Cerato

System Description

TELTRONICS

Cerato

System Description

Part Number: 955303-01 Rev B

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Cerato Software License

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(c) 911 dialing to an appropriate public safety answering point ("PSAP") for emergency service is limited when using a VOIP phone Product co-located with and connected to the switch Product at your enterprise location because VOIP telephone 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 You make alternative 911 dialing available to employees and other individuals at your enterprise via traditional wire line service over the PSTN.

(d) Prior to initiating the use of Teltronics Products in conjunction with any IP network including Internet telephone service for VOIP communications, You 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 PRODUCT AT A STREET ADDRESS THAT IS DIFFERENT FROM THE STREET ADDRESS OF THE END USER'S ENTERPRISE WITH AN IP NETWORK CONNECTION FROM THAT REMOTE LOCATION TO THE SWITCH SERVICING THE END USER'S ENTERPISE. DO NOT USE SUCH PORTABLE VOIP PHONE PRODUCT AT THE REMOTE LOCATION TO PLACE 911 EMERGENCY CALLS BECAUSE SUCH PORTABLE VOIP PHONE IS NOT CAPABLE OF COMMUNICATING THE STREET ADDRESS OF THE REMOTE LOCATION. EMERGENCY 911 CALLS MUST 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 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 You permit any User to use the VOIP phone Product at a remote location connected to the switch at your
enterprise location, it is strongly recommended that You affix a non removable label on the hand set of each VOIP 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 YOU ARE PHYSICALLY LOCATED AT THE FOLLOWING ADDRESS: (INSERT YOUR ENTERPRISE ADDRESS WHERE THE PSAP WILL RESPOND TO 911 EMERGENCY CALLS DIALED THROUGH THE SWITCH)

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Figures

Summary of Changes

Revision B, February 2010

- Added Mid Density Control Shelf (MDC) option to the Cerato ME

Revision A, January 2009

- Initial Release

1 Cerato ME/LE Overview

The Teltronics Cerato ME and LE systems are fully integrated, non-blocking digital switching systems capable of supporting the most demanding networking and stand-alone private voice/data switching system requirements. These two systems provide support for VOIP, Digital and Analog telephony devices and a large number of signaling protocols used worldwide.

The Cerato switches serve from 256 to 9,216 ports, efficiently meeting the communications needs of small businesses to large corporations. The switch provides full tandem switching features, as well as standard, advanced, and custom calling features.

The power, flexibility, and reliability of the Teltronics systems have earned Teltronics a loyal following in business and government worldwide. More than 20,000 Teltronics switching systems are in operation in many environments – in a wide range of business sites, including utilities, right-of-way, manufacturing, retail, government, health care, high security, and financial institutions; in private networks; and at local and long-distance telephone companies. Teltronics systems are installed worldwide, including North, Central, and South America, Eastern and Western Europe, Asia, the Middle East, and Africa.

Architecture

The Cerato switches' flexible and modular architecture, as illustrated in Figure 1, enables them to be customized and to adapt to a wide range of evolving applications. Cerato switches consist of a non-blocking switching matrix and a common control system, the latter of which contains microprocessors, memory, disk drives, and telephony control equipment.

There are two models (ME and LE) of the Cerato switch to accommodate the full range of sizes (from 256 to 9,216 ports). The two models also have different common controls, but they share a common interface for trunks and lines. This universal port architecture allows assignment of lines, trunks, and service units to any interface card slot. Because of this flexibility, the expense of additional lines or trunks is kept to a minimum in a model upgrade.

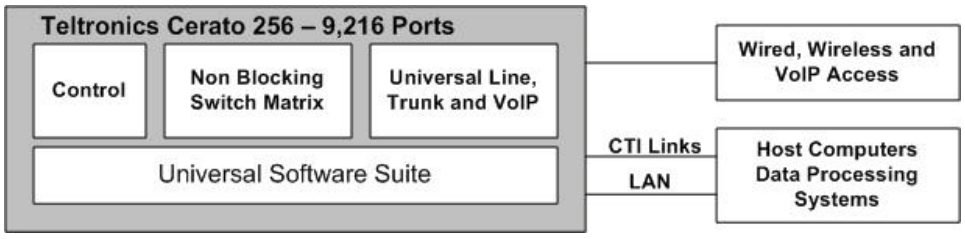


Figure 1. Overview of Cerato ME/LE Architecture

The Cerato switches incorporate current technology such as Pulse Code Modulation (PCM), Time Division Multiplex (TDM) switching, and Voice over Internet Protocol (VoIP), while being completely non-blocking in their design. The systems

support both North American μ-Law and ITU-T (CCITT) A-Law encoding. The Cerato also employs TCP/IP for use in network management and CTI.

Cerato Models

The Cerato ME and LE models differ in size and common control.

Cerato ME

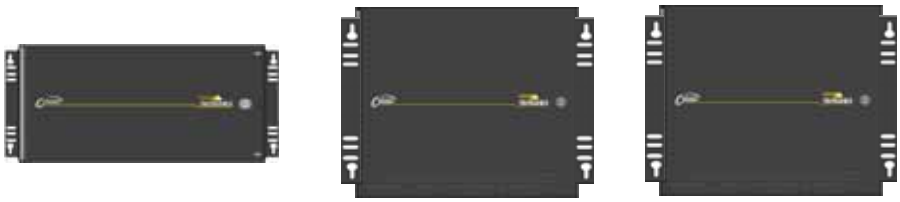
The Cerato ME model supports a maximum of 2,048 ports using a single High-Density/Mid-Density Control (HDC/MDC) shelf and any combination of High Density Expansion (HDX), Mid Density Expansion (MDX) and Low Density Expansion (LDX) shelves, to meet precise customer requirements. Designed for installation in Universal EIA RS310-D 19-inch racks, the Cerato ME is equipped to run in a redundant or non-redundant configuration.

High Density Control

The High Density Control (HDC) shelf is a common control option for the Cerato ME model. The HDC includes slots for two Central Processing Units (CPUs), two shelf DC power supplies, two Time Switch Array (TSA) Common Control and Interface units, and slots for 4 x 128 port cards. The Cerato HDC can be equipped with a single or dual processor, power supplies and common control interfaces to provide full hot standby redundancy.

Mid Density Control

The Mid Density Control (MDC) shelf is a common control option for the Cerato ME model. The MDC includes slots for two Central Processing Units (CPUs), two shelf DC power supplies, two Time Switch Array (TSA) Common Control and Interface units, and slots for 12 port cards. The Cerato MDC can be equipped with a single or dual processor, power supplies and common control interfaces to provide full hot standby redundancy.



HDC/HDX MDC/MDX LDX

Figure 2. Cerato ME – Control and Expansion Shelves

Cerato LE

The Cerato LE model supports a maximum of 9,216 ports using a VME-based common control and any combination of High Density Expansion (HDX), Mid Density Expansion (MDX) and Low Density Expansion (LDX) shelves to meet precise customer requirements. Designed for installation in Universal EIA RS310-D 19-inch racks, the Cerato LE is equipped to run in a full, hot standby redundant configuration.

Common Control

A VME-based common control unit is housed in one cabinet with redundant common equipment. The cabinet includes one VME-based shelf for the two common control processors, and two shelves for the telephony common control units.

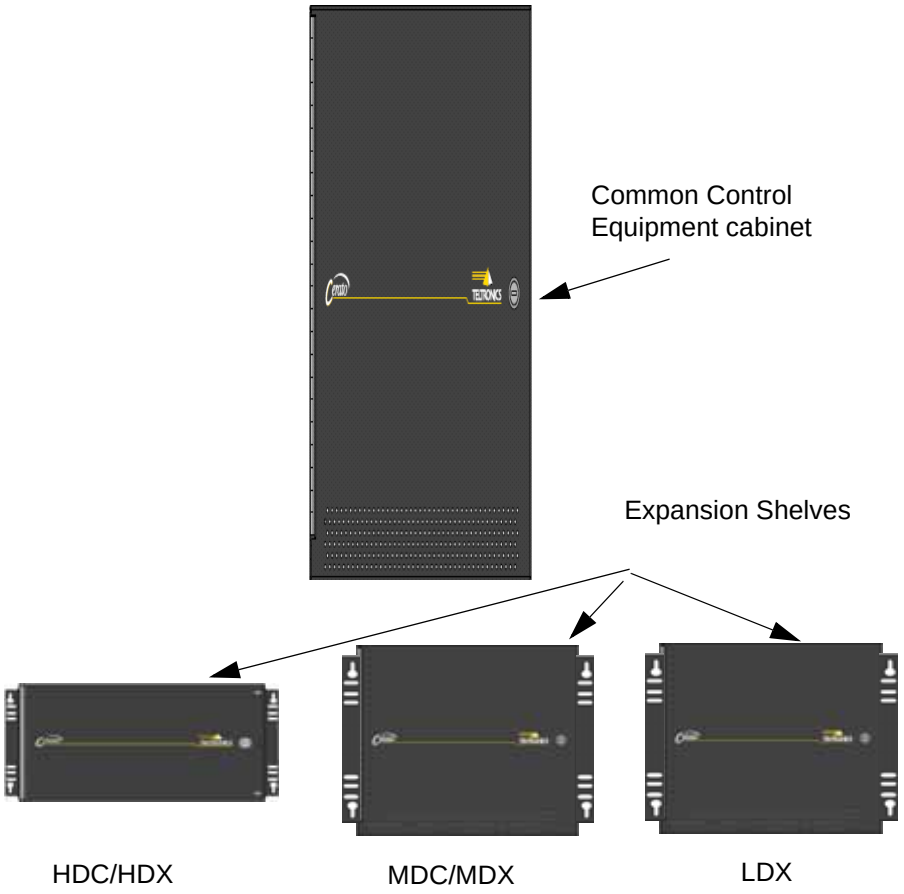


Figure 3. Cerato LE Common Control Equipment Cabinet & Expansion Shelves

Cerato Expansion Shelves

The following expansion shelves are available for the Cerato switch, both LE and ME models.

HDX High Density Expansion Shelf – 512 ports.

MDX Mid Density Expansion Shelf – 512 ports.

LDX Low Density Expansion Shelf – 256 ports.

Global Signaling Packages

A broad range of signaling protocols such as DTMF, Ground Start/Loop Start, R2MFC, R2SMFC, E and M (pulsed and continuous), MFR1, Loop, Dial pulse,

ISDN, QSIG, Signaling System 7 (SS7), VoIP, and more are available in the Cerato switches. These packages and a flexible database configuration allow easy adaptation to new telecommunication requirements.

Feature Set

Cerato switches are full-featured versatile communication systems, providing a complete set of PBX and network calling features, as well as enhanced services via the LAN Gateway. Calling features include standard items such as call forward; call waiting, callback, conference, privacy, and transfer. For a complete list, see “Call Features” on page 45.

Enhanced services include VoIP, advanced conference capabilities, announcement services, and computer-telephone integration (CTI) links that allow the development of computer supported telephony applications. These options can provide the value-added services important in today’s competitive market.

Operation and Maintenance

Cerato switches are designed for ease of operation and maintenance. A set of graphical user interface (GUI) software administration programs are used to configure the switches and provide real-time, detailed information about system operation. The programs also allow testing of line, trunk, and service units. Administration programs are operated from either a centralized system ASCII administration terminal, telnet via local or remote PC on corporate LAN/WAN or Internet.

Cerato switches are equipped with automatic alarm systems that detect common control failures and automatically switch the common control to redundant equipment without interrupting established calls. The modular hardware design facilitates system repair without interrupting system operation as most problems are solved by nothing more than replacing a printed circuit board or power supply.

2 System Implementation

This chapter gives an overview on setting up a new Cerato ME or LE switch and how to upgrade an existing one. For a more detailed account of Cerato ME or LE system installation, see the Cerato ME/LE Installation and Maintenance manual, p/n 955 480.

New System Setup Overview

Installing the Cerato system for the first time is simply a matter of making sure the installation area has the recommended space and power requirements, and following the directions in the installation manual. The system must be installed in a space with limited access; only trained personnel may operate it. In most cases, the system fits into the limited space allotments and incoming power structure found within existing buildings.

Each new installation arrives with the shelves, cards, cables, and documentation necessary to get the system up and running with a minimum of time and effort. The shelves arrive at the destination site ready for installation. The Cerato LE Common Control Equipment arrives in a single cabinet. The documentation that accompanies every system provides easily followed installation procedures including step-by-step instructions and interconnection diagrams.

Shelves The shelves are constructed with a rigid steel framework and designed for easy access. All common control and interface units and cables are readily accessible for installation or change out by simply sliding modules in or out of the connectorized backplane.

Cables Cables enter and exit the cabinets and modules through specially designed exit points, either from the top and run overhead or from the bottom and run in floor channels. The serial-link cables between cabinets or shelves have plugs at both ends to eliminate wiring mistakes.

Units After the shelves are installed, units are plugged into the appropriate slot, using the installation instructions and shelf diagrams provided.

Upgrading an existing system

The design of Cerato switches allows for the expansion of existing systems without disruption to existing service. Upgrading systems involves adding another shelf to existing racks or adding another rack, having minimum down time. Additional interface units are plugged into new shelves and pre-assembled cables connect new factory tested cabinets to existing hardware.

Software Configuration

Each Teltronics Cerato system can be uniquely tailored to serve the call processing requirements of various applications. The same configuration software runs on both Cerato models, so systems are configured and features operate the same way on both systems.

The Cerato system is highly configurable and therefore very flexible. A set of database tables, illustrated in Figure 4, govern all call processing from digit analysis to routing over outbound trunks, as well as the features available to users. These database tables are configured and edited using the Cerato Switch Console, the graphical user interface (GUI) into the Cerato.

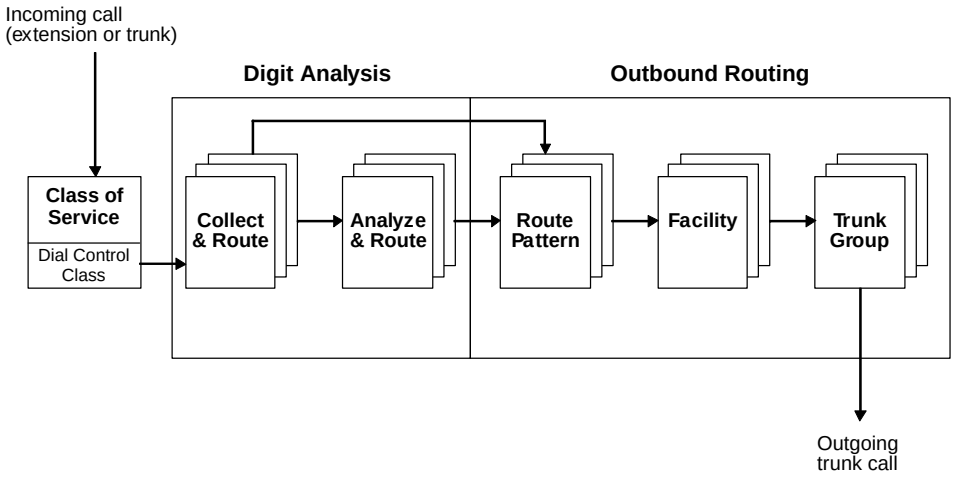


Figure 4. Call Processing Overview

Dialing Plan and Feature Access

The Cerato system supports a wide variety of dialing options. The system dialing plan is controlled through class of service, collect and route tables, and analyze and route tables.

Class of Service

The Cerato system supports 256 distinct classes of service which are assigned to attendant workstations, extensions, trunk groups, authorization codes, etc. Each class of service is comprised of six elements which collectively define the dialing structure and feature access available to a caller.

- **Dial Control Class** determines dialing type (such as no origination allowed, normal dialing, and forced authorization code) and intercept handling.
- **Feature Class** specifies the set of features, available to a user. Features include call hold, barge, paging, and call waiting.
- **Routing Class** determines which outgoing routes can be used by the user.
- **Connection Class** determines which ports are allowed to be connected to one another. In most PBXs, all ports are allowed to be connected to all others. Port connection restriction is generally employed in cases where the Cerato is a shared resource among several independent constituents, such as a multi-tenant environment.
- **Reliable Disconnect** lets you specify whether a circuit provides reliable disconnect. In any connection - a two party connection or an attempt to join a conference call - at least one circuit must provide reliable disconnect.
- **Bearer Capability Class** controls the types of connections a caller will be allowed.

- **Hold Treatment** allows connection of a held party to the specified announcement (Default, ANN-1 - ANN-64). The default hold treatment connects an external held party to the system wide Music-on-Hold treatment (only given to held parties that have external extension treatment enabled in their Feature Class.) The default hold treatment for parties that do not have external extension treatment is ‘Hold Tick Tone’.

  When hold treatment for ANN-1 - ANN-64 is configured, the hold treatment connects all held parties (regardless of external extension treatment) to the specified announcement.

Authorization codes may be used as passwords to the system. A caller’s authorization code must be dialed and validated before other digits are accepted for call processing. When a caller dials a valid authorization code, the code's class of service overrides the class of service of the extension or trunk being used for the call. Authorization codes may be forced (required) or voluntary. Voluntary use of codes is typically done when callers wish to gain access to restricted system features or outgoing routes.

Dialing Plan

Collect and Route and Analyze and Route tables define the dialing plan for a system.

Collect and Route tables define one or more collection patterns that consist of digit sequences and destinations. Digit sequences may be unique telephone numbers, digit patterns (such as NXX XXXX), or a combination of both.

The destination associated with a Collect and Route digit sequence may be a feature, a subscriber line, another database table, or an intercept. Destination database tables can be other Collect and Route, Automated Voice Response, Speed Dial, Authorization Code tables, Analyze and Route tables for further digit analysis, or Route Pattern tables for outgoing calls. Allowed intercepts are tones, lines, or Route Pattern tables. When call processing software identifies a match with a collection pattern, it routes the call to the appropriate destination.

Analyze and Route tables perform more detailed analysis of specific digit sequences. For example, a Collect and Route table might direct all outbound calls matching the digit sequence 415 XXX XXXX to an Analyze and Route table that examines the middle three digits to determine what outbound facilities to use.

As in the collect and route tables, each analyze and route sequence has an associated destination. A default destination is specified for numbers that are directed to the table for analysis but have not been defined.

Outbound Traffic

Three database tables – Route Patterns, Facility, and Trunk Group – affect processing of calls bound for outgoing trunks.

The primary purpose of a route pattern is to check if a user has sufficient Class of Service to use the particular outgoing route. Route Pattern tables direct calls to specific Facilities that are associated with specific Trunk Groups. A Route Pattern is an ordered list of routing and queuing instructions which direct calls to specified facilities for outgoing calls, as well as what Class of Service may use a particular route.

Route patterns typically include a collection of facilities appropriate to the types of outgoing calls they will be handling. To establish Least Cost Routing, facilities are

ordered in route patterns from least costly to most costly. For facilities with time sensitive costs, access may be restricted by time of day and day of week.

Facility tables tell the system what information to out-pulse over each trunk group. These facilities are used to either out-pulse calls over outgoing trunk groups or send calls to trunk groups connected to paging equipment, voice mail equipment, or prerecorded messages.

Trunk Group tables define sets of trunk circuits that share common incoming/outgoing routing parameters, signaling attributes, and same destination. They also define how the Cerato system searches for available trunk circuits, which is important for avoiding glare. When an incoming and outgoing call try to access the same trunk circuit at the same time, the Cerato system automatically gives precedence to the incoming call and searches for another trunk circuit for the outgoing call.

Inbound Traffic

Since called parties may be unavailable to answer their calls and/or the volume of incoming calls may be great, several Cerato system features are available to ensure proper call coverage.

Call Redirection Groups

Each call redirection group (CRG) contains call-forwarding instructions for a group of extensions and/or trunks. When used for extensions, this feature is equivalent to system call forwarding.

Trunk circuits in a CRG are commonly referred to as direct-in lines.

Each trunk in a CRG is assigned a single destination for all incoming calls on that trunk. Each extension in a CRG may be assigned different call destinations for different types of calls (internal/external caller, ring no answer/busy/redirect all calls).

A CRG is activated by dialing the CRG-ON feature code followed by the CRG number. A similar procedure deactivates the group.

Extension users can override their call forwarding instructions by programming individual call forwarding instructions at their station instruments. This action does not cancel the CRG instructions. When station-forwarding instructions are deactivated at an instrument, the CRG instructions resume.

Shared Extensions

Each Teletronics phones' keyset is assigned a primary extension number; the remaining line keys may be assigned secondary extension numbers, remote numbers, shared primary extension numbers, shared remote extensions numbers, or shared secondary extension numbers. With a shared extension, the user is able to monitor the status of another extension when needed and answer its in-coming or held calls.

Pick-up Groups

Pick-up Groups consist of up to 32 extensions. Any ringing extension in a Pick-up Group can be answered from any other extension in the group.

Pick-up Groups are usually configured on the basis of physical and/or departmental boundaries.

Pick-up Groups may also include RKEY extensions configured in two or more Cerato switches.

Hunt Groups

When the Hunt Group feature is activated for an incoming call, the system searches sequentially through an assigned group of station or telephone exten-

sions until an idle extension is found. The Hunt Group feature is activated either when there is an incoming call to the group's *master number* or when there is an incoming call to a busy Hunt Group member designated as an originator.

The assigned Hunt Group type – circular or terminal – determines what happens when the system reaches the last extension of the Hunt Group without finding an idle extension. With *circular* hunting, hunting continues from the top of the list and stops just before the extension where hunting began. With *terminal* hunting, hunting will cease at the last extension in the hunt group regardless of where in the list hunting began.

For both circular and terminal hunting, if no idle extension is found, then the caller is either queued for the Hunt Group or is routed to a defined overflow number for the Hunt Group.

3 System Hardware

The Cerato switch consists of the following main components:

- Common control - consists of microprocessors, system memory, floppy and hard disk drives. The common control scans the ports for service requests and provides the mechanism for all switch and/or data connections. The common control also provides tone and conference functions and the timing for the Pulse Code Modulation (PCM), CODECs, and data.
- Interface units - such as trunk, line, and service units (digital, analog, and VoIP)

Cerato ME and LE systems differ only in port size and type of common control units as described in Table 1.

Table 1. Cerato model differences

Cerato model	Common Control	System Port Capacity
Cerato ME	HDC/MDC	256 - 2048
Cerato LE	LE	1024 - 9216

Cerato ME System Architecture

Cerato ME systems consist of one HDC/MDC shelf and any combination of expansion shelves (HDX, MDX and LDX) up to the maximum of 2048 ports, installed in up to seven Universal EIA RS310-D 19-inch racks. To expand a system, simply add additional shelves to system capacity. Figure 5 shows examples of four different 2048 port Cerato ME systems.

All shelves have interface unit slots, while HDC/MDC shelves, which can additionally contain common equipment units, can also have common equipment unit slots. The common equipment unit slots can be equipped to provide either non-redundant or a fully hot, standby redundant operation,

All shelves either have one Power Supply Module (PSM) in either slot, or two PSMs for power supply redundancy. Each shelf uses 48Vdc power. An optional universal AC (110 or 220 VAC, 50/60 Hz) to 48Vdc power module is available for purchase if the system is powered by a local AC source or UPS.

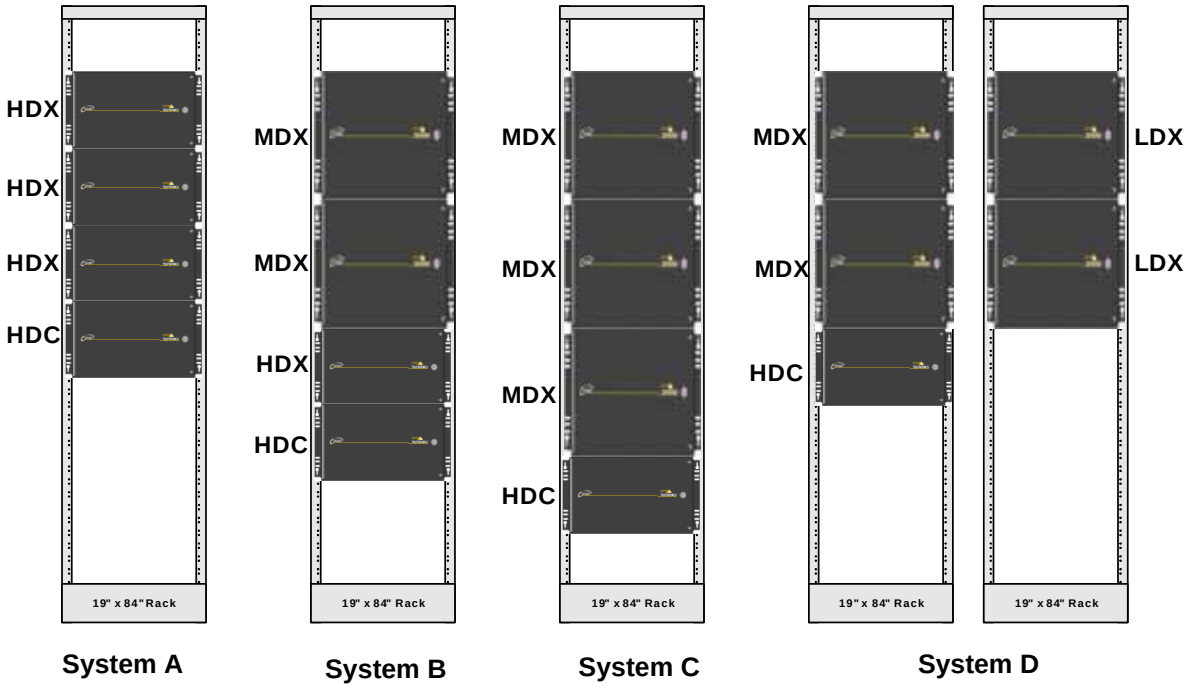


Figure 5. Cerato ME - 4 sample configurations, all using 2048 ports

Shelf Architecture

The Cerato ME has four types of shelves:

- The High Density Control (HDC) shelf contains common control and interface units, and supports up to 512 ports via four 128 port card slots
- The Mid Density Control (MDC) shelf contains common control and interface units, and supports up to 512 ports via 12 port card slots

- The High Density Expansion (HDX) shelf contains Shelf Driver Units (SDUs) and interface units and supports up to 512 ports via four 128 port card slots
- The Mid Density Expansion (MDX) shelf contains SDUs and interface units and supports up to 512 ports via sixteen 32 port card slots
- The Low Density Expansion (LDX) shelf contains SDUs and interface units and supports up to 256 ports via sixteen 16 port card slots

HDC

The HDC shelf has two power supply slots, two CPU slots, and two TSA slots. The remaining 4 x 128 port card slots accommodate any combination of 128, 64, 32, 16 or 8 port cards. An HDC shelf with 4 x 128 port cards is shown in Figure 6. The HDC is used as the common control shelf of the system regardless of whether the system is redundant or non - redundant. In non-redundant systems, the second CPU and TSA slots are not equipped. The HDC backplane provides interconnection of the common control and the interface units. The HDC backplane also enables connection of peripheral equipment such as disk drives, interface slots, and alarm systems, and provides cross connections to the redundant common control counterparts. Access adapter boards with RJ48C connectors for up to sixteen T1 or E1 connections are attached to the backplane.

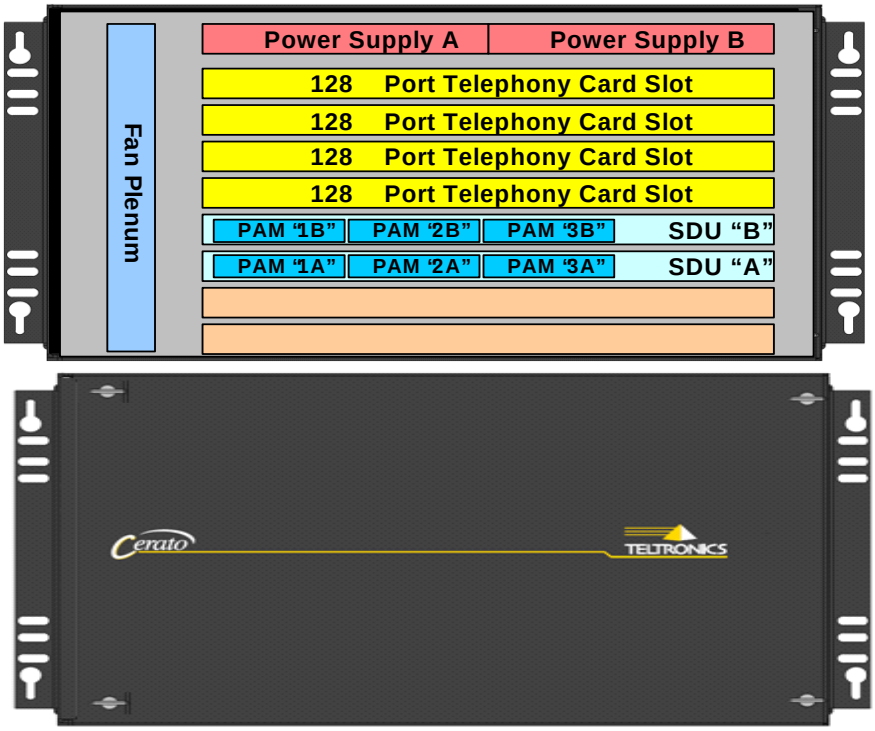


Figure 6. HDC Common Control shelf, front view

MDC

The MDC shelf has two power supply slots, two CPU slots, and two TSA slots. The remaining 12 port card slots accommodate many different combinations of 128, 64, 32, 16 or 8 port cards. An MDC shelf with 12 port cards is shown in Figure 6. The MDC is used as the common control shelf of the system regard-

less of whether the system is redundant or non - redundant. In non-redundant systems, the second CPU and TSA slots are not equipped. The MDC backplane provides interconnection of the common control and the interface units. The MDC backplane also enables connection of peripheral equipment such as disk drives, interface slots, and alarm systems, and provides cross connections to the redundant common control counterparts. Access adapter boards with RJ48C connectors for up to sixteen T1 or E1 connections are attached to the backplane.

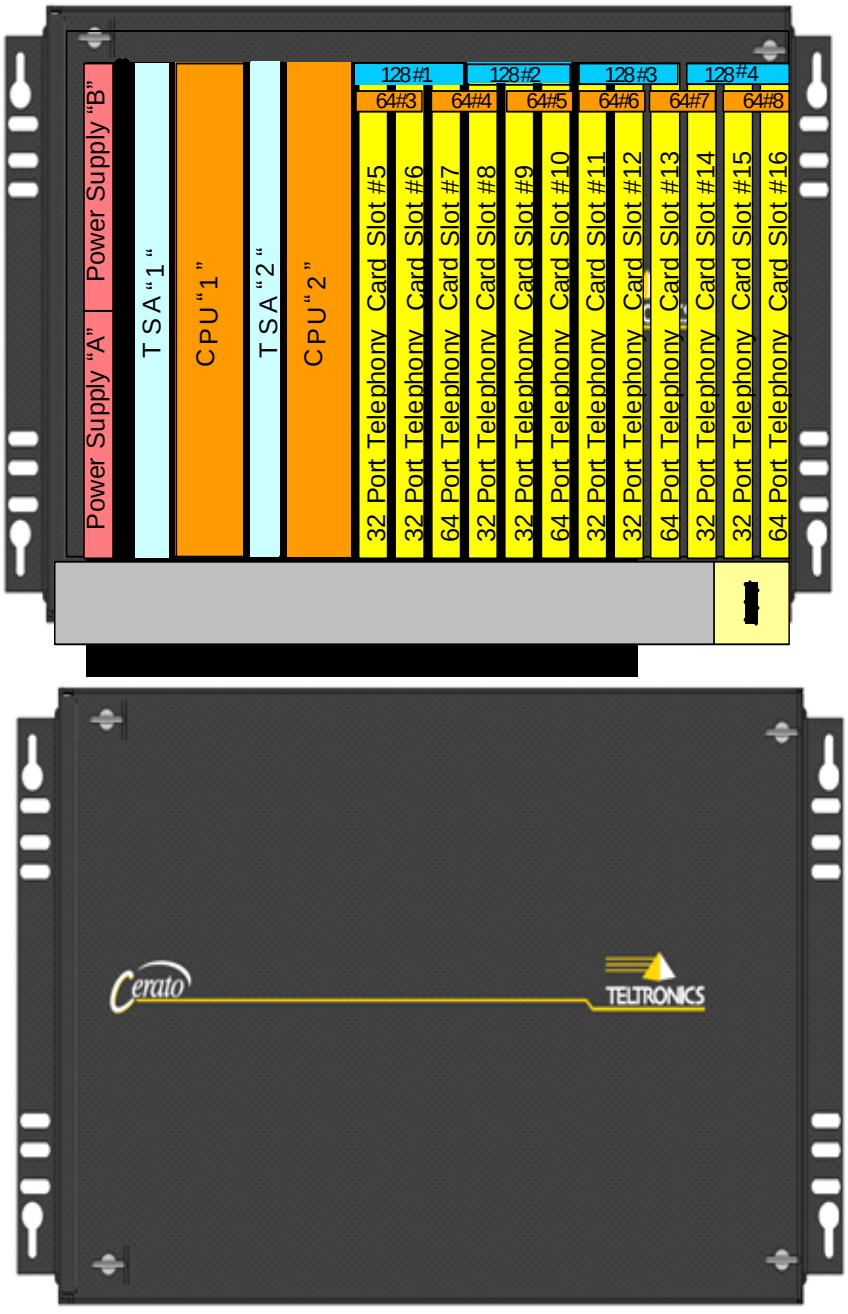


Figure 7. MDC Common Control shelf, front view

HDX

The HDX shelf, as illustrated in Figure 8, is housed in Universal EIA RS310-D 19-inch enclosed or open frame racks. The HDX shelf includes four 128 port card slots. The HDX has two power slots for redundant power supply and two SDU slots for redundant telephony systems. Universal port architecture allows any combination of up to four 128, 64, 32, 16 or 8 port cards to be installed in the four available card slots. The HDX backplane interfaces to the common control through two serial S-link interfaces that connect to an SDU. The SDU provides the transport of Pulse Code Modulation (PCM) digital data as well as signaling, alarm and configuration data. Each SDU can provide communication for a total of 512 PCM ports. Attached to the backplane are access adapter boards with RJ48C connectors for up to sixteen T1 or E1 connections.

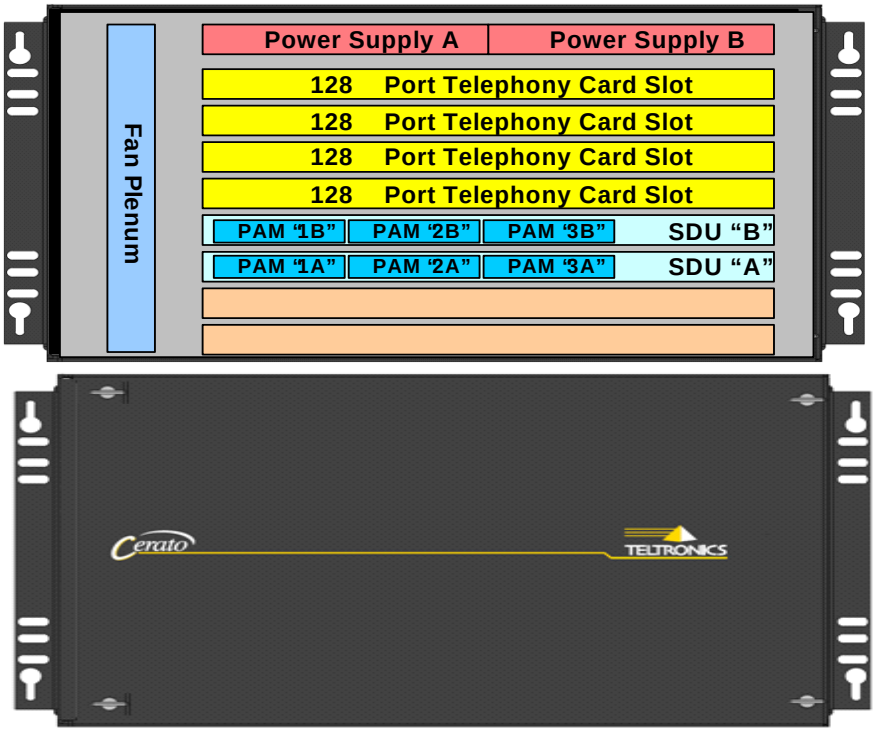


Figure 8. HDX shelf, front View

MDX

The MDX shelf, as illustrated in Figure 9, is housed in Universal EIA RS310-D 19-inch enclosed or open frame racks. The MDX includes sixteen 32 port card slots. The MDX has two power slots for redundant power supply and two SDU slots for redundant telephony systems. Both SDU slots are filled for redundancy. Universal port architecture allows any combination of up to four 128 port cards, eight 64 port cards, sixteen 32 port cards, sixteen 16 port cards or sixteen 8 port cards to be installed in the sixteen available card slots. The MDX backplane interfaces to the common control through two serial S-link interfaces that connect to an SDU. The SDU provides the transport of PCM digital data as well as signaling, alarm and configuration data. Each SDU can provide communication for a total of 512 PCM ports. The backplane has built-in access connectors (RJ48C) for up to sixteen T1 or E1 connections.

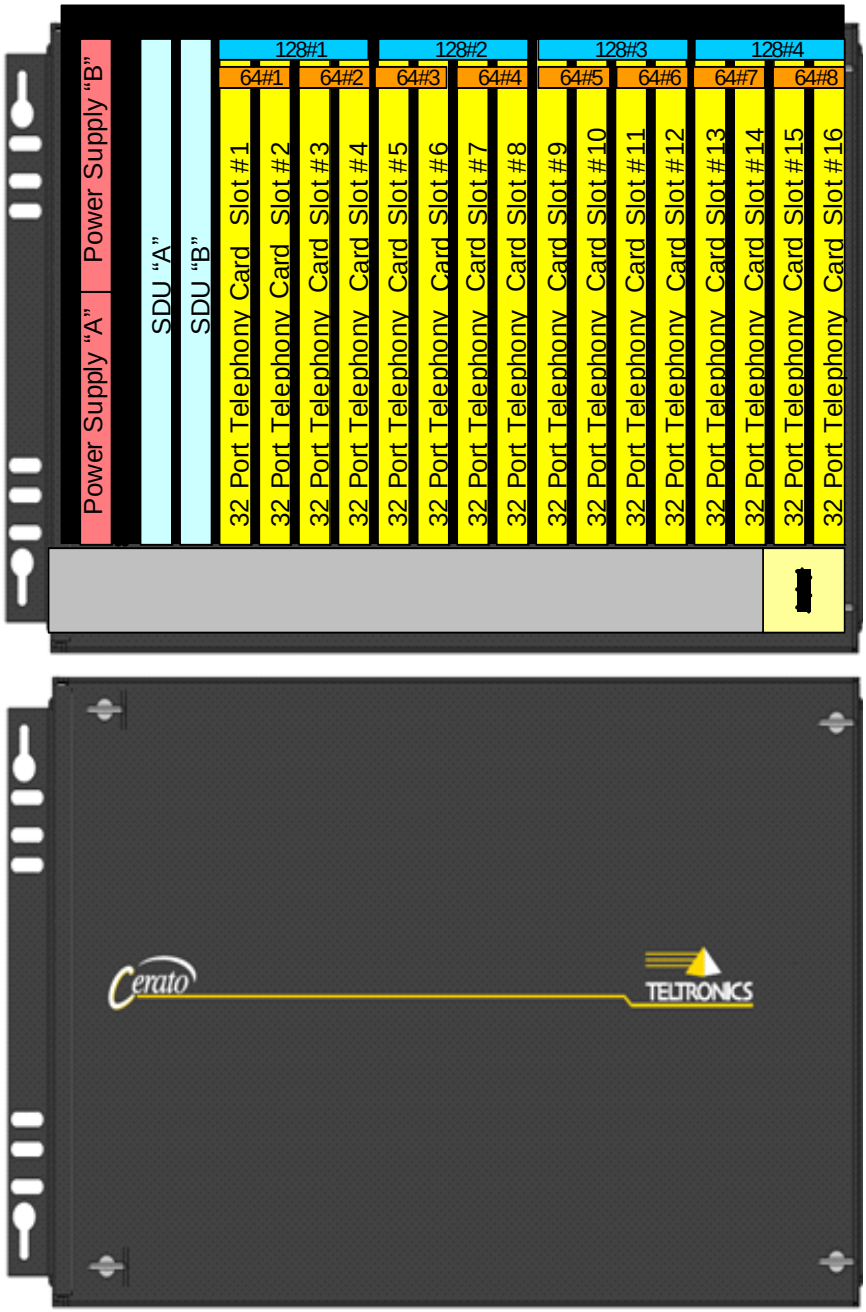


Figure 9. Cerato MDX shelf, front view

MDC The MDC shelf, as illustrated in Figure 10, is housed in Universal EIA RS310-D 19-inch enclosed or open frame racks. The MDC includes sixteen 12 port card slots. The MDC has two power slots for redundant power supply and two SDU slots for redundant telephony systems. Both SDU slots are filled for redundancy. Universal port architecture allows any combination of up to sixteen 12 port cards, eight 64 port cards, sixteen 32 port cards, sixteen 16 port cards or sixteen 8 port cards to be installed in the sixteen available card slots.

The MDC backplane interfaces to the common control through two serial S-link interfaces that connect to an SDU. The SDU provides the transport of PCM digital data as well as signaling, alarm and configuration data. Each SDU can provide communication for a total of 512 PCM ports. The backplane has built-in access connectors (RJ48C) for up to sixteen T1 or E1 connections.

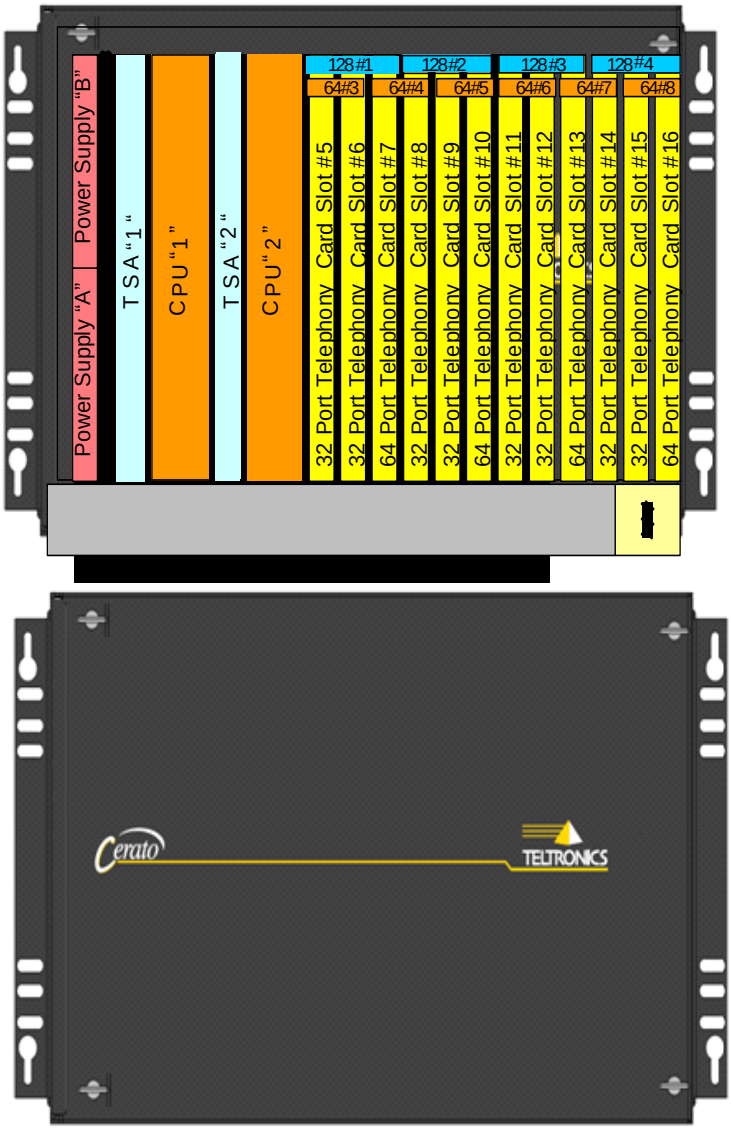


Figure 10. Cerato MDC shelf, front view

LDX

The LDX shelf, as illustrated in Figure 11, is housed in Universal EIA RS310-D 19-inch enclosed or open frame racks. The LDX shelf includes sixteen 16 Port card slots. The LDX has two power slots for redundant power supply and two SDU slots for redundant telephony systems. Both SDU slots are filled for redundancy. Universal port architecture allows any combination of up to two 128 port cards, four 64 port cards, eight 32 port cards, sixteen 16 port cards or sixteen 8 port cards to be installed in the sixteen available card slots. The LDX

backplane interfaces to the common control through two serial S-link interfaces that connect to an SDU. The SDU provides the transport of PCM digital data as well as signaling, alarm and configuration data. Each SDU can provide communication for a total of 512 PCM ports. This means a single SDU can provide service for two paired LDX shelves. The backplane has built-in access connectors (RJ48C) for up to eight T1 or E1 connections.

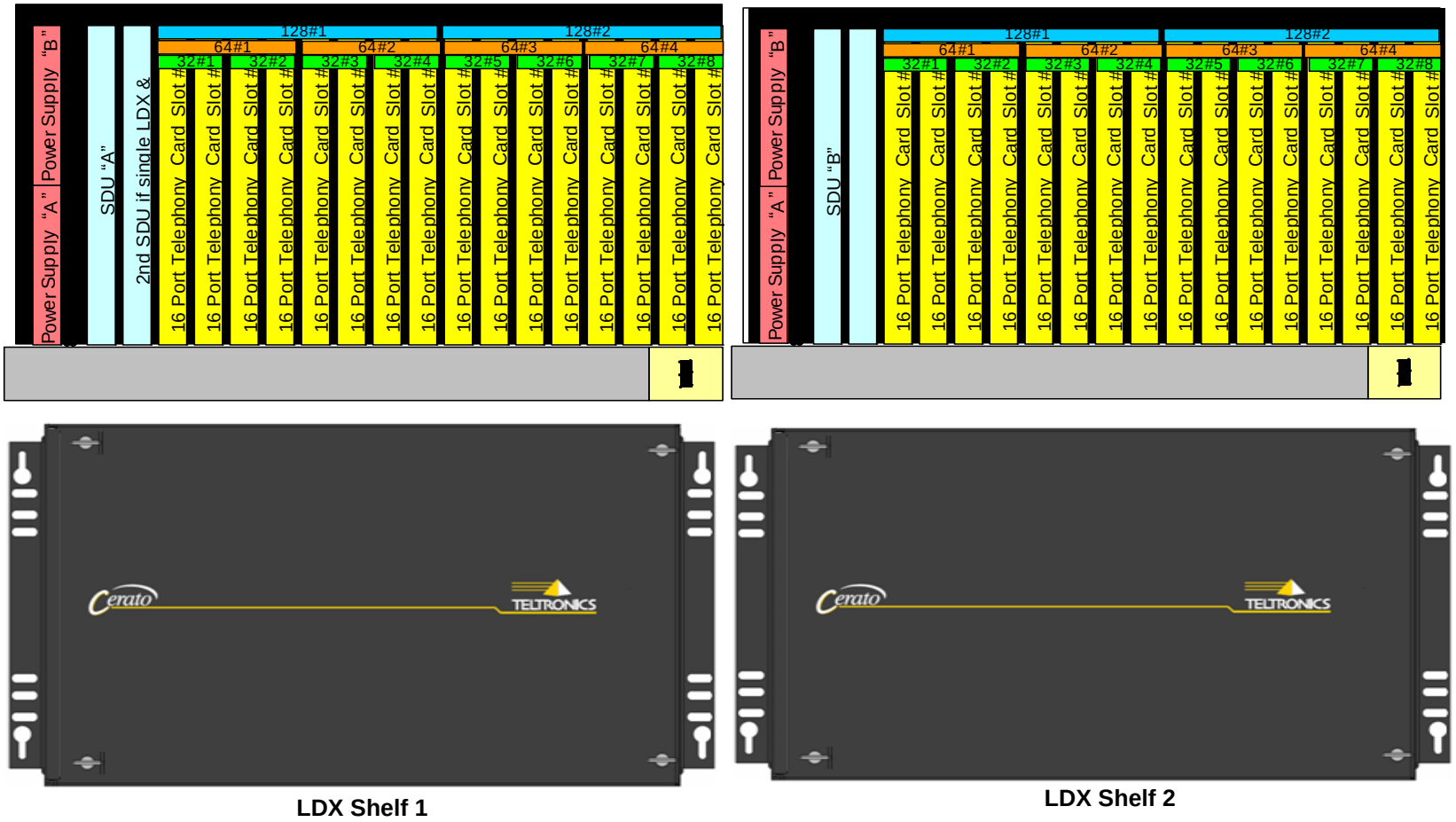


Figure 11. LDX shelf, front View – first and second shelves

Buses

The various buses in the system (C-Bus, Redundant Bus, and Telephony Bus) provide communication paths between various units in the system. Figure 12 illustrates Cerato ME common control units and the connections between those units.

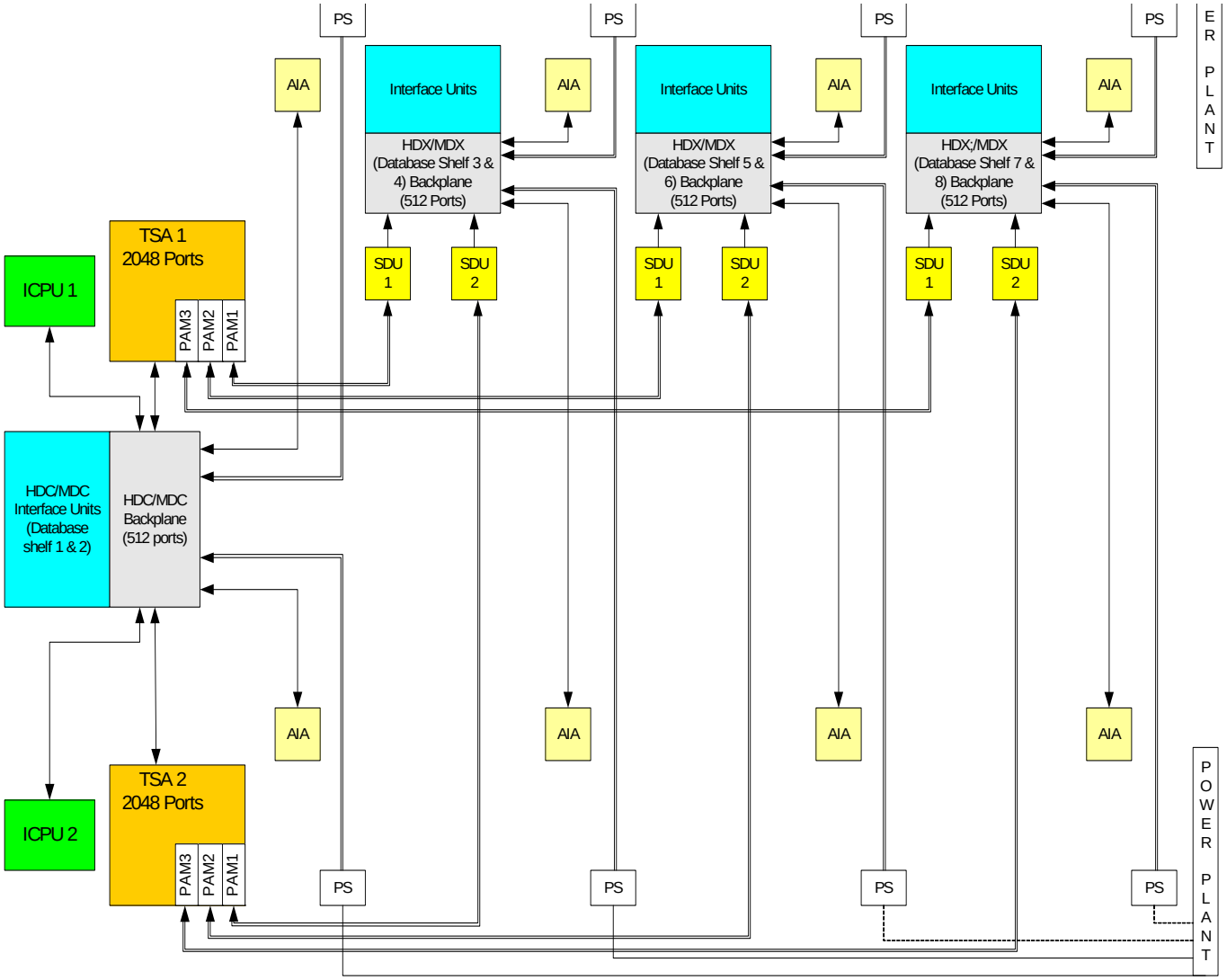


Figure 12. Cerato ME System Architecture

Common Control Units

The Common Control is located in slots CT1 nd CT2 of the HDC shelf.

Central Processor Unit (CPU)

The CPU provides memory, hard drive, floppy drive and LAN access for the Cerato ME. The CPU is also responsible for call control, call tracking and database management. It also stores information on ports established in voice or data conversation and writes that information to the standby shelf in the event of an active shelf failure or switchover.

Time Switch Array (TSA)

The TSA is a 2,048 port switch matrix unit. It transports 512 ports directly through the backplane to peripherals in the HDC and another 1536 ports through Peripheral Access Module (PAM) interfaces and high speed serial links to the remaining expansion shelves. The TSA provides tone and conference functions, system timing, host computer interface, redundant common control interface, backplane ID and contains redundant memory.

Peripheral Access Module (PAM)

Each PAM provides access to an additional 512 ports of the TSA switch matrix through high speed serial twisted pair connections (S-link cables).

Serial Link S-Link Cables

Two (primary/expansion) serial S-link cables connect between each PAM and designated SDU. The cables are shielded category 5 cables with RJ45 connectors on each end that can be as long as 100 meters in length. The cables transport Pulse Code Modulation (PCM) digital data as well as signaling, alarm and configuration data.

Serial Link S-Link Cables

Each SDU provides communication for 512 PCM ports. For redundancy, SDUs operate as pairs and provide transport interface between the Common Control units and the interface units. Each SDU incorporates two serial S-link interfaces (cables). The SDU provides for the transport of Pulse Code Modulation (PCM) digital data as well as signaling, alarm and configuration data.

For HDX and MDX shelves - the SDU serves 512 ports in the shelf in which it is installed via direct connection to the backplane.

For paired LDX shelves - the SDU serves the first 256 ports to the shelf in which it is installed via direct connection to the backplane. The second 256 ports are served through a pair of ribbon cables connecting to the adjacent shelf.

Table 2. Cerato ME SDU Slot Locations

Shelf	SDU Location
Redundant Systems:	
HDX/MDX	CT1, CT2
Paired LDX	CT1 in both LDX shelves
Single shelf LDX	CT1, CT2
Non-Redundant Systems	
HDX/MDX	CT1
Paired LDX	CT1 in one LDX shelf
Single shelf LDX	CT1

Cerato LE System Architecture

The 9,216 port Cerato LE system consists of one Common Control Equipment Cabinet, as illustrated in Figure 13, and any combination of HDX, MDX and LDX expansion shelves up to 9,216 ports. The Common Control Equipment Cabinet contains a VME Redundant Common Control shelf, and two Telephony Control shelves, the latter of which provide the switching matrix to the interface units on the expansion shelves. .

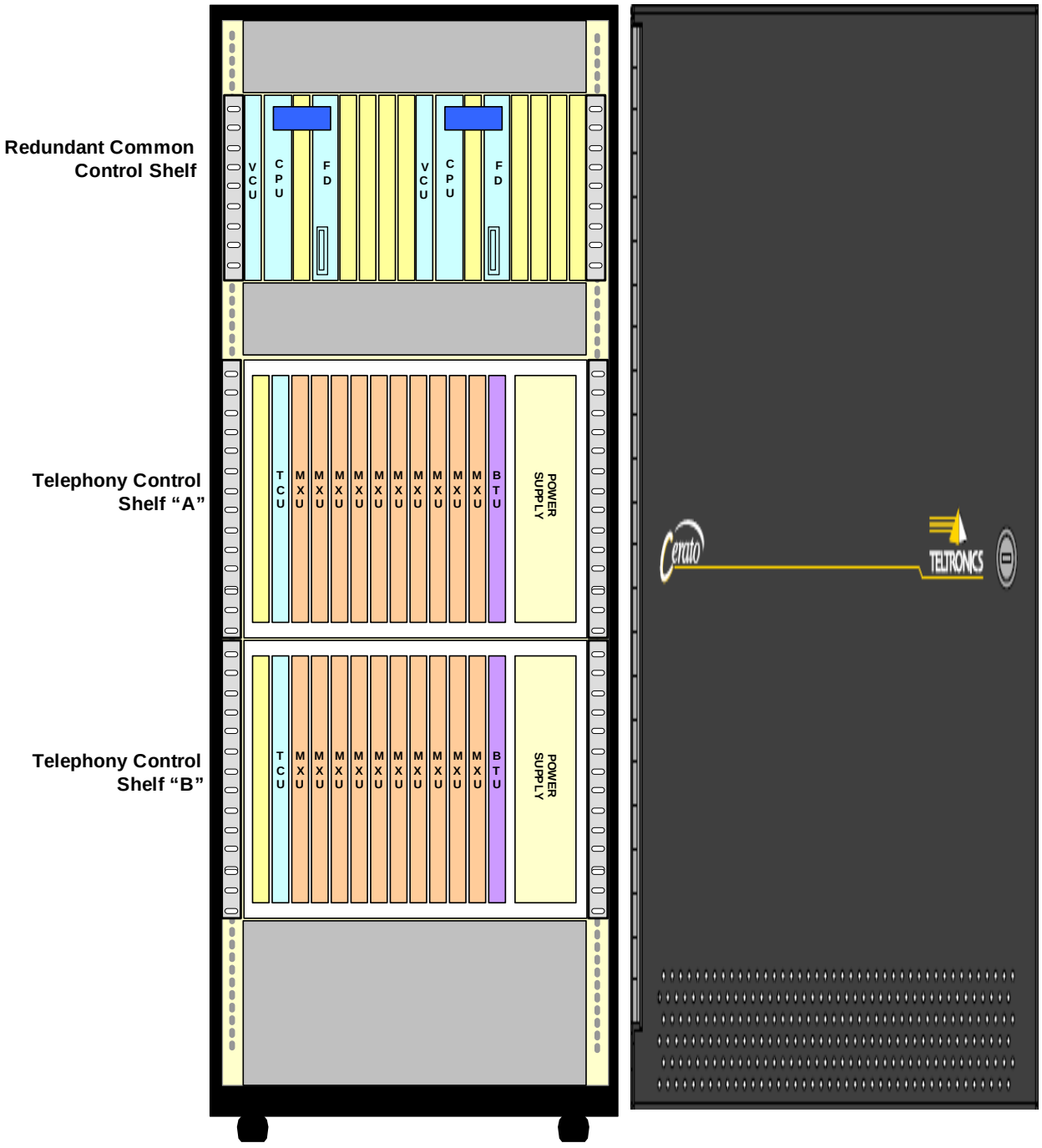


Figure 13. Cerato LE Common Control Equipment Cabinet, front view

Common Control Equipment Cabinet

The Cerato LE Common Control Equipment Cabinet houses the Common Control and Telephony Control shelves required to support redundancy on the Cerato LE System (see Figure 14 for an overview.) Common Control shelves have 21 slots and Telephony Control shelves have 12 slots. Both shelves are fully connectorized.

The Common Equipment cabinet requires -48VDC incoming power and has dual inputs to support redundant DC power sources.

HDX, MDX, LDX Shelves

The High Density Expansion Shelf (HDX) provides four 128 port card slots, Mid Density Expansion Shelf (MDX) provides sixteen 32 port card slots, Low Density Expansion Shelf (LDX) provides sixteen 16 port card slots for interface units. They have power supplies (power slots) and two Shelf Driver Units (SDU) slots. Their universal port architecture allows up to any combination of interface cards to be installed in any type of expansion shelf. The HDX supports four 128 port cards. Each card slot can have either a 128, 64, 32, 16 or 8 port card inserted. The MDX supports up to four 128 port cards, eight 64 port cards, sixteen 32, 16 or 8 port cards. The LDX supports two 128 port cards, four 64 port cards, eight 32 port cards or sixteen 16 or 8 port cards. Any combination of cards can be installed in any shelf up to the total ports supported by the expansion shelf.

Backplanes

The Cerato LE has Common Control, Telephony Control, and Expansion shelf backplanes. The Common Control backplane provides interconnections for the Common Control units and distributes +5, +12, and -12VDC to those units. The Telephony Control backplane provides interconnections for the Telephony Control units and distributes +5VDC to those units. Common Control and Telephony Control shelves are connected via the T-Link Adapter and cable as shown in Figure 14. Redundant shelves are connected via the Redundant Link (R-Link) embedded in the Telephony Control backplane.

The expansion shelf backplanes provide access to the telephony PCM buses for connection to the PCM switching matrix in the Common Equipment shelves. They provide interconnection to the interface units and distribute +/- 5VDC, +/ -12VDC, and -48VDC, and ringing voltages throughout the expansion shelves. Each backplane provides access to T1 or E1 connections via RJ48C connectors Note that the HDC/HDX shelf requires an access adapter board.

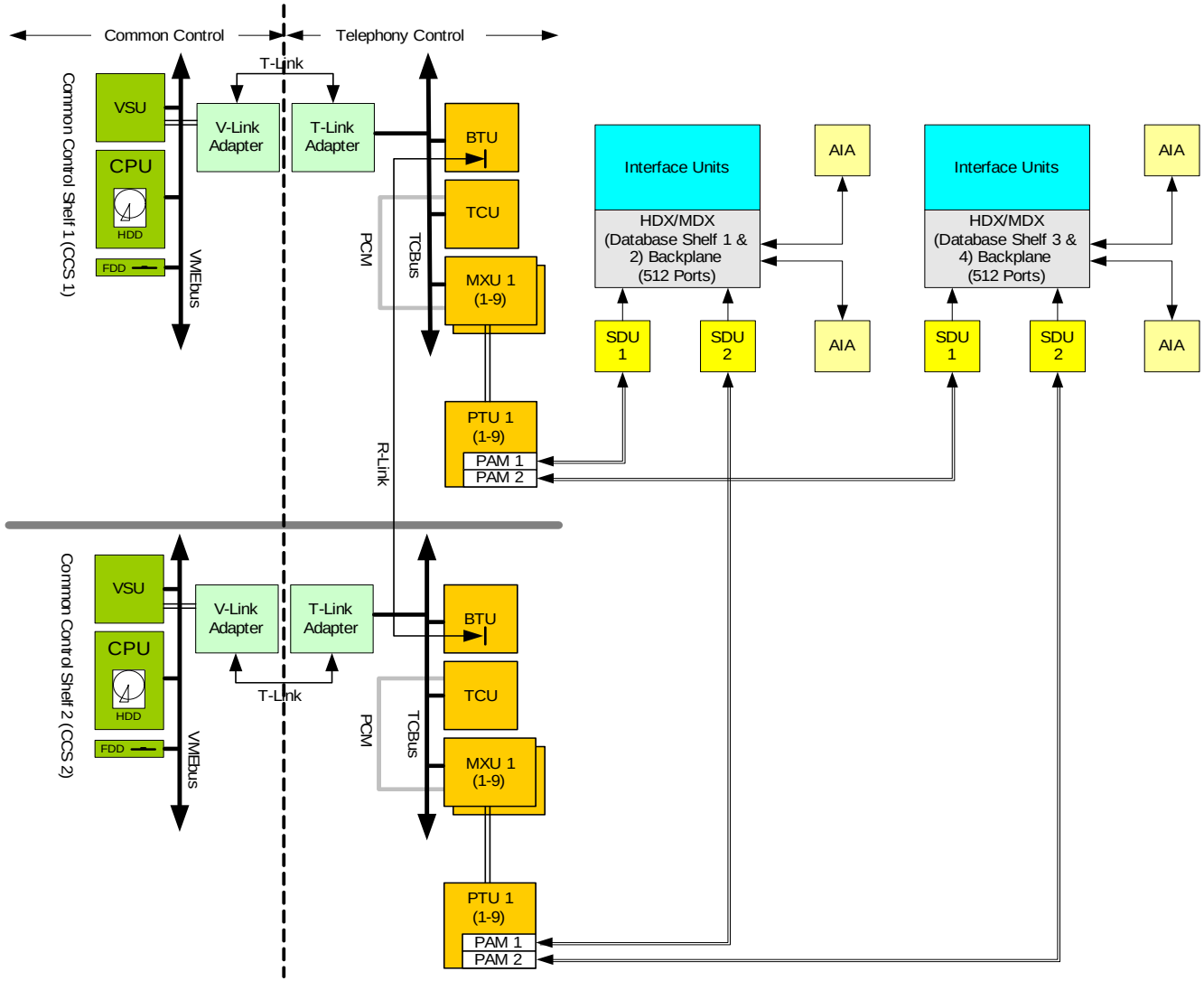


Figure 14. Cerato LE System Architecture

Common Control Units

Each Common Control shelf contains one VME Central Processing Units (VME CPUs), a VME bus Service Unit (VSU), and a floppy drive.

VME Central Processing Unit (VME CPU)

The VME CPU is responsible for call control, call tracking, and database management. It contains the flash drive and Ethernet connections.

VME Bus Service Unit (VSU)

The VSU controls the VME bus and provides an interface between the CPU and telephony control equipment.

Telephony Control Units

Each Telephony Control shelf contains a Base Timing Unit (BTU), a Tone and Conference Unit (TCU), and up to nine Matrix Units (MXU). Telephony Control cabinets also contain one Peripheral Transport Unit (PTU) per MXU. The Telephony Control backplane is a mid-plane. Peripheral Transport Units (PTUs) plug in the rear of the backplane and the BTU, TCU, and MXUs plug in the front side.

Base Timing Unit (BSU)

The BTU provides redundant shelf cross connection, timing cross-connect, and is the CPU interface with the MXU. The BTU also serves as the reference timing generator. The BTU stores information on ports established in conversation and writes that information to the standby shelf in the event of an active shelf failure or switchover. It also ensures that call processing databases on redundant shelves are identical and contains redundant memory.

Matrix Unit (MXU)

MXUs perform PCM switching and port scanning, as well as monitoring of all communication between the PTU and the expansion shelf data links. Each MXU supports 1024 ports and any of those ports can be connected to any other port in the system.

Tone and Conference Unit (TCU)

The TCU performs PCM switching conference control, and tone generation for the Cerato LE. Each TCU provides up to 256 tone ports and up to 768 conference ports.

Peripheral Transport Unit (PTU)

PTUs distribute the PCM byte samples they receive from the MXU to the expansion shelves via the Peripheral Access Module (PAM) and S-Link cable. The PTU also transfers signaling and overhead data to the MXU, and recovers time slot and signaling information from the S-Link interface. A local bus connects each PTU slot to the associated MXU slot.

Peripheral Access Modules (PAMs)

Each PTU has two Peripheral Access Modules. Each PAM provides access to an additional 512 ports of the MXU/PTU switch matrix through high speed serial twisted pair connections (S-link cables).

Serial Link (S-Link) Cables

Two (primary/expansion) serial S-link cables connect each PAM and designated PTU together. The cables are shielded category 5 cables with RJ45 connectors on each end that can be as far as 100 meters in length. The cables transport Pulse Code Modulation (PCM) digital data as well as signaling, alarm and configuration data.

Serial Link S-Link Cables

Each SDU provides communication for 512 PCM ports. For redundancy, SDUs operate as pairs and provide transport interface between the Common Control units and the interface units. Each SDU incorporates two serial S-link interfaces (cables). The SDU provides for the transport of Pulse Code Modulation (PCM) digital data as well as signaling, alarm and configuration data.

For HDX and MDX shelves - the SDU serves 512 ports in the shelf in which it is installed via direct connection to the backplane.

For paired LDX shelves - the SDU serves the first 256 ports to the shelf in which it is installed via direct connection to the backplane. The second 256 ports are served through a pair of ribbon cables connecting to the adjacent shelf.

Table 3. Cerato LE SDU Slot Locations

Shelf	SDU Location
Redundant Systems:	
HDX/MDX	CT1, CT2
Paired LDX	CT1 in both LDX shelves
Single shelf LDX	CT1, CT2

VoIP Cards

IP-32 The IP-32 is an interface card that can be configured on the Cerato system to use up to 32 Cerato system ports. The IP-32 is programmed via software to give it a specific module identity (i.e., IPEC, IPHU, IPTU, IPGW, EGW). Each module identity has special features that allow the IP-32 ports to be programmed as trunks, lines, service units or any combination of those devices. The IP-32 has a single Ethernet port that can connect to a LAN for access to VoIP trunks and/or lines. When the IP-32 is configured as an IPTU, IPGW or an EGW, it can be connected to Legacy 20-20 systems (i.e., M, L, LH, LX, MAP, IXP, CCS, IXP LCC) that are equipped with an IPTU or IPGW or to any Gateway that supports SIP.

IP-64 The IP-64 is the equivalent of two IP-32 cards. This card has two modules and two ethernet ports. Each module is programmed separately.

IP-128 The IP-128 is the equivalent of four IP-32 cards. This card has four modules and four ethernet ports. Each module is programmed separately.

Analog Line Units (Plus)

The Analog Line Units are designed for station service to standard rotary or tone-dial analog telephones. These units support loop start signaling for call origination and are available with an automatic testing feature and message waiting capability. ALUs are available in 16 circuit configurations. If the Cerato system is equipped with ASG circuits, the caller's calling name and number are provided. ALUs can be set up to support local or off premise (Long Loop) terminations.

Digital Line Units

The DLU2 translates internal PCM to a signaling format that can be transmitted over standard telephone twisted-pair wire for a loop distance of up to 3500 feet. It combines 16 Kbits for signaling and 64 Kbits for voice or data at each port. Each DLU2 supports 16 circuits. DLU2 Cards support termination of ClearCom Digital Phones only.

Analog Trunk Units

Ground Start/Loop Start Trunk Unit

The Ground Start/Loop Start (GS/LS) Trunk Unit is used to link the Cerato directly to a Central Office (CO), transmitting audio information and supervisory signals between the two locations. The unit contains test circuitry, for internal audio diagnostics and for external signaling diagnostics. There are eight trunk circuits per unit. Each circuit can be configured as either ground start or loop start. There is metering with some loop start trunks.

2-Wire E&M Trunk Unit

The two-wire E&M Trunk Unit is capable of both sending and receiving digital information in MF, DTMF, and dial pulse formats. It may be configured for wink-start, delay dial, dial tone start, or immediate start. Trunk signaling methods include Type-I and Type-V E&M. The unit has strap-able 600 or 900-ohm impedance and “M” lead idle and active conditions. Each unit has eight circuits.

4-Wire E&M Trunk Unit

The 4-wire E&M Trunk Unit has the same options as the two-wire E&M, and uses two wire pairs to transmit and receive.

Direct Inward Dial Trunk Unit

Direct Inward Dialing (DID) provides direct-dial access to PBX stations from the public switched network. The DID trunk unit is capable of receiving dialing information in DTMF, dial pulse, or MF formats. It operates in Immediate, Wink, or Delay start modes and provides reverse-battery answer supervision. DID Trunk Units have 600/900ohm impedance and are equipped with eight circuits per unit.

Single Frequency 2600Hz Units

The 2600Hz SF Trunk Unit is a four-wire interface with separate receive and transmit audio pairs. The SF2600Hz unit supports an analog interface to TOLL and SLM line signaling protocols using MFP (Multi-Frequency Pulsed) and Decadic (Dial Pulse) register signaling protocols. Each port also contains a busy or “C” lead driver. The crystal controlled tone generator circuit generates a 2600Hz sine wave at –9.5 dBm0 for each transmit channel. The tone is added to the transmit audio under software control on a per channel basis.

Digital Trunk Units

Digital Trunk Units support both North American (T1) and European ITU-T (E1) standards. A DTU can also be configured as a Primary Rate Interface (PRI), and DTU channels are configured as ISUP voice/data trunks and SS7 signaling links.

T1-32 Digital Trunk Unit

The T1-32 Digital Trunk Unit contains the framing, signaling, and synchronization circuitry required for interfacing with standard T1 facilities. The unit has a capacity of 1.544 Mbps and supports 24 digital channels operating at 64 Kbps. The T1-32 includes DSP capabilities to provide digit detection during the conversation phase of incoming T1 Trunk calls and is used with the DSP Digit Collection feature.

T1-64 Digital Trunk Unit

The T1-64 Digital Trunk Unit provides two T1 Digital Trunks and contains the framing, signaling, and synchronization circuitry required for interfacing with two standard T1 facilities. Each trunk has a capacity of 1.544 Mbps and supports 24 digital channels operating at 64 Kbps. The T1-64 includes DSP capabilities to provide digit detection during the conversation phase of incoming T1 Trunk calls and is used with the DSP Digit Collection feature.

T1-128 Digital Trunk Unit

The T1-128 Digital Trunk Unit provides four T1 Digital Trunks and contains the framing, signaling, and synchronization circuitry required for interfacing with

four standard T1 facilities. Each trunk has a capacity of 1.544 Mbps and supports 24 digital channels operating at 64 Kbps. The unit includes DSP capabilities to provide digit detection during the conversation phase of incoming T1 Trunk calls and is used with the DSP Digit Collection feature.

E1-32 Digital Trunk Unit

The E1-32 Digital Trunk Unit contains the framing, signaling, and synchronization circuitry required for interfacing with standard E1 facilities. Each trunk has a capacity of 2.048 Mbps and supports 32 digital channels operating at 64 Kbps. The unit includes DSP capabilities to provide digit detection during the conversation phase of incoming E1 Trunk calls and is used with the DSP Digit Collection feature.

E1-64 Digital Trunk Unit

The E1-64 Digital Trunk Unit contains the framing, signaling, and synchronization circuitry required for interfacing with two standard E1 facilities. Each trunk has a capacity of 2.048 Mbps and supports 32 digital channels operating at 64 Kbps. The unit includes DSP capabilities to provide digit detection during the conversation phase of incoming E1 Trunk calls and is used with the DSP Digit Collection feature

E1-128 Digital Trunk Unit

The E1-128 Digital Trunk Unit contains the framing, signaling, and synchronization circuitry required for interfacing with four standard E1 facilities. Each trunk has a capacity of 2.048 Mbps and supports 32 digital channels operating at 64 Kbps. The unit includes DSP capabilities to provide digit detection during the conversation phase of incoming E1 Trunk calls and is used with the DSP Digit Collection feature.

Service Units

DTMF Receiver

The Dual-Tone Multi-Frequency Receiver receives touch-tone dialing and decodes DTMF codes into digital format. The receiver allows all 16 combinations of DTMF signals. The 8-circuit DTMF receiver has one circuit which can be configured to provide Music On Hold and it also contains circuitry for dial tone detectors to determine when a distant switch is returning dial tone and is ready to receive digits

Multi-Frequency Receiver Unit (MFR)

The Multi-Frequency Receiver Unit monitors the audio channel on particular calls and translates MF codes into a digital format. Each plug-in unit has up to eight multi-frequency receivers.

Multi-Frequency R2 Receiver Unit (MFR2)

The Multi-Frequency R2 Receiver Unit decodes international 2-of-6 frequency code signaling. It is available in models that handle both forward and backward frequencies.

Reference Timing Unit (RTU)

The Reference Timing Unit provides the Cerato with a local timing reference that allows the system to comply with Bellcore TA-NPA-000436 Digital Synchronization Network Plan as a Stratum III entity.

The RTU is commonly used as an alternate reference source for digital trunking (1.544 Mbps and 2.048 Mbps). It can also provide an external input to allow a customer-provided local stable timing reference (such as Stratum II or I) for the system.

Analog Signal Generator (ASG)

An Analog Signal Generator (ASG) card provides Caller ID (CID) signaling to analog phones.

Analog Signal Receiver (ASR)

An Analog Signal Receiver (ASR) card provides Caller ID FSK signal detection and decoding for Loop Start analog trunks that are using the Teltronics GS/LS trunk cards. The Caller ID displays on digital or analog phones that have been configured as the auto-dial destination of the LS trunk circuits.

Incoming calls from the Loop Start Caller ID trunks must be routed to pass through the ASR prior to routing to the destination extension. The ASR collects Caller ID (name and number) as the call routes through the card and displays it on the destination extension.

IP Embedded Controller (IPEC)

The IPEC software that runs on an IP-32/64/128 board has the ability to provide service to Cerato circuits that have been configured as ASG, DTMF, EM, HDLU, HDLU2, HLUT, or MUSIC in the Cerato switch database. The IPEC software also provides the Data Communications Adapter (DCA) capability which allows access to a low level command line interface to configure parts of the Cerato switch database and to capture Alarms and CDR (Call Detail Record) output from the Cerato switch.

Alarm Interface Assembly (AIA)

The AIA indicates critical, major, and minor alarms and serves as an alarm signal junction for the switch. The AIA also has an Alarm Bypass toggle switch to allow manual bypass of an alarm condition and inputs for customer supplied alarm equipment. The Alarm Interface Assembly (AIA) in the Cerato system is attached to the backplane of each expansion shelf and the HDC shelf. The backplane provides interfaces for shelf power, shelf power cables and redundant shelf link cable connectors.

4 Cerato Workstations/Phones

The following workstations and phones are compatible with the Cerato ME and LE systems:

- Teltronics Workstations
- Teltronics VoIP and digital phones
- Teltronics SoftPhones
- Non-Teltronics VoIP phones

Teltronics Workstations

The section describes workstations that can be used with the Cerato system; currently the Enhanced Attendant Workstation (EAWS) is available.

Enhanced Attendant Workstation (EAWS)

The Teltronics Enhanced Attendant Workstation (EAWS) application is a Windows-based software version of the Teltronics Attendant Workstation system, a call processing system that allows attendants to quickly and efficiently manage multiple incoming/outgoing calls in a busy environment. The EAWS has most of the features of a regular phone, in addition to many other features that are available with computer-based technology. See Figure 15 for an illustration of the EAWS.

The EAWS uses the LAN to connect back to the Cerato processor.

Each EAWS can be located anywhere on the corporate LAN/WAN or via an Internet connection. It is AC powered, although a small UPS system is recommneded to be used to protect against loss of power.

The keyboard supports one-touch commands for the attendant's basic jobs, such as answering calls and recalls, placing calls on hold, paging, etc. Keys are grouped logically for quick training and efficient operation.

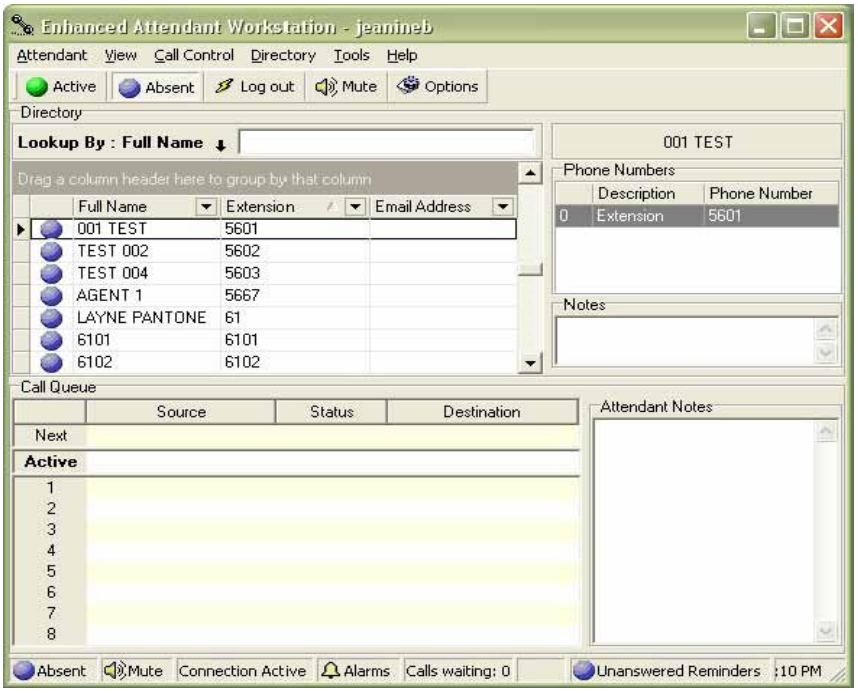


Figure 15. EAWS software main screen

EAWS Functional Areas:

The EAWS main screen is made up of several functional areas, the main ones of which are:

Directory - an online 'phone book' that lists all published extensions in the Cerato system, along with other information about that extension

(including their non-switch based phone extensions, such as a cell phone or home phone number). The Directory can be used to quickly look up numbers, add new records, dial an extension, and get other information about any extension on the switch. For example, even in office environments with hundreds of extensions, the attendant can quickly extend calls using the Directory. The attendant searches the Directory by typing all or part of the extension user's name, and then extends the incoming call to the extension simply by pressing the DIAL key. The Directory has two other windows associated with it:

- *<User> Phone Numbers window* - located to the right of the Directory, this window displays all phone numbers and extensions for the currently selected Directory record, enabling the Attendant to quickly see and/or dial any phone number.
- *Directory Notes window* - located to the right of the Directory just below the <User> Phone Numbers widow, displays misc. notes the attendant enters for the currently selected Directory record

Call Queue - where attendants manage calls. Made up three areas:

- *the Next Call Queue* - shows the next call waiting in queue,
- *the Active Call Display* - shows the call/conference that you are currently connected to
- *the Recall Queue* - shows calls that have been answered but need further assistance from the attendant, such as calls on hold, parked, etc. Up to eight calls can be displayed at one time. Each of these calls can be accessed individually by the operator.

In addition the Call Queue has an **Attendant Notes Window** which is an online 'scratch pad' where Attendants can write notes.

EAWS Features

In addtion to common call processing phone features, the EAWS includes:

The EAWS can be used in **multiple languages**. See your Teltronics Sales Rep for a current languages.

Whenever an attendant attempts to extend a call to a workstation that is using **Messaging**, the message displays heir own workstation and he or she can relay the information on to the caller.

The EAWS can be used in **Multiple Console Operation**, where an unlimited number of EAWS' are supported with up to 16 EAWS' online at one time. They can be arranged into attendant groups, with incoming calls to a group distributed evenly among the attendants. Or, they may be configured individually for specialized functions. For example, in a multi-tenant environment, different workstations may be configured to serve different companies in the building.

An attendant can mark a call as a **Serial Call,** (including on hold or serial calls), so that if it goes unanswered, it will be automatically returned back to the Recall Queue for further handling. Especially useful when callers wish to reach multiple destinations.

When an attendant has two active calls, the **Split feature** can be used to alternate between conversation with the source party and the caller's destination party. The party that appears highlighted in the Active Call Display is the conversation party, while the party not currently in conversation remains on hold.

An **Alarms** window can be opened to view or clear a list of current alarms in the Cerato switch.

An attendant can **Inquire** or check the status of any extension in the system or view information about a busy extension with **Identify Busy**. Or an attendant can set, cancel and view **Reminder Calls** for an extension or unanswered reminder calls for all extensions.

Teltronics VoIP and Digital phones

The following Teltronics VoIP and digital phones are available for the Cerato as described in the following sub-sections:

- VoIP phones
- Digital phones

VoIP Phones

The following VoIP phones are compatible with the Cerato:

- CIP210
- 2903 VoIP phone

CIP210

The Teltronics Communication IP (CIP) 210 is a VoIP phone that uses an IPSU card to interface with the Teltronics Cerato system, retaining all the features of the Cerato and adding the advantages of IP telephony.

The CIP210 combined with the IPSU can be used on the company data network, or, by using WAN services such as the Internet. be located at remote sites.

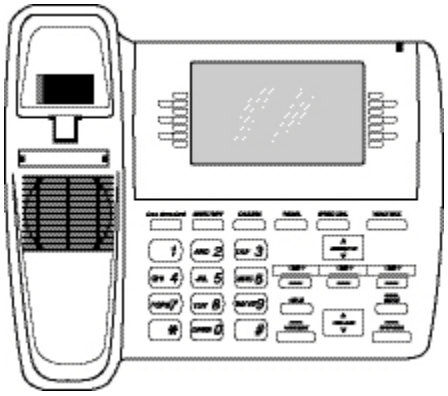


Figure 16. CIP210 phone

The CIP210 has the following features:

Keys and Indicators

- 14 LCD keys
- six feature keys
- headset, speaker, mute, hold, 3-line in-use, voice mail, privacy, and forward indicators

Display

- LCD – Text Display (9x22)
- Tilt Adjustable

Audio

- Adjustable Handset, Headset, and Spearkerphone Volume Control

- Hearing-Aid Compatible
- Automatic Headset Detection
- 10 Ring Tones to select from
- 4-position modular headset jack compatible with Plantronics and GN Netcom business headsets

Phone Features

- 50 Entry Caller ID Log for Call History / Logging
- Last 50 number Redial List for Outbound Call Logging
- Message Waiting Indicator
- 50 Entry Directory
- 12 Entry Speed Dial List
- Advanced Call features (park, conference, transfer)
- Color: Black or Gray

Call Services (One touch access to):

- Call pickup (this extension, group), Page (by zone), COM, Privacy, Forward (all, busy, no answer), View Extension

Power options

- Power over LAN (IEEE Standard), AC Line Input

Networking

- Dual 10/100 Switch full/half-duplex Ethernet ports, 10/100 Base-T, Auto Negotiation & Parallel Detection, RJ-45, Category 5 per IEEE 802.3

Audio Codec Supported

- G.711, G.729AB, Automatic Codec Negotiation, Voice Activity Detection (VAD), Silence Suppression

Voice Transport

- G.711, G.729AB, Receive Jitter Buffer Provisioning, Packetization Rate Provisioning

Quality of Service (QoS)

- 802.1q, 802.1p, VLAN

Certifications

- TIA 810, USA FCC Part 15, Class A, USA ULC, IEEE Standard 802.3af option B

Protocols

- TCP/IP (transmission control protocol / internet protocol), UDP (user datagram protocol), RTP (real time transport)

DTMF Support

- In-band DTMF Signaling, Out-of-band DTMF signaling

IP Address Configuration

- DHCP, Static Address, DNS Support

Configuration

- Remote software upgrade, Mass update of software upgrades, Directory, speed dial, redial, call record migration

2903 VoIP Phones: This phone has 3 line keys, 14 soft keys, 12 fixed feature keys, a 9x20 LED display, and a spearkerphone. The phone replaces the CIP210 phone. The phone uses the IPEC card. External power supply not included. The phone requires Cerato Firmware 4.0 or later.

Digital Phones

The following digital phones are available for the Cerato:

- ClearCom
- 1215 digital phone

Clearcom Telesets The ClearCom12 and ClearCom24 telesets are multi-line digital telesets with a liquid crystal display (LCD), 10 fixed features, and data networking capabilities. The ClearCom12 has 12 programmable buttons while the ClearCom24 has 24 programmable buttons. Of these, the first button (LINE) is reserved for the user's extension. The remaining buttons can be set up by the System Administrator as features or additional extensions that can be shared with others.

The teleset's primary extension number, as well as additional extensions that have been set up, can appear as "shared extensions" on other users' telesets. Those users with ClearCom12 or ClearCom24 telesets (with or without the BEM24) or with Optic Keysets or Key Service Units can also share extensions with you.

Anyone who shares an extension is able to monitor the status of the shared extension and answer its in-coming or held calls, if configured to do so.

The LEDs on the LINE, MSG, SPEAKER/HEADSET and configured extension buttons display in different colors and patterns, according to the status of the teleset.

The ClearCom 12 and 24 telesets may use a headset, handset or speakerphone to talk to callers. The user may switch between handset and speakerphone during a call. See Speakerphone on page 53 for more details.

The LEDs on the LINE, MSG, SPEAKER/HEADSET and configured extension buttons display in different colors and patterns, according to the status of the teleset.

Users of the ClearCom12 and 24 telesets may use a headset, handset or speakerphone to talk to callers. The user may switch between handset and speakerphone during a call.

The ClearCom12 and 24 phone's functionality can be extended with a Button Expansion Module 24 (BEM24).

The ClearCom telephones connect to the Teltronics Hexadecimal Digital Line Unit 2 (HDLU2) via 26-gauge twisted pair wiring that can be located up to one km (3281 feet) from the switch.

ClearCom12

The ClearCom12 phone, is illustrated in Figure 17.

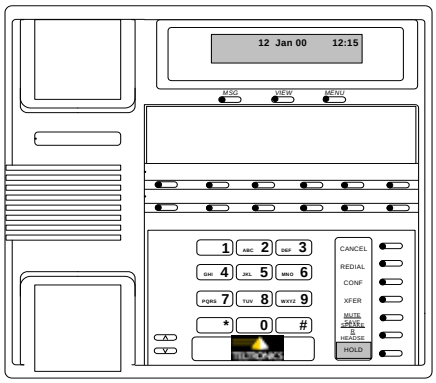


Figure 17. .ClearCom12 phone

The ClearCom12 has the following features:

- an LCD display
- pre-programmed feature buttons: Line, Message, Redial, Transfer/Conference, Monitor/Cancel, Hold, Mute/Save, Speaker, View and Menu
- 12 additional buttons are included of which 11 are configurable as either line appearance buttons or feature buttons (the 12th button is reserved as the 'Owner' button).
- internally switchable for μ-Law and A-law
- headset operation available

The BEM24 can be connected for 24 additional buttons.

ClearCom12 ACD

The ClearCom12 ACD is an ACD agent version of the ClearCom12, that includes an LCD display and eight hard-coded ACD keys. The other four keys may be configured as shared keys. It supports speakerphone and headset operation 12.

Note The ClearCom12 ACD does not support ACD supervisor functions and is not operational with BEM24.

ClearCom24

The ClearCom24, as illustrated in Figure 18, has the same features as the ClearCom12 but with 23 additional configurable buttons (the 24th is reserved

as the ‘Owner’ button). The BEM24 can be connected for 24 additional buttons.

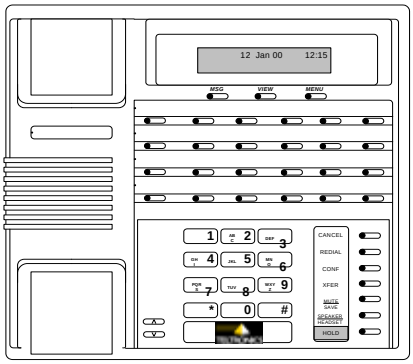


Figure 18. ClearCom24 phone

BEM24

The Button Expansion Module (BEM24) provides additional configurable buttons for the ClearCom12 or 24 phones. The BEM24 is available in “bridged mode” operation, connected to the ClearCom12 or ClearCom24 through a serial link. Note that although there are 28 physical buttons on the BEM24, the last four are not used at this time. The 24 buttons on the BEM24 may be configured as either line appearance or feature buttons controlled by the ClearCom12 or ClearCom24. The BEM24 is powered through an adapter that connects to 110 or 220 VAC.

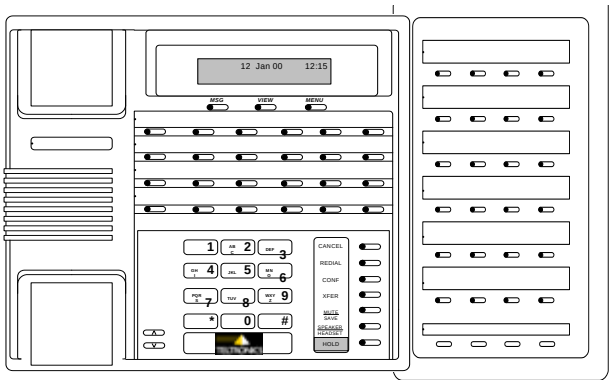


Figure 19. ClearCom24 w/BEM (24 buttons configurable as features/ ext’s)

1215 Digital phones

This phone has 13 line, programmable keys, 14 fixed feature keys, 2 x 20 LED display, speakerphone, and handset. It can be used as a direct Optic 1 replacement terminated to DLU (p/n 764 309) & HDLU (p/n 764 308) cards. The phone can also be used as a direct replacement of ClearCom 12 phones terminated to HDLU2 (p/n 764 333). The phone requires Cerato Firmware Release 4.0 or later. Uses HDLU2.

SoftPhones

The following Teltronics softphones are available for the Cerato as described in the following sub-section:

- CIP1 and CIP2 SoftPhones

The Teltronics Communication IP (CIP)1 and CIP2 SoftPhones are Windows' software phone that emulate the Teltronics CIP210, a digital, desktop phone that uses an IPSU card to interface with the Teltronics switch.

The CIP1 SoftPhone, as illustrated in Figure 20, can reside on any PC desktop or laptop running Windows XP. The CIP1 SoftPhone can be programmed to be a standalone softphone or work as a bridged connection to the Teltronics VoIP/Digital phones, Model #'s: 2903/2215/3903/3215.

The CIP2 Softphone, as illustrated in Figure 21, has all the features of the CIP1 SoftPhone, with the addition of a Button Expansion (BEM) 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.

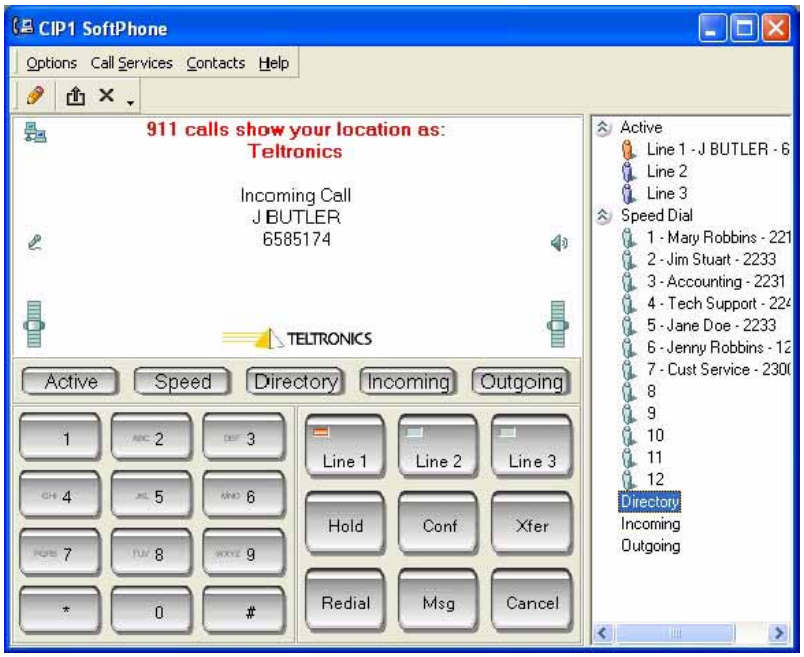


Figure 20. CIP1 SoftPhone

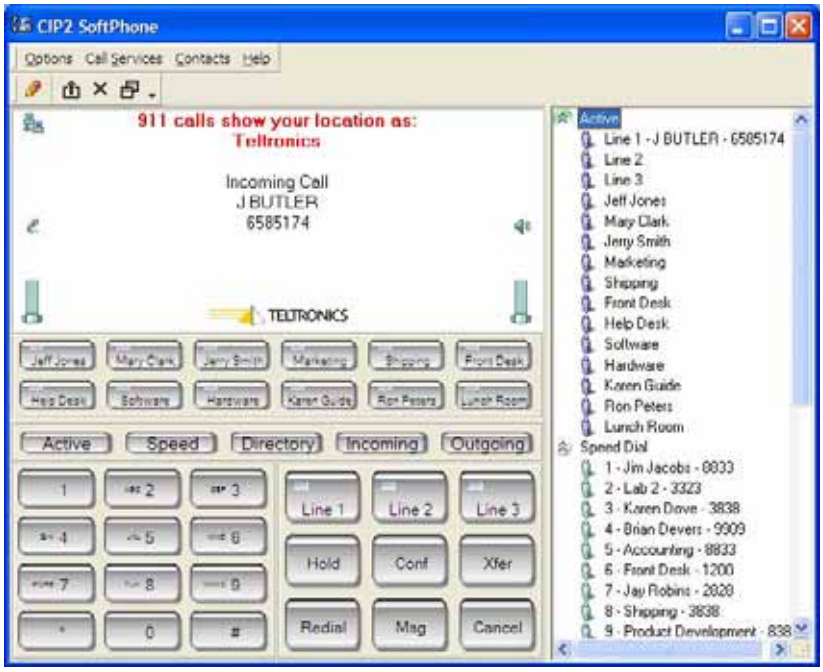


Figure 21. CIP2 SoftPhone

The CIP1/CIP2 SoftPhones have the following features:

- 3- Line keys with LCD
- voice mail indicator and voice mail auto dial key
- audio via USB or standard Headset plugged into PC Audio Card
- 50 name/number directory
- caller and redial lists
- 12 number private speed dial list
- volume control for headset, ring tone and cadence selection key
- Account Code Calling
- Active List
- Appointment Reminder
- Callback
- Call Services
- Contacts' window
- Dialing from Microsoft Outlook
- Dial Prefix
- Incoming/Outgoing Lists

- Intercom (COM) Dialing

Non-Teltronics VoIP phones

The Cerato switch can be used with 3rd party phones such as:

- Aastra 9112, 9133, 480i, 53i, 55i, 57i, 57CTi
- Polycom IP Soundstation 4000
- Polycom 601 + BEM

See the phone manufacturer's user documentation for setup, configuration instructions, and feature descriptions.

5 System Features and Applications

The following list contains features and applications available on Cerato systems, which the sub-sections that follow give a general overview.

- Accommodator
- Announcement Services
- Automatic Call Distribution (ACD)
- Call Features
- Computer-Telephone Integration (CTI) links
- Conferences
- Networking
- Paging
- Release Link Trunks (RLTs)
- Special Security Advantage (SSA)
- Voice Mail Interface

Accommodator

The Teltronics Accommodator is a feature package designed for the lodging and hospitality industry, including hotels, motels, resorts, hospitals, and health care facilities. Accommodator features include:

- Audit Trail – Records all wake-up attempts, wake-up settings, room status changes from the guest room phone, message-waiting turn on/turn off, and PMS interface status.
- Automatic Wake-up – Lets guests program their phones for up to three wake-up calls in any 24-hour period.
- Check-in/Check-out – As guests check in or check out, updates room status (vacant or occupied), enables or disables room phones, and enters or deletes names from the guest directory.
- Do-Not-Disturb – Lets guests or a system administrator block incoming calls while still being able to call out.
- Guest Directory – Contains guest names and room numbers which are displayed at ClearCom telesets, Attendant Workstations, and Teltronics system or PMS administration terminals.
- Message Waiting – Automatically notifies guests of messages.
- Room Station Disable – Lets an administrator restrict outgoing calls from unoccupied rooms.
- Room Status – Reports whether a room is vacant or occupied, clean or dirty,

or needs maintenance.

- Room Swap – Room Swap allows guest registration information to be moved to another room.

Accommodator features can be used in a stand-alone system or integrated with a property management system. Teltronics offers a data link interface which allows a property management system to communicate with the Teltronics system.

Announcement Services

Automated Voice Response

The Automated Voice Response (AVR) feature allows you to set up a system which greets callers with an initial greeting and then offers a menu of call processing options. Callers choose an option by dialing the appropriate digit(s), and the system routes the call to the appropriate destination. Destinations can be special features, other AVR announcements, lines, or trunks. For callers that dial incorrect digits, you can configure the system to direct them to an error announcement, the initial greeting announcement, or error tone.

You might use the AVR feature to automate customer service calls or combine it with other announcement services features to let callers choose from a variety of services you offer.

Batch Broadcast

The batch broadcast feature allows you to simultaneously connect multiple callers to a single trunk circuit that is connected to an audio announcement source. Given incoming network information, such as DNIS (Dialed Number Identification Service) or CLI (Calling Line Information), it is possible to configure the system to determine what audio sources might be more appropriate.

Continuous Broadcast

The continuous broadcast feature allows immediate connection of many callers to a telephony broadcast port providing on-going announcements such as live sports events or weather reports.

Automatic Call Distribution

Teltronics Automatic Call Distribution (ACD) software enables a business to process a large volume of incoming calls efficiently and professionally. ACD software can be configured to provide a unique call distribution plan for your application.

Incoming calls are routed to an ACD pilot number, or pattern. Each ACD pattern has an associated first-in first-out (FIFO) queue that is served by a list of one to eight operator groups. When a call enters the FIFO queue for an ACD pattern, recorded messages and/or music may be played to the caller in a timed sequence until the caller is connected to an agent.

The system searches the pattern's first agent group for an idle agent. When more than one agent is idle, the call is routed to the agent who has been idle longest. If no agents are available, the call remains in queue until an agent becomes available.

If additional agent groups serve the pattern, the system adds these groups to the search in a timed sequence. If an unusually large number of callers are in queue for the first group, the system can override the timed sequence and add additional

groups earlier. A call maintains its place in the FIFO queue so the pool of potential agents to serve the call continues to grow as the call waits in queue.

Two ClearCom telesets are specially designed for ACD operation: an agent teleset and supervisor teleset. Both ClearCom telesets offer single-button access to PBX features, liquid crystal display, and color-coded function keys that execute ACD features and functions, such as wrap-up and supervisor assistance. The supervisor teleset has an RS-232-C port for connecting the ACD supervisor's console which provides real-time displays and detailed management reports on agent and system performance.

The ClearCom24 ACD teleset is specially designed for ACD agent operation. The ClearCom ACD teleset offers single-button access to PBX features, liquid crystal display, and color-coded function keys that execute ACD features and functions, such as wrap-up and supervisor assistance.

ACD Reports

The ACD system maintains statistics on and generates reports for agents, teams, groups, patterns, answered calls, abandoned calls, Dialed Number Identification Service (DNIS) numbers, and event codes. The reports can be viewed on a terminal, printed on a system printer, or downloaded to a personal computer. A report can be printed immediately or you can schedule the report to print automatically on a regular basis.

Call Features

The Cerato supports a full set of telephone features. These include:

Account Code Calling
Appointment Reminder
Barge
Callback
Call Forward
Call Park
Call Waiting (Camp-On)
Conference
Directed Call Pickup
Extension Security
Extension Status Inquiry
Group Pickup
Hold
Mute
Page
Privacy (Do Not Disturb)
Redial
Speed Dial
Transfer

Computer-Telephone Integration (CTI) Links

Teltronics provides a switch-to-computer interfaces – the Host Interface Link (HIL). This interface allows you to create computer-supported telephony applications that integrate the Cerato with computer databases and data processing systems.

Host Interface Link

The Host Interface Link (HIL) is a TCP/IP or RS-232-C OpenLAN connection that supports asynchronous, full duplex communication between the Cerato and a host computer. The Cerato supports up to 40 HILs which may be connected to one or more types of equipment, including host computers, voice response units, voice recognition and synthesis units, and other network management tools. (For information on OpenLAN, see “Networking” on page 47.)

A message oriented communication protocol allows communication between the Cerato and host computer. HIL messages have a defined format and use ASCII characters. Teltronics provides full access to the entire HIL message sets, which provide the functionality described in the following paragraphs.

Route Request Messages

Route request messages allow the Cerato to send call routing information – such as ANI, DNIS or CLI, dialed digits – from the public network to a host computer. The host can then decide how to route calls and pass that information back to the Cerato.

Route request messages are often used in locator type applications, in which callers who dial a toll-free business number are forwarded to other destination numbers based on details such as caller location or time of day.

Digital Signaling Messages

Digital signaling messages allow the Cerato and host to relay information to initiate, manipulate, and terminate calls on telephony circuits. These messages duplicate many of the typical functions available to standard telephones.

Linking this message set with equipment that plays recorded messages and can accept digits from callers allows an unlimited number of possibilities. Callers dialing into the Cerato can be greeted with recorded greetings and messages which prompt them for additional information they enter using the telephone key pad. Given network information and responses from callers, the host computer can provide information to callers or handle special requests. If a caller prefers to speak with a live representative, the host easily transfers the call.

Call Tracking Messages

Call tracking messages allow a host computer to track the state of particular circuits. After the host sends a request to the Cerato for information about a specific circuit, the Cerato sends an event report message whenever the circuit is connected to another circuit, or a call involving the circuit is being routed, fails, is released, or is terminated.

Call Connection Messages

Call connection messages allow the host to:

- break a connection between two circuits
- play a short tone to one or both parties in a two-party conversation
- establish an immediate connection between two offhook, busy ports.

Device Control Messages

Device control messages allow a host computer to apply muting to and reestablish full cut-through between specified circuits. Muting can be applied such that:

- a caller can hear another party but cannot be heard
- a caller cannot hear another party but can be heard
- a caller can neither hear another party nor be heard

HIL API

The HIL Application Program Interface (API) is a programming tool designed to facilate development of computer-switch applications. The API is written in the C programming language and contains routines that format, send, and read HIL messages. The API is available for MS-DOS® based IBM® compatible PCs and includes all source code for customization.

Conferences

In addition to the conference feature that allows a caller to connect multiple callers into a single conversation, the Cerato provides Preset and Meet-me conferences.

Preset Conference

A Preset conference has a preconfigured set of members. When one of the members dials an access code, the system automatically dials the other members of the conference. As members answer, they are automatically connected to the conference.

Conference members who did not answer conference ringing, group members who left the conference, and non-members may join an existing conference by dialing an access code.

A Preset conference may include a maximum of 64 participants on a Cerato. The number of configured members is limited to 63 so that non-members may originate and participate in Preset conferences.

Meet-Me Conference

Meet-me conferences provide a conference connection for any group of callers who dial the same Meet-me access code. You can configure the maximum size allowed for any given Meet-me conference.

There are two types of Meet-me conferences: controlled and uncontrolled. In controlled Meet-me conferences, the system automatically calls the conference controller when the first caller dials a Meet-me access code. The system then connects callers who dial the access code only when the conference controller answers the conference, and terminates the conference when the controller hangs up. In uncontrolled Meet-me conferences, the system initiates the conference when any caller dials the access code, and terminates it when the last participant hangs up.

Conference Status Program

The Conference Status administration program is another program that can be operated from a system administration terminal. This program provides information, such as active/idle and participant status, for all configured Preset and Meet-me conferences.

Networking

One of the greatest strengths of the Cerato is its ability to interface with various types of communication systems and methods of transmission. The Cerato can be connected to other Teltronics PBXs, local central offices, toll central offices, international central offices, and satellite systems. It can also interface with traditional copper cable, fiber optic cable, trunking radio, and microwave radio.

Signaling Protocols

The Cerato provides a full range of signaling capabilities which meet North American standard, world standard, and non-world standard protocols.

Analog:	Ground Start/Loop Start 2 and 4-wire E&M Direct Inward Dial
Digital:	T1 (1.544 Mbps μ-Law) E1 (2.048 Mbps A-Law)

VoIP:	SIP H.323
	Note: Other vendors can be connected to with the VoIP standard protocol.
ISDN:	Layer 1 (Physical): • Primary Rate Interface (PRI), ITU-T 30B+D and ANSI N American 23B+D
	Layer 3 (Protocols): • AT&T 41449 • DMS 100/250 ISDN • Euro-ISDN Primary Rate Interface • Teltronics ISDN Basic Rate Interface • Teltronics ISDN • QSIG • NTT ISDN
SS7:	*ITU-T (CCITT) Signaling System 7* *ANSI 92*
	***Note:** SS7 will be available in the future.*
R2:	Compatible with ITU standards; deployed in many countries throughout the world
Non-standard:	China, Czech Republic, Poland, Russia
Proprietary:	Teltronics Defined Networking (TDN)

Primary Rate Interface

The Primary Rate Interface (PRI) is a multi-purpose, high speed multiplexed digital interface based on AT&T® Primary Rate Interface Specifications 41449 and 41459, and CCITT Fascicle VI.10 – Recommendations Q.921 and Q.931.

PRI serves as a platform for advanced communications capabilities and allows you to take advantage of the numerous applications being developed under Integrated Services Digital Network (ISDN) standards. PRI also offers many practical advantages over T1 or analog trunking environments, such as:

- Rapid call processing (faster and more reliable call setup, tear-down)
- Full 64 Kbps bandwidth (instead of 56 Kbps T1)
- Software controlled network that avoids DC signaling methods and the inherent disadvantages of these signals
- Digital Automatic Number Identification (ANI)
- Call-by-call service selection for AT&T network services

Euro-ISDN Primary Rate Interface

Teltronics' Euro-ISDN Primary Rate Interface (PRI) complies with the Euro-ISDN standard established by the European Telecommunications Standards Institute

(ETSI). This standard allows for a common ISDN implementation throughout Europe.

Complete compliance information is included in the Teltronics Euro-ISDN technical documentation.

Teltronics ISDN Basic Rate Interface

Teltronics ISDN Basic Rate Interface (BRI) is comprised of two 64Kbps Bearer (B) channels, and one 16Kbps Data (D) channel that carries call set-up data for network connection. The BRI interface is also referred to as a 2B+D connection.

The BRI line units support the ITU-T "S" interface using a subset of the Bellcore National ISDN-1 (NI-1) or ETSI (NET3) protocols to the desktop. Of the NI-1 supported bearer capabilities grouped into Call Types (CT), Teltronics supports the Voice and voiceband data Information (VI) Call Type which includes Circuit-Mode/ Speech. Bearer Services is defined in terms of User Layer 3 Protocol, User Layer 2 Protocol and User Layer 1 Protocol of the channel provided between ISDN users on the successful connection of a call.

Teltronics' BRI software is based on ITU-T 1988 Blue Book Recommendations I.430/I.431, Q.921, and Q.931 (Chapters 1-5).

Complete compliance information is included in the Teltronics BRI technical documentation.

QSIG

Private Integrated services Network Exchanges (PINX) have evolved from established voice band networks that includes multi-vendor equipment. QSIG is an evolving digital standard that allows PINX's to provide interconnection between multi-vendor equipment.

SS7

Signaling System 7 (SS7) is an international standard that uses out-of-band signaling for set up and tear down of calls. SS7 provides faster, less expensive call setup and tear-down by not allocating trunks until they are required. It also offers the increased ability to take advantage of future network database services.

The Cerato incorporates the MTP (Message Transfer Part) and ISUP (ISDN User Part) portions of the SS7 protocol, which allow the Cerato to operate as a Signaling Point (SP). Digital Trunk Unit (DTU) channels are used for ISUP voice/data trunks and SS7 signaling links.

SS7 is designed towards ANSI 92, ITU-T, and Bellcore specifications. Complete compliance information is included in the Teltronics SS7 technical documentation.

Teltronics-Defined Networking

Teltronics-Defined Networking (TDN) is a proprietary version of PRI which links Teltronics system switching platforms with one another, and enables multiple co-located or distributed Teltronics systems to function as a single, unified switching system. Teltronics-Defined Networking software provides seamless operation for a wide range of services, including a Network Attendant Directory, calling name and number display, uniform numbering plan, and PBX features such as Camp-on, External Call Forward, and Extension Callback.

Sample Application

The GazProm network in Russia exemplifies Cerato's networking capabilities. GazProm, the world's largest supplier of natural gas, has the largest digital network in the world with over 200 switches in a unified network. The network uses Teltronics switches connected by microwave using Teltronics Defined Networking digital trunks to connect major nodes in the network. Switches are connected along the pipeline using unique signaling protocols developed specially for Gaz-

Prom. The entire network is connected to the Russian public network using Russia-specific signaling protocols for public connections. Teltronics developed flexible signaling to interface with the various GazProm and Russian signaling protocols. The result is the ability to provide communication from Eastern Siberia to Moscow using a range of signaling protocols from the most modern to least modern. It is now possible to put the Cerato anywhere in Russia and provide a full range of capabilities.

Paging

Telephone users can dial customer-provided paging equipment that interfaces to the system via E&M trunk units or line circuits. If the paging equipment is already in use, the paging party may wait in queue until the equipment is free. The attendant workstation is equipped with a special PAGE key to allow the attendant immediate access to the paging system.

Users can also dial customer-owned radio paging equipment and selectively page individuals carrying pocket paging receivers. A paged individual may go to the nearest telephone and dial the configured answer back code to be connected to the paging party.

Page Park

This feature may be used when a station user calls an internal number and receives no answer. The station user hookflashes, then dials the configured page access code to access the paging equipment. After paging the called party, the station user is automatically parked on the called line. (Or, if another call is already parked on the called line, the station user receives busy tone.) The paged party may answer the call at his or her own telephone extension, or by using the Directed Call Pick-Up feature from another extension.

Release Link Trunks

Release Link Trunks (RLTs) allow an operator connected at one node in a network to handle the disposition of a call in a remote node, using resources in the remote switch. When the operator is no longer involved with the call, the Release Link Trunk drops and is free for other calls. Release Link trunks are particularly useful in network applications offering centralized operator services.

Special Security Advantage

The Special Security Advantage (SSA) is a package of specialized security features designed for use in high-security and high-risk applications, such as correctional institutions, international and military detainment facilities, or other security environments.

The SSA is a fully integrated system that eliminates the need for third-party hardware. It includes the following features:

- Security Conference – Allows an authorized person to establish a conference with a predefined group of people.
- Fire and Emergency Conference – Allows an authorized person to dial an access code which signals all telephones on a predetermined list with a distinctive ring.

- Watch Call/Head Count Conference – Allows convenient reporting of inmate head counts at convenient intervals.
- No-Dial Alarm – Activates a no-dial control station when a telephone goes off-hook or fails to start or complete dialing.
- Watch Call Station – An auto-answer/auto-hang-up ClearCom teleset which enables control center personnel to record head-count information while talking on the phone.
- Security Display Terminal and Printer – Displays and records real-time call-origination data for a system's security conferences and no-dial alarms.
- Conference Status Monitor – To facilitate system administration, reports the status of conferences in the system.

Teltronics also offers Advantage Plus which adds inmate call management features to the security features of the SSA.

Voice Mail Interface

The Teltronics system can be integrated with a wide variety of other systems designed to provide services such as Voice Mail, Automated Attendant, and Voice Response. These systems usually have recorded greetings and messages that allow callers to choose from a list of options by dialing touch tones.

Voice Mail systems can be accessed from the Cerato via either trunks or lines in a trunk group. The number of access ports is variable according to your needs. In addition to flexible system access, the Cerato provides a variety of message-waiting indications to extension users. For example, when a voice mail message has been recorded for a ClearCom teleset, the teleset LCD reads MAIL. The Cerato can also be programmed to illuminate message-waiting lights and LEDs at telephones and to play a tone to extensions when a message is waiting.

6 Operation and Maintenance

Operation and maintenance of the Cerato are are facilitated by hardware and software features. These features ensure high quality of service for phone users and efficient administration and maintenance for system administrators.

Remote maintenance and configuration of the Cerato switch is performed via a graphical user interface (GUI) called the Cerato Switch Console or via a text command line interface. Both of these interfaces provide access to administrative maintenance and status software (ADMIN), database configuration editor (EDT), and maintenance utilities (UTI).

Overall reliability of the system is achieved by a variety of factors. Redundant systems have duplicate common equipment, with one set in active mode and the other in hot-standby mode. If the active equipment fails, the standby equipment is ready to take over and calls in progress continue without interruption. Cross wiring of power is also employed to prevent loss of power to the common equipment.

Effective use of operation and maintenance personnel is ensured by internal software which detects faults, records information about system performance, and provides access to this information through system software administration programs.

Configuration Software

This section details the differences between the two configuration programs for the Cerato switch, and lists the specific functions. In general, the Cerato Switch Console can be used for the everyday moves, adds, and changes to the database whereas the Database Configuration Editor can be used for any task needed done to the database.

Cerato Switch Console

The Cerato Switch Console, the graphical user interface (GUI) software for the Cerato switch, is used for the every day moves, adds and changes to the database.

Database Configuration Editor

The Database Configuration Editor (EDT) is used perform any configuration and maintenance of the system databases that define extensions and how calls are processed and routed.

Using EDT, a system administrator can:

- add and remove extensions
- maintain directory information related to extensions
- change extension class of service

Information in system databases also determine how calls are routed. Using EDT, a system administrator can define:

- the dialing plan, features, and outgoing routes available to callers
- dialing plans that affect how the system interprets digits dialed by callers
- primary and alternative outgoing routes for calls

- the information to be outpulsed over various trunks
- signaling characteristics of trunks

The *Call Processing* chapter contains more detailed information on the call processing databases.

EDT also has a set of utility (UTI) commands that activate and deactivate databases, copy databases to and from floppy disks, and delete databases.

A system administrator can maintain two databases concurrently on the system hard disk. Either database may be used for call processing. When database activation is requested, the database is loaded from the hard disk to the call processor subsystem, which then uses the database to process calls.

As call processing requirements change, the system administrator can modify the database currently in use or activate the alternative database. The utility commands of EDT allow an administrator to test most changes to a database before saving them permanently to hard disk. With the entry of a single command, the system processes calls using recent changes, and the administrator can determine whether the changes are accurate. Depending on the results of a test, the administrator can cancel the changes, make more modifications, or save the changes.

In redundant systems, EDT automatically maintains the databases on both common equipment shelves to ensure consistent operation in the event of a switchover to the standby shelf.

System Monitors

The maintenance facilities provided with the Cerato ensure that high quality of service is provided and maintained at an economical cost. Hardware and software are designed to constantly monitor the performance of and detect malfunctions in operation of the system. Extensive reporting of system operation through system administration programs allows a system administrator to immediately detect problems, isolate faults, and restore the system to normal operation without disrupting live traffic.

Some of the important monitors available on the Cerato switch are listed here and described in detail in the sub-sections that follow:

- ACD - Teltronics call processing system
- ACM - Accommodator application
- ALM - alarms
- CDR - call detail recording
- CSM - conference status monitor
- MHP - maintenance history program
- NCF - network control facilities
- SMM -
- SPM -

- STS - system traffic statistics
- TDD - telephony device diagnostics

ACD

The Teltronics ACD system is a call processing system, providing efficient distribution of calls to the agents in the ACD system. Incoming calls are distributed to agent groups. Within each group, the longest idle agent receives the first call. The agents in a group use a phone which provides access to many useful features. If all agents are busy, the system can be configured to play either a recorded announcement followed by music, or continuous announcement or music. Further announcements can be offered to a caller after the caller has waited in queue for a specified time. By arranging the announcements in an effective order, a business can provide incoming callers with helpful information while they are waiting for an available agent. If a call is routed to a group that already has many calls queued, the call can be made available to additional groups so that the call has a greater opportunity of being answered.

Each ACD extension in the Cerato system, except for ClearCom ACDs, is assigned a circuit location on a digital line unit (DLU or HDLU). ClearCom ACD extensions are assigned circuit locations on HDLU 2, or SVD DLU digital line units. Each ACD extension is assigned a class of service, speed dial option, and directory entry.

ACD extensions are not assigned any configurable keys on the ClearCom teleset.

There are three types of ACD extensions:

- ACD Agent Teleset is equipped with a voice port which is configured as an ACD-type (teleset) extension. While there may be a data port, it is not configurable (the WIL-ACD - see page page 14-13) - has a configurable data port.
- ACD Supervisor Teleset is equipped with a voice port and a data port for simultaneous voice and data. The voice port is configured as an ACD-type (teleset) extension. The data port must be configured as a DCA-type extension
- ClearCom ACD Agent Teleset (see the section on ClearCom Telesets below)

Accommodator (ACM) Program

The Accommodator (ACM) program is used in managing operation of the Accommodator application of the Cerato system, unless a Property Management System (PMS) interface is available, in which case few functions are operational in the ACM program unless the PMS link is down. The operations managed are listed by integrated or standalone type as follows:

Integrated PMS Operation

- PMS - Registration (Check-in, Check-out) and Room Status operations
- ACM Program - WAKEUP and AUDIT commands (If link is down, can access REGISTRATION)

Standalone Operation

- ACM Program - AUDIT, REGISTRATION (Check-in, Check-out), ROOM (Room Status), and WAKEUP commands

If a PMS interface is used, the PMS functions will be documented in each vendor's PMS manual.

Alarms (ALM)

Alarm reporting software reports significant system and/or hardware failures, as well as general information about system operation. Alarms are reported at the system administration terminal and by visual indicators.

Alarms are classified in the following categories:

- NMI (Non-Maskable Interrupt) alarms cause a shelf reset.
- Critical alarms indicate call processing has stopped.
- Major alarms appear for either power or common equipment related problems - failures that represent a potential catastrophe such as loss of power to a common equipment shelf.
- Minor alarms, which indicate faults in an isolated area of the switch such as the loss of an interface (telephony) board.
- Information alarms pertain to a very small or isolated portion of the switch as in one circuit or port.
- Diagnostic alarms report unusual diagnostic results that need to be interpreted by engineers and are not necessarily a problem.

Critical, major, and minor alarms also activate LEDs on system alarm units.

Information and diagnostic alarms are generally used for troubleshooting and, therefore, can be turned off during normal system operation. They are useful in diagnosing the causes of unexpected system operation, such as configuration errors.

Alarms are recorded in alarm history and reset history files. The Alarms administration program allows a system administrator to:

- set up automatic reporting of alarms to an output device such as a printer or terminal
- schedule a daily alarm summary report
- view alarm history files at a system administration terminal
- suppress reporting of alarms
- modify alarm text, type, and the threshold conditions at which an alarm is reported

Call Detail Recording (CDR)

CDR allows a system administrator to:

- set up automatic reporting of call detail to output devices such as printers or terminals
- define what call data is sent to the CDR output devices and recorded in the CDR history file
- view the CDR history file at a system administration terminal
- log onto the system via a host computer and collect call detail records for processing by software on the host system.

A sample CDR call record is illustrated below:

```
-------------------------------------------------------------------------------
| RECORD NUMBER:     1     TIME STAMP: 10-JAN-2009  12:06                     |
-------------------------------------------------------------------------------
| Start Date       1/10/09 | Answer Date    01/10/09 | End Date       1/10/09 |
| Start Time      12:02:55 | Answer Time    12:03:01 | End Time      12:06:24 |
-------------------------------------------------------------------------------
| Caller Station Number    5001      | Selected Trunk Group     003           |
| Caller Circuit           02-12-01  | Selected Circuit         03-01-06      |
| Caller COS               2         | Selected COS             11            |
| Caller Routing COS       1         | Selected Routing Class   1             |
| Caller Switch ID                   | Selected Route Pattern   11            |
| Caller ANI                         | Selected Facility        23            |
| Record Audit                       | Call Type      LINE TO TRUNK           |
| Conference Audit                   | Call Status    ROUTING                 |
| Access Code              30        | Queue Status   NULL QUEUE              |
| Code Validation          ----      | Queue Time                             |
-------------------------------------------------------------------------------
| Dialed Number        8831212                                                |
| Authorization Code                                                          |
| Account Code                                                                |
-------------------------------------------------------------------------------
```

Conference Status Monitor (CSM)

The Conference Status Monitor (CSM) administration program allows the system administrator or other authorized personnel to view the status of each Meet-Me conference group (active or idle) and the status of each participant in an active Meet-Me conference.

An Outpulse command used to enable the system to detect busy over a trunk. The command is placed before the PANSWER command, and can be used only if Pre-Answer Rerouting is enabled for the system.

Maintenance History Program (MHP)

Maintenance History (MHP) software records keyboard entries from the system administration terminal(s) in a maintenance history file.

The information in the Maintenance History file includes:

- user name entered at log on to a system administration terminal
- port where log on occurred
- date and time of activity
- system prompts and user entries

A system administrator can use information stored in the maintenance history file to track configuration errors and unauthorized use of the system.

Network Control Facilities (NCF)

The Network Control Facilities (NCF) administration software allows a system administrator to temporarily override normal call routing. For example, emergency conditions might require temporary blocking of calls to particular area codes or it might be necessary to change the routing of particular calls.

With NCF, an administrator can:

- directionalize trunk circuits to prohibit outgoing traffic yet allow incoming calls
- turn down trunk circuits to prohibit both incoming and outgoing traffic
- redirect calls from one trunk facility to another

- force calls to bypass certain trunk facilities
- suppress alternate routing in route pattern tables
- block calls to particular area codes, exchanges, or dialed numbers
- control the number of calls that may be sent to a specified location during a given time period

These features may be used to troubleshoot system problems, as well as to ensure continuing standards of operation during emergency conditions.

Callers who dial blocked destination numbers can be directed to error tone or a recorded announcement.

SMM

SPM

System Traffic Statistics (STS)

System software collects statistics on operation of system equipment and stores them in traffic files. The statistics collected by the Cerato include:

- peg counts, which measure the number of times particular events, such as number of incoming calls or seize failures, take place during a collection period
- usage counts, which measure the amount of time a circuit satisfies certain traffic conditions, such as time expended in incoming or outgoing calls
- busy hour information, which records the traffic statistics for the hour of greatest activity for all equipment types
- equipment type related statistics, such as CRC counts and error overflows for digital trunk units

The Cerato maintains separate traffic files for trunk groups, Digital Trunk Unit control channels, receivers, detectors, and individual trunk circuits. Monitoring traffic statistics allows system administrators to note changes in traffic which may require additional resources, ensure that resources are properly allocated for efficient handling of traffic, and detect possible problems in performance of the system.

System Traffic Statistics (STS) is the administration program that defines traffic statistics collection and reporting parameters. STS allows a system administrator to:

- set up automatic reporting of traffic statistics to an output device such as a printer or terminal
- view traffic statistics files at a system administration terminal
- view statistics as they are collected at a system administration terminal
- schedule traffic reports on an as-needed or regular basis
- define traffic collection parameters such as collection rate and the types of statistics reported in automatic and scheduled traffic reports

A sample STS report is illustrated below:

```
Displaying Current Traffic Data ...
-------------------------------------------------------------------------------
| Equipment: TRUNK GRP = 8      23-JAN-2009  14:23:07      Col. Rate: 60  MIN  |
-------------------------------------------------------------------------------
| Configured Trunks 6     | Max Trunks in Use  2     | Trunks Maint Busy 0     |
| Average Circuits  6     | Min Trunks in Use  0     | Trunks in Lockout 0     |
|                         | Trunks in Use      2     | Trunks Outgoing   1     |
-------------------------------------------------------------------------------
| Incoming Peg Count             1      | Outgoing Peg Count             1     |
| Incoming Abandoned Peg Cnt     0      | Outgoing Abandoned Peg Cnt     0     |
| Incoming Successful Peg Count  1      | Outgoing Successful Peg Count  1     |
| Incoming Answered Peg Count    1      | Outgoing Answered Peg Count    1     |
| Incoming Usage                 2      | Outgoing Usage                 2     |
| Incoming Successful Usage      2      | Outgoing Successful Usage      2     |
| Incoming Answered Usage        2      | Outgoing Answered Usage        2     |
-------------------------------------------------------------------------------
| Total Usage          4  | ATB Peg Count      0      | Seize Failure CNT     0  |
| Total Peg Cnt        2  | ATB Usage          0      | Overflow Peg Cnt      0  |
-------------------------------------------------------------------------------
| Permanent Trunks                                                            |
| Unused Trunks     01-24-08   01-24-09   01-24-10   01-24-11   01-24-12      |
| Killer Trunks                                                               |
-------------------------------------------------------------------------------
```

Telephony Device Diagnostics (TDD)

The Telephony Device Diagnostics (TDD) administration software performs diagnostic tests on telephony ports, or circuits, in the system.

Using TDD, a system administrator can perform any of the following tasks on demand:

- check the busy, idle, or out of service status of circuits
- remove and restore service to circuits
- connect ports to test tones
- test trunks for external seizure protocol
- test lines and trunks for internal audio integrity
- test receiver units for proper detection of valid digits

A sample report from the TDD TEST command is shown below:

```
TDD ...? TEST

Starting circuit location ...? 03-01-04

Ending circuit location [03-01-04] ...?

Enter TEST option [NONE] ...? LONG

... BEGINNING MANUAL TESTS ...

--------------------------------------------------------------------------------
Starting external tests
Diagnostic port received dial tone
Diagnostic port dialing digits
Connection made
Test complete
Diagnostic port returning idle
Port under test has completed diagnostics
Ended external tests
Starting internal tests
Port under test passed internal audio test
Ended internal tests
TEST:        03-01-04           EXTERNAL TESTS PASSED
                                  INTERNAL TESTS PASSED
CIRCUIT DESCRIPTION: (Mu-Law Four Wire EM Trunk)
CONFIGURATION:       EM Trunk
--------------------------------------------------------------------------------
```

Used in conjunction with alarm reports, diagnostic information can help maintenance personnel localize faults in the system. Traffic statistics software also reports information, such as seize failures, trunk and receiver overflows, and abandoned calls, that can be helpful in isolating faults.

7 Specifications

This chapter provides specifications for the Cerato ME and LE systems. Unless therwise indicated, the specifications listed below apply to both Cerato models.

Model	Cerato ME	Cerato LE
Interfaces		
IP/Analog/Digital Phones	2048	9216
Conference ports	256	768
T1/E1 Digital Trunk Units	64	288
VoIP IPTU Trunk Channels	1920	8640
Simultaneous Phone Calls	Non-Blocking up to 2048 Ports	Non-Blocking up to 9216 Ports
Standalone Capability	Yes	
Networked Capability	Yes	
Network Interface	10/100 Base T Ethernet (RJ-45 Connection, 802.1p p-tagging and V-LAN Support)	
VoIP Specifications		
Voice Specifications	G.168 Echo Cancellation, VoIP Packet Coalescing, SIP RFC 3261 and 2833, DTMF Detection, Auto Codec	
Voice Codecs	G.711 a-law/u-law, G.729 a,b, Voice Activity Detection (VAD) and Comfort Noise Generation	
Fax Support	Modem, T38 and FAX Clear Channel Auto Detect	
SIP Trunks	RFC 3261 - SIP, 2976 - SIP info, 3821 - SIP Replace, 3515 - SIP Refer, 2396 - URI, 2388 - DTMF, DTMF - RTP in-band	
Trunks		
Analog - FXO Interface	Loop Start/Ground Start, 2 and 4 Wire E&M, and Direct Inward Dial, Single Frequency 2600 Hz (DTMF, MF, and Dial Pulse)	
Digital T1		
Signaling	AT&T, NI-2, 4ESS, 5ESS, DMS100/250,SS7 ISUP, Loop/Ground Start, 2 & 4 Wire E&M Wink, Timed, Tone & Immediate Start, Teltronics Defined Network (TDN)	
CCS	ISUP	
CAS	Loop/Ground Start, E&M Wink, Timed, Tone & Immediate Start	
Coding & Framing	AMI or HDB3 and CRC4 of or on	
Digital E1		
Signaling	NET5, QSIG, NTT, R2, ISUP, and Non-standard: China, Chile, Czech Republic, Poland, Russia, Venezuela, Teltronics Defined Network (TDN), ISUP, Loop/Ground Start, 2 and 4 Wire E&M Wink, Timed, Tone & Immediate Start	
CCS	ISUP	
CAS	Loop/Ground Start, E&M Wink, Timed, Tone & Immediate Start	
Coding & Framing	AMI or HDB3 and CRC4 off or on	
Common Control		
Input Power	-48VDC	

Input Current	**DC Power:** 16A@-42 to - 56 VDC <20dBm C	**DC Power:** 22 Amp max @-48 VDC 16.6 Amp nominal full load
Physical Specifications		
Common Control Cabinet Dimensions	17.375x24x10.5 in (44.1x61x27 cm)	70.5in High x 23.2 in. Wide x 28.5 in Deep (179 cm High x 68.9cm Wide x 72.4cm Deep)
Telephony Shelves Power		
Input Power	**DC Power:** -48VDC	
MDX Input Current	**DC Power:** 12A@-42 to -66 VDC <20dBm C	
HDX Input Current	**DC Power:** 12A@-42 to -66 VDC <20dBm C	
FXS Ringing Voltage	65.0 to 90.0 (VAC)	
Physical Specifications		
19” rack mount	Yes	
HDX Dimensions	17.375x24x10.5 in 44.1x61x27 cm	
HDX Weight	55 lbs / 25 Kg	
MDX/LDX Dimensions	17.375x24x17.5 in 44.1x61x44.4 cm	
MDX/LDX Weight	85 lbs / 38.6 Kg	
Bracket	Yes	
Environmental	0 to 40 C / 32 to 104 F	
Operating Temperature	10 - 80% non-condensing	
Storage Temperature	20 to 51 C/ -4 to 125 F	
Certifications		
EN60950	Yes	
FCC Part 15	Yes	
FCC Part 68	Yes	

Cerato System Description

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p/n: 955303-01 Rev B