

# TDC



## Theater Deployable Communications

**Baseline Requirements Document**  
for the  
Large Voice Module (v1)

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## 1 SCOPE

This requirements document establishes the performance, manufacture and test requirements for the TDC ICAP Large Voice Module.

## 2 APPLICABLE DOCUMENTS

To the extent specified herein, the following documents of latest current issue on the date of this appendix, form a part of this appendix.

<u>Document Number</u>	<u>Title</u>
ANSI Std. T1.102	American National Standard for Telecommunications - Digital Hierarchy - Electrical Interfaces
ANSI Std. T1.107	American National Standard for Telecommunications - Digital Hierarchy-Formats Specifications
ATT Pub. 43801	Digital Channel Bank Requirements and Objectives
ANSI T1.601-1988	American National Standard for Telecommunications - Minimal Set of Bearer Services for the ISDN U Interface
ANSI T1.601-1992	American National Standard for Telecommunications - Minimal Set of Bearer Services for the ISDN U Interface
ANSI T1.603-1990	American National Standard for Telecommunications - Minimal Set of Bearer Services for the ISDN Primary Rate Interface
EIA RS-470	Telephone Instruments with Loop Signaling
EIA-232	Interface Between Data Terminal Equipment and Data Circuit-Terminating Equipment Employing Serial Binary Data Interchange (Rates to 20 kbps)
ITU Q.310 -- Q.326	[Signaling System R1, Various Recommendations]
ITU Q.920	ISDN User-Network Interface - Data Link Layer, General Aspect - Digital Subscriber Signaling System No.1
ITU Q.921	ISDN User-Network Interface - Data Link Layer Specification - Digital Subscriber Signaling System No.1
ITU Q.930	ISDN User-Network Interface - Layer 3, General Aspects - Digital Subscriber Signaling System No.1
ITU Q.931	ISDN User-Network Interface -Layer 3 Specification - Digital Subscriber Signaling System No.1
ITU X.25	Interface Between Data Terminal Equipment (DTE) and Data Circuit-Terminating Equipment (DCE) for Terminals Operating in the Packet Mode and Connected to Public Data Networks by Dedicated Circuit
MIL-STD-810E	Environmental Test Methods
*REDCOM Laboratories, INC	IGX●C ISDN Gateway Exchange User's Manual

\*Delivered with Module

### 3 REQUIREMENTS

#### 3.1 MODULE DEFINITION

The Large Voice Module (LVM) provides access for analog and digital voice users and PRI/DS1 connectivity to the Switch Circuit Network ICAP backbone. The Large Voice Module can be configured to provide all the functions of the Legacy PTT/Voice Module, some of the standard and configurable functions are:

1. User Access for:
  - Analog (POTS)
  - Digital ISDN-BRIs
  - KY-68 Interface
  - Secure push-to-talk (PTT) radio
  - Analog FXO (foreign exchange office) trunks
  - E&M trunks
  - Analog Trunk programmable single frequency (SF) signaling to connect to TRI TAC circuit switches and/or commercial SF trunks.
2. Backbone Connectivity for :
  - ISDN-PRI Trunk
  - T-1 Trunk
  - E-1 Trunk

The Large Voice Module application in TDC ICAP is presented graphically in Figure 1. The standard configuration are shown as bold and configurable functions are shown as gray.

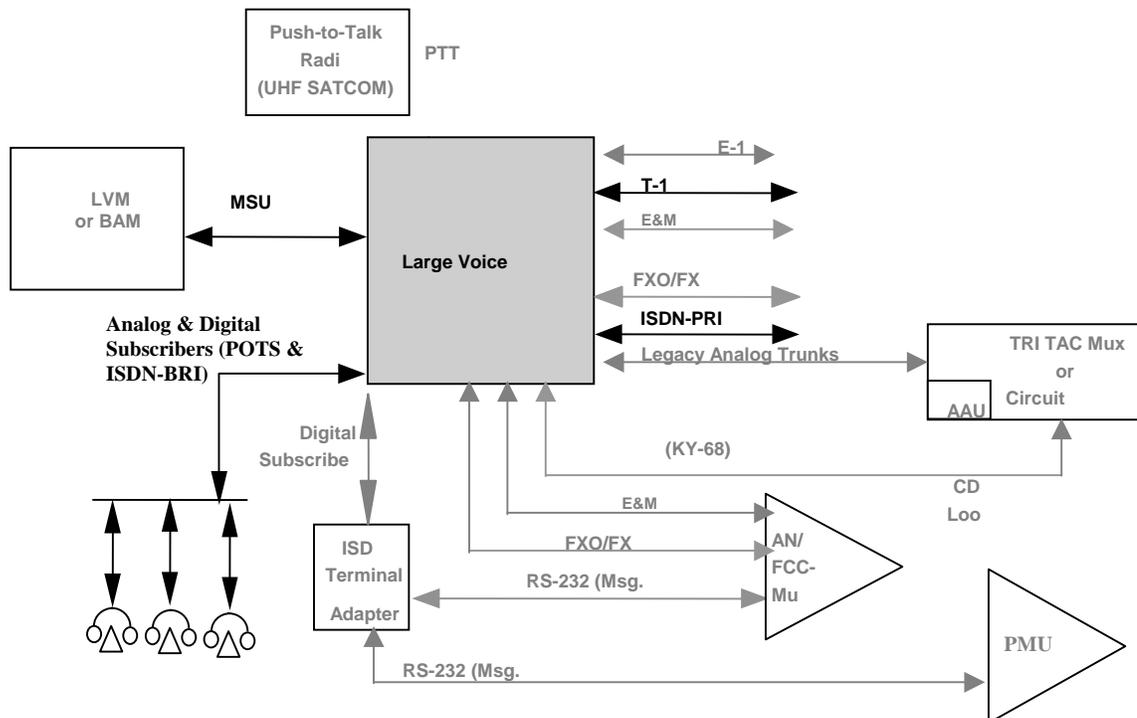
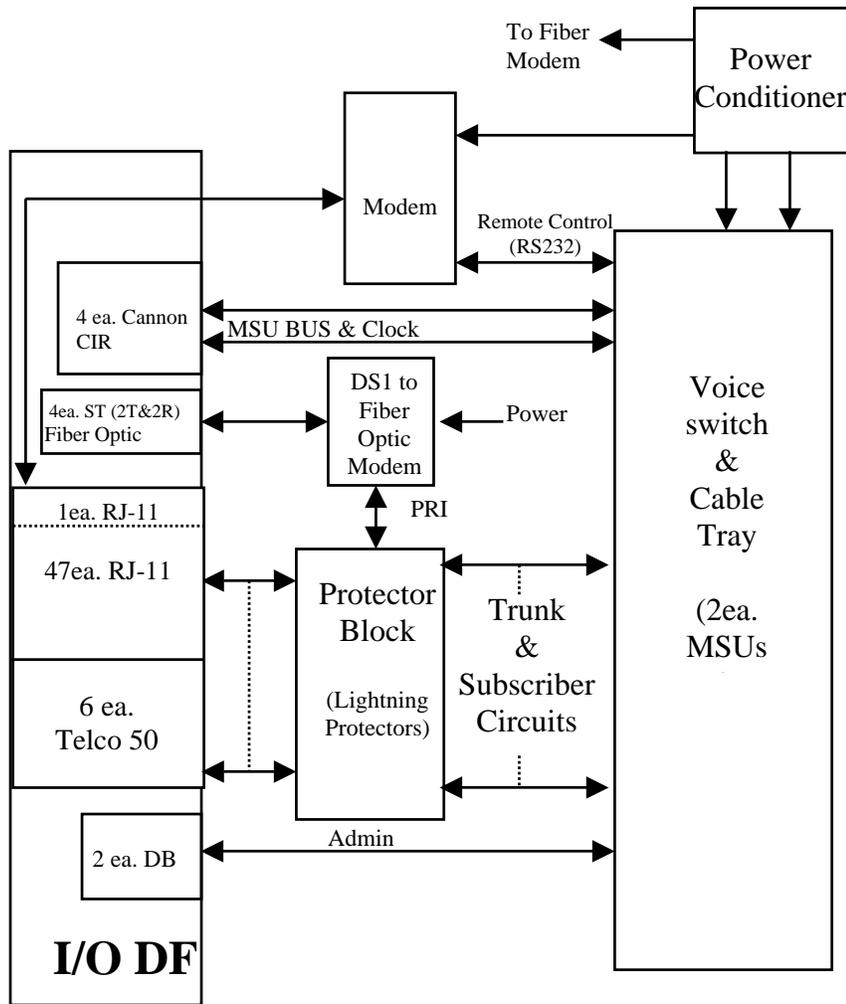


Figure 1: Large Voice Module Application in TDC-ICAP

Figure 2 show the Large Voice Module internal and external interconnections. Detail characteristics for each function are in section 3.2.



**Figure 2. LVM Internal Functional Block Diagram**

## 3.2 PERFORMANCE REQUIREMENTS

### 3.2.1 Electrical Interface Requirements (External)

Access to the Large Voice Module is through the module's Distribution Frames (DF) shown in Section 6 Figure 5. The DFs are internally wired to provide all the required connections, except the input power. The input power connection is at the power conditioner. The access ports on the DFs include the number and type of external interfaces presented in Table 1.

**Table 1: LVM, External Interface Characteristics**

Signal Name	#	Connector	Input/Output	Primary Interface	Electrical Characteristics
Prime Power	1	IEC 320 C20 Receptacle	I	Local power source	3-wire Single Phase 120/240 VAC; 50/60 Hz.
PRI/DS1	2	ST (T/R)	I/O	LVM or BAM	ANSI T1.603-1990
Switch Bus	2	Cannon CIR 20R	I/O	BAM, or another LVM	Circuit switch proprietary.
Clock Syn	2	Cannon CIR	I/O	BAM, or another LVM	Circuit switch proprietary.
Remote Voice Connectors	6	Telco-50	I/O	Remote DF	EIA Std RS-470, ANSI T1.601-1992: 24 ea. 2-wire analog or digital subscriber lines
Voice User access	48	RJ-11 (zone)	I/O	Analog & digital user access	EIA Std RS-470, ANSI T1.601-1992: 2 & 4 wire analog and/or digital voice access
Admin (Administration)	2	DB-9F	I/O	VT-100 type terminal	EIA-232

### 3.2.1.1 Prime Power.

The Large Voice Module is designed to operate from 100 to 240 VAC, 47 - 63 Hz, single phase, 3-wire power. The Large Voice Module includes an internal power conditioner to minimize line variation and transients. The prime power connector is an IEC 320- C20 receptacle. Separate breakers are provided on the power conditioner for each prime component; Voice Switch, DS1 to Fiber Optic Modem, etc.

### 3.2.1.2 DS1 Backbone.

The ISDN-PRI backbone signals are 1.544 Mbps serial data and can be formatted as either ISDN PRI or T-1s trunks. The two backbone connections are made on the distribution frame with four type ST, fiber optic connector jacks (two transmits and two receives). Two additional DSI/PRI are accessible either directly at the cards or through the RJ-11s via zone connections.

- When configured as ISDN PRI digital trunk connections the DS1s has the following features and characteristics:
  - a. Electrical interface is the same as T-1 with B8ZS line coding.
  - b. 23 ISDN B-channels mapped into 23 DS0 T-1 channels.
  - c. 64 Kbps D-channel mapped into 24th DS0 T-1 channel.
  - d. Digital Subscriber System No. 1 D-Channel signaling.
  - e. Access procedures as defined in ITU recommendations Q.920, Q921, Q9.30, Q.931 and X.25.
- When configured as T-1 digital trunk connections the DSI has the following features and characteristics:
  - a. Electrical characteristics in accordance with ANSI Standard T-1.102
  - b. Programmable at the circuit switch to support both super frame (SF) and extended superframe in accordance with ANSI Standard T1.107.
  - c. Programmable at the circuit switch to support both AMI (alternate mark inversion) and B8ZS (bipolar 8-zero suppression) line codes.

d. Line signaling in accordance with Table 2.

**Table 2: T-1 Signaling Protocols Supported**

Signaling Type	Standard
E & M (R1)	ITU (CCITT) Q.310 -- Q.326
FX Loop Start	ATT Publication 43801 Section C
FX Ground Start	ATT Publication 43801 Section C

**3.2.1.3 Switch Bus.**

The Voice Switch Bus connectors are Cannon CIR 020R jacks with the pinouts being proprietary. A cable suitable to interconnect two LVMs or a LVM and BAM are supplied with each LVM

**3.2.1.4 Clock Sync**

The Clock Sync pinouts are proprietary. The Clock Sync is normally connected to the Voice Switch Bus IN connector. A cable suitable to interconnect two LVMs or a LVM and a BAM are supplied with each LVM.

**3.2.1.5 Remote Voice Connectors.**

The six Remote Voice connectors are Telco-50 pin receptacles. The Remote Voice connectors provide up to 24 ea. 2-wire analog and/or digital connections (POTS, ISDN-BRI, etc.). Pin assignments are shown in the following table.

**Table 3: Telco-50 Remote Voice Connectors**

Pin	Signal	Pin	Signal	Pin	Signal	Pin	Signal
1	Ring	26	Tip	13	Ring	38	Tip
2	Ring	27	Tip	14	Ring	39	Tip
3	Ring	28	Tip	15	Ring	40	Tip
4	Ring	29	Tip	16	Ring	41	Tip
5	Ring	30	Tip	17	Ring	42	Tip
6	Ring	31	Tip	18	Ring	43	Tip
7	Ring	32	Tip	19	Ring	44	Tip
8	Ring	33	Tip	20	Ring	45	Tip
9	Ring	34	Tip	21	Ring	46	Tip
10	Ring	35	Tip	22	Ring	47	Tip
11	Ring	36	Tip	23	Ring	48	Tip
12	Ring	37	Tip	24	Ring	49	Tip
				25		50	

**3.2.1.6 Voice User Access**

The 48 Voice User Access connectors are RJ-11s and in the basic configuration 32 are wired via the zone connectors to provide 24 two wire analog subscriber ports and 8 two wire digital

subscriber ports (unused connections are covered and clearly labeled) that have the following features and characteristics:

- Analog Subscriber.
  - a. 2-Wire loop start interface compatible with EIA RS-470 instruments.
  - b. Support for dual tone multi-frequency (DTMF) or pulse (rotary) dialing in accordance with EIA RS-470.
  - c. RJ-11 connectors -- Ring (pin 3); Tip (pin 4); Zone connectors A, B, C and D.
- Digital Subscriber.
  - a. ISDN 2B+D Basic Rate Interface (BRI).
  - b. 2-Wire “U-Interface”, 2B1Q line waveform in accordance with ANSI T1.601-1988.
  - c. Independent B-channel signaling (either B-channel may be independently dialed).
  - d. RJ-11 connectors -- Ring (pin 3); Tip (pin 4); Zone connectors A, B, C and D.

### 3.2.1.7 Admin.

The Voice Switch Administration ports are in accordance with the DB-9F RS-232 standards pin assignments as shown in the following table, using a VT100 Emulator (9600 bps, No Parity, 8 Data Bits, 1 Stop Bit):

**Table 4: Admin**

Pin	Signal	Pin	Signal	Pin	Signal
1	Data Carrier Detect	4	Data Terminal Ready	7	Request to Send
2	Received Data	5	Signal Ground	8	Clear to Send
3	Transmitted Data	6	Data Set Ready	9	Ring Indicator

### 3.2.2 Electrical Interfaces Requirements (Internal)

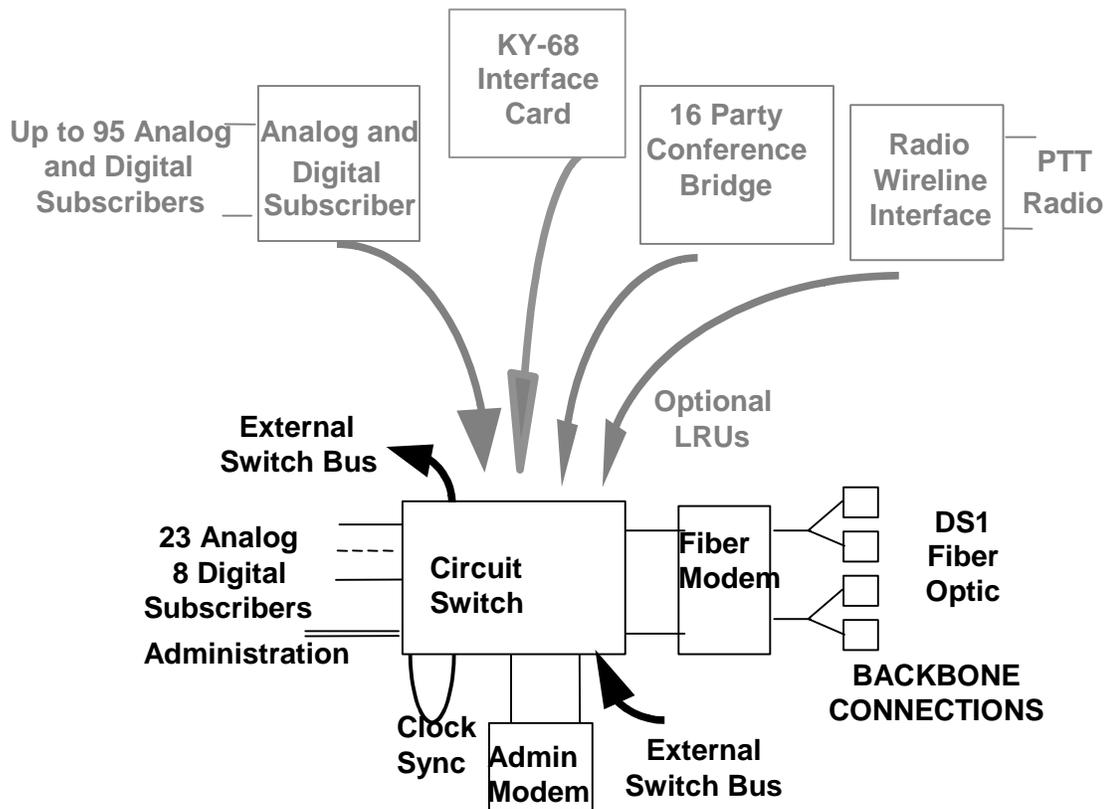
Internal module interconnections and cable diagrams are provided as separate documentation.

### 3.2.3 Functional Requirements

#### 3.2.3.1 Basic Configuration.

The LVM is a flexible, scaleable and configurable module, which performs Switched Circuit Network functions (Figure 1). The LVM includes a two-shelf circuit switch that implements a private branch exchange (PBX). The LVM provides four ISDN-PRI, two via fiber optic at the I/O DF and two either via RJ-11s at the I/O DF or via DB-9s at the trunk card. The PRI s can be interconnected to the network hub or to another network node. The basic circuit switch configuration; i.e., no optional circuit cards; provides service for up to twenty-three 2-wire analog plus one analog circuit used for remote administration, eight ISDN-BRI subscribers, and 4 ISDN-PRI trunk connections (Figure 3). The circuit switch is a REDCOM IGX\*C Exchange.

The installer may customize the switch by adding additional line replaceable units (circuit cards) for increased subscriber access and switch functionality. The circuit switch provides the features in Table 5.



**Figure 3: LVM's Functions and Options**

External circuit switch backplane bus connections are provided so that multiple LVMs may be connected together to form a single voice circuit switch. These connections permit additional SCN subscribers to be added as a mission grows.

All of the users phone ports are fused with lightning surge protectors.

### 3.2.3.1.1 Local Subscriber Access.

The LVM, in its basic configuration, provides access to the Circuit Switch for 23 local telephone subscribers via 2-wire analog circuits, for POTS (WECO 2500) and compatible products such as Faxes, modems and STU IIIs, and 8 ISDN-BRI "U" digital subscribers, i.e. digital phones and video teleconference units.

**Table 5: Voice Switch Features**

AUTOVON	Multi Level Precedence and Preemption (MLPP) & PRIORITY FEATURES-provides for processing emergency calls. There are six levels of emergency override.
SITE DOCS/PSR	SITE DOCS/V-LIST-provides the ability to execute the Site Office Records program available on a PCMCIA card. This program will automatically generate IGX system information including details on the following: Hardware Configuration, Dialing Plan, Trunks, Lines, and System Tables.
TOLL RESTRICTION	TOLL RESTRICTION FEATURE- provides the capability to restrict originating lines and trunks from accessing specified trunks, and to restrict the digits that they may dial on those trunks.
CO MF	MF SIGNALLING FEATURE-provides the ability for the switch to interpret Central Office Multi-Frequency signaling. The MF Sender/Receiver card is needed for this feature to work.
CUSTOM	ROSMI CUSTOM FEATURE- provides the ability for the switch to interface to the KY-68 Interface card.
HOST	HOST COMPUTER CONTROL (CTI) FEATURE- provides user access to the IGX Host Control Interface. This allows control of switching functions through an external host computer.

#### **3.2.3.1.2 Voice Switch Administration.**

The LVM provides the capability for management of the voice switch through a local lap top computer via the Voice Switch Admin connector at the module's I/O DF or from a remote location though a dial-up connection. In the basic configuration the eighth time slot of the line card is reserved for the dial-up connection. Management of the following functions is provided:

- a) Configuration
- b) Health and Status
- c) Control
- d) Downloading statistical data

#### **3.2.3.1.3 Circuit Switch Interconnection.**

The Circuit Switch is configured with external backplane connections to enable multiple switches to be interconnected to form a larger switch with "single switch" functionally. When a "single switch" is formed, only one dial-up administration connection is required.

#### **3.2.3.1.4 Fiber Optic Modem.**

The fiber optic modem converts the bi-directional ISDN PRI trunks to an optical waveform.

#### **3.2.3.2 Configuration Options**

In addition to the basic functions and features the installer may customize the switch by modifying the card complement to provide the additional functions and features. Some of the customize interfaces are listed below:

- In conjunction with the KY-68 Interface Card access to 2 each KY-68s per card
- Additional users - 2-wire analog and digital BRI "U"
- Push to Talk (PTT) - Radio wireline Interface
- 16 party conferencing

- E&M – 2 & 4 wire Type 1 & 2
- T1, E1 Trunks
- BRI S
- Etc.\*

\*See REDCOM Manual for a more complete listing of the interface and feature options.

The configuration shall not violate the basic configuration rules of the REDCOM IGX\*C for the 192 time slots and three highways.

### Configuration Kits

All TDC configuration Kits are described in Motorola document TDC ICAP Configuration Kit Descriptions (62-P43381D). The following kits are available to provide additional capabilities to the LVM.

- **Echo Cancellation Kit** – provides voice circuit echo cancellation for T1 and E1 circuits.
- **TRI-TAC Interface Kit** – provides SF Trunk circuits to interface with TRI-TAC services, such as TTC-39, SB-3865 circuit switches.
- **International Kit** – provides and MSU controller, E1 trunk and support cards for the REDCOM switch preloaded with software features activated, to support interconnections to E1 circuits.
- **Radio Interface Kit** – provides LST-5 UHF radio interface cards for the REDCOM switch.
- **Local Base Interface Kit** – provides for interconnectivity with local PBX systems via LSRD/GSRD trunk board FXO Trunk and E&M trunk 4-wire.
- **Subscriber Loop Kit** – provides additional 2-wire POTS analog and ISDN-BRI U digital interface cards.
- **T1 Trunk** – provides increase T1/ISDN-PRI trunk capability for the REDCOM switch.
- **Subscriber Extension Kit** – provides the capability to remotely distribute voice circuits from the voice modules.

Many of the system level and maintenance kits can be used for LVM module troubleshooting and cable repair. These kits include:

- **Fireberd Analyzer Kit** – Contains the Fireberd 6000 and interfaces for circuit testing.
- **Cable Maintenance Kit** – Contains Fiber Optic Time Domain Reflectometer, HP Digital Average Power Meter, Cable Tester, Digital Multimeter, Oscilloscope, RS530 and Breakout Box.
- **Voice/Data Cable Kit** – Contains Category 5 Twisted Pair materials to make 10/100 BaseT cables (RJ11 and RJ45) with label package.
- **LAN Kit** – Contains Network Time Server, 10/100 BaseT Ethernet switch and repeater, 10BaseFL / TX and 10Base2 Media Converter and Hub.
- **Fiber Cable Kit** – Contains tactical 1.5 K m of fiber cable, SC/ST connectors and fiber termination tool kit.

- **Circuit Extension Kit** – Contains Campus Rex T1/E1, T1/E1 Fiber line driver and CV-2048 Modem.
- **Laptop Computer Kit** – Contains Laptop Computer w/ CD-ROM, Portable Ethernet Sniffer w/ software.
- **Small UPS Kit** – Provides protection and backup (650VA) of prime power circuits.
- **Large UPS Kit** – Provides protection and backup (1500VA) of prime power circuits.

### 3.2.4 Physical Characteristics

#### 3.2.4.1 Transit Case.

The Large Voice Module shall be housed in a 13”U man-transportable container (transit case), approximately 22.5”(W) x 27.3”(D) x 34.5”(H). The transit cases are designed to stack on top of and mechanically interlock to like cases. The transit cases with their covers in place are designed to protect the electronic equipment inside from direct exposure to environmental conditions; e.g., rain, snow, ice, dust, etc., likely to be encountered during world wide military transit.

#### 3.2.4.2 Weight.

As a goal, the Large Voice Module, including all internally carried cables, does not exceed 107 Kg/240 LB.

#### 3.2.4.3 Storage Space.

The Large Voice Module transit case includes storage pouches within its covers to contain cables, manuals, etc. that must be transported and used with the module.

#### 3.2.4.4 Marking.

The Large Voice Module is visually identified by color code, having two inch wide White and Gray diagonally striped tape surrounding the case. A nameplate is permanently affixed to the module body (not its covers) listing the module’s stock number, name, supplier code and serial number. Each removable cover and cable are suitably marked identifying it as part of a specific module. The Large Voice Module has a bar code label that identifies the module stock number and serial number.

A warning or information label is prominently affixed to the module body that informs the installer of the module’s power requirements.

Permanent marking is prominently placed on the module body to indicate fully-loaded weight, center of gravity and top of case.

### 3.2.5 Cables and Accessories

The Large Voice Module includes the cables and terminators listed in Table 6, stored within its covers. Strain relief and cable management hardware are provided with the module.

**Table 6: Cables and Terminators Included with LVM**

Function	Color Code	QTY	Description
Power	N/R	1	IEC 320 female (or equivalent) to NEMA-5P.
Backbone	N/R	2	Multimode fiber optic; 2 fibers; ST to ST.
Admin	N/R	1	DB 9 Plug to DB 9 Jack pin-to- pin
E1 Bus Terminator	N/R	1	Cannon CIR 020R plug Bus Terminator
E2 Bus Terminator	N/R	1	Cannon CIR 020R plug Bus Terminator
Terminator GI	N/R	1	Cannon CIR plug Clock Sync Terminator
Cable Assembly	N/R	1	CLK IN to CLK OUT
Cable Assembly	N/R	1	Bus In to Bus Out
SCN Backbone	N/R	2	Fiber optic ST Plug to ST Plug (2 fibers)

**3.2.6 Reliability**

The Large Voice Module with its standard complement of LRUs, shall have a mean time between failure (MTBF) commensurate with similar commercial equipment in its class. The actual MTBF for the major components are shown in Table 7. Where reliability data is not available for the vendor, this is indicated.

**Table 7: MTBF of Major Components**

Components	MTBF
IGX*C Configured for LVM	10,200 hr. (Estimated)

**3.2.7 Maintainability**

Maintainability characteristics are part of the selection criteria for all hardware. Ease of maintenance, such as accessibility to Line Replaceable Units, fault detection / isolation software capability, and fault annunciation are considered. The module is capable of operating 24 hours per day, seven (7) days a week.

**3.2.7.1 Mean Time Between Preventive Maintenance [MTBPM]**

The MTBPM is 30 days and consist of cleaning the dust cover, checking and cleaning any filter, and inspecting the cable for and cuts, etc.

**3.2.8 Environmental Conditions****3.2.8.1 Temperature**

The temperature characteristics for the major equipment components are shown in Table 8.

**Table 8: Module Temperature Characteristics**

Equipment	Temperature (°C)	
	Operating	Non-operating
IGX*C Configured for LVM	0 to 50	Not Available

**3.2.8.2 Humidity**

The relative humidity characteristics for the major equipment components are shown in Table 9.

**Table 9: Module Humidity Characteristics**

Equipment	Humidity Non-condensing
IGX*C Configured for LVM	5 to 95%

**3.2.8.3 Altitude**

The altitude characteristics for the major equipment components are shown in Table 10.

**Table 10: Module Altitude Characteristics**

Equipment	Altitude	
	Operating	Non-operating
IGX*C Configured for LVM	Not Available	Not Available

**3.2.8.4 Sand and Dust.**

During storage and transport, the module shall be protected when exposed to sand and dust in accordance with the best commercial practices for close proximity to operating aircraft. During operation with covers removed, the module shall withstand sand and dust in accordance with the best commercial practices for natural conditions.

**3.2.8.5 Shock**

The module equipment rack is equipped with rubber shock isolation mounts and is protected from shocks induced during handling, setup and teardown. Modules and components can operate without degradation following exposure to the non-operating shock environment described by Method 516.4, Procedure VI (Bench Handling) of MIL STD 810E.

**3.2.8.6 Vibration**

The module is equipped with rubber shock isolation mounts so that the module can withstand the vibration encountered while being transported by commercial and military airlift, sealift and vehicular (over unimproved roads) systems.

**3.3 DESIGN AND CONSTRUCTION**

**3.3.1 Material Parts and Processes**

This module shall be built to good commercial practices. Mechanical and electrical interchangeability shall exist between like systems, subsystems, assemblies, subassemblies and replaceable parts.

**3.3.2 Safety**

The Large Voice Module shall not present a safety, fire or health hazard to personnel.

**3.3.2.1 Electrical Safety.**

The LVM is designed to eliminate the hazard to personnel of inadvertent lethal voltage contact. All electrical conductors carrying voltages in excess of 70 volts are insulated to

prevent contact or covered by a protective barrier. All removable protective barriers are interlocked to automatically disconnect power behind the barrier upon removal or clearly marked with a warning label that indicates the voltage potential that will be encountered behind the barrier. If warning labels are used, the warning labels are visible after the cover has been removed.

#### **3.3.2.2 Mechanical Safety.**

All sharp surfaces have protective covers or other suitable features to minimize injury where personnel are likely to be exposed to such surfaces.

### **3.4 LOGISTICS**

The module accommodates a two level maintenance concept: organizational (Air Force personnel) and depot (contractor personnel). Removal and replacement of an LRU is defined at the organizational level and any needed repair of the LRU is defined at the depot level. Any special tests or support equipment required to effect removal or replacement of an LRU at the organizational level are provided as part of the module. No more than two persons are required to remove or replace an LRU.

An LRU is defined as the lowest element of the module which can be isolated to be faulty through inspection; built-in test; technical manuals; TDC-ICAP system performance; spares substitution; or other diagnostic aid approved by the Government for organizational level maintenance, exclusive of expendables such as fuses, lamps and LEDs.

## **4 QUALITY ASSURANCE PROVISIONS**

### **4.1 GENERAL**

The quality assurance program includes tests and other evaluations to the extent specified herein. The quality assurance program is designed to verify the electrical, mechanical and functional characteristics of each module. The purpose is to ensure that each module complies with or performs better than the requirements specified herein.

### **4.2 RESPONSIBILITY FOR INSPECTION**

Unless otherwise specified in the contract, the contractor is responsible for the performance of all inspection requirements and may use his own or any other facilities suitable for the performance of the inspection requirements. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to the prescribed requirements.

### **4.3 PRODUCT QUALIFICATION TEST (PQT)**

Inspections, analyses, demonstrations and tests were used to verify compliance of Section 3 of this specification on the initial prototype module.

#### **4.3.1 Verification Cross Reference Matrix (VCRM)**

Table 11 provides a list of each Section 3 requirement and the verification method to be used. The following paragraphs define the codes employed in the VCRM. Unless otherwise noted, where more than one verification method is shown, one method or a combination of methods may be used to show compliance.

#### **4.3.1.1 Not Required (N/R).**

This method indicates that verification is not required because the paragraph is a title, heading, general introductory paragraph or statement of a goal and contains no “shall” or “must” statements.

#### **4.3.1.2 Inspection.**

Inspection is a method of verification of the module performance or characteristics by examination of the equipment or associated documentation. Inspections are conducted with the use of inspection tools, measurement devices, visual means and comparison. Most inspections apply to verification of requirements associated with physical characteristics such as size, weight, appearance, adherence to specified standards and engineering practices, quality design, and construction supported with quality documentation. Inspections also include the auditing of manufacturer’s data that verifies the performance of non-developmental items that comprise the TDC ICAP module. Inspections may occur during any assembly stage of the unit under test.

#### **4.3.1.3 Analysis.**

Analysis is a method of verification through technical evaluation of calculations, computations, models, analytical solutions, use of studies, reduced data, and/or representative data to determine that the item conforms to the specified requirements.

#### **4.3.1.4 Demonstration.**

Demonstration is a method of verification whereby the properties, characteristics and parameters of the item are determined by observation alone and without the use of instrumentation for quantitative measurements. This method is used when a requirement does not contain a specific numerical parameter, which must be measured. Demonstrations may occur during verification of a unit under test at any assembly stage. Pass/fail criteria are simple yes/no indications of functional performance since no quantitative values are specified.

#### **4.3.1.5 Test.**

Test is a method to verify that a specified requirement is met by thoroughly exercising the applicable item under specified conditions and by using the appropriate instrumentation in accordance with test procedures. This method requires the use of laboratory equipment, simulators, or services to verify compliance to the specified requirements. This method is used when it is practicable to make direct or indirect measurement of a specified numerical parameter to verify compliance with a requirement. Tests may occur during verification of a unit at any assembly stage. Actual measured values are recorded, and pass/fail is determined by comparing the measured value with the specified value. Measurement accuracy shall be precise enough to ensure that the measured value is within the specified tolerance.

### **4.4 ACCEPTANCE TEST PROCEDURE (ATP)**

Each Basic Access Module delivered to the Government undergoes an Acceptance Test Procedure (ATP) as identified in Table 11. The acceptance test verifies that the module interfaces are operating properly prior to delivery to the Government.

## **5 PREPARATION FOR DELIVERY**

Each module shall be packaged for shipment and the package marked in accordance with the requirements of the contract under which the module is ordered.

**Table 11: Verification Cross Reference Matrix**

Paragraph	Title	Verification Method					ATP
		N/R	Inspect	Analysis	Demo	Test	
3.0	REQUIREMENTS	X					
3.1	Module Definition	X					
3.2	Performance Requirements	X					
3.2.1	Electrical Interface Requirements (External)		X				
3.2.1.1	Prime Power		X			X	
3.2.1.2	DS1 Backbone		X				X
3.2.1.3	Switch Bus		X				X
3.2.1.4	Clock Sync		X				X
3.2.1.5	Remote Voice Connectors		X				X
3.2.1.6	Voice User Access		X				X
3.2.1.7	Admin		X				X
3.2.2	Electrical Interfaces Requirements (Internal)	X					
3.2.3	Functional Requirements	X					
3.2.3.1	Basic Configuration	X					
3.2.3.2	Configuration Options	X					
3.2.4	Physical Characteristics	X					
3.2.4.1	Transit Case		X				
3.2.4.2	Weight		X			X	
3.2.4.3	Storage Space		X				
3.2.4.5	Marking		X				X
3.2.5	Cables and Accessories		X				X
3.2.6	Reliability			X			
3.2.7	Maintainability			X			
3.2.7.1	Mean Time Between Preventive Maintenance [MTBPM]			X			
3.2.8	Environmental Conditions	X					
3.2.8.1	Temperature					X	
3.2.8.2	Humidity		X				
3.2.8.3	Altitude		X	X			
3.2.8.4	Sand and Dust		X	X			
3.2.8.5	Shock					X	
3.2.8.6	Vibration					X	
3.3	Design and Construction	X					
3.3.1	Materials Parts and Processes		X				X
3.3.2	Safety			X			
3.3.2.1	Electrical Safety		X	X			X
3.2.2.2	Mechanical Safety		X				X
3.4	Logistics		X	X			

## 6 Initial Configuration

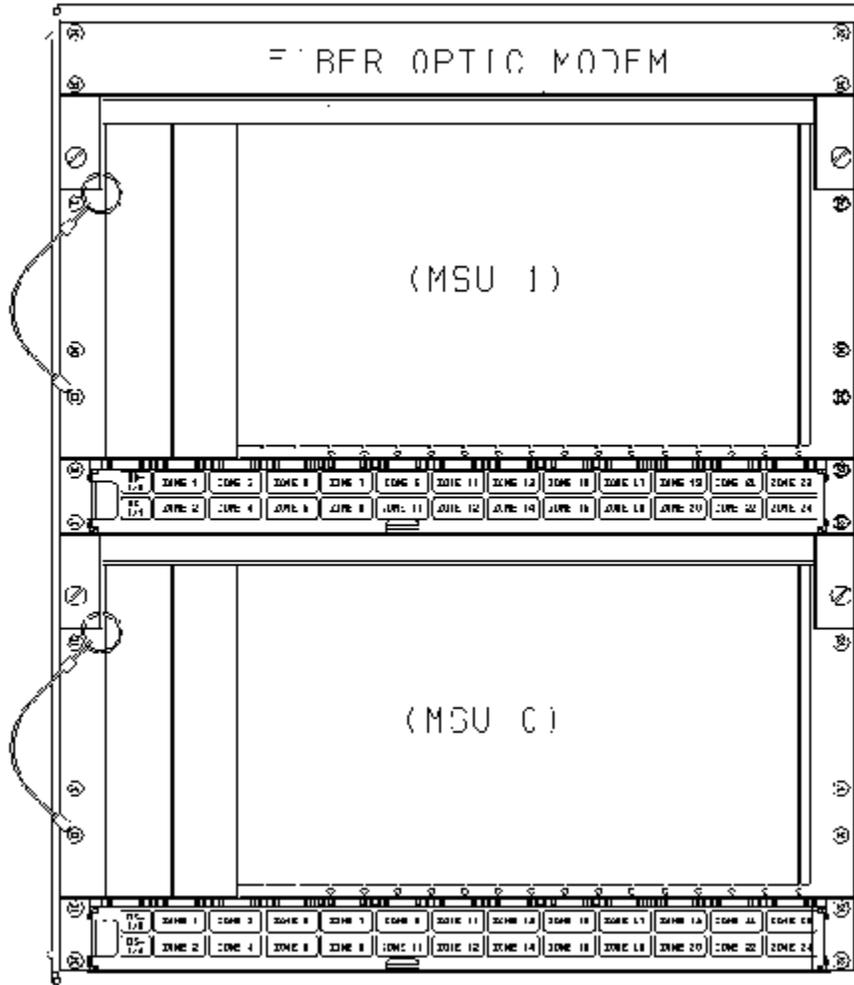
### 6.1 EQUIPMENT LIST

Device	MFG	Part Number	Description	Qty
Circuit Switch	Redcom	IGX*C Standard Shelf	Circuit switch single self	2
Software	Redcom	4.0-TDC	VERSION 4.0, R2, P1	2
Software	Redcom	AUTOVON	MLPP & Priority Feature	2
Software	Redcom	Toll Restriction	Toll Restriction Feature	2
Software	Redcom	CO MF	MF Signaling Feature	2
Software	Redcom	CUSTOM	ROSMI Custom Feature	2
Software	Redcom	HOST	Host Computer Control (CTI) Feature	2
Software	Redcom	PSR	Print Site Records Feature	1
Timeslot Interchange	Redcom	MA0588-103	Voice matrix	2
MSU Controller	Redcom	MA0489-105	Supervisor and Control Bd. Set	2
Ring Generator	Redcom	MA0060-005	Switch Ring Generator	2
Line Circuit Board	Redcom	MA0653-103	8 Circuit Expand Line Bd.	3
DS-1 Board	Redcom	MA0292-003	TRK DS-1 2 Board Set	4
MF Sender/Receiver Board	Redcom	MA0308-101	MF Sender/Receiver Bd. 2 CKT.	1
MTI Board	Redcom	MA0463-101	MTI User Config BD	2
CLK SYNC Board	Redcom	MA0473-163	Universal CLK Sync Perm SW/OVR	1
ISDN BRIU Bd.	Redcom	MA0530-322	Line Bd. ISDN BRIU Board	2
Cable	Redcom	CA0490-101	Internal MPU Cable	1
Cable	Redcom	SC0483-001	Internal TSI Cable	1
Power Conditioner	Marway	411355	Power Conditioner	1
Cable Mgmt Bar	Leviton Telcom	41150-019	Polyrack Cable Mgmt Bar	2
Cable Loop	Leviton Telcom	41020-SPR	Polytie Cable Loop	2
Connector	Fiber Systems Intl	BSTA2000	Bulkhd Coup	4
Fiber Optic Modem	STI	2890-2R-ASP-1	Dual T1 Fiber Optic Modem	1
Case	ECS Composites	11245	Transit Case	1
(W1) Cable	Panel Comp.	93011060.0102061.2	Power Cable PS1	1
(W2) Cable	Panel Comp.	93011060.0103122.2	Power Cable MSU 0	1
(W3) Cable	Panel Comp.	93011060.0103122.2	Power Cable MSU 1	1
(W5) Cable	Fiber Systems Intl	MOTO-0028	T1 Voice Backbone Cable	1
(W6) Cable	Fiber Systems Intl	MOTO-0028	T1 Voice Backbone Cable	1
(W8) Cable	Az Comp.	AM6162	Switch Admin Cable MSU 0	1

(W9) Cable	Az Comp.	AM6163	Switch Admin Cable MSU 1	1
(W10) Cable	Az Comp.	AM6164	Admin Modem Cable	1
(W11) Cable	Az Comp.	AM6263	Remote Zone Cable Shelf 0 (7-12)	1
(W12) Cable	Az Comp.	AM6263	Remote Zone Cable Shelf 0 (13-18)	1
(W13) Cable	Az Comp.	AM6263	Remote Zone Cable Shelf 0 (19-24)	1
(W14) Cable	Az Comp.	AM6263	Remote Zone Cable Shelf 1(7-12)	1
(W15) Cable	Az Comp.	AM6263	Remote Zone Cable Shelf 1 (13-18)	1
(W16) Cable	Az Comp.	AM6263	Remote Zone Cable Shelf 1 (19-24)	1
Power Supply	Ault	SW109MA0003F01	PS1 Power Supply	1
Modem	StarComm	3342E-203-2	Switch Admin Modem	1
Cable			Fiber Optic (DS1) Cable	2
Cable	Kent Data Comm	742-110	Computer Admin Cable	1
Cable	Redcom	CA9079-A12	Conv cable 9 pin Female to 9 pin Male	2
Cable	Redcom	CA9079-B12	Conv cable 15 pin Male to 9 pin Male	4
Cable	Redcom	CA9079-C12	Conv cable 15 pin Male to 9 pin Male	2
Cable	Redcom	CA9079-E12	Conv cable 15 pin Female to 4ea. 9 pin Male	1
Cable	Redcom	SC9079-048	Clock Out Cable	1
Cable	Redcom	SC9079-148	Clock In Cable	1
Cable	Redcom	SH9079-020	Bus Out Cable	1
Cable	Redcom	SH9079-140	Bus In Cable	1
Cable	Redcom	CA9079-T08	Cable Assembly F CLK to Bus In (stored in pouch)	1
Cable	Redcom	CA9079-T3A	Cable Assembly E1 Bus Terminator (stored in pouch)	1
Cable	Redcom	CA9079-T3B	Cable Assembly E2 Bus Terminator (stored in pouch)	1
Cable	Redcom	CA9079-T5B	Cable Terminator GI (5 Pin) Clock Sync (stored in pouch)	1
Cable	Redcom	CA9079-040	Cable Assembly Bus In to Bus Out (stored in pouch)	1
Cable	Redcom	CA9079-140	Cable Assembly CLK In to CLK Out (stored in pouch)	1

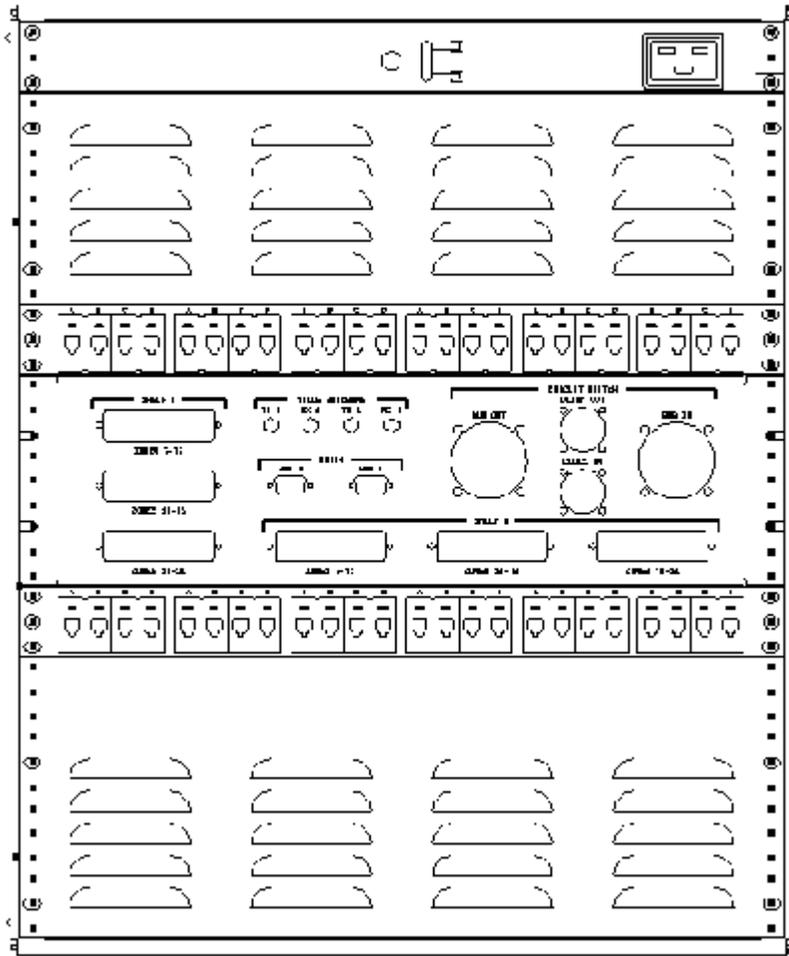
## 6.2 ELEVATION DRAWINGS

Figure 4 shows the front elevation of the Large Voice Module.



**Figure 4: Large Voice Module Front Elevation Drawing**

Figure 5 shows the rear elevation of the Large Voice Module.



**Figure 5: Large Voice Module Rear Elevation Drawing**