140;1020	-8	0.35
28	MFC ITU-T B2	1140;900	-8	0.35
29	MFC ITU-T B3	1020;900	-8	0.35
30	MFC ITU-T B4	1140;780	-8	0.35
31	MFC ITU-T B5	1020; 780	-8	0.35
32	MFC ITU-T B6	900; 780	-8	0.35
33	MFC ITU-T B7	1140; 660	-8	0.35
34	MFC ITU-T B8	1020; 660	-8	0.35
35	MFC ITU-T B9	900; 660	-8	0.35
36	MFC ITU-T BO	780; 660	-8	0.35
37	MFC ITU-T F1	1380; 1500	-8	0.2
38	MFC ITU-T F2	1380; 1620	-8	0.2
39	MFC ITU-T F3	1500; 1620	-8	0.2
40	MFC ITU-T F4	1380; 1740	-8	0.2
41	MFC ITU-T F5	1500; 1740	-8	0.2
42	MFC ITU-T F6	1620; 1740	-8	0.2
43	MFC ITU-T F7	1380; 1860	-8	0.2
44	MFC ITU-T F8	1500; 1860	-8	0.2
45	MFC ITU-T F9	1620; 1860	-8	0.2
46	MFC ITU-T F0	1740; 1860	-8	0.2
47	MFC ITU-T F11	1380; 1980	-8	0.2
48	MFC ITU-T F12	1500; 1980	-8	0.2
49	MFC ITU-T F13	1620; 1980	-8	0.2
50	MFC ITU-T F14	1740; 1980	-8	0.2
51	MFC ITU-T F15	1860; 1980	-8	0.2
52	DMI Flags Tone	-	-	-
53	DMI Hold Tone	-	-	-

Ringback Cadences

Table 7-O. Ringback Cadences, Taiwan Tone Set

Ringback	Tone	Duration	Freq. (Hz)	Level (dB)
ringback 1	ringback tone RS464 silence	2000 ms 4000 ms	440; 480 -	-22 -
ringback 2	ringback tone RS464 silence	2000 ms 4000 ms	440; 480 -	-22 -
ringback 3	ringback tone RS464 silence ringback tone RS464 silence ringback tone RS464 silence	400 ms 200 ms 400 ms 200 ms 400 ms 2400 ms	440; 480 - 440; 480 - 440; 480 -	-22 - -22 - -22 -
ringback 4	ringback tone RS464 silence ringback tone RS464 silence	1000 ms 1000 ms 1000 ms 1000 ms	440; 480 - 440; 480 -	-22 - -22 -

Cadenced Tones

Table 7-P. Cadenced Tones, Taiwan Tone Set

Name	Tones	Duration	Freq. (Hz)	Level (dB)	Freq. Tol.
busy	busytone RS464 silence	500 ms 500 ms	480; 620 -	-27 -	0.5 -
fast busy	busytone RS464 silence	250 ms 250 ms	480; 620 -	-27 -	0.5 -
intercept	camp-on tone RS464 intercept tone	250 ms 250 ms	440 620	-16 -17	0.5 1.0
error	intercept tone camp-on tone RS464	500 ms 500 ms	620 440	-17 -16	1.0 0.5
queue	que tone 1 (C) que tone 2 (D) que tone 3 (E)	500 ms 500 ms 500 ms	262 294 330	-24 -24 -24	0.5 0.5 0.5
premium	high tone silence	100 ms 100 ms	480 -	-17 -	0.5 -

Table 7-P. Cadenced Tones, Taiwan Tone Set

Name	Tones	Duration	Freq. (Hz)	Level (dB)	Freq. Tol.
receiver off hook	howler silence	120 ms 130 ms	2060; 2450 -	0 -	2.0 -
lock out	high tone silence	10 ms 490 ms	480 -	-17 -	0.5 -
high tick	high tone silence	10 ms 990 ms	480 -	-17 -	0.5 -
ringback queue	ringback tone RS464 silence	2000 ms 4000 ms	440; 480 -	-22 -	0.5 -

Ringing Cadences

Table 7-Q. Ringing Cadences, Taiwan Tone Set

Ring	Cadence
ring 1	ring on 2000 ms; ring off 4000 ms
ring 2	ring on 2000 ms; ring off 4000 ms
ring 3	ring on 400 ms; ring off 200 ms ring on 400 ms; ring off 200 ms ring on 400 ms; ring off 2400 ms
ring 4	ring on 1000 ms; ri ng off 1000 ms ring on 1000 ms; ring off 1000 ms

Chile Tone Set (International Feature Set 4)

Continuous Tones

Table 7-R. Continuous Tones, Chile Tone Set

Tone#	Tone	Frequency (Hz)	ME/LE Level (dB)	ME/LE Freq. Tol.
0	silence	-		
1	dial tone (ME/LE)	425	-9	0.5
2	busy tone (ME/LE)	425	-12	0.5
3	ringback tone	400	-10	0.5
4	camp-on tone RS464	440	-16	0.5
5	high tone	480	-17	0.5
6	preemption tone RS464	440; 620	-20	0.5
7	intercept tone RS464	620	-20	1.0
8	howler	2060; 2450	0	2.0
9	carrier dial tone	400	-10	0.5
10	que tone 1 (C)	262	-24	0.5
11	que tone 2 (D)	294	-24	0.5
12	que tone 3 (E)	330	-24	0.5
13	carrier milliwatt	1004	0	0.05
14	DTMF 1	697; 1209	-11; -9	0.5
15	DTMF 2	697; 1336	-11; -9	0.5
16	DTMF 3	697; 1477	-11; -9	0.5
17	DTMF 4	770; 1209	-11; -9	0.5
18	DTMF 5	770; 1336	-11; -9	0.5
19	DTMF 6	770; 1477	-11; -9	0.5
20	DTMF 7	852; 1209	-11; -9	0.5
21	DTMF 8	852; 1336	-11; -9	0.5
22	DTMF 9	852; 1477	-11; -9	0.5
23	DTMF 0	941; 1336	-11; -9	0.5
24	DTMF #	941; 1477	-11; -9	0.5
25	DTMF *	941; 1209	-11; -9	0.5

Table 7-R. Continuous Tones, Chile Tone Set **(continued)**

Tone#	Tone	Frequency (Hz)	ME/LE Level (dB)	ME/LE Freq. Tol.
26	DTMF A	697; 1633	-11; -9	0.5
27	DTMF B	770; 1633	-11; -9	0.5
28	Cmet Outpulse Tone 1	625	-10	1.0
29	Cmet Outpulse Tone 2	750	-10	1.0
30	C-notched Noise 1	1004	-10	0.1
31	1000 Hz reference	-	-	-
32	MFC ITU-T B1	1140;1020	- 8	0.35
33	MFC ITU-T B2	1140;900	- 8	0.35
34	MFC ITU-T B3	1020;900	- 8	0.35
35	MFC ITU-T B4	1140;780	- 8	0.35
36	MFC ITU-T B5	1020; 780	- 8	0.35
37	MFC ITU-T B6	900; 780	- 8	0.35
38	MFC ITU-T B7	1140; 660	- 8	0.35
39	MFC ITU-T B8	1020; 660	- 8	0.35
40	MFC ITU-T B9	900; 660	- 8	0.35
41	MFC ITU-T B0	780; 660	- 8	0.35
42	MFC ITU-T F1	1380; 1500	- 8	0.2
43	MFC ITU-T F2	1380; 1620	- 8	0.2
44	MFC ITU-T F3	1500; 1620	- 8	0.2
45	MFC ITU-T F4	1380; 1740	- 8	0.2
46	MFC ITU-T F5	1500; 1740	- 8	0.2
47	MFC ITU-T F6	1620; 1740	- 8	0.2
48	MFC ITU-T F7	1380; 1860	- 8	0.2
49	MFC ITU-T F8	1500; 1860	- 8	0.2
50	MFC ITU-T F9	1620; 1860	- 8	0.2
51	MFC ITU-T FO	1740; 1860	- 8	0.2
52	MFC ITU-T F11	1380; 1980	- 8	0.2
53	MFC ITU-T F12	1500; 1980	- 8	0.2
54	MFC ITU-T F13	1620; 1980	- 8	0.2
55	MFC ITU-T F14	1740; 1980	- 8	0.2

Table 7-R. Continuous Tones, Chile Tone Set **(continued)**

Tone#	Tone	Frequency (Hz)	ME/LE Level (dB)	ME/LE Freq. Tol.
56	MFC ITU-T F15	1860; 1980	- 8	0.2
57	DMI Flags Tone	-	-	-
58	DMI Hold Tone	-	-	-
60	Audio Test	852; 1633	-3	1.5

Ringback Cadences

Table 7-S. Ringback Cadences, Chile Tone Set

Ringback	Tone	Duration	Freq. (Hz)	Level (dB)
ringback 1	carrier dial tone silence	1000 ms 3000 ms	400 -	-10 -
ringback 2	carrier dial tone silence	1000 ms 3000 ms	400	-10
ringback 3	carrier dial tone silence carrier dial tone silence carrier dial tone silence	400 ms 200 ms 400 ms 200 ms 400 ms 2400 ms	400 - 400 - 400 -	-10 - -10 - -10 -
ringback 4	carrier dial tone silence	1000 ms 1000 ms	400 -	-10 -

Cadenced Tones

Table 7-T. Cadenced Tones, Chile Tone Set

Name	Tones	Duration	Freq. (Hz)	Level (dB)	Freq. Tol.
busy	carrier dial tone silence	500 ms 500 ms	400 -	-10 -	0.5 -
fast busy	carrier dial tone silence	200 ms 200 ms	400 -	-10 -	0.5 -
intercept	camp-on tone RS464 intercept tone	250 ms 250 ms	440 620	-16 -17	0.5 1.0
error	busy tone RS464 silence	250 ms 250 ms	480; 620 -	-27 -	0.5 -
queue	que tone 1 (C) que tone 2 (D) que tone 3 (E)	500 ms 500 ms 500 ms	262 294 330	-24 -24 -24	0.5 0.5 0.5
premium	high tone silence	100 ms 100 ms	480 -	-17 -	0.5 -
receiver off hook	howler silence	120 ms 130 ms	2060; 2450 -	0 -	2.0 -
outpulse	outpulse tone 1 outpulse tone 2 C-notched noise 1 silence	100 ms 100 ms 100 ms 700 ms	625 750 1004 -	-10 -10 -10 -	1.0 1.0 0.1 -
lock out	high tone silence	10 ms 490 ms	480 -	-17 -	0.5 -
high tick	high tone silence	10 ms 990 ms	480 -	-17 -	0.5 -
ringback queue	carrier dial tone silence	1000 ms 2000 ms	400 -	-10 -	0.5 -

Ringing Cadences

Table 7-U. Ringing Cadences, Chile Tone Set

Ring	Cadence
ring 1	ring on 1000 ms; ring off 3000 ms
ring 2	ring on 1000 ms; ring off 3000 ms
ring 3	ring on 400 ms; ring off 200 ms ring on 400 ms; ring off 200 ms ring on 400 ms; ring off 2400 ms
ring 4	ring on 1000 ms; ring off 1000 ms

Default A-Law Tone Set (International Feature Set 5)

Continuous Tones

Table 7-V. Continuous Tones, Default A-Law Tone Set

Tone #	Tone	Frequency (Hz)	Level (dB)	Freq. Tol.
0	silence	-	-	-
1	dial tone RS464	350; 440	-16	0.5
2	busy tone RS464	480; 620	-27	0.5
3	ringback tone RS464	440; 480	-22	0.5
4	camp-on tone RS464	440	-16	0.5
5	high tone	480	-17	0.5
6	preemption tone RS464	440; 620	-20	0.5
7	intercept tone RS464	620	-20	1.0
8	howler	2060; 2450	0	2.0
9	carrier dial tone	400	-10	0.5
10	que tone 1 (C)	262	-24	0.5
11	que tone 2 (D)	294	-24	0.5
12	que tone 3 (E)	330	-24	0.5
13	carrier milliwatt	1004	0	0.05
14	DTMF 1	697; 1209	-11; -9	0.5
15	DTMF 2	697; 1336	-11; -9	0.5
16	DTMF 3	697; 1477	-11; -9	0.5
17	DTMF 4	770; 1209	-11; -9	0.5
18	DTMF 5	770; 1336	-11; -9	0.5
19	DTMF 6	770; 1477	-11; -9	0.5
20	DTMF 7	852; 1209	-11; -9	0.5
21	DTMF 8	852; 1336	-11; -9	0.5
22	DTMF 9	852; 1477	-11; -9	0.5
23	DTMF 0	941; 1336	-11; -9	0.5
24	DTMF #	941; 1477	-11; -9	0.5
25	DTMF *	941; 1209	-11; -9	0.5
26	1000 Hz reference	-	-	-

Table 7-V. Continuous Tones, Default A-Law Tone Set **(continued)**

Tone #	Tone	Frequency (Hz)	Level (dB)	Freq. Tol.
27	MFC ITU-T B1	1140;1020	-8	0.35
28	MFC ITU-T B2	1140;900	-8	0.35
29	MFC ITU-T B3	1020;900	-8	0.35
30	MFC ITU-T B4	1140;780	-8	0.35
31	MFC ITU-T B5	1020; 780	-8	0.35
32	MFC ITU-T B6	900; 780	-8	0.35
33	MFC ITU-T B7	1140; 660	-8	0.35
34	MFC ITU-T B8	1020; 660	-8	0.35
35	MFC ITU-T B9	900; 660	-8	0.35
36	MFC ITU-T BO	780; 660	-8	0.35
37	MFC ITU-T Fl	1380; 1500	-8	0.2
38	MFC ITU-T F2	1380; 1620	-8	0.2
39	MFC ITU-T F3	1500; 1620	-8	0.2
40	MFC ITU-T F4	1380; 1740	-8	0.2
41	MFC ITU-T F5	1500; 1740	-8	0.2
42	MFC ITU-T F6	1620; 1740	-8	0.2
43	MFC ITU-T F7	1380; 1860	-8	0.2
44	MFC ITU-T F8	1500; 1860	-8	0.2
45	MFC ITU-T F9	1620; 1860	-8	0.2
46	MFC ITU-T F0	1740; 1860	-8	0.2
47	MCF ITU-T F11	1380; 1980	-8	0.2
48	MFC ITU-T F12	1500; 1980	-8	0.2
49	MCF ITU-T F13	1620; 1980	-8	0.2
50	MCF ITU-T F14	1740; 1980	-8	0.2
51	MFC ITU-T F15	1860; 1980	-8	0.2
52	DMI Flag Tone	-	-	-
53	DMI Hold Tone	-	-	-

Ringback Cadences

Table 7-W. Ringback Cadences, Default A-Law Tone Set

Ringback	Tone	Duration	Freq. (Hz)	Level (dB)
ringback 1	ringback tone RS464 silence	1000 ms 3000 ms	440; 480 -	-22 -
ringback 2	ringback tone RS464 silence ringback tone RS464 silence	400 ms 200 ms 400 ms 3000 ms	440; 480 - 440; 480 -	-22 - -22 -
ringback 3	ringback tone RS464 silence ringback tone RS464 silence ringback tone RS464 silence	400 ms 200 ms 400 ms 200 ms 400 ms 2400 ms	440; 480 - 440; 480 - 440; 480 -	-22 - -22 - -22 -
ringback 4	ringback tone RS464 silence	1000 ms 1000 ms	440; 480 -	-22 -

Cadenced Tones

Table 7-X. Cadenced Tones, Default A-Law Tone Set

Name	Tones	Duration	Freq. (Hz)	Level (dB)	Freq. Tol.
busy	busy tone RS464 silence	500 ms 500 ms	480;620 -	-27 -	0.5 -
fast busy	busy tone RS464 silence	250 ms 250 ms	480;620 -	-27 -	0.5 -
intercept	camp-on tone RS464 intercept tone	250 ms 250 ms	440 620	-16 -17	0.5 1.0
error	intercept tone camp-on tone RS464	500 ms 500 ms	620 440	-17 -16	1.0 0.5
queue	que tone 1 (C) que tone 2 (D) que tone 3 (E)	500 ms 500 ms 500 ms	262 294 330	-24 -24 -24	0.5 0.5 0.5
premium	high tone silence	100 ms 100 ms	480 -	-17 -	0.5 -

Table 7-X. Cadenced Tones, Default A-Law Tone Set

Name	Tones	Duration	Freq. (Hz)	Level (dB)	Freq. Tol.
receiver off hook	howler silence	120 ms 130 ms	2060; 2450 -	0 -	2.0 -
lock out	high tone silence	10 ms 490 ms	480 -	-17 -	0.5 -
high tick	high tone silence	10 ms 990 ms	480 -	-17 -	0.5 -
ringback queue	ringback tone RS464 silence	1000 ms 2000 ms	440;480 -	-22 -	0.5 -

Ringing Cadences

Table 7-Y. Ringing Cadences, Default A-Law Tone Set

Ring	Cadence
ring 1	ring on 1000 ms; ring off 3000 ms
ring 2	ring on 400 ms; ring off 200 ms ring on 400 ms; ring off 3000 ms
ring 3	ring on 400 ms; ring off 200 ms ring on 400 ms; ring off 200 ms ring on 400 ms; ring off 2400 ms
ring 4	ring on 1000 ms; ring off 1000 ms

Japan Tone Set (International Feature Set 6)

Continuous Tones

Table 7-Z. Continuous Tones, Japan Tone Set

Tone #	Tone	Frequency (Hz)	Level (dB)	Freq. Tol.
0	silence	-	-	-
1	dial tone RS464	400	-16	1.0
2	busy tone RS464	400	-16	1.0
3	ringback tone RS464	400; 420	-16	1.0
4	camp-on tone RS464	800	-16	0.5
5	high tone	480	-17	0.5
6	preemption tone RS464	440; 620	-20	0.5
7	intercept tone RS464	620	-20	1.0
8	howler	2060; 2450	0	2.0
9	carrier dial tone	400	-10	0.5
10	que tone 1 (C)	262	-24	0.5
11	que tone 2 (D)	294	-24	0.5
12	que tone 3 (E)	330	-24	0.5
13	carrier milliwatt	1004	0	0.05
14	DTMF 1	697; 1209	-16	0.5
15	DTMF 2	697; 1336	-16	0.5
16	DTMF 3	697; 1477	-16	0.5
17	DTMF 4	770; 1209	-16	0.5
18	DTMF 5	770; 1336	-16	0.5
19	DTMF 6	770; 1477	-16	0.5
20	DTMF 7	852; 1209	-16	0.5
21	DTMF 8	852; 1336	-16	0.5
22	DTMF 9	852; 1477	-16	0.5
23	DTMF 0	941; 1336	-16	0.5
24	DTMF #	941; 1477	-16	0.5
25	DTMF *	941; 1209	-16	0.5
26	DTMF A	697; 1633	-16	0.5

Table 7-Z. Continuous Tones, Japan Tone Set **(continued)**

Tone #	Tone	Frequency (Hz)	Level (dB)	Freq. Tol.
27	DTMF B	770; 1633	-16	0.5
35	DTMF C	852; 1633	-16	0.5
36	DTMF D	941; 1633	-16	0.5
37	1000 Hz reference		-	-
38	MF 1	700;900	-7	0.5
39	MF 2	700;1100	-7	0.5
40	MF 3	900; 1100	-7	0.5
41	MF 4	700; 1300	-7	0.5
42	MF 5	900; 1300	-7	0.5
43	MF 6	1100; 1300	-7	0.5
44	MF 7	700; 1500	-7	0.5
45	MF 8	900; 1500	-7	0.5
46	MF 9	1100; 1500	-7	0.5
47	MF 0	1300; 1500	-7	0.5
48	MF ST3P	700; 1700	-7	0.5
49	MF STP	900; 1700	-7	0.5
50	MF KP	1100; 1700	-7	0.5
51	MF ST2P	1300; 1700	-7	0.5
52	MF ST	1500; 1700	-7	0.5
53	DMI Flags Tone	-	-	-
54	DMI Hold Tone	-	-	-
55	Splash	1750	-5	0.5
56	SS7 ISUP 4W tone	2010	-12	0.5

Ringback Cadences

Table 7-AA. Ringback Cadences, Japan Tone Set

Ringback	Tone	Duration	Freq. (Hz)	Level (dB)
ringback 1	ringback tone RS46 silence	1000 ms 2000 ms	400; 420 -	-16 -
ringback 2	ringback tone RS46 silence ringback tone RS46 silence	400 ms 200 ms 400 ms 2000 ms	400; 420 - 400; 420 -	- 16 - -16 -
ringback 3	ringback tone RS46 silence ringback tone RS46 silence ringback tone RS46 silence	400 ms 200 ms 400 ms 200 ms 400 ms 1400 ms	400; 420 - 400; 420 - 400; 420 -	-16 - -16 - -16 -
ringback 4	ringback tone RS46 silence	1000 ms 1000 ms	400; 420 -	-16 -

Cadenced Tones

Table 7-AB. Cadenced Tones, Japan Tone Set

Name	Tones	Duration	Freq. (Hz)	Level (dB)	Freq. Tol.
busy	busy tone RS46 silence	500 ms 500 ms	400 -	-16 -	1.0 -
fast busy	busy tone RS46 silence	250 ms 250 ms	400 -	-16 -	1.0 -
intercept	camp-on tone RS46 intercept tone	250 ms 250 ms	800 620	-16 -17	1.0 1.0
error	intercept tone camp-on tone RS46	500 ms 500 ms	620 800	-17 -16	1.0 1.0
queue	que tone 1 (C) que tone 2 (D) que tone 3 (E)	500 ms 500 ms 500 ms	262 294 330	-24 -24 -24	0.5 0.5 0.5
premium	high tone silence	100 ms 100 ms	480 -	-17 -	0.5 -
receiver off hook	howler silence	120 ms 130 ms	2060; 2450 -	0 -	2.0 -

Table 7-AB. Cadenced Tones, Japan Tone Set **(continued)**

Name	Tones	Duration	Freq. (Hz)	Level (dB)	Freq. Tol.
lock out	high tone silence	10 ms 490 ms	480 -	-17 -	0.5 -
high tick	high tone silence	10 ms 990 ms	480 -	-17 -	0.5 -
ringback queue	ringback tone RS46 silence	1000 ms 2000 ms	400; 420 -	-16 -	1.0 -

Ringing Cadences

Table 7-AC. Ringing Cadences, Japan Tone Set

Ring	Cadence
ring 1	ring on1000 ms; ring off 2000 ms
ring 2	ring on 400 ms; ring off 200 ms ring on 400 ms; ring off 2000 ms
ring 3	ring on 400 ms; ring off 200 ms ring on 400 ms; ring off 200 ms ring on 400 ms; ring off 1400 ms
ring 4	ring on 1000 ms; ring off 1000 ms

United Kingdom Tone Set (International Feature Set 7)

Continuous Tones

Table 7-AD. Continuous Tones, United Kingdom Tone Set

Tone #	Tone	Frequency (Hz)	Level (dB)	Freq. Tol.
0	silence	-	-	-
1	dial tone RS46	350; 440	-16	0.5
2	busy tone RS46	480; 620	-27	0.5
3	ringback tone	400; 450	-12	2.0
4	camp-on tone RS46	440	-16	0.5
5	high tone	480	-17	0.5
6	UK intrusion tone	1400	-8	2.0
7	intercept tone RS46	620	-20	1.0
8	howler	2060; 2450	0	2.0
9	carrier dial tone	400	-10	0.5
10	que tone 1 (C)	262	-24	0.5
11	que tone 2 (D)	294	-24	0.5
12	que tone 3 (E)	330	-24	0.5
13	carrier milliwatt	1004	0	0.05
14	DTMF 1	697; 1209	-11; -9	0.5
15	DTMF 2	697; 1336	-11; -9	0.5
16	DTMF 3	697; 1477	-11; -9	0.5
17	DTMF 4	770; 1209	-11; -9	0.5
18	DTMF 5	770; 1336	-11; -9	0.5
19	DTMF 6	770; 1477	-11; -9	0.5
20	DTMF 7	852; 1209	-11; -9	0.5
21	DTMF 8	852; 1336	-11; -9	0.5
22	DTMF 9	852; 1477	-11; -9	0.5
23	DTMF 0	941; 1336	-11; -9	0.5
24	DTMF #	941; 1477	-11; -9	0.5
25	DTMF *	941; 1209	-11; -9	0.5
26	1000 Hz reference	-	-	-

Table 7-AD. Continuous Tones, United Kingdom Tone Set **(continued)**

Tone #	Tone	Frequency (Hz)	Level (dB)	Freq. Tol.
27	MFC ITU-T B1	1140;1020	-8	0.35
28	MFC ITU-T B2	1140;900	-8	0.35
29	MFC ITU-T B3	1020;900	-8	0.35
3	MFC ITU-T B4	1140;780	-8	0.35
31	MFC ITU-T B5	1020; 780	-8	0.35
32	MFC ITU-T B6	900; 780	-8	0.35
33	MFC ITU-T B7	1140; 660	-8	0.35
34	MFC ITU-T B8	1020; 660	-8	0.35
35	MFC ITU-T B9	900; 660	-8	0.35
36	MFC ITU-T B0	780; 660	-8	0.35
37	MFC ITU-T F1	1380; 1500	-8	0.2
38	MFC ITU-T F2	1380; 1620	-8	0.2
39	MFC ITU-T F3	1500; 1620	-8	0.2
40	MFC ITU-T F4	1380; 1740	-8	0.2
41	MFC ITU-T F5	1500; 1740	-8	0.2
42	MFC ITU-T F6	1620; 1740	-8	0.2
43	MFC ITU-T F7	1380; 1860	-8	0.2
44	MFC ITU-T F8	1500; 1860	-8	0.2
45	MFC ITU-T F9	1620; 1860	-8	0.2
46	MFC ITU-T FO	1740; 1860	-8	0.2
47	MFC ITU-T F11	1380; 1980	-8	0.2
	MFC ITU-T F12	1500; 1980	-8	0.2
	MFC ITU-T F13	1620; 1980	-8	0.2
	MFC ITU-T F14	1740; 1980	-8	0.2
48	MFC ITU-T F15	1860; 1980	-8	0.2
49	Path Engaged 1 (UK)	400	-21	2.0
50	Path Engaged 2 (UK)	400	-15	2.0
51	Intrusion (UK)	1400	-8	2.0
52	Awaiting Answer (UK)	400; 450	-12	2.0
53	DMI Flags Tone	-	-	-
54	DMI Hold Tone	-	-	-

Ringback Cadences

Table 7-AE. Ringback Cadences, United Kingdom Tone Set

Ringback	Tone	Duration	Freq. (Hz)	Level (dB)
ringback 1	ringback tone silence	1000 ms 2000 ms	400; 450 -	-12 -
ringback 2	ringback tone silence ringback tone silence	400 ms 200 ms 400 ms 2000 ms	400; 450 - 400; 450 -	-12 - -12 -
ringback 3	ringback tone silence ringback tone silence ringback tone silence	400 ms 200 ms 400 ms 200 ms 400 ms 1400 ms	400; 450 - 400; 450 - 400; 450 -	-12 - -12 - -12 -
ringback 4	ringback tone silence	1000 ms 1000 ms	400; 450 -	-12 -

Cadenced Tones

Table 7-AF. Cadenced Tones, United Kingdom Tone Set

Name	Tones	Duration	Freq. (Hz)	Level (dB)	Freq. Tol.
busy	path engaged (2) silence	370 ms 380 ms	400 -	-15 -	2.0 -
fast busy	path engaged (1) silence path engaged (2) silence	400 ms 350 ms 220 ms 530 ms	400 - 400 -	-21 - -15 -	2.0 - 2.0 -
intercept	camp-on tone RS464 intercept tone	250 ms 250 ms	440 620	-16 -17	0.5 1.0
error	path engaged (2) path engaged (2)	500 ms 500 ms	400 400	-15 -15	2.0 2.0
queue	que tone 1 (C) que tone 2 (D) que tone 3 (E)	500 ms 500 ms 500 ms	262 294 330	-24 -24 -24	0.5 0.5 0.5
premium	high tone silence	100 ms 100 ms	480 -	-17 -	0.5 -
receiver off hook	howler silence	120 ms 130 ms	2060; 2450 -	0 -	2.0 -

Table 7-AF. Cadenced Tones, United Kingdom Tone Set **(continued)**

Name	Tones	Duration	Freq. (Hz)	Level (dB)	Freq. Tol.
lock out	high tone silence	10 ms 490 ms	480 -	-17 -	0.5 -
high tick	high tone silence	10 ms 990 ms	480 -	-17 -	0.5 -
ringback queue	awaiting answer silence awaiting answer silence	400 ms 200 ms 400 ms 2000 ms	400; 450 - 400; 450 -	-12 - -12 -	2.0 - 2.0 -

Ringing Cadences

Table 7-AG. Ringing Cadences, United Kingdom Tone Set

Ring	Cadence
ring 1	ring on 1000 ms; ring off 2000 ms
ring 2	ring on 400 ms; ring off 200 ms ring on 400 ms; ring off 2000 ms
ring 3	ring on 400 ms; ring off 200 ms ring on 400 ms; ring off 200 ms ring on 400 ms; ring off 1400 ms
ring 4	ring on 1000 ms; ring off 1000 ms

Hong Kong Tone Set (International Feature Set 8)

Continuous Tones

Table 7-AH. Continuous Tones, Hong Kong Tone Set

Tone #	Tone	Frequency (Hz)	Level (dB)	Freq. Tol.
0	silence	-		-
1	dial tone RS464	350; 440	-16	0.5
2	busy tone	480; 620	-10	0.5
3	ringback tone	440; 480	-10	0.5
4	camp-on tone RS464	440	-16	0.5
5	high tone	480	-17	0.5
6	preemption tone RS464	440; 620	-20	0.5
7	intercept tone RS464	620	-20	1.0
8	howler	2060;2450	0	2.0
9	carrier dial tone	400	-10	0.5
10	que tone 1 (C)	262	-24	0.5
11	que tone 2 (D)	294	-24	0.5
12	que tone 3 (E)	330	-24	0.5
13	carrier milliwatt	1004	0	0.05
14	DTMF 1	697; 1209	-5	0.5
15	DTMF 2	697; 1336	-5	0.5
16	DTMF 3	697; 1477	-5	0.5
17	DTMF 4	770; 1209	-5	0.5
18	DTMF 5	770; 1336	-5	0.5
19	DTMF 6	770; 1477	-5	0.5
20	DTMF 7	852; 1209	-5	0.5
21	DTMF 8	852; 1336	-5	0.5
22	DTMF 9	852; 1477	-5	0.5
23	DTMF 0	941; 1336	-5	0.5
24	DTMF #	941; 1477	-5	0.5
25	DTMF *	941; 1209	-5	0.5
26	DTMF A	697; 1633	-5	0.5

Table 7-AH. Continuous Tones, Hong Kong Tone Set **(continued)**

Tone #	Tone	Frequency (Hz)	Level (dB)	Freq. Tol.
27	DTMF B	770; 1633	-5	0.5
35	DTMF C	852; 1633	-5	0.5
36	DTMF D	941; 1633	-5	0.5
37	1000 Hz reference	-	-	-
38	MF 1	700; 900	-7	0.5
39	MF 2	700; 1100	-7	0.5
40	MF 3	900; 1100	-7	0.5
41	MF 4	700; 1300	-7	0.5
42	MF 5	900; 1300	-7	0.5
43	MF 6	1100; 1300	-7	0.5
44	MF 7	700; 1500	-7	0.5
45	MF 8	900; 1500	-7	0.5
46	MF 9	1100; 1500	-7	0.5
47	MF 0	1300; 1500	-7	0.5
48	MF ST3P	700; 1700	-7	0.5
49	MF STP	900; 1700	-7	0.5
50	MF KP	1100; 1700	-7	0.5
51	MF ST2P	1300; 1700	-7	0.5
52	MF ST	1500; 1700	-7	0.5
53	DMI Flags Tone	-	-	-
54	DMI Hold Tone	-	-	-
55	Splash Tone	1750	-5	0.5
56	HK Busy Tone RS464	480; 620	-10	0.5
57	HK Ringback RS464	440; 480	-10	0.5
58	SS7 ISUP 4W Test	2010	-12	0.35

Ringback Cadences

Table 7-AI. Ringback Cadences, Hong Kong Tone Set

Ringback	Tone	Duration	Freq. (Hz)	Level (dB)
ringback 1	HK ringback tone RS464 silence HK ringback tone RS464 silence	400 ms 200 ms 400 ms 3000 ms	440; 480 - 440; 480 -	-10 - -10 -
ringback 2	HK ringback tone RS464 silence	1000 ms 3000 ms	440; 480 -	-10 -
ringback 3	HK ringback tone RS464 silence HK ringback tone RS464 silence HK ringback tone RS464 silence	400 ms 200 ms 400 ms 200 ms 400 ms 2400 ms	440; 480 - 440; 480 - 440; 480 -	-10 - -10 - -10 -
ringback 4	HK ringback tone RS464 silence	1000 ms 1000 ms	440; 480 -	-10 -

Cadenced Tones

Table 7-AJ. Cadenced Tones, Hong Kong Tone Set

Name	Tones	Duration	Freq. (Hz)	Level (dB)	Freq. Tol.
busy	HK busy tone RS464 silence	500 ms 500 ms	480; 620 -	-10 -	0.5 -
fast busy	HK busytone RS464 silence	250 ms 250 ms	480; 620 -	-10 -	0.5 -
intercept	camp-on tone RS464 intercept tone	250 ms 250 ms	440 620	-16 -17	0.5 1.0
queue	que tone 1 (C) que tone 2 (D) que tone 3 (E)	500 ms 500 ms 500 ms	262 294 330	-24 -24 -24	0.5 0.5 0.5

Table 7-AJ. Cadenced Tones, Hong Kong Tone Set

Name	Tones	Duration	Freq. (Hz)	Level (dB)	Freq. Tol.
premium	high tone silence	100 ms 100 ms	480 -	-17 -	0.5 -
receiver off hook	howler silence	120 ms 130 ms	2060; 2450 -	0 -	2.0 -
lock out	high tone silence	10 ms 490 ms	480 -	-17 -	0.5 -
high tick	high tone silence	10 ms 990 ms	480 -	-17 -	0.5 -
ringback queue	HK ringback tone RS464 silence	1000 ms 2000 ms	440; 480 -	-10 -	0.5 -

Ringing Cadences

Table 7-AK. Ringing Cadences, Hong Kong Tone Set

Ring	Cadence
ring 1	ring on 400 ms; ring off 200 ms ring on 400 ms; ring off 3000 ms
ring 2	ring on 1000 ms; ring off 3000 ms
ring 3	ring on 400 ms; ring off 200 ms ring on 400 ms; ring off 200 ms ring on 400 ms; ring off 2400 ms
ring 4	ring on 1000 ms; ring off 1000 ms

Netherlands Tone Set (International Feature Set 9)

Continuous Tones

Table 7-AL. Continuous Tones, Netherlands Tone Set

Tone #	Tone	Frequency (Hz)	Level (dB)	Freq. Tol.
0	silence	-	-	-
1	dial tone	425	-11	2.0
2	busy tone	425	-11	2.0
3	ringback tone	425	-11	2.0
4	camp-on tone RS464	440	-16	0.5
5	high tone	480	-17	0.5
6	preemption tone RS464	440;620	-20	0.5
7	intercept tone RS464	620	-20	1.0
8	howler	2060; 2450	0	2.0
9	carrier dial tone	400	-10	0.5
10	que tone 1 (C)	262	-24	0.5
11	que tone 2 (D)	294	-24	0.5
12	que tone 3 (E)	330	-24	0.5
13	carrier milliwatt	1004	0	0.05
14	DTMF 1	697; 1209	-11; -9	0.5
15	DTMF 2	697; 1336	-11; -9	0.5
16	DTMF 3	697; 1477	-11; -9	0.5
17	DTMF 4	770; 1209	-11; -9	0.5
18	DTMF 5	770; 1336	-11; -9	0.5
19	DTMF 6	770; 1477	-11; -9	0.5
20	DTMF 7	852; 1209	-11; -9	0.5
21	DTMF 8	852; 1336	-11; -9	0.5
22	DTMF 9	852; 1477	-11; -9	0.5
23	DTMF 0	941; 1336	-11; -9	0.5
24	DTMF #	941; 1477	-11; -9	0.5
25	DTMF *	941; 1209	-11; -9	0.5
26	Netherlands Std. Tone	425	-11	2.0

Table 7-AL. Continuous Tones, Netherlands Tone Set **(continued)**

Tone #	Tone	Frequency (Hz)	Level (dB)	Freq. Tol.
27	1000 Hz reference	-	-	-
28	MFC ITU-T B1	1140; 1020	-8	0.35
29	MFC ITU-T B2	1140; 900	-8	0.35
30	MFC ITU-T B3	1020; 900	-8	0.35
31	MFC ITU-T B4	1140; 780	-8	0.35
32	MFC ITU-T B5	1020; 780	-8	0.35
33	MFC ITU-T B6	900; 780	-8	0.35
34	MFC ITU-T B7	1140; 660	-8	0.35
35	MFC ITU-T B8	1020; 660	-8	0.35
36	MFC ITU-T B9	900; 660	-8	0.35
37	MFC ITU-T B0	780; 660	-8	0.35
38	MFC ITU-T F1	1380; 1500	-8	0.2
39	MFC ITU-T F2	1380; 1620	-8	0.2
40	MFC ITU-T F3	1S00; 1620	-8	0.2
41	MFC ITU-T F4	1380; 1740	-8	0.2
42	MF ITU-TC F5	1500; 1740	-8	0.2
43	MFC ITU-T F6	1620; 1740	-8	0.2
44	MFC ITU-T F7	1380; 1860	-8	0.2
45	MFC ITU-T F8	1500; 1860	-8	0.2
46	MFC ITU-T F9	1620; 1860	-8	0.2
47	MFC ITU-T F0	1740; 1860	-8	0.2
48	MFC ITU-T F11	1380; 1980	-8	0.2
49	MFC ITU-T F12	1500; 1980	-8	0.2
50	MFC ITU-T F13	1620; 1980	-8	0.2
51	MFC ITU-T F14	1740; 1980	-8	0.2
52	MFC ITU-T F15	1860; 1980	-8	0.2
53	DMI Flags Tone	-	-	-
54	DMI Hold Tone	-	-	-

Ringback Cadences

Table 7-AM. Ringback Cadences, Netherlands Tone Set

Ringback	Tone	Duration	Freq. (Hz)	Level (dB)
ringback 1	Netherlands Std. Tone silence	1000 ms 4000 ms	425 -	-11 -
ringback 2	Netherlands Std. Tone silence	1000 ms 4000 ms	425 -	-11 -
ringback 3	Netherlands Std. Tone silence Netherlands Std. Tone silence Netherlands Std. Tone silence	400 ms 200 ms 400 ms 200 ms 400 ms 3400 ms	425 - 425 - 425 -	-11 - -11 - -11 -
ringback 4	Netherlands Std. Tone silence	1000 ms 1000 ms	425 -	-11 -

Cadenced Tones

Table 7-AN. Cadenced Tones, Netherlands Tone Set

Name	Tones	Duration	Freq. (Hz)	Level (dB)	Freq. Tol.
busy	busy Tone silence	500 ms 500 ms	425 -	-11 -	2.0 -
fast busy	busy Tone silence	250 ms 250 ms	425 -	-11 -	2.0 -
intercept	camp-on tone RS464 intercept tone	250 ms 250 ms	440 620	-16 -17	0.5 1.0
error	busy Tone silence	50 ms 50 ms	425 -	- 11 -	2.0 -
queue	que tone 1 (C) que tone 2 (D) que tone 3 (E)	410 ms 420 ms 420 ms	262 294 330	-24 -24 -24	0.5 0.5 0.5
premium	high tone silence	100 ms 100 ms	480 -	-17 -	0.5 -
receiver off hook	howler silence	120 ms 130 ms	2060; 2450 -	0 -	2.0 -
lock out	high tone silence	10 ms 490 ms	480 -	-17 -	0.5 -
high tick	high tone silence	10 ms 990 ms	480 -	-17 -	0.5 -
ringback queue	ringback Tone silence	1000 ms 4000 ms	425 -	-11 -	2.0 -

Ringing Cadences

Table 7-AO. Ringing Cadences, Netherlands Tone Set

Ring	Cadence
ring 1	ring on 1000 ms; ring off 4000 ms
ring 2	ring on 400 ms; ring off 200 ms ring on 400 ms; ring off 4000 ms
ring 3	ring on 400 ms; ring off 200 ms ring on 400 ms; ring off 200 ms ring on 400 ms; ring off 3400 ms
ring 4	ring on 1000 ms; ring off 1000 ms

Finland Tone Set (International Feature Set 10)

Continuous Tones

Table 7-AP. Continuous Tones, Finland Tone Set

Tone #	Tone	Frequency (Hz)	Level (dB)	Freq. Tol.
0	silence	-	-	-
1	dial tone	425	-15	2.0
2	busy tone	425	-15	2.0
3	ringback tone	425	-15	2.0
4	camp-on tone RS464	440	-16	0.5
5	high tone	480	-17	0.5
6	preemption tone RS464	440; 620	-20	0.5
7	intercept tone RS464	620	-20	1.0
8	howler	2060; 2450	0	2.0
9	carrier dial tone	400	-10	0.5
10	carrier milliwatt	1004	0	0.05
11	DTMF 1	697; 1209	-11; -9	0.5
12	DTMF 2	697; 1336	-11; -9	0.5
13	DTMF 3	697; 1477	-11; -9	0.5
14	DTMF 4	770; 1209	-11; -9	0.5
15	DTMF 5	770; 1336	-11; -9	0.5
16	DTMF 6	770; 1477	-11; -9	0.5
17	DTMF 7	852; 1209	-11; -9	0.5
18	DTMF 8	852; 1336	-11; -9	0.5
19	DTMF 9	852; 1477	-11; -9	0.5
20	DTMF 0	941; 1336	-11; -9	0.5
21	DTMF #	941; 1477	-11; -9	0.5
22	DTMF *	941; 1209	-11; -9	0.5
23	que tone 1 (C)	262	-24	0.5
24	que tone 2 (D)	294	-24	0.5
25	que tone 3 (E)	330	-24	0.5
26	Finland Std. Tone	425	-15	2.0

Table 7-AP. Continuous Tones, Finland Tone Set **(continued)**

Tone #	Tone	Frequency (Hz)	Level (dB)	Freq. Tol.
27	1000Hz reference	-	-	-
28	MFC ITU-T B1	1140;1020	-8	0.35
29	MFC ITU-T B2	1140;900	-8	0.35
30	MFC ITU-T B3	1020;900	-8	0.35
31	MFC ITU-T B4	1140;780	-8	0.35
32	MFC ITU-T B5	1020; 780	-8	0.35
33	MFC ITU-T B6	900; 780	-8	0.35
34	MFC ITU-T B7	1140; 660	-8	0.35
35	MFC ITU-T B8	1020; 660	-8	0.35
36	MFC ITU-T B9	900; 660	-8	0.35
37	MFC ITU-T B0	780; 660	-8	0.35
38	MFC ITU-T F1	1380; 1500	-8	0.2
39	MFC ITU-T F2	1380; 1620	-8	0.2
40	MFC ITU-T F3	1500; 1620	-8	0.2
41	MFC ITU-T F4	1380; 1740	-8	0.2
42	MFC ITU-T F5	1500; 1740	-8	0.2
43	MFC ITU-T F6	1620; 1740	-8	0.2
44	MFC ITU-T F7	1380; 1860	-8	0.2
45	MFC ITU-T F8	1500; 1860	-8	0.2
46	MFC ITU-T F9	1620; 1860	-8	0.2
47	MFC ITU-T F0	1740; 1860	-8	0.2
48	MFC ITU-T F11	1380; 1980	-8	0.2
49	MFC ITU-T F12	1500; 1980	-8	0.2
50	MFC ITU-T F13	1620; 1980	-8	0.2
51	MFC ITU-T F14	1740; 1980	-8	0.2
52	MFC ITU-T F15	1860; 1980	-8	0.2
53	DMI Flags Tone	-	-	-
54	DMI Hold Tone	-	-	-

Ringback Cadences

Table 7-AQ. Ringback Cadences, Finland Tone Set

Ringback	Tone	Duration	Freq. (Hz)	Level (dB)
ringback 1	ringback Tone silence	1000 ms 4000 ms	425 -	-15 -
ringback 2	ringback Tone silence	1000 ms 4000 ms	425 -	-15 -
ringback 3	ringback Tone silence ringback Tone silence ringback Tone silence	400 ms 200 ms 400 ms 200 ms 400 ms 3400 ms	425 - 425 - 425 -	-15 - -15 - -15 -
ringback 4	ringback Tone silence	1000 ms 1000 ms	425 -	-15 -

Cadenced Tones

Table 7-AR. Cadenced Tones, Finland Tone Set

Name	Tones	Duration	Freq. (Hz)	Level (dB)	Freq. Tol.
busy	busy tone silence	300 ms 300 ms	425 -	-15 -	2.0 -
fast busy	busy tone silence	250 ms 250 ms	425 -	-15 -	2.0 -
intercept	camp-on tone RS464 intercept tone	250 ms 250 ms	440 620	-16 -17	0.5 1.0
error	busy tone silence	60 ms 60 ms	425 -	-15 -	2.0 -
queue	que tone 1 (C) que tone 2 (D) que tone 3 (E)	500 ms 500 ms 500 ms	262 294 330	-24 24 24	0.5 0.5 0.5
premium	high tone silence	100 ms 100 ms	480 -	-17 -	0.5 -
receiver off hook	howler silence	120 ms 130 ms	2060; 2450 -	0 -	2.0 -
lock out	high tone silence	10 ms 490 ms	480 -	-17 -	0.5 -
high tick	high tone silence	10 ms 990 ms	480 -	-17 -	0.5 -
ringback queue	ringback tone silence	1000 ms 2000 ms	425 -	-15 -	2.0 -

Russia Tone Set (International Feature Set 11)

Continuous Tones

Table 7-AS. Continuous Tones, Russian Tone Set

Tone #	A-Law Tone	Frequency (Hz)	Level (dB)	Freq. Tol.
0	silence	-	-	-
1	Russia dial tone	425	-10	1.0
2	camp-on tone	425	-10	1.0
3	high tone	480	-17	0.5
4	busy tone	425	-10	1.0
5	ringback tone	425	-10	1.0
6	preemption tone	425	-10	1.0
7	intercept tone	620	-17	1.0
8	howler	2060; 2450	0	2.0
9	carrier dial tone	400	-10	0.5
10	que tone 1 (C)	262	-24	0.5
11	que tone 2 (D)	294	-24	0.5
12	que tone 3 (E)	330	-24	0.5
13	ANI Request Tone	500	-4.5	0.5
14	Carrier Milliwatt	1004	0	0.05
15	DTMF 1	697; 1209	-6; -3	0.5
16	DTMF 2	697; 1336	-6; -3	0.5
17	DTMF 3	697; 1477	-6; -3	0.5
18	DTMF 4	770; 1209	-6; -3	0.5
19	DTMF 5	770; 1336	-6; -3	0.5
20	DTMF 6	770; 1477	-6; -3	0.5
21	DTMF 7	852; 1209	-6; -3	0.5
22	DTMF 8	852; 1336	-6; -3	0.5
23	DTMF 9	852; 1477	-6; -3	0.5
24	DTMF 0	941; 1336	-6; -3	0.5
25	DTMF #	941; 1477	-6; -3	0.5
26	DTMF *	941; 1209	-6; -3	0.5

Table 7-AS. Continuous Tones, Russian Tone Set

Tone #	A-Law Tone	Frequency (Hz)	Level (dB)	Freq. Tol.
27	DTMF A	697; 1633	-6; -3	0.5
28	DTMF B	770; 1633	-6; -3	0.5
29	DTMF C	852; 1633	-6; -3	0.5
30	DTMF D	941; 1633	-6; -3	0.5
31	MF 1	700; 900	-7	0.5
32	MF 2	700; 1100	-7	0.5
33	MF 3	900; 1100	-7	0.5
34	MF 4	700; 1300	-7	0.5
35	MF 5	900; 1300	-7	0.5
36	MF 6	1100; 1300	-7	0.5
37	MF 7	700; 1500	-7	0.5
38	MF 8	900; 1500	-7	0.5
39	MF 9	1100; 1500	-7	0.5
40	MF A	1300; 1500	-7	0.5
41	MF B	700; 1700	-7	0.5
42	MF C	900; 1700	-7	0.5
43	MF D	1100; 1700	-7	0.5
44	MF E	1300; 1700	-7	0.5
45	MF F	1500; 1700	-7	0.5
46	1000 Hz reference	-	-	-
47	DMI Flags Tone	-	-	-
48	DMI Hold Tone	-	-	-
49	error tone 1	950	-10	0.5
50	error tone 2	1400	-10	0.5
51	error tone 3	1800	-10	0.5

Ringback Cadences

Table 7-AT. Ringback Cadences, Russian Tone Set

Ringback	Tone	Duration	Freq. (Hz)	Level (dB)
ringback 1	ringback tone silence	1000 ms 4000 ms	425 -	-10 -
ringback 2	ringback tone silence	1000 ms 4000 ms	425 -	-10 -
ringback 3	ringback tone silence ringback tone silence ringback tone silence	400 ms 200 ms 400 ms 200 ms 400 ms 3400 ms	425 - 425 - 425 -	-10 - -10 - -10 -
ringback 4	ringback tone silence	1000 ms 1000 ms	425 -	-10 -

Cadenced Tones

Table 7-AU. Cadenced Tones, Russian Tone Set

Name	Tones	Duration	Freq. (Hz)	Level (dB)	Freq. Tol.
busy	busy tone silence	300 ms 300 ms	425 -	-10 -	1.0 -
fast busy	busy tone silence	250 ms 250 ms	425 -	-10 -	1.0 -
intercept	camp-on tone intercept tone	250 ms 250 ms	440 620	-17 -17	0.5 1.0
error	error Tone 1 error Tone 2 error Tone 3 silence	340 ms 330 ms 330 ms 1000 ms	950 1400 1800 -	-10 -10 -10	0.5 0.5 0.5 -
queue	que tone 1 (C) que tone 2 (D) que tone 3 (E)	500 ms 500 ms 500 ms	262 294 330	-24 -24 -24	0.5 0.5 0.5
premium	high tone silence	100 ms 100 ms	480 -	-17 -	0.5 -
receiver off hook	howler silence	120 ms 130 ms	2060; 2450 -	0 -	2.0 -

Table 7-AU. Cadenced Tones, Russian Tone Set **(continued)**

Name	Tones	Duration	Freq. (Hz)	Level (dB)	Freq. Tol.
lock out	high tone silence	10 ms 490 ms	480 -	-17 -	0.5 -
high tick	high tone silence	10 ms 990 ms	480 -	-17 -	0.5 -
ringback queue	ringback tone silence	1000 ms 2000 ms	425 -	-10 -	1.0 -

Ringing Cadences

Table 7-AV. Ringing Cadences, Russian Tone Set

Ring	Cadence
ring 1	ring on 1000 ms; ring off 4000 ms
ring 2	ring on 400 ms; ring off 200 ms ring on 400 ms; ring off 4000 ms
ring 3	ring on 400 ms; ring off 200 ms ring on 400 ms; ring off 200 ms ring on 400 ms; ring off 3400 ms
ring 4	ring on 1000 ms; ring off 1000 ms

Czech Republic Tone Set (International Feature Set 12)

Continuous Tones

Table 7-AW. Continuous Tones, Czech Republic Tone Set

Tone #	Tone	Frequency (Hz)	Level (dB)	Freq. Tol.
0	silence	-	-	-
1	CR dial tone	425	-6	1.0
2	busy tone	425	-6	1.0
3	ringback tone	425	-6	1.0
4	camp-on tone	425	-6	1.0
5	high tone	480	-17	0.5
6	preemption tone	425	-11	2.0
7	intercept tone	425	-6	1.0
8	howler	2060; 2450	0	2.0
9	carrier dial tone	425	-6	1.0
10	que tone 1 (C)	262	-24	0.5
11	que tone 2 (D)	294	-24	0.5
12	que tone 3 (E)	330	-24	0.5
13	carrier milliwatt	1004	0	0.05
14	DTMF 1	697; 1209	-11; -9	0.5
15	DTMF 2	697; 1336	-11; -9	0.5
16	DTMF 3	697; 1477	-11; -9	0.5
17	DTMF 4	770; 1209	-11; -9	0.5
18	DTMF 5	770; 1336	-11; -9	0.5
19	DTMF 6	770; 1477	-11; -9	0.5
20	DTMF 7	852; 1209	-11; -9	0.5
21	DTMF 8	852; 1336	-11; -9	0.5
22	DTMF 9	852; 1477	-11; -9	0.5
23	DTMF 0	941; 1336	-11; -9	0.5
24	DTMF #	941; 1477	-11; -9	0.5
25	DTMF *	941; 1209	-11; -9	0.5
26	Czech Std. dial tone	425	-6	1.0

Table 7-AW. Continuous Tones, Czech Republic Tone Set **(continued)**

Tone #	Tone	Frequency (Hz)	Level (dB)	Freq. Tol.
27	1000 Hz reference	-	-	-
28	MFC ITU-T B1	1140; 1020	-8	0.35
29	MFC ITU-T B2	1140; 900	-8	0.35
30	MFC ITU-T B3	1020; 900	-8	0.35
31	MFC ITU-T B4	1140; 780	-8	0.35
32	MFC ITU-T B5	1020; 780	-8	0.35
33	MFC ITU-T B6	900; 780	-8	0.35
34	MFC ITU-T B7	1140; 660	-8	0.35
35	MFC ITU-T B8	1020; 660	-8	0.35
36	MFC ITU-T B9	900; 660	-8	0.35
37	MFC ITU-T B0	780; 660	-8	0.35
38	MFC ITU-T F1	1380; 1500	-8	0.2
39	MFC ITU-T F2	1380; 1620	-8	0.2
40	MFC ITU-T F3	1S00; 1620	-8	0.2
41	MFC ITU-T F4	1380; 1740	-8	0.2
42	MFC ITU-T F5	1500; 1740	-8	0.2
43	MFC ITU-T F6	1620; 1740	-8	0.2
44	MFC ITU-T F7	1380; 1860	-8	0.2
45	MFC ITU-T F8	1500; 1860	-8	0.2
46	MFC ITU-T F9	1620; 1860	-8	0.2
47	MFC ITU-T F0	1740; 1860	-8	0.2
48	MFC ITU-T F11	1380; 1980	-8	0.2
49	MFC ITU-T F12	1500; 1980	-8	0.2
50	MFC ITU-T F13	1620; 1980	-8	0.2
51	MFC ITU-T F14	1740; 1980	-8	0.2
52	MFC ITU-T F15	1860; 1980	-8	0.2
53	DMI Flags Tone	-	-	-
54	DMI Hold Tone	-	-	-
55	425L11 std.l tone	425	-11	2.0

Ringback Cadences

Table 7-AX. Ringback Cadences, Czech Republic Tone Set

Ringback	Tone	Duration	Freq. (Hz)	Level (dB)
ringback 1	ringback tone silence	1000 ms 4000 ms	425 -	-6 -
ringback 2	ringback tone silence ringback tone silence	400 ms 200 ms 400 ms 3000 ms	425 - 425 -	-6 - -6 -
ringback 3	ringback tone silence ringback tone silence ringback tone silence	400 ms 200 ms 400 ms 200 ms 400 ms 2400 ms	425 - 425 - 425 -	-6 - -6 - -6 -
ringback 4	ringback tone silence	1000 ms 1000 ms	425 -	-6 -

Cadenced Tones

Table 7-AY. Cadenced Tones, Czech Republic Tone Set

Name	Tones	Duration	Freq. (Hz)	Level (dB)	Freq. Tol.
carrier dial tone	Czech Std. dial tone silence Czech Std. dial tone silence	300 ms 300 ms 700 ms 700 ms	425 - 425 -	-6 - -6 -	1.0 - 1.0 -
busy	busy tone silence	300 ms 300 ms	425 -	-6 -	1.0 -
fast busy	busy tone silence	120 ms 130 ms	425 -	-6 -	1.0 -
intercept	camp-on tone intercept tone	250 ms 250 ms	425 620	-6 -17	1.0 1.0
error	intercept tone silence	120 ms 130 ms	425 -	-6 -	1.0 -
queue	que tone 1 (C) que tone 2 (D) que tone 3 (E)	500 ms 500 ms 500 ms	262 294 330	-24 -24 -24	0.5 0.5 0.5

Table 7-AY. Cadenced Tones, Czech Republic Tone Set

Name	Tones	Duration	Freq. (Hz)	Level (dB)	Freq. Tol.
premium	high tone silence	100 ms 100 ms	480 -	-17 -	0.5 -
receiver off hook	howler silence	120 ms 130 ms	2060; 2450 -	0 -	2.0 -
lock out	Czech Std. dial tone silence	120 ms 130 ms	425 -	-6 -	1.0 -
high tick	high tone silence	10 ms 990 ms	480 -	-17 -	0.5 -
ringback queue	ringback tone silence	1000 ms 2000 ms	425 -	-6 -	1.0 -

Ringing Cadences

Table 7-AZ. Ringing Cadences, Czech Republic Tone Set

Ring	Cadence
ring 1	ring on 1000 ms; ring off 3000 ms
ring 2	ring on 400 ms; ring off 200 ms ring on 400 ms; ring off 3000 ms
ring 3	ring on 400 ms; ring off 200 ms ring on 400 ms; ring off 200 ms ring on 400 ms; ring off 2400 ms
ring 4	ring on 1000 ms; ring off 1000 ms

Hungary Tone Set (International Feature Set 13)

Continuous Tones

Table 7-BA. Continuous Tones, Hungary Tone Set

Tone #	Tone	Frequency (Hz)	ME/LE Level (dB)	ME/LE Freq. Tol.
0	silence	-	-	-
1	dial tone	425	-7	0.5
2	busy tone	425	-7	0.5
3	ringback tone	425	-7	0.5
4	camp-on tone RS464	440	-16	0.5
5	high tone	480	-17	0.5
6	preemption tone	425	-15	0.5
7	intercept tone	300; 425	-17	0.5
8	howler	1000	0	0.1
9	carrier dial tone	425; 450	-8; -13	0.5
10	que tone 1 (C)	262	-24	0.5
11	que tone 2 (D)	294	-24	0.5
12	que tone 3 (E)	330	-24	0.5
13	carrier milliwatt	900	-2	0.1
14	DTMF 1	697; 1209	-11; -9	0.5
15	DTMF 2	697; 1336	-11; -9	0.5
16	DTMF 3	697; 1477	-11; -9	0.5
17	DTMF 4	770; 1209	-11; -9	0.5
18	DTMF 5	770; 1336	-11; -9	0.5
19	DTMF 6	770; 1477	-11; -9	0.5
20	DTMF 7	852; 1209	-11; -9	0.5
21	DTMF 8	852; 1336	-11; -9	0.5
22	DTMF 9	852; 1477	-11; -9	0.5
23	DTMF 0	941; 1336	-11; -9	0.5
24	DTMF #	941; 1477	-11; -9	0.5
25	DTMF *	941; 1209	-11; -9	0.5
26	error tone	300; 425	-17	0.5

Table 7-BA. Continuous Tones, Hungary Tone Set **(continued)**

Tone #	Tone	Frequency (Hz)	ME/LE Level (dB)	ME/LE Freq. Tol.
27	1000 Hz reference	-		
28	MFC ITU-T B1	1140; 1020	-8	0.35
29	MFC ITU-T B2	1140; 900	-8	0.35
30	MFC ITU-T B3	1020; 900	-8	0.35
31	MFC ITU-T B4	1140; 780	-8	0.35
32	MFC ITU-T B5	1020; 780	-8	0.35
33	MFC ITU-T B6	900; 780	-8	0.35
34	MFC ITU-T B7	1140; 660	-8	0.35
35	MFC ITU-T B8	1020; 660	-8	0.35
36	MFC ITU-T B9	900; 660	-8	0.35
37	MFC ITU-T B0	780; 660	-8	0.35
38	MFC ITU-T F1	1380; 1500	-8	0.2
39	MFC ITU-T F2	1380; 1620	-8	0.2
40	MFC ITU-T F3	1500; 1620	-8	0.2
41	MFC ITU-T F4	1380; 1740	-8	0.2
42	MFC ITU-T F5	1500; 1740	-8	0.2
43	MFC ITU-T F6	1620; 1740	-8	0.2
44	MFC ITU-T F7	1380; 1860	-8	0.2
45	MFC ITU-T F8	1500; 1860	-8	0.2
46	MFC ITU-T F9	1620; 1860	-8	0.2
47	MFC ITU-T F0	1740; 1860	-8	0.2
48	MFC ITU-T F11	1380; 1980	-8	0.2
49	MFC ITU-T F12	1500; 1980	-8	0.2
50	MFC ITU-T F13	1620; 1980	-8	0.2
51	MFC ITU-T F14	1740; 1980	-8	0.2
52	MFC ITU-T F15	1860; 1980	-8	0.2
53	DMI Flags Tone	-	-	-
54	DMI Hold Tone	-	-	-

Ringback Cadences

Table 7-BB. Ringback Cadences, Hungary Tone Set

Ringback	Tone	Duration	Freq. (Hz)	Level (dB)
ringback 1	ringback tone silence	1250 ms 3750 ms	425 -	-7 -
ringback 2	ringback tone silence ringback tone silence	400 ms 200 ms 400 ms 3000 ms	425 - 425 -	-7 - -6 -
ringback 3	ringback tone silence ringback tone silence ringback tone silence	400 ms 200 ms 400 ms 200 ms 400 ms 2400 ms	425 - 425 - 425 -	-7 - -7 - -7 -
ringback 4	ringback tone silence	1000 ms 1000 ms	425 -	-7 -

Cadenced Tones

Table 7-BC. Cadenced Tones, Hungary Tone Set

Name	Tones	Duration	Freq. (Hz)	Level (dB)	Freq. Tol.
busy	busy tone silence	300 ms 300 ms	425 -	-7 -	0.5 -
fast busy	busy tone silence	250 ms 250 ms	425 -	-7 -	0.5 -
intercept	camp-on tone RS464 intercept tone	250 ms 250 ms	440 620	-16 -17	0.5 1.0
error	error tone silence	200 ms 200 ms	300; 425 -	-17 -	0.5 -
queue	que tone 1 (C) que tone 2 (D) que tone 3 (E)	500 ms 500 ms 500 ms	262 294 330	-24 -24 -24	0.5 0.5 0.5
premium	high tone silence	100 ms 100 ms	480 -	-17 -	0.5 -
receiver off hook	howler silence	120 ms 130 ms	1000 -	0 -	0.1 -

Table 7-BC. Cadenced Tones, Hungary Tone Set

Name	Tones	Duration	Freq. (Hz)	Level (dB)	Freq. Tol.
lock out	high tone silence	10 ms 490 ms	480 -	-17 -	0.5 -
high tick	high tone silence	10 ms 990 ms	480 -	-17 -	0.5 -
ringback queue	ringback tone silence	1000 ms 2000 ms	425 -	-7 -	0.5 -

Ringing Cadences

Table 7-BD. Ringing Cadences, Hungary Tone Set

Ring	Cadence
ring 1	ring on 1000 ms; ring off 3000 ms
ring 2	ring on 400 ms; ring off 200 ms ring on 400 ms; ring off 3000 ms
ring 3	ring on 400 ms; ring off 200 ms ring on 400 ms; ring off 200 ms ring on 400 ms; ring off 2400 ms
ring 4	ring on 1000 ms; ring off 1000 ms

Singapore Tone Set (International Feature Set 14)

Continuous Tones

Table 7-BE. Continuous Tones, Singapore Tone Set

Tone #	Tone	Frequency (Hz)	Level (dB)	Freq. Tol.
0	silence	-	-	-
1	dial tone	425	-15	2.0
2	busy tone	425	-11	2.0
3	ringback tone	425	-11	2.0
4	camp-on tone RS464	440	-16	0.5
5	high tone	480	-17	0.5
6	preemption tone RS464	440; 620	-20	0.5
7	intercept tone RS464	620	-20	1.0
8	howler	2060; 2450	0	2.0
9	carrier dial tone	400	-10	0.5
10	que tone 1 (C)	262	-24	0.5
11	que tone 2 (D)	294	-24	0.5
12	que tone 3 (E)	330	-24	0.5
13	carrier milliwatt	1004	0	0.05
14	DTMF 1	697; 1209	-11; -9	0.5
15	DTMF 2	697; 1336	-11; -9	0.5
16	DTMF 3	697; 1477	-11; -9	0.5
17	DTMF 4	770; 1209	-11; -9	0.5
18	DTMF 5	770; 1336	-11; -9	0.5
19	DTMF 6	770; 1477	-11; -9	0.5
20	DTMF 7	852; 1209	-11; -9	0.5
21	DTMF 8	852; 1336	-11; -9	0.5
22	DTMF 9	852; 1477	-11; -9	0.5
23	DTMF 0	941; 1336	-11; -9	0.5
24	DTMF #	941; 1477	-11; -9	0.5
25	DTMF *	941; 1209	-11; -9	0.5
26	1000 Hz reference	-	-	-

Table 7-BE. Continuous Tones, Singapore Tone Set **(continued)**

Tone #	Tone	Frequency (Hz)	Level (dB)	Freq. Tol.
27	MFC ITU-T B1	1140; 1020	-8	0.35
28	MFC ITU-T B2	1140; 900	-8	0.35
29	MFC ITU-T B3	1020; 900	-8	0.35
30	MFC ITU-T B4	1140; 780	-8	0.35
31	MFC ITU-T B5	1020; 780	-8	0.35
32	MFC ITU-T B6	900; 780	-8	0.35
33	MFC ITU-T B7	1140; 660	-8	0.35
34	MFC ITU-T B8	1020; 660	-8	0.35
35	MFC ITU-T B9	900; 660	-8	0.35
36	MFC ITU-T B0	780; 660	-8	0.35
37	MFC ITU-T F1	1380; 1500	-8	0.2
38	MFC ITU-T F2	1380; 1620	-8	0.2
39	MFC ITU-T F3	1500; 1620	-8	0.2
40	MFC ITU-T F4	1380; 1740	-8	0.2
41	MFC ITU-T F5	1500; 1740	-8	0.2
42	MFC ITU-T F6	1620; 1740	-8	0.2
43	MFC ITU-T F7	1380; 1860	-8	0.2
44	MFC ITU-T F8	1500; 1860	-8	0.2
45	MFC ITU-T F9	1620; 1860	-8	0.2
46	MFC ITU-T F0	1740; 1860	-8	0.2
47	MFC ITU-T F11	1380; 1980	-8	0.2
48	MFC ITU-T F12	1500; 1980	-8	0.2
49	MFC ITU-T F13	1620; 1980	-8	0.2
50	MFC ITU-T F14	1740; 1980	-8	0.2
51	MFC ITU-T F15	1860; 1980	-8	0.2
52	DMI Flags Tone	-	-	-
53	DMI Hold Tone	-	-	-

Ringback Cadences

Table 7-BF. Ringback Cadences, Singapore Tone Set

Ringback	Tone	Duration	Freq. (Hz)	Level (dB)
ringback 1	ringback tone silence	1000 ms 3000 ms	425 -	-11 -
ringback 2	ringback tone silence ringback tone silence	400 ms 200 ms 400 ms 3000 ms	425 - 425 -	-11 - -11 -
ringback 3	ringback tone silence ringback tone silence ringback tone silence	400 ms 200 ms 400 ms 200 ms 400 ms 2400 ms	425 - 425 - 425 -	-11 - -11 - -11 -
ringback 4	ringback tone silence	1000 ms 1000 ms	425 -	-11 -

Cadenced Tones

Table 7-BG. Cadenced Tones, Singapore Tone Set

Name	Tones	Duration	Freq. (Hz)	Level (dB)	Freq. Tol.
busy	busy tone silence	500 ms 500 ms	425 -	-11 -	2.0 -
fast busy	busy tone silence	250 ms 250 ms	425 -	-11 -	2.0 -
intercept	camp-on tone RS464 intercept tone	250 ms 250 ms	440 620	-16 -17	0.5 1.0
error	intercept tone camp-on tone RS464	500 ms 500 ms	620 440	-17 -16	1.0 0.5
queue	que tone 1 (C) que tone 2 (D) que tone 3 (E)	500 ms 500 ms 500 ms	262 294 330	-24 -24 -24	0.5 0.5 0.5
premium	high tone silence	100 ms 100 ms	480 -	-17 -	0.5 -
receiver off hook	howler silence	120 ms 130 ms	2060; 2450 -	0 -	2.0 -

Table 7-BG. Cadenced Tones, Singapore Tone Set

Name	Tones	Duration	Freq. (Hz)	Level (dB)	Freq. Tol.
lock out	high tone silence	10 ms 490 ms	480 -	-17 -	0.5 -
high tick	high tone silence	10 ms 990 ms	480 -	-17 -	0.5 -
ringback queue	ringback tone silence	1000 ms 2000 ms	425 -	-11 -	2.0 -

Ringing Cadences

Table 7-BH. Ringing Cadences, Singapore Tone Set

Ring	Cadence
ring 1	ring on 1000 ms; ring off 3000 ms
ring 2	ring on 400 ms; ring off 200 ms ring on 400 ms; ring off 2000 ms
ring 3	ring on 400 ms; ring off 200 ms ring on 400 ms; ring off 200 ms ring on 400 ms; ring off 2400 ms
ring 4	ring on 1000 ms; ring off 1000 ms

NAPN USA Tone Set (International Feature Set 16)

Continuous Tones

Table 7-BI. Continuous Tones, NAPN USA Tone Set

Tone #	Tone	Frequency (Hz)	Level (dB)	Freq. Tol.
0	silence	-		-
1	dial tone RS464	350; 440	-16	0.5
2	busy tone RS464	480; 620	-27	0.5
3	ringback tone RS464	440; 480	-22	0.5
4	camp-on tone RS464	440	-16	0.5
5	high tone	480	-17	0.5
6	preemption tone RS464	440; 620	-20	0.5
7	intercept tone RS464	620	-20	1.0
8	howler	2060; 2450	0	2.0
9	carrier dial tone	400	-10	0.5
10	que tone 1 (C)	262	-24	0.5
11	que tone 2 (D)	294	-24	0.5
12	que tone 3 (E)	330	-24	0.5
13	carrier milliwatt	1004	0	0.05
14	DTMF 1	697; 1209	-5	0.5
15	DTMF 2	697; 1336	-5	0.5
16	DTMF 3	697; 1477	-5	0.5
17	DTMF 4	770; 1209	-5	0.5
18	DTMF 5	770; 1336	-5	0.5
19	DTMF 6	770; 1477	-5	0.5
20	DTMF 7	852; 1209	-5	0.5
21	DTMF 8	852; 1336	-5	0.5
22	DTMF 9	852; 1477	-5	0.5
23	DTMF 0	941; 1336	-5	0.5
24	DTMF #	941; 1477	-5	0.5
25	DTMF *	941; 1209	-5	0.5
26	DTMF A	697; 1633	-5	0.5

Table 7-BI. Continuous Tones, NAPN USA Tone Set **(continued)**

Tone #	Tone	Frequency (Hz)	Level (dB)	Freq. Tol.
27	DTMF B	770; 1633	-5	0.5
35	DTMF C	852; 1633	-5	0.5
36	DTMF D	941; 1633	-5	0.5
37	1000 Hz reference	-	-	-
38	MF 1	700;900	-7	0.5
39	MF 2	700;1100	-7	0.5
40	MF 3	900;1100	-7	0.5
41	MF 4	700;1300	-7	0.5
42	MF 5	900; 1300	-7	0.5
43	MF 6	1100; 1300	-7	0.5
44	MF 7	700; 1500	-7	0.5
45	MF 8	900; 1500	-7	0.5
46	MF 9	1100; 1500	-7	0.5
47	MF 0	1300; 1500	-7	0.5
48	MF ST3P	700; 1700	-7	0.5
49	MF STP	900; 1700	-7	0.5
50	MF KP	1100; 1700	-7	0.5
51	MF ST2P	1300; 1700	-7	0.5
52	MF ST	1500; 1700	-7	0.5
53	DMI Flags Tone	-	-	-
54	DMI Hold Tone	-	-	-
55	Splash	1750	-5	0.5
56	SS7 4W COT test	2010	-12	0.35

Ringback Cadences

Table 7-BJ. Ringback Cadences, NAPN USA Tone Set

Ringback	Tone	Duration	Freq. (Hz)	Level (dB)
ringback 1	ringback tone RS464 silent tone	2000 ms 4000 ms	440; 480 -	- 22 -
ringback 2	ringback tone RS464 silent tone	2000 ms 4000 ms	440; 480 -	-22 -
ringback 3	ringback tone RS464 silent tone ringback tone RS464 silent tone ringback tone RS464 silent tone	400 ms 200 ms 400 ms 200 ms 400 ms 2400 ms	440; 480 - 440; 480 - 440; 480 -	-22 - -22 - -22 -
ringback 4	ringback tone RS464 silent tone	1000 ms 1000 ms	440; 480 -	-22 -

Cadenced Tones

Table 7-BK. Cadenced Tones, NAPN USA Tone Set

Name	Tones	Duration	Freq. (Hz)	Level (dB)	Freq. Tol.
busy	busy tone RS464 silence	500 ms 500 ms	480; 620 -	-27 -	0.5 -
fast busy	busy tone RS464 silence	250 ms 250 ms	480;620 -	-27 -	0.5 -
intercept	camp-on tone RS464 intercept tone	250 ms 250 ms	440 620	-16 -17	0.5 1.0
error	intercept tone camp-on tone RS464	500 ms 500 ms	620 440	-17 -16	1.0 0.5
queue	que tone 1 (C) que tone 2 (D) que tone 3 (E)	500 ms 500 ms 500 ms	262 294 330	-24 -24 -24	0.5 0.5 0.5
premium	high tone silence	100 ms 100 ms	480 -	-17 -	0.5 -
receiver off hook	howler silence	120 ms 130 ms	2060;2450 -	0 -	2.0 -
lock out	high tone silence	10 ms 490 ms	480 -	-17 -	0.5 -

Table 7-BK. Cadenced Tones, NAPN USA Tone Set **(continued)**

Name	Tones	Duration	Freq. (Hz)	Level (dB)	Freq. Tol.
high tick	high tone silence	10 ms 990 ms	480 -	-17 -	0.5 -
ringback queue	ringback tone silence	2000 ms 4000 ms	440;480 -	-22 -	0.5 -
slow ringback queue	ringback tone silence	2000 ms 4000 ms	440; 480 -	-22 -	0.5 -

Ringing Cadences

Table 7-BL. Ringing Cadences, NAPN USA Tone Set

Ring	Cadence
ring 1	ring on 2000 ms; ring off 4000 ms
ring 2	ring on 2000 ms; ring off 4000 ms
ring 3	ring on 400 ms; ring off 200 ms ring on 400 ms; ring off 200 ms ring on 400 ms; ring off 2400 ms
ring 4	ring on 1000 ms; ring off 1000 ms

Domestic Customer Tone Set (International Feature Set 17)

Continuous Tones

Table 7-BM. Continuous Tones, Domestic Customer Tone Set

Tone #	Tone	Frequency (Hz)	Level (dB)	Freq. Tol.
0	silence	-	-	-
1	dial tone RS464	350; 440	-5	0.5
2	busy tone RS464	480; 620	-27	0.5
3	ringback tone RS464	440; 480	-22	0.5
4	camp-on tone RS464	440	-16	0.5
5	high tone	480	-17	0.5
6	preemption tone RS464	440; 620	-20	0.5
7	intercept tone RS464	620	-20	1.0
8	howler	2060; 2450	0	2.0
9	carrier dial tone	400	-10	0.5
10	que tone 1 (C)	262	-24	0.5
11	que tone 2 (D)	294	-24	0.5
12	que tone 3 (E)	330	-24	0.5
13	carrier milliwatt	1004	0	0.05
14	DTMF 1	697; 1209	-5	0.5
15	DTMF 2	697; 1336	-5	0.5
16	DTMF 3	697; 1477	-5	0.5
17	DTMF 4	770; 1209	-5	0.5
18	DTMF 5	770; 1336	-5	0.5
19	DTMF 6	770; 1477	-5	0.5
20	DTMF 7	852; 1209	-5	0.5
21	DTMF 8	852; 1336	-5	0.5
22	DTMF 9	852; 1477	-5	0.5
23	DTMF 0	941; 1336	-5	0.5
24	DTMF #	941; 1477	-5	0.5
25	DTMF *	941; 1209	-5	0.5
26	DTMF A	697; 1633	-5	0.5

Table 7-BM. Continuous Tones, Domestic Customer Tone Set **(continued)**

Tone #	Tone	Frequency (Hz)	Level (dB)	Freq. Tol.
27	DTMF B	770; 1633	-5	0.5
35	DTMF C	852; 1633	-5	0.5
36	DTMF D	941; 1633	-5	0.5
37	1000 Hz reference		-	-
38	MF1	700;900	-7	0.5
39	MF2	700;1100	-7	0.5
40	MF3	900; 1100	-7	0.5
41	MF4	700; 1300	-7	0.5
42	MF5	900; 1300	-7	0.5
43	MF6	1100; 1300	-7	0.5
44	MF7	700; 1500	-7	0.5
45	MF8	900; 1500	-7	0.5
46	MF9	1100; 1500	-7	0.5
47	MFO	1300; 1500	-7	0.5
48	MF ST3P	700; 1700	-7	0.5
49	MF STP	900; 1700	-7	0.5

Ringback Cadences

Table 7-BN. Ringback Cadences, Domestic Customer Tone Set

Ringback	Tone	Duration	Freq. (Hz)	Level (dB)
ringback 1	ringback tone RS464 silence	1000 ms 3000 ms	440; 480 -	- 22 -
ringback 2	ringback tone RS464 silence ringback tone RS464 silence	400 ms 200 ms 400 ms 3000 ms	440; 480 - 440; 480 -	-22 - -22 -
ringback 3	ringback tone RS464 silence ringback tone RS464 silence ringback tone RS464 silence	400 ms 200 ms 400 ms 200 ms 400 ms 2400 ms	440; 480 - 440; 480 - 440; 480 -	-22 - -22 - -22 -
ringback 4	ringback tone RS464 silence	1000 ms 1000 ms	440; 480 -	-22 -

Cadenced Tones

Table 7-BO. Cadenced Tones, Domestic Customer Tone Set

Name	Tones	Duration	Freq. (Hz)	Level (dB)	Freq. Tol.
busy	busy tone RS464 silence	500 ms 500 ms	480; 620 -	-27 -	0.5 -
fast busy	busy tone RS464 silence	250 ms 250 ms	480; 620 -	-27 -	0.5 -
intercept	camp-on tone RS464 intercept tone	250 ms 250 ms	440 620	-16 -17	0.5 1.0
error	intercept tone camp-on tone RS464	500 ms 500 ms	620 440	-17 -16	1.0 0.5
queue	que tone 1 (C) que tone 2 (D) que tone 3 (E)	500 ms 500 ms 500 ms	262 294 330	-24 -24 -24	0.5 0.5 0.5
premium	high tone silence	100 ms 100 ms	480 -	-17 -	0.5 -
receiver off hook	howler silence	120 ms 130 ms	2060; 2450 -	0 -	2.0 -
lock out	high tone silence	10 ms 490 ms	480 -	-17 -	0.5 -
high tick	high tone silence	10 ms 990 ms	480 -	-17 -	0.5 -

Ringing Cadences

Table 7-BP. Ringing Cadences, Domestic Customer Tone Set

Ring	Cadence
Ring 1	Ring On 1000 ms; Ring Off 3000 ms
Ring 2	Ring On 400 ms; Ring Off 200 ms Ring On 400 ms; Ring Off 3000 ms
Ring 3	Ring On 400 ms; Ring Off 200 ms Ring On 400 ms; Ring Off 200 ms Ring On 400 ms; Ring Off 2400 ms
Ring 4	Ring On 1000 ms; Ring Off 1000 ms

Spain Tone Set (International Feature Set 19)

Continuous Tones

Table 7-BQ. Continuous Tones, Spain Tone Set

Tone #	Tone	Frequency (Hz)	Level (dB)	Freq. Tol.
0	silent tone	-	-	-
1	dial tone	425	-5	2.0
2	busy tone	425	-10	2.0
3	ringback tone	425	-10	2.0
4	camp-on tone	425	-10	2.0
5	high tone	480	-17	0.5
6	preemption tone	425	-11	2.0
7	intercept tone	425	-10	2.0
8	howler tone	2060; 2450	0	2.0
9	carrier dial tone	600	-10	0.5
10	carrier milliwatt	1004	0	0.05
11	queue 1 tone (C)	262	-24	0.5
12	queue 2 tone (D)	294	-24	0.5
13	queue 3 tone (E)	330	-24	0.5
14	DTMF 1	697; 1209	-11; -9	0.5
15	DTMF 2	697; 1336	-11; -9	0.5
16	DTMF 3	697; 1477	-11; -9	0.5
17	DTMF 4	770; 1209	-11; -9	0.5
18	DTMF 5	770; 1336	-11; -9	0.5
19	DTMF 6	770; 1477	-11; -9	0.5
20	DTMF 7	852; 1209	-11; -9	0.5
21	DTMF 8	852; 1336	-11; -9	0.5
22	DTMF 9	852; 1477	-11; -9	0.5
23	DTMF 0	941; 1336	-11; -9	0.5
24	DTMF#	941; 1477	-11; -9	0.5
25	DTMF *	941; 1209	-11; -9	0.5
26	DTMF D	941; 1633	-11; -9	0.5

Table 7-BQ. Continuous Tones, Spain Tone Set **(continued)**

Tone #	Tone	Frequency (Hz)	Level (dB)	Freq. Tol.
27	1000Hz Reference	-	-	-
28	MFC ITU-T B1	1140; 1020	-8	0.35
29	MFC ITU-T B2	1140; 900	-8	0.35
30	MFC ITU-T B3	1020; 900	-8	0.35
31	MFC ITU-T B4	1140; 780	-8	0.35
32	MFC ITU-T B5	1020; 780	-8	0.35
33	MFC ITU-T B6	900; 780	-8	0.35
34	MFC ITU-T B7	1140; 660	-8	0.35
35	MFC ITU-T B8	1020; 660	-8	0.35
36	MFC ITU-T B9	900; 660	-8	0.35
37	MFC ITU-T B0	780; 660	-8	0.35
38	MFC ITU-T F1	1380; 1500	-8	0.2
39	MFC ITU-T F2	1380; 1620	-8	0.2
40	MFC ITU-T F3	1500; 1620	-8	0.2
41	MFC ITU-T F4	1380; 1740	-8	0.2
42	MFC ITU-T F5	1500; 1740	-8	0.2
43	MFC ITU-T F6	1620; 1740	-8	0.2
44	MFC ITU-T F7	1380; 1860	-8	0.2
45	MFC ITU-T F8	1500; 1860	-8	0.2
46	MFC ITU-T F9	1620; 1860	-8	0.2
47	MFC ITU-T F0	1740; 1860	-8	0.2
48	MFC ITU-T F11	1380; 1980	-8	0.2
49	MFC ITU-T F12	1500; 1980	-8	0.2
50	MFC ITU-T F13	1620; 1980	-8	0.2
51	MFC ITU-T F14	1740; 1980	-8	0.2
52	MFC ITU-T F15	1860; 1980	-8	0.2
53	DMI Flags Tone	-	-	-
54	DMI Hold Tone	-	-	-

Ringback Cadences

Table 7-BR. Ringback Cadences, Spain Tone Set

Ringback	Tone	Duration	Freq. (Hz)	Level (dB)	Freq. Tol.
ringback 1	ringback tone silent tone	1500 ms 3000 ms	425 -	-10 -	2.0 -
ringback 2	ringback tone silent tone ringback tone silent tone	400 ms 200 ms 400 ms 2500 ms	425 - 425 -	-10 - -10 -	2.0 - 2.0 -
ringback 3	ringback tone silent tone ringback tone silent tone ringback tone silent tone	400 ms 200 ms 400 ms 200 ms 400 ms 3500 ms	425 - 425 - 425 -	-10 - -10 - -10 -	2.0 - 2.0 - 2.0 -
ringback 4	ringback tone silent tone	1000 ms 1000 ms	425 -	-10 -	2.0 -

Cadenced Tones

Table 7-BS. Cadenced Tones, Spain Tone Set

Name	Tones	Duration	Freq. (Hz)	Level (dB)	Freq. Tol.
busy tone	busy tone silent tone	200 ms 200 ms	425 -	-10 -	2.0 -
fast busy tone	busy tone silent tone busy tone silent tone busy tone silent tone	200 ms 200 ms 200 ms 200 ms 200 ms 500 ms	425 - 425 - 425 -	-10 - -10 - -10 -	2.0 - 2.0 - 2.0 -
intercept tone	campon tone silent tone	250 ms 250 ms	425 -	-10	2.0 -
error tone	intercept tone silent tone intercept tone silent tone	200 ms 200 ms 200 ms 600 ms	425 - 425 -	-10 - -10 -	2.0 - 2.0 -
queue prompt tone	queue 1 tone (C) queue 2 tone (D) queue 3 tone (E)	500 ms 500 ms 500 ms	262 294 330	-24 -24 -24	0.5 0.5 0.5

Table 7-BS. Cadenced Tones, Spain Tone Set **(continued)**

Name	Tones	Duration	Freq. (Hz)	Level (dB)	Freq. Tol.
lock out tone	intercept tone silent tone	120 ms 130 ms	425 -	-10 -	2.0 -
hold tick tone	high tone silent tone	10 ms 990 ms	480 -	-17 -	0.5 -
premium route warning tone	high tone silent tone	100 ms 100 ms	480 -	-17 -	0.5 -
howler tone	howler silent tone	120 ms 130 ms	2060; 2450 -	0 -	2.0 -
ringback queue tone	ringback tone silent tone	1000 ms 2000 ms	425 -	-10 -	2.0 -
SIT tone	SIT 1 tone SIT 2 tone SIT 3 tone silent tone	330 ms 330 ms 340 ms 1000 ms	950 1400 1800 -	-10 -10 -10 -	0.5 0.5 0.5 -

Ringing Cadences

Table 7-BT. Ringing Cadences, Spain Tone Set

Ring	Cadence
ring 1	ring on 1500 ms; ring off 3000 ms
ring 2	ring on 400 ms; ring off 200 ms ring on 400 ms; ring off 2500 ms
ring 3	ring on 400 ms; ring off 200 ms ring on 400 ms; ring off 200 ms ring on 400 ms; ring off 3500 ms
ring 4	ring on 1000 ms; ring off 1000 ms

8

R2 Signaling System Specifications

Multi-frequency Combinations

The Cerato ME provides tone combinations complying with ITU-T Red Book, Volume VI, Fascicle VI.4, Recommendation Q.440, Q.441, Q.442.

Tone Combinations, Forward Direction

Table 8-A. Group I/III Tones, Forward Direction

Tone	Designation	Freq. 1 (Hz)	Freq. 2 (Hz)	Freq. Tol. (%)
1	I/III-1	1380	1500	0.2
2	I/III-2	1380	1620	0.2
3	I/III-3	1500	1620	0.2
4	I/III-4	1380	1740	0.2
5	I/III-5	1500	1740	0.2
6	I/III-6	1620	1740	0.2
7	I/III-7	1380	1860	0.2
8	I/Ill-8	1500	1860	0.2
9	I/III-9	1620	1860	0.2
10	I/III-10	1740	1860	0.2
12	I-12	1500	1980	0.2
15	I/III-15	1860	1980	0.2

Table 8-B. Group II Tones, Forward Direction

Tone	Designation	Freq. 1 (Hz)	Freq. 2 (Hz)	Freq. Tol. (%)
1	II-1	1380	1500	0.2
2	II-2	1380	1620	0.2
3	II-3	1500	1620	0.2
4	II-4	1380	1740	0.2
5	Il-5	1500	1740	0.2
6	II-6	1620	1740	0.2
7	II-7	1380	1860	0.2
8	Il-8	1500	1860	0.2
9	II-9	1620	1860	0.2
10	II-10	1740	1860	0.2
11	II-11	1380	1980	0.2

Tone Combinations, Backward Direction

Table 8-C. Group A/B/C Tones, Backward Direction

Tone	Group A/B/C Designation	Freq. 1 (Hz)	Freq. 2 (Hz)	Freq. Tol. (%)
1	A/B/C-1	1140	1020	0.35
2	A/B/C-2	1140	900	0.35
3	A/B/C-3	1020	900	0.35
4	A/B/C-4	1140	780	0.35
5	A/B/C-5	1020	780	0.35
6	A/B/C-6	900	780	0.35
7	A/B/C-7	1140	660	0.35
8	A/B/C-8	1020	660	0.35
9	A/B/C-9	900	660	0.35
10	A/B/C-10	780	660	0.35

Forward Signals

Group I and III Forward signals Table 8-D provide digit address information to the terminating end. Group I and III signals are not configurable.

Table 8-D. Group I/III Tones, Forward (Fixed)

Group I Symbols (Numerical)	Meaning
I/III-1	1
I/III-2	2
I/III-3	3
I/III-4	4
I/III-5	5
I/III-6	6
I/III-7	7
I/III-8	8
I/III-9	9
I/III-10	0
I-12	Subscriber not identifying
I/III-15	End of digits

Group II Forward signals Table 8-E provide the category of the calling party to the terminating end. Group II signals are configurable in the Teltronics switch database.

Table 8-E. Group II Signals, Forward (Configurable)

Group II Symbols (category)	Meaning
SUB-PRIORITY	Subscriber With Priority
SUB-NO-PRIORITY	Subscriber Without Priority
MAINT-EQUIP	Maintenance Equipment
OPERATOR	Operator
DATAEQUIP	Data Transmission
SUB-NO-IDENTIFY	Subscriber is not identifying

Backward Signals

Group A Backward signals Table 8-D acknowledge Group I Forward signals. Group A signals are configurable in the Teltronics switch databases.

Table 8-F. Group A Signals, Backward (Configurable)

Group A Symbols (Functions)	Meaning
SND	Send next digit (n + 1)
EOS	End of selection, address complete, changeover to reception of group B signals.
SND-1	Send last but one digit (n-1)
SND-2	Send last but two digits (n-2)
SND-3	Send last but three digits (n-3)
SND-N	Sent last digit (n)
RESTART	Restart sending digit sequence
SND-CAT	Send calling party's category
CONGES-TION	Congestion in the national network
SPEECH	Address complete, charge, setup speech condition
SND-CATC	Send calling party's category, change to Group C signals
UNALLOC	Unallocated number or vacant code
SND-NAT	Send calling party’s national number
RESTRICT	Trunk restricted for general users

Group B Backward signals Table 8-G acknowledge Group II Forward signals. Group B signals are configurable in the Teltronics switch databases.

Table 8-G. Group B Signals, Backward (Configurable)

Group B Symbols (Status)	Meaning
IDLE	Subscriber's line free, charge
BUSY	Subscriber's line busy
NOCHARGE	Subscriber's line free, no charge
UNALLOCATED	Unallocated number
CONGESTION	Congestion in network
SND-TONE	Send special information tone
MCT	Malicious call trace
OUT-SERV	Out of service [provider generated]
UNAVAIL	Subscriber’s line unavailable
FAULTY	Subscriber’s line faulty (out of order) [could be user generated]
NUM-CHG	Subscriber’s number has been changed

Group C Backward signals Table 8-H acknowledge Group III Forward signals. Group C signals are configurable in the Teltronics switch databases.

Table 8-H. Group C Signals, Backward (Configurable)

Group C Symbols (Functions)	Meaning
SND–ANIC	Send next calling party’s ANI digit
RESTARTC	Change to group A signals, re-send address digits
EOAC	ANI complete, change over to group B signals
SNDC	Change to group A signals, send next address digit (n-1)
SLDC	Change to group A signals, send last address digit
CONGESTION	Congestion in the national network

R2 Protocol Parameters

Table 8-I. R2 Protocol Parameters

Parameter Statement	Function	Default
Send ANI after sending Category of SUB-NO-IDENTIFY	This overrides the normal R2 operation. When set to YES, an ANI will be sent by the outgoing trunk when possible [there may be no ANI if its a trunk call], even for a category of SUB-NO-IDENTIFY.	NO
Send I-12 if ANI is requested, but no ANI is available.	This overrides the normal R2 operation. When set to YES, an I-12 will be sent by the outgoing trunk in cases where the ANI is requested, but none is available. An I-15 will be sent if this parameter is set to NO.	NO
Release trunk after receiving undefined Group A signals	This overrides the normal R2 operation. When set to YES, the trunk is released when undefined Group A signals are received. The trunk is held if NO is set.	NO
Send Congestion Tone after receiving undefined Group B signals	This overrides the normal R2 operation. When set to YES, a Congestion Tone is sent after receiving an undefined Group B signal. If NO is set, no tone is sent.	NO
Treat R2 B1 Signal as IDLE	This overrides the normal R2 operation. When set to YES, when the Subscriber's line is free, a charge condition will exist. If NO is set, the B1 signal’s normal meaning is taken.	NO

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DTU Configurable Signaling

A-B Bit Signaling Information

There are several options for signaling in the Cerato ME. Some of these are selected from the setup of the 2MB card and some are in the trunk group configuration. To make things easier, the following reference will be included in all the charts below:

Digital card type:	(STANDARD, UK-EM, PCM30, HK-EM, etc. as configured in the card setup. Individual channels are below.)
Digital card config:	(T1, 2MB or T1 and 2MB)
Individual channel config:	(EM, GS, LS, DID, R2DGTL, etc.)
Trunk group type:	(EM, GS, LS, DID, R2DGTL, etc.)
Trunk group config:	(Typically outgoing start signaling, but could be anything about the trunk or system trunk timers.)
Notes:	(Other specifications or information)

Standard A-B Bit Signaling System

Direct Inward Dial (DID)

Digital card type:	T1 and 2MB
Digital card config:	Standard
Individual channel config:	DID
Trunk group type:	DID
Trunk group config:	WINK (Other options are IMMEDIIATE and TIMED. These will not provide the SEIZURE ACK signal.)
Dialing mode:	DP, DTMF, MF, R2MFC

Note C and D are always 0 and 1 respectively. The OUTGOING side is provided in the Cerato ME by configuring EM trunk types. The B bit always follows the A bit (for spec. and other equipment use), however, the RX side only looks at the A bit. X means 0 or 1 (don't care).

Table 9-A. DID Line Signaling

Outgoing					Incoming			
TX		RX			TX		RX	
A	B	A	B		A	B	A	B
0	0	0	X	IDLE	0	0	0	X
1	1	0	X	SEIZURE	0	0	1	X
1	1	1	X	SEIZE ACK (WINK)	1	1	1	X
0/1	0/1	0	X	DECADIC DIALING	0	0	0/1	X
1	1	1	X	ANSWER	1	1	1	X
0	0	1	X	CLEAR FORWARD	1	1	0	X
1	1	0	X	CLEAR BACK	0	0	1	X
X	X	1	X	BLOCKING	1	1	X	X

Note DID line signaling can support DP, DTMF, MF and MFC register signaling

E & M Line Signaling

Digital card type:	T1 and 2MB
Digital card configuration:	Standard
Individual channel config:	EM
Trunk group type:	EM
Trunk group config:	Wink

Note Conforms to Bellcore, specification SP-1378R2, EIA/TIA-464A. A and B bits are always the same, even though what is received on the B bit doesn't matter (other equipment vendors require this as do technical specifications). X means 0 or 1 (don't care).

Table 9-B. Standard EM Line Signaling

Outgoing Call From Switch					Incoming Call To Switch			
TX		RX			TX		RX	
A	B	A	B		A	B	A	B
0	0	0	X	IDLE	0	0	0	X
1	1	0	X	SEIZURE	0	0	1	X
1	1	1	X	SEIZURE ACK. (WINK)	1	1	1	X
0/1	0/1	0	X	DECADIC DIALING	0	0	0/1	X
1	1	1	X	ANSWER	1	1	1	X
0	0	1	X	CLEAR FORWARD	1	1	0	X
1	1	0	X	CLEAR BACK	0	0	1	X
0	0	0	X	RELEASE GUARD	0	0	0	X
1	1	X	X	BLOCKING	X	X	1	1

Note EM line signaling can support DP, DTMF, MF, KPOPT, MFC or SMFC register signaling.

Ground Start

Digital card type:	T1 and 2MB
Digital card configuration:	Standard
Individual channel config:	GS
Trunk group type:	GS
Trunk group config:	N/A

Note This is not a 'mirror' type signaling where the incoming side is just a reverse of the outgoing side. The Cerato ME doesn't provide the C.O. side of this connection. Therefore, the information below is for the two kinds of calls that can be made on a GS trunk, as viewed by the INP or MNP. To test this interface, connect a commercially available channel bank to the digital trunk and the analog side to a GS trunk from the local C.O. Conforms to EIA/TIA-464A. X means 0 or 1 (don’t care). N/A means Not Applicable in this scenario.

Table 9-C. Standard GS Line Signaling

Outgoing Call From Switch					Incoming Call To Switch			
Cerato ME		RX			Cerato ME		RX	
A	B	A	B		A	B	A	B
0	1	1	X	IDLE	0	1	1	X
0	0	1	X	RING GROUND	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	RINGING	0	1	0	0
0	0	0	X	TIP GROUND	0	1	0	1
0	1	0	X	RING GND OFF	N/A	N/A	N/A	N/A
1/0	1	0	X	DECADIC DIAL-ING	N/A	N/A	N/A	N/A
1	1	0	X	CONVERSATION	1	1	0	X
0	X	X	X	CLEAR FORWARD	X	X	0	X
1	1	1	X	CLEAR BACK	0	1	0	X

Note GS line signaling can support DP or DTMF register signaling (for outgoing calls only)

Loop Start

Digital card type:	T1 and 2MB
Digital card configuration:	Standard
Individual channel config:	LS
Trunk group type:	LS
Trunk group config:	N/A

Note Conforms to EIA/TIA-464A. This protocol cannot be 'looped around' in the Cerato ME. To test this protocol, you should use either LU or OPS (as a station or LINE trunk) on the other side of the connection. X means 0 or 1 (don't care). N/A means Not Applicable in this scenario.

Table 9-D. Standard LS Line Signaling

Outgoing Call From Switch					Incoming Call To The Switch			
Cerato ME		RX			Cerato ME		RX	
A	B	A	B		A	B	A	B
0	1	0	1	IDLE	0	1	0	1
1	1	0	1	SEIZURE	N/A	N/A	N/A	N/A
0/1	1	0	1	DECADIC DIALING	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	RINGING	0	1	0	0/1
N/A	N/A	N/A	N/A	ANSWER	1	1	0	X
0	1	X	X	CLEAR FORWARD	X	1	0	1
1	1	0	1	CLEAR BACK	0	1	0	X

Note LS line signaling can support DP or DTMF register signaling.

Line Type Trunk Signaling

Digital card type:	T1 and 2MB
Digital card configuration:	Standard
Individual channel config:	LU
Trunk group type:	LINE
Trunk group config:	N/A (default cannot be modified)

Note Typically this is used to provide the CO side of LS telephone service to a remote site by connecting a channel bank to the digital trunk. It can be used for large VMS applications. Conforms to EIA-TIA-464A. N/A means Not Applicable in this scenario.

Table 9-E. Standard Line Type Trunk

Station Places Call					Switch Calls Station			
Cerato ME		Station			Cerato ME		Station	
A	B	A	B		A	B	A	B
0	1	0	1	IDLE	0	1	0	1
0	1	1	1	OFF HOOK	N/A	N/A	N/A	N/A
0	1	0/1	1	DECADIC DIALING	N/A	N/A	N/A	N/A
0	1	1	1	DIALING COMPLETE	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	RINGING	0	0/1	0	1
N/A	N/A	N/A	N/A	ANSWER	0	1	1	1
0	1	0	1	DISCONNECT	0	1	0	1

Note Line type Trunk signaling only supports DTMF register signaling

Line Unit - Off Premise Station (LU-OPS)

Digital card type:	T1 and 2MB
Digital card configuration:	Standard
Individual channel config:	LU or OPS (as desired)
Trunk group type:	N/A
Trunk group config:	N/A

Note Typically this is used to provide telephone service to a remote site by connecting a channel bank to the digital trunk. It can be used as a C.O. side of a LS trunk. Conforms to EIA-TIA-464A. N/A means Not Applicable in this scenario.

Table 9-F. Standard LU and OPS Line Signaling

Station Places Call					Switch Calls Station			
Cerato ME		Station			Cerato ME		Station	
A	B	A	B		A	B	A	B
0	1	0	1	IDLE	0	1	0	1
0	1	1	1	OFF HOOK	N/A	N/A	N/A	N/A
0	1	0/1	1	DECADIC DIALING	N/A	N/A	N/A	N/A
0	1	1	1	DIALING COMPLETE	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	RINGING	0	0/1	0	1
N/A	N/A	N/A	N/A	ANSWER	0	1	1	1
0	1	0	1	DISCONNECT	0	1	0	1

Note LU and OPS line signaling can support DP or DTMF register signaling

Line Unit - European Off Premise Station (EOPS)

Digital card type:	2MB
Digital card configuration:	Standard
Individual channel config:	EOPS
Trunk group type:	N/A
Trunk group config:	N/A

Note Typically this is used to provide telephone service to a remote site by connecting a channel bank to the digital trunk. Conforms to MARCONI MD90 Description 131-6263/01 DE. N/A means Not Applicable in this scenario.

Table 9-G. Standard LU and OPS Line Signaling

Station Places Call					Switch Calls Station			
Cerato ME		Station			Cerato ME		Station	
A	B	A	B		A	B	A	B
1	0	1	0	IDLE	1	0	1	0
1	0	0	0	OFF HOOK	N/A	N/A	N/A	N/A
1	0	1/0	0	DECADIC DIALING	N/A	N/A	N/A	N/A
1	0	0	0	DIALING COMPLETE	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	RINGING	1	1/0	1	0
N/A	N/A	N/A	N/A	ANSWER	1	0	0	0
1	0	1	0	DISCONNECT	1	0	1	0

Note EOPS line signaling can support DP or DTMF register signaling

Pulsed E & M Line Signaling

Digital card type:	T1 and 2MB
Digital card configuration:	Standard
Individual channel config:	EM
Trunk group type:	Pulsed
Trunk group config:	WINK (Immediate and Timed don't provide the SEIZURE ACK signal.)

Note B, C and D bits are always 1, 0 and 1 respectively for outgoing calls and are permanently set in software. This signaling type conforms to ITU-T Fascicle VI.4 - Supplement No. 7 recommendations. 0 below represents the change of state for the amount of time listed. Const. Below means constant signal.

Table 9-H. Standard Pulsed E&M Line Signaling

Outgoing				Incoming	
TX	RX			TX	RX
A	A	Time	Signal	A	A
1	1	Const.	IDLE	1	1
0	1	150	SEIZURE	1	0
1	0	150	SEIZE ACK (WINK)	0	1
1	0	150	ANSWER/REANSWER	0	1
1	0	150	METER PULSE	0	1
0	1	150	CALL BACK/RERING	1	0
0	1	600	CLEAR FORWARD	1	0
1	0	600	CLEAR BACK	0	1
1	0	600	RELEASE GUARD	0	1
1	0	600	FORCED RELEASE	0	1
1	0	Const.	BLOCKING	0	1

Note PULSED E&M line signaling can support MFC or SMFC register signaling.

R2 Analog Line Signaling

Digital card type:	T1 and 2MB (Typically only used in 2MB areas)
Digital card configuration:	Standard
Individual channel config:	R2ANLG
Trunk group type:	R2ANLG
Trunk group config:	Automatic (Timed)

Note B, C, and D bits are always 0, 0 and 1 respectively. This signaling type conforms to ITU-T Q.411 recommendations. X means 0 or 1 (don't care). 0 relates to tone-off, 1 is for tone-on.

Table 9-I. Standard R2ANLG Line Signaling

OUT			IN	
TX	RX		TX	RX
A	A		A	A
1	1	IDLE	1	1
0	1	SEIZURE	1	0
0	0	ANSWER	0	0
0	1	CLEAR BACK	1	0
1	X	RELEASE	X	1
1	0	BLOCKING	0	1

Note R2ANLG line signaling supports MFC register signaling.

R2 Digital Line Signaling

Digital card type:	T1 and 2MB (R2 is typically only used in 2MB areas)
Digital card configuration:	Standard
Individual channel config:	R2DGTL
Trunk group type:	R2DGTL.
Trunk group config:	DP requires selection of A or B bit (country specific).

Note C and D bits are always 0 and 1 respectively. This signaling chart conforms to ITU-T Q.421 recommendations. B-bit dialing is per The K Signaling System Specification, version 6.1, January, 1992. Pulse Metering must be purchased in the OCR for the Meter Pulse signals. NS means not supported at this time. X is 0 or 1 (don't care).

Table 9-J. Standard R2DGTL Line Signaling

Outgoing					Incoming				
TX		RX			TX		RX		
A	B	A	B		A	B	A	B	
1	0	1	0	IDLE	1	0	1	0	
0	0	1	0	SEIZURE	1	0	0	0	
0	0	1	1	SEIZE ACK	1	1	0	0	
1/0	0	1	1	A-BIT DEC. DIALING	1	1	1/0	0	*
0	1/0	1	1	B-BIT DEC. DIALING	1	1	0	1/0	*
0	1	1	1	TRUNK OFFER	1	1	0	1	
0	0	0	1	ANSWER	0	1	0	0	
0	0	1	1	A-BIT METER PULSE	NS	NS	0	0	
0	0	0	0	B-BIT METER PULSE	NS	NS	0	0	
0	0	1	0	CALL HELD	1	0	0	0	
1	0	X	X	CLEAR FORWARD	X	X	1	0	
0	0	1	1	CLEAR BACK	1	1	0	0	
0	0	0	0	FORCED RELEASE	0	0	0	0	
1	0	1	0	RELEASE GUARD	1	0	1	0	
1	0	1	1	BLOCKING	1	1	1	0	

* R2DGTL line signaling supports DP on A or B bit, DTMF, MF, MFC or SMFC register signaling.

Hong Kong A-B Bit Signaling System

Hong Kong E & M Line Signaling

Digital card type: T1

Digital card configuration: HK-EM

Individual channel config: EM (automatic)

Trunk group type: EM

Trunk group config:

Note C and D bits are always 0. Line signals equal those specified in Customer Technical Guide Number 14 - Technical Conditions for IDA-M Service. X means 0 or 1 (don't care).

Table 9-K. HK-EM Line Signaling

Outgoing					Incoming			
TX		RX			TX		RX	
A	B	A	B		A	B	A	B
1	1	1	1	IDLE	1	1	1	1
0	0	1	1	SEIZURE	1	1	0	0
0	0	0	0	ANSWER	0	0	0	0
0	0	0	0	HOLDING	0	0	0	0
0	0	1	1	CLEAR BACK	1	1	0	0
1	1	X	X	CLEAR FORWARD	X	X	1	1
1	1	0	0	REMOTE BLOCKING				

Note HK-EM line signaling can support DTMF, MF and MFC register signaling

Russian PCM-30 A-B Bit Signaling System

Russian SL Line Signaling

Digital card type:	2MB
Digital card configuration:	PCM30
Individual channel config:	automatic
Trunk group type:	PCM30
Trunk group config:	SL

Note C and D bits are always 0 and 1 respectively. X means 0 or 1 (don't care).

Table 9-L. PCM-30 SL Line Signaling

Outgoing					Incoming			
TX		RX			TX		RX	
A	B	A	B		A	B	A	B
1	1	0	1	IDLE	0	1	1	1
1	0	0	1	SEIZURE	0	1	1	0
1	0	1	1	SEIZE ACK	1	1	1	0
0/1	0	1	1	DECADIC DIALING	1	1	0/1	0
1	0	0	0	SUBSCRIBER BUSY	0	0	1	0
1	1	X	X	CLEAR FORWARD	X	X	1	1
1	0	1	0	ANSWER	1	0	1	0
0	0	1	0	CLR FWD AFTER ANS	1	0	0	0
X	0	0	0	CLEAR BACK	0	0	X	0
1	1	1	1	BLOCKING	1	1	1	1

Note SL line signaling supports DP or MF register signaling.

Russian SLM Line Signaling

Digital card type:	2MB
Digital card configuration:	PCM30
Individual channel config:	automatic
Trunk group type:	PCM30
Trunk group config:	SLM

Note C and D bits are always 0 and 1 respectively. X means 0 or 1 (don't care).

Table 9-M. PCM-30 SLM Line Signaling

Outgoing					Incoming			
TX		RX			TX		RX	
A	B	A	B		A	B	A	B
1	1	0	1	IDLE	0	1	1	1
1	0	0	1	SEIZURE	0	1	1	0
1	0	1	1	SEIZE ACK	1	1	1	0
0/1	0	1	1	DECADIC DIALING	1	1	0/1	0
1	0	1	0	SUBSCRIBER FREE	1	0	1	0
1	0	0	0	SUBSCRIBER BUSY	0	0	1	0
1	0	1	1	ANSWER	1	1	1	0
1	1	X	X	CLEAR FORWARD	X	X	1	1
1	0	1	0	CLEAR BACK	1	0	1	0
0/1	0	1	0	OPERATOR RE-RING	1	0	0/1	0
1	1	1	1	BLOCKING	1	1	1	1

Note SLM line signaling supports DP or MF register signaling.

Russian ZSL Specialized Protocol

Digital card type:	2MB
Digital card configuration:	PCM30
Individual channel config:	automatic
Trunk group type:	PCM30
Trunk group config:	ZSL

Note This signaling system requires both MFR1 and BDTD receivers. C and D bits are always 0 and 1 respectively. Subscriber FREE and BUSY are not present because the incoming (TOLL) switch provides acoustic signals. X means 0 or 1 (don't care).

Table 9-N. PCM-30 ZSL Specialized Protocol

Outgoing					Incoming			
TX		RX			TX		RX	
A	B	A	B		A	B	A	B
1	1	0	1	IDLE	0	1	1	1
1	0	0	1	SEIZURE	0	1	1	0
1	0	1	1	SEIZE ACK	1	1	1	0
1	0	1	0	REQUEST ANI (AON)	1	0	1	0
1	0	1	1	END OF ANI (AON)	1	1	1	0
0/1	0	1	1	DECADIC DIALING	1	1	0/1	0
1	1	X	X	CLEAR FORWARD	X	X	1	1
1	0	1	0	ANSWER	1	0	1	0
0	0	1	0	CLR FWD AFTER ANS	1	0	0	0
1	1	1	1	BLOCKING	1	1	1	1

Note ZSL is a specialized protocol and doesn't allow user configuration of the register signaling.

United Kingdom A-B Bit Signaling System

United Kingdom E & M Signaling (UK-EM)

Digital card type:	2MB
Digital card configuration:	UK-EM
Individual channel config:	EM (automatic)
Trunk group type:	EM
Trunk group config:	

Note C and D bits are always 0 and 1 respectively. X means 0 or 1 (don't care). Meets Specification No SS5002 - Customer PBX Connection To The Mercury Switched Services At The 2.048 Mbits/s Level.

Table 9-O. UK-EM line signaling

Outgoing					Incoming			
TX		RX			TX		RX	
A	B	A	B		A	B	A	B
1	1	1	1	IDLE	1	1	1	1
0	1	1	1	SEIZURE	1	1	0	1
0	1	0/1	1	DELAYED DIAL/PTS	0/1	1	0	1
1/0	1	1	1	DECADIC DIALING	1	1	1/0	1
0	1	0	1	ANSWER	0	1	0	1
1	1	X	1	CLEAR FORWARD	X	1	1	1
0	1	1	1	CLEAR BACK	1	1	0	1
1	1	1	1	RELEASE GUARD	1	1	1	1
1	0	1	1	BLOCKING	1	1	0	1

Note UK-EM line signaling supports DP or DTMF register signaling.

10

Peripherals Specifications

The following applications are available for the Cerato ME:

- 2903 Phone
- CIP210
- CIP1/CIP2 SoftPhone
- HIL SoftPhone
- Enhanced Attendant Workstation
- 1215 Phone
- ClearCom Telesets
- Data Communication Adaptor (DCA)
- SoftDCA

See the sections that follow for the specifications for each application/peripheral device.

2903 Phone

General

Description: The Teltronics 2903 Phone replaces the CIP210 Phone. This phone has 3 line keys, 14 soft keys, 12 fixed feature keys, a 9x20 LED display, and a speakerphone. The phone uses the IPEC card. External power supply not included. The phone requires Cerato ME Firmware 4.1 or later.

Weights and Dimensions

Table 10-A. Weights, Dimensions & Color of 2903 Phone

2903 Phone	Color	Weight	Length	Width	Height
2903 Phone	Black with Silver	2.10 lbs	9.5	8.75	2.5

Power Requirements

Power over LAN (IEEE Standard)

AC Line Input (optional

Headset

The 2903 Phone is compatible with either the Plantronics or GN Netcom business headset.

CIP210

General

Description: The Teltronics Communication IP (CIP) 210 is a business phone that transmits voice data using the data network instead of traditional telephone lines, taking advantage of the economies of an existing network while retaining the capabilities and reliability of a standard telephone.

The CIP210 uses an IPEC card to interface with the Teltronics Cerato ME switch, thereby retaining all the features of the Cerato ME and adding the advantages of IP telephony. The CIP210 combined with the IPEC can be used on the company data network. CIP210 can also be located at remote sites by using WAN services such as the Internet.

Weights and Dimensions

Table 10-A. Weights, Dimensions & Color of 2903 Phone

2903 Phone	Color	Weight	Length	Width	Height
2903 Phone	Black with Silver	2.10 lbs	9.5	8.75	2.5

Power Requirements

Power over LAN (IEEE Standard)

AC Line Input (optional

Headset

The CIP210 is compatible with either the Plantronics or GN Netcom business headset.

CIP1/CIP2 SoftPhone

General

Description:	The Teltronics Communication IP (CIP)1 SoftPhone is a Windows' software phone that emulates the Teltronics CIP210. The CIP2 SoftPhone has all the features of the CIP1 SoftPhone with the addition of a Button Expansion feature. The Button Expansion feature allows up to 42 additional lines to be configured as shared or DSS keys so calls can be answered, the state of other lines can be monitored, or extensions can be dialed with the push of a button.
Transmission:	256k Burst Mode (80kbps effective rate)
Voice:	64kbit B Channel
Signaling:	16 kbit D Channel

Headset

There are two types of headsets you can use with the CIP1/CIP2 SoftPhone:

.

Sound Card Interfacing	Can configure CIP1/CIP2 SoftPhone to ring through the PC speakers - although is expensive and harder to find.
USB	The headset earpiece is the speaker. These are easier to find, there is a good selection available, and they are less expensive than using a sound card.

HIL SoftPhone

General

Description:	The Teltronics HIL SoftPhone via the IPHU makes and receives calls in conjunction with remote Teltronics OMNIWorks Agent Console's Dial Pad.
Transmission:	256k Burst Mode (80kbps effective rate)
Voice:	64kbit B Channel
Signaling:	16 kbit D Channel

Headset

The Windows PC headset, preferably USB, is required for the HIL SoftPhone.

Enhanced Attendant Workstation (EAWS)

General

Description:	The EAWS is a Windows-based call processing workstation that allows users to quickly and efficiently manage multiple incoming/outgoing calls in a busy environment. The EAWS contains most of the features of the previous version of the Teltronics Attendant Workstation, in addition to several new ones, such as a GUI interface, the removal of conventional telephony wiring requirement, and the introduction of VoIP technology along with other Cerato ME switch features.
Transmission:	256k Burst Mode (80kbps effective rate)
Voice:	64kbit B Channel
Signaling:	16 kbit D Channel
PC OS:	Wndows 2000 or XP or later

Headset

A USB headset is used with the EAWS.

1215 Phone

General

Description:	The 1215 Phone replaces the ClearCom 12 phone. This phone has 13 line, programmable keys, 14 fixed feature keys, 2 x 20 LED display, speakerphone, and handset. The phone can be used as a direct replacement of ClearCom 12 phones terminated to HDLU2 (p/n 764 333). The phone requires Cerato ME Firmware Release 4.1 or later. Uses HDLU2.
Transmission:	512K Burst Mode (80kbps effective rate)
Voice:	64kbit B Channel
Signaling:	16kbit D Channel
Hearing Aid Compatibility:	The 1215 phones meet both HAC (Hearing Aid Compatibility) and VC (Volume Control) requirements. (FCC Part 15 & Part 68, including .316 and .317 Hearing Aid Compatibility criteria)

Weights and Dimensions

Table 10-A. Weights, Dimensions & Color of 1215 Phone

1215 Phone	Color	Weight	Length	Width	Height
	Black with Silver	2.10 lbs	9.5	8.75	2.5

Display (ClearCom12, 24)

Type:	Liquid Crystal Display (LCD), alphanumeric
Size:	40 characters displayed on two lines
Character Field:	2 x 20

Loop Limits

1 km [3281 ft] for Tip and Ring

Power Requirements

2.15 Watts supplied by the switch

Environmental Requirements

Temperature:	0 - 50° C (32 - 122° F)
Relative Humidity:	0 - 90%, no condensation

Headsets

The 1215 phones are designed to work with the headsets below. These headsets will provide adequate transmit and receive OLRs for most users without a separate amplifier. Other headsets may also work without the need for a separate amplifier.

Orator Monaural SL/Comdial with boom mic 732-3060-02

Orator Binaural SL/Comdial with boom mic 732-3065-02

ClearCom Telesets (ClearCom12, 24), with BEM24

General

Description:	Digital telephone. Two models: ClearCom12 (can be adapted as an ACD phone), and ClearCom24 with pre-programmed feature buttons and other features available via access codes. ClearCom12 and ClearCom24 have LCD display and integrated speakerphone. A 24-key Button Expansion Module (BEM24) can be connected to the ClearCom12/24. ACD version of ClearCom 12 supports agent phone operation only and is not operational with the BEM24.
Transmission:	512K Burst Mode (80kbps effective rate)
Voice:	64kbit B Channel
Signaling:	16kbit D Channel
Hearing Aid Compatibility:	ClearCom telesets (revision 02) meet both HAC (Hearing Aid Compatibility) and VC (Volume Control) requirements. (FCC Part 15 & Part 68, including .316 and .317 Hearing Aid Compatibility criteria)

Weights and Dimensions

Teleset With Handset:

ClearCom12	1.36 kg [3 lbs]	23.11 cm wide [9.1 in.]	8.38 cm deep [3.3 in.]	22.35 cm high [8.8 in.]
ClearCom24	1.36 kg [3 lbs]	22.86 cm wide [9.0 in.]	9.4 cm deep [3.7 in.]	22.35 cm high [8.8 in.]
BEM24	.82 kg [1.8 lbs]	15.88 cm wide [6.25 in.	4.32 cm deep [1.7 in.]	22.35 cm high [8.8 in.]

Display (ClearCom12, 24)

Type:	Liquid Crystal Display (LCD), alphanumeric
Size:	40 characters displayed on two lines
Character Field:	2 x 20

Loop Limits

26 AWG	All Telesets: 1 km [3281 ft] for Tip and Ring
24 AWG	BEM 24: 1 km [3281 ft] for Tip and Ring

Power Requirements

Both Telesets:	2.15 Watts supplied by the switch
BEM 24:	Less than 16 Watts

Environmental Requirements

Temperature:	0 - 50° C (32 - 122° F)
Relative Humidity:	0 - 90%, no condensation

ClearCom Teleset Headsets

The ClearCom telesets are designed to work with the headsets below. These headsets will provide adequate transmit and receive OLRs for most users without a separate amplifier. Other headsets may also work without the need for a separate amplifier.

ACS	Orator Monaural SL/Comdial with boom mic 732-3060-02
ACS	Orator Binaural SL/Comdial with boom mic 732-3065-02

Data Communications Adapter (DCA)

General

Description: A data device that supports data transmission. Two types are available: the Asynchronous Data Communications Adapter (DCA) and Synchronous Data Communications Adapter (SDCA). The DCA has desktop and rack mount versions; the SDCA has a desktop version only.

Distance Limits

The DCA is only limited by LAN, WAN or Internet connections.

Interface Characteristics

Asynchronous Data Communications Adapter (DCA)

Baud Rate: RS232-C interface: 300, 1200, 2400, 4800, 9600, 19200 bps

Supported Devices: The following asynchronous data devices: computers, modems, protocol converters (X.25, 3270), printers, personal computers, ASCII terminals

Synchronous Data Communications Adapter (SDCA)

Baud Rate:	V.35 interface:	64 Kbps 56 Kbps
	RS232-C Interface:	300, 1200, 2400, 4800, 9600, 19200 bps

SoftDCA

General

Description: A software version of the Data Communicator Adaptor (DCA) described in the last section.

Distance Limits

The SoftDCA is only limited by LAN, WAN or Internet connections.

Interface Characteristics

Asynchronous Data Communications Adapter (DCA)

Baud Rate: RS232-C interface: 300, 1200, 2400, 4800, 9600, 19200 bps

Supported Devices: The following asynchronous data devices: computers, modems, protocol converters (X.25, 3270), printers, personal computers, ASCII terminals

Synchronous Data Communications Adapter (SDCA)

Baud Rate:	V.35 interface:	64 Kbps 56 Kbps
	RS232-C Interface:	300, 1200, 2400, 4800, 9600, 19200 bps

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Cerato System Specifications

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