

TDC



Theater Deployable Communications

Baseline Requirements Document
for the
Basic Access Module
BAM (v2)

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1. SCOPE

This requirements document establishes the performance, manufacture and test requirements for the TDC ICAP Basic Access Module v2 (BAMv2).

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.

Document Number	Title
EIA/TIA-232-E Jul-91	Interface Between Data Terminal Equipment and Data Circuit-Terminating Equipment Employing Serial Binary Data Interchange(Rates to 20kbps)
EIA 530 Jun - 92	High Speed 25-Position Interface for Data Terminal Equipment and Data Circuit-Terminating and Data Circuit-Terminating Equipment. (Mar 87)
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 Standard RS-470	Telephone Instruments with Loop Signaling for Voiced Applications
ISO/IEC 8802-3 1996 ANSI/IEEE Std 802.3 1996	Information Technology- Local Metropolitan Area Networks-- Part3: Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specification. (Documents are one in the same; from IEEE, ANSI, ISO and IEC)
MIL-STD-810E	Environmental Test Methods
*REDCOM Laboratories, INC	IGX•2000 ISDN Gateway Exchange User's Manual

*Delivered with Module

3. REQUIREMENTS

3.1 Module Definition

The Basic Access Module v2 (BAM v2) is a flexible, scaleable and configurable module that provides both voice and data functions. It has two Fast Ethernet switches and a voice circuit switch that provide the following functions:

- Datagram Switched Network Functions
 - Access for local 10BaseT/100Base TX Ethernet users
 - Connectivity via 100BaseFX or 10BaseFL
 - Ethernet switching
 - Local and remote configuration management
 - Circuit surge protection fusing

- Switched Circuit Network (SCN) Functions
 - Access for local phone (POTS and digital) users

- Trunks for SCN backbone
- Local and remote configuration management
- Circuit surge protection fusing
- Configurable Voice Switch Functions
 - Additional analog and digital subscribers
 - Radio wireline interface
 - 16 party conferencing
 - KY-68 interface

Figure 1 shows the Basic Access Module v2 internal and external interconnections. Detailed characteristics for each function may be found in section 3.2.

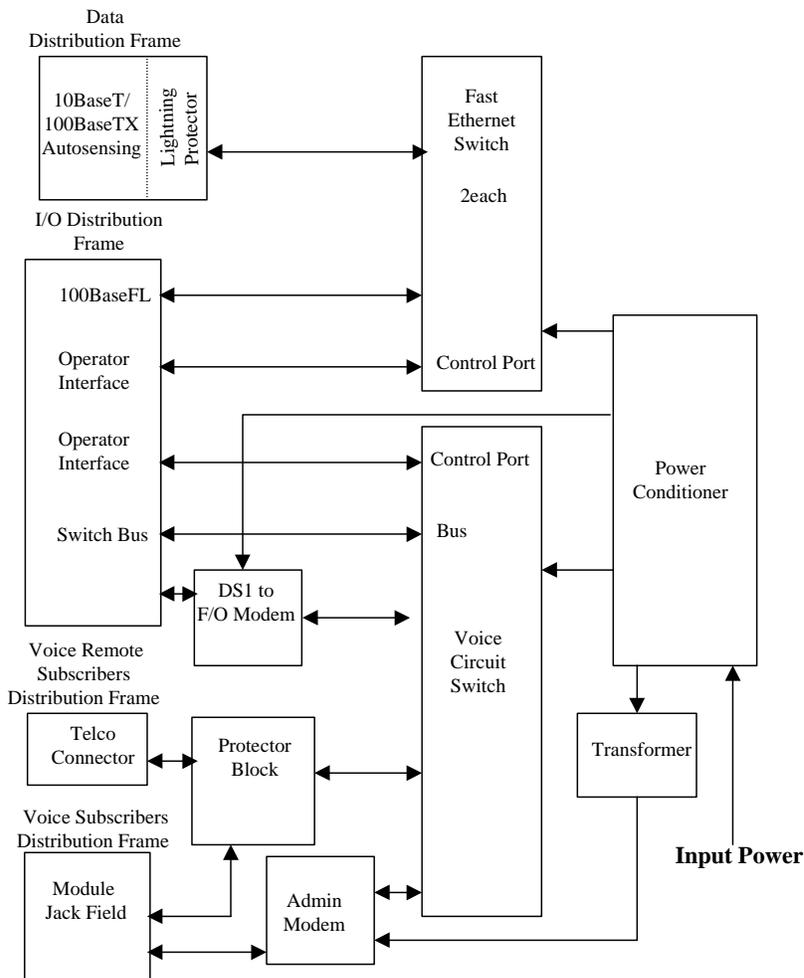


Figure 1 - Internal Functional Block Diagram

3.2 Performance Requirements

3.2.1 Electrical Interface Requirements (External)

Access to the BAM v2 is through the module's Distribution Frames (DF). 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 - BAM v2 External Interface Characteristics

Signal Name	Number	Connector	Input/Output	Primary Interface	Electrical Characteristics
Prime power	1	IEC 320-C20 Receptacle	I	Local power source	90-240 VAC 47-63 HZ
IP 10BaseT/100Base TX	42	RJ 45	I/O	Local users – I/O DF IP	IEEE Std 802.3
100BaseFX Backbone	4	ST (Fiber Optic)	I/O	IP Backbone and/or BAMs	IEEE Std 802.3
Voice Switch Bus	2	Cannon CIR 020R	I/O	Module inter-connections	REDCOM proprietary
IP Switch Admin	2	DB 9F	I/O	Local administrator – I/O DF	EIA RS-232
Circuit Switch Admin	1	DB 9F	I/O	Local administrator – I/O DF	EIA RS-232
2 wire analog	24	RJ 11	I/O	Local users – I/O DF	EIA Std RS-470
ISDN-BRI “U”	4	RJ 11	I/O	Local users – I/O DF	ANSI T1.601-1992
ISDN-PRI	2	ST (Fiber Optic)	I/O	node to node or node to Base Hub connectivity	ANSI T1.603-1990;
Clock Sync	1	Cannon CIR 020R	I	Voice Switch	REDCOM proprietary
Remote Voice	1	TELCO 50 Pin Receptacle	I/O	Remote and local users –Zones 19-24 DF	EIA Std RS-470

3.2.1.1 Prime Power

The Basic Access Module v2 is designed to operate from 100 to 130 VAC and 200 to 240 VAC, 50 to 60 Hz, single phase, three-wire power. The maximum current does not exceed 5 amperes at 120 VAC or 2.5 amperes at 230 VAC. The BAM v2 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, that is Ethernet Switches, voice switch, etc.

3.2.1.2 IP 10BaseT/100BaseTX

The 10BaseT/100BaseTX input ports are in accordance with the eight wire ANSI/IEEE Std 802.3 10BaseT/100BaseTX Standards. The connectors are RJ 45 Modular Jacks. Pin assignments are as shown in the table below. All inactive jacks on the I/O DF shall be physically covered.

Table 2 - IP 10BaseT/100BaseTX

Pin	Signal	Pin	Signal	Pin	Signal
1	TD+	4	Not used	7	Not used
2	TD-	5	Not used	8	Not used
3	RD+	6	RD-		

3.2.1.3 100BaseFX

The 100BaseFX Datagram Switched Network Backbone connections are fiber optic multi mode. Connectors are ST jacks (transmit and receive).

3.2.1.4 Voice Switch Bus

The Voice Switch Bus connectors are Cannon CIR 020R jacks with the pinouts being proprietary. A 4-foot cable suitable to interconnect two BAMs is supplied with each BAM.

3.2.1.5 Admin

The IP Ethernet Switches and Circuit Switch Administration ports are in accordance with the DB 9 RS-232 standards using the VT100 Emulators (9600 bps, No Parity, 8 Data Bits, 1 Stop Bit). Each Admin connector is a DB-9F with pin assignments as shown in the following table:

Table 3 - 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

3.2.1.6 Wire Analog and BRI

The 2-wire analog ports, Zone 1-6, have the following features and characteristics:

- Single line 2-Wire Loop Start interface
- RJ-11 modular jack interface connector.
- Dual tone multi-frequency (DTMF) dialing (EIA RS-470) with 12 button keypad (0-9; *, #) or Pulse (Rotary) Dialing (EIA RS-470).
- Powered from telephone line.

The ISDN-BRI ports - Zone 18 A, B, C, D - are 2-wire “W” interface.

The connectors are RJ-11 modular jacks. Pin assignments are in accordance with the six-wire RJ-11C and RJ-11W as shown in the table below. All inactive jacks - Zone 7-17 - shall be physically covered.

Table 4 - 2-wire Analog and BRI

Pin	Signal	Pin	Signal	Pin	Signal
1	Not used	3	Ring	5	Not used
2	Not used	4	Tip	6	Not used

3.2.1.7 ISDN-PRI

The SCN Backbone signals are 1.544 MBPS serial data formatted as ISDN-PRI trunks. The SCN Backbone connections are fiber optic multi-mode ST jacks (transmit and receive).

3.2.1.8 Clock Sync

A clock synchronization cable shall be permanently attached to the Clock Sync out port. The CIR 020R connector of the Clock Sync cable is normally connected to the Voice Switch Bus In connector J 16.

3.2.1.9 Remote Voice

The Remote Voice connector is a 50-pin TELCO plug. The Remote Voice connection provides up to 24 each 2-wire phone connections. Pin assignments are as shown in the following table:

Table 5 - Remote Voice

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	

3.2.2 Electrical Interface (Internal)

This documentation shows the internal wiring of the major module components and the details of each major cable assembly internal to the module distribution frame. This information is found in Section 6.3.

3.2.3 Functional Requirements

3.2.3.1 Basic Configuration

The BAM v2 is a flexible, scalable and configurable module, which performs both Datagram Switched Network and Switched Circuit Network functions (Figure 2). It includes both an internal circuit switch that implements a private branch exchange (PBX) and IP Ethernet switchable ports to permit users to create a local area IP datagram network. The BAM v2 provides two SCN and four datagram network backbone connections which 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 23 2-wire analog plus one analog circuit used for remote administration and four ISDN-BRI subscribers. However, the installer may customize the switch by adding additional line replaceable units (circuit cards) for increased subscriber access and switch functionality.

External circuit switch backplane bus and Ethernet switch connections are provided so that multiple BAMs may be connected together to form a single voice circuit switch and large LANs. These connections permit additional SCN subscribers and LAN users to be added as a mission grows.

All of the local users phone ports and data 10BaseT/100BaseTX ports are fused with lightning surge protectors.

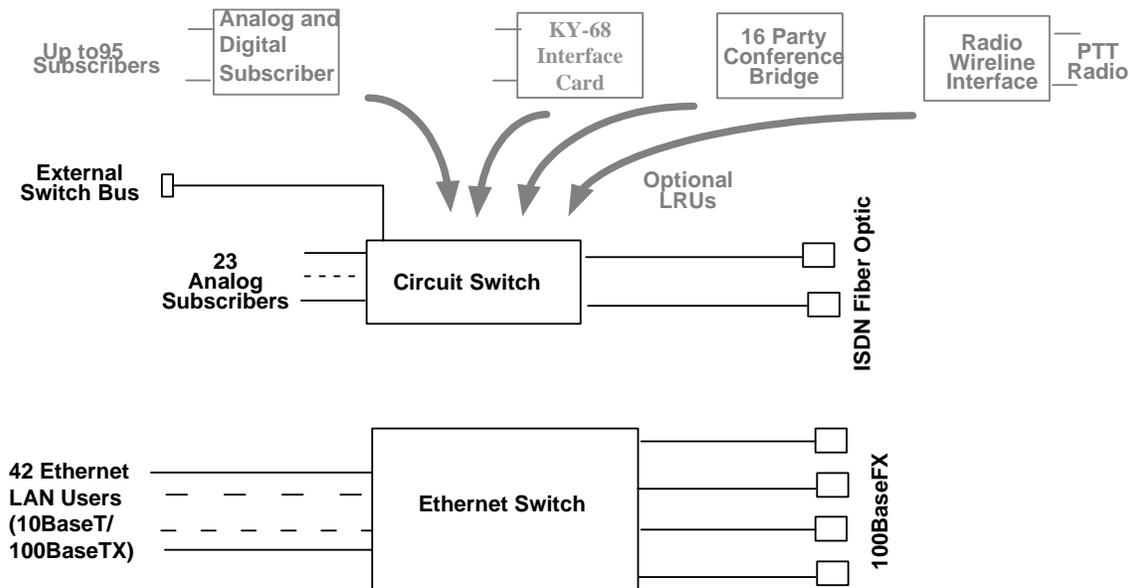


Figure 2 - BAM v2 Block Diagram

3.2.3.1.1 Datagram Switched Network Functions

The BAM v2 provides local LAN users access to the Datagram Switched Network, Ethernet switching, connectivity to the TDC ICAP Datagram Switched Network backbone and administration and control (Figure 3).

3.2.3.1.1.1 10BaseT/100BaseTX LAN Access

The BAM v2 provides Ethernet access for local data users to the TDC ICAP Datagram Switched Network. Access is provided for up to 42 10BaseT/100BaseTX user ports. All 10BaseT/100BaseTX accesses are Ethernet switch ports.

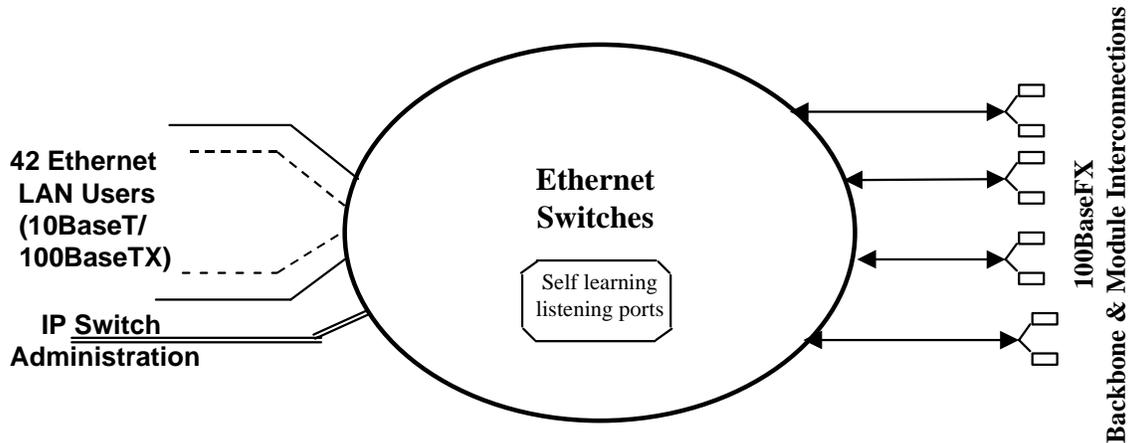


Figure 3 - BAM v2 Datagram Switched Network Functions Block

3.2.3.1.1.2 IP Backbone Connectivity

Four 100BaseFX fiber optic multi mode output ports are provided at the I/O Distribution Frame. These ports provide connectivity to the Datagram Switched Network backbone and interconnections to other BAMs that are collocated.

3.2.3.1.1.3 IP Administration

The IP functions of the BAM v2 are manageable via an external PC computer interconnected to the IP Switch and IP Term-Server Admin connectors at the module's I/O DF. Management of the following functions is provided:

- a) Configuration
- b) Status
- c) Control

3.2.3.1.2 SCN Functions

In the basic circuit switch configuration (i.e., no optional circuit cards), the BAM v2 provides local phone access for up to 23 analog, one port dedicated for remote administration, 4 digital users to the Switched Circuit Network, and 2 ISDN-PRI trunk connections to the TDC ICAP SCN backbone (Figure 4). The circuit switch is a REDCOM IGX*C Exchange, configured with the following cards:

- 2 ea. DS-1 trunk cards
- 1 ea. MTI card
- 1 ea. Clock synchronizer card
- 3 ea. Line Circuit card
- 1 ea. ISDN-Basic Rate “U” Interface card

The circuit switch provides the features in Table 6.

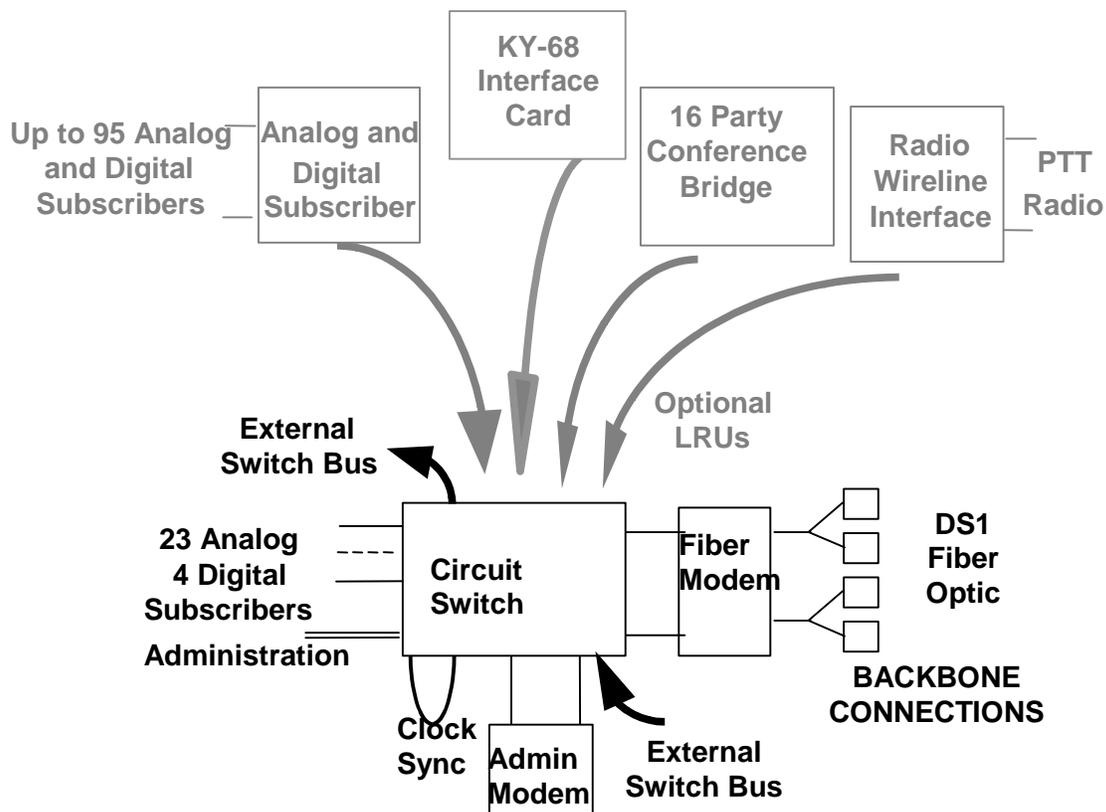


Figure 4 - Switched Circuit Network Functions and Options

3.2.3.1.2.1 Local Subscriber Access

The BAM v2, 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 4 ISDN-BRI “U” digital subscribers, i.e. digital phones and video teleconference units.

3.2.3.1.2.2 Voice Switch Administration

The BAM v2 provides the capability for management of the voice switch through a local laptop computer via the Voice Switch Admin connector at the module's I/O DF or from a remote location through a dial-up connection. In the basic configuration the eighth time slot of the line card is reserved for the dial-up connection (Zone 6-D). Management of the following functions is provided:

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

Table 6 - 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.

3.2.3.1.2.3 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" functionality. When a "single switch" is formed, only one dial-up administration connection is required.

3.2.3.2 Configuration Options

3.2.3.2.1 10BaseFL Connectivity

A 10BaseT/100BaseTX to 10BaseFL Media converter is provided with the BAM v2 that allows connection to the legacy 10BaseFL equipped devices.

3.2.3.2.2 Circuit Switch Configuration Options

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

- In conjunction with the KY-68 Interface Card access to 2 each KY-68s per card
- Up to 95 phone 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 96 time slots and three highways.

3.2.3.2.3 Configuration Kits

The following kits are available to provide additional capabilities to the BAM:

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

Many of the system level and maintenance kits can be used for BAM 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.
- **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 Basic Access Module v2 is housed in a 13 U 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

The Basic Access Module v2, including all internally carried cables, does not exceed 96kg/210lb.

3.2.4.3 Storage Space

The Basic Access Module v2 transit case include storage pouches within its covers to contain cables, manuals, etc. that must be transported and used with the module.

3.2.4.4 Marking

See TDC ICAP Standards Document for required markings.

3.2.5 Cables and Accessories

The BAM v2 includes the cables and terminators listed in Table 7, stored within the covers. Strain relief and cable management hardware are provided with the module.

Table 7 - Cables and Terminators Included with BAM v2

Function	Color Code	Qty	Description
Power	N/R	1	IEC-320 C20 Jack to NEMA 5-15P
Cable Assembly F	N/R	1	CLK to BUS IN
Cable Assembly E1	N/R	1	Bus Terminator
Cable Assembly E2	N/R	1	Bus Terminator
Cable Terminator GI	N/R	1	(5PIN) Clock Sync

Function	Color Code	Qty	Description
Cable Assembly	N/R	1	CLK IN to CLK OUT
Cable Assembly	N/R	1	Bus In to Bus Out
SCN & IP Backbone	N/R	2	Fiber optic ST Plug to ST Plug (2 fibers)
Configuration Port	N/R	1	DB 9 Plug to DB 9 Jack pin-to- pin
Ethernet Switch Jumper	N/R	1	RJ-45 to RJ-45 10/100BaseT

3.2.6 Reliability

The Basic Access Module v2 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 8. Where reliability data is not available from the vendor, this is indicated.

Table 8 - MTBF of Major Components

Components	MTBF
Catalyst 2924C	30,000 to 60,000 hr. typical of Cisco switches
IGX*C Configured for BAM v2	25,000 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 9.

Table 9 - Module Temperature Characteristics

Equipment	Temperature (°C)	
	Operating	Non-operating
Catalyst 2924C	0 to 50	-20 to 65
IGX*C Configured for BAM v2	0 to 50	Not Available

3.2.8.2 Humidity

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

Table 10 - Module Humidity Characteristics

Equipment	Humidity Non-condensing
Catalyst 2924C	10 to 85%
IGX*C Configured for BAM v2	5 to 95%

3.2.8.3 Altitude

The altitude characteristics for the major equipment components are shown in Table 11.

Table 11 - Module Altitude Characteristics

Equipment	Altitude	
	Operating	Non-operating
Catalyst 2924C	Not Available	Not Available
IGX*C Configured for BAM v2	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 can 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 tear down. 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 is 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 Basic Access Module v2 does not present a safety, fire or health hazard to personnel.

3.3.2.1 Electrical Safety

The BAM v2 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 remain 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.

4.4 Production Acceptance Test (ATP)

Each Basic Access Module delivered to the Government undergoes a Acceptance Test Processor (ATP) as identified in Table 12. The acceptance test verifies that the module interfaces are operating properly prior to delivery to the Government.

4.5 Verification Cross-Reference Matrix (VCRM)

Table 12 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.

4.5.1 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.

4.5.2 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.

4.5.3 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.

4.5.4 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.

4.5.5 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.

Table 12 - Verification Cross-Reference Matrix

Paragraph	Title	Verification Method					
		N/R	Inspect	PQT			ATP
				Analysis	Demo	Test	Test
3.	Requirements	X					
3.1	Functional Requirements	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 – 9	Connectors		X				X
3.2.2	Electrical Interface (Internal)	X					
3.2.3	Functional Requirements	X					
3.2.3.1	Basic Configuration	X					
3.2.3.1.1	Datagram Switched Network Functions	X					
3.2.3.1.1.1	10BaseT/10BaseTX LAN Access		X		X		X
3.2.3.1.1.2	IP Backbone Connectivity		X		X		X
3.2.3.1.1.3	IP Administration		X		X		X
3.2.3.1.2	SCN Functions	X					
3.2.3.1.2.1	Local Subscriber Access		X		X		X
3.2.3.1.2.2	Voice switch Administration		X		X		X
3.2.3.1.2.3	Circuit Switch Interconnection		X		X		X
3.2.3.2	Configuration Options	X					
3.2.3.2.1	10BaseFL Connectivity	X					
3.2.3.2.2	Circuit Switch Configuration Options	X					
3.2.3.2.3	Configuration Kits	X					
3.2.4	Physical Characteristics	X					

Paragraph	Title	Verification Method					
		PQT					ATP
		N/R	Inspect	Analysis	Demo	Test	Test
3.2.4.1	Transit Case		X				
3.2.4.2	Weight		X				X
3.2.4.3	Storage Space		X				
3.2.4.4	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	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					
3.2.8.4	Sand and Dust		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
3.2.2.2	Mechanical Safety		X				X
3.4	Logistics	X					

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.

6. Baseline Configuration

6.1 Equipment

Table 13 - Equipment Listing

Device	MFG	Part Number	Description	Qty
Circuit Switch	Redcom	IGX*C Standard Shelf	Circuit switch single self	1
Software	Redcom	4.0-TDC	Version 4.0, R2P1	1
Software	Redcom	AUTOVON	MLPP & Priority Feature	1
Software	Redcom	Toll Restriction	Toll Restriction Feature	1
Software	Redcom	CO MF	MF Signaling Feature	1
Software	Redcom	CUSTOM	ROSMI Custom Feature	1
Software	Redcom	HOST	Host Computer Control (CTI) Feature	1
Software	Redcom	PSR	Print Site Records Feature	1
Timeslot Interchange	Redcom	MA0588-103	Voice matrix	1
MSU Controller	Redcom	MA0489-105	Supervisor and Control Brd Set	1
BRI Card	Redcom	MA0530-322	Basic Rate "U" Interface	1
Trunk Card	Redcom	MA0292-003	DS-1 or T-1 Trunk card	2
Message Transceiver Interface	Redcom	MA0463-101	ISDN-PRI implemented in conjunction with DS-1 Trunk	1
Clock Synchronizer	Redcom	MA0473-163	T-1 Clock Synchronizer and Master Clock Synchronizer	1
Line Circuit	Redcom	MA0653-103	2-wire analog circuits	3
Ring Generator	Redcom	MA0060-005	Switch Ring Generator	1
CASE	ECS Composites	11245	TRANSIT CASE	1
MOUNTING RAIL	Atlantic Scientific	24500	DIN MOUNTING RAIL FOR LIGHTNING PROTECTORS	1
Ethernet Switch	Cisco Systems	WS-C2924C-XL-EN	Catalyst 2924C XL 22-10BaseT /100BaseTX & 2-100BaseFX Switchable Ports	2
Software	Cisco Systems	Version 12.0 (5.xx) XU	WS-C2924C-XL-EN Enterprise IOS	1
Bridging Media Converter	Transition Networks	E-PSW-FX-03	10/100BASETX to 100BaseFX Bridging Media Converter	1
Lighting Protection	Atlantic Scientific	24550	Transient Suppressor, Lightning protector Dual Port, Zone Barrier	22
Power Conditioner	Marway	411355	Multiple Power switch Power Supply	1
Media Converter	Transition Networks	E-TBT-FRL-04	Media Converter 10BASET TO 10BASEFL	1
Cable Loop	Leviton Telcom	41020-SPR	Polytie Cable Loop	2
Modem	StarComm	3342E-203-2	Switch Admin Modem	1
Software	StarComm	Version 1.5.1E_03	Firmware	1
(W1) Cable	Panel Components	93011060.102061.2	Power Cable	1
(W2) Cable	Panel Components	93011060.103122.2	Power Cable	1
(W3) Cable	Az Comp.	AM6015	Cable Assembly	1

(W4) Cable	Az Comp.	AM6263	Remote Zone Cable Assembly	1
(W5) Cable	Fiber System Inc	MOTO-0028	Fiber Optic Cable	1
(W6) Cable	Az Comp.	AM6083	Cable Assembly, 10/100 BASET	1
(W7) Cable	Az Comp.	AM6060	Cable Assembly, 10/100 BASET	1
(W8) Cable	Az Comp.	AM6061	Cable Assembly, 10/100 BASET	1
(W9) Cable	Az Comp.	AM6062	Cable Assembly, 10/100 BASET	1
(W10) Cable	Az Comp.	AM6063	Cable Assembly, 10/100 BASET	1
(W11) Cable	Az Comp.	AM6064	Cable Assembly, 10/100 BASET	1
(W12) Cable	Az Comp.	AM6065	Cable Assembly, 10/100 BASET	1
(W13) Cable	Az Comp.	AM6066	Cable Assembly, 10/100 BASET	1
(W14) Cable	Az Comp.	AM6067	Cable Assembly, 10/100 BASET	1
(W15) Cable	Az Comp.	AM6068	Cable Assembly, 10/100 BASET	1
(W16) Cable	Az Comp.	AM6069	Cable Assembly, 10/100 BASET	1
(W17) Cable	Az Comp.	AM6070	Cable Assembly, 10/100 BASET	1
(W18) Cable	Az Comp.	AM6071	Cable Assembly, 10/100 BASET	1
(W19) Cable	Az Comp.	AM6072	Cable Assembly, 10/100 BASET	1
(W20) Cable	Az Comp.	AM6073	Cable Assembly, 10/100 BASET	1
(W21) Cable	Az Comp.	AM6074	Cable Assembly, 10/100 BASET	1
(W22) Cable	Az Comp.	AM6075	Cable Assembly, 10/100 BASET	1
(W23) Cable	Az Comp.	AM6076	Cable Assembly, 10/100 BASET	1
(W24) Cable	Az Comp.	AM6077	Cable Assembly, 10/100 BASET	1
(W25) Cable	Az Comp.	AM6078	Cable Assembly, 10/100 BASET	1
(W26) Cable	Az Comp.	AM6079	Cable Assembly, 10/100 BASET	1
(W27) Cable	Az Comp.	AM6301	Cable Assembly, 10/100 BASET Internal crossover	1
(W28) Cable	Az Comp.	AM6081	Cable Assembly, 10/100 BASET	1
(W29) Cable	Az Comp.	AM6082	Cable Assembly, 10/100 BASET	1
(W30) Cable	Az Comp.	AM6271	Cable Assembly, 10/100 BASET	1
(W31) Cable	Az Comp.	AM6272	Cable Assembly, 10/100 BASET	1
(W32) Cable	Az Comp.	AM6273	Cable Assembly, 10/100 BASET	1
(W33) Cable	Az Comp.	AM6274	Cable Assembly, 10/100 BASET	1
(W34) Cable	Az Comp.	AM6275	Cable Assembly, 10/100 BASET	1
(W35) Cable	Az Comp.	AM6276	Cable Assembly, 10/100 BASET	1
(W36) Cable	Az Comp.	AM6277	Cable Assembly, 10/100 BASET	1
(W37) Cable	Az Comp.	AM6278	Cable Assembly, 10/100 BASET	1
(W38) Cable	Az Comp.	AM6279	Cable Assembly, 10/100 BASET	1
(W39) Cable	Az Comp.	AM6280	Cable Assembly, 10/100 BASET	1
(W40) Cable	Az Comp.	AM6281	Cable Assembly, 10/100 BASET	1
(W41) Cable	Az Comp.	AM6282	Cable Assembly, 10/100 BASET	1
(W42) Cable	Az Comp.	AM6283	Cable Assembly, 10/100 BASET	1
(W43) Cable	Az Comp.	AM6284	Cable Assembly, 10/100 BASET	1
(W44) Cable	Az Comp.	AM6285	Cable Assembly, 10/100 BASET	1
(W45) Cable	Az Comp.	AM6286	Cable Assembly, 10/100 BASET	1
(W46) Cable	Az Comp.	AM6287	Cable Assembly, 10/100 BASET	1
(W47) Cable	Az Comp.	AM6288	Cable Assembly, 10/100 BASET	1
(W48) Cable	Az Comp.	AM6289	Cable Assembly, 10/100 BASET	1
(W58) Cable	Fiber System Inc	MOTO-0028	Fiber Optic Cable	1
Fiber Optic Modem	S.I. Tech	2890-2R-ASP-1	Dual T1 Fiber Optic Modem	1
Cable Mgmt Bar	Leviton Telcom	41150-019	Polyrack Cable Mgmt Bar	2
(W50) Cable	Az Comp.	AM6100	Cable Assembly	1
(W51) Cable	Az. Comp	AM6100	Cable Assembly	1

(W52) Cable	Panel Component	86557000	Power Cable Assembly	1
(W53) Cable	Panel Component	86557000	Power Cable Assembly	1
(W54-W57)	Fiber System Intl	MOTO-0079	Fiber Optic Cable	4
(W59) Cable	Az. Comp	AM6139	Cable Assembly	1
Connector	Fiber System Intl	BSTA2000	Bulkhd Coup	12
Power Supply	Ault	SW109MA0003F01	Modem Power Supply	1
Cable (In Pouch)	Kent Data Comm	742-110	Admin cable, Laptop to DF	1
Cable (In Pouch)	Az .Comp	MOTO-0024	Cable Assembly Fiber Optic	2
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	2
Cable	Redcom	CA9079-C12	Conv cable 15 pin Male to 9 pin Male	1
Cable	Redcom	CA9079-E12	Conv cable 15 pin Female to 4 ea. 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	SH9079-120	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 G2 (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
Protector Block	Motorola	01-P49369M001	Protector Block for Circuit Switch	1

6.2 Elevation Drawings

Figure 5 shows the front elevation of the BAM.

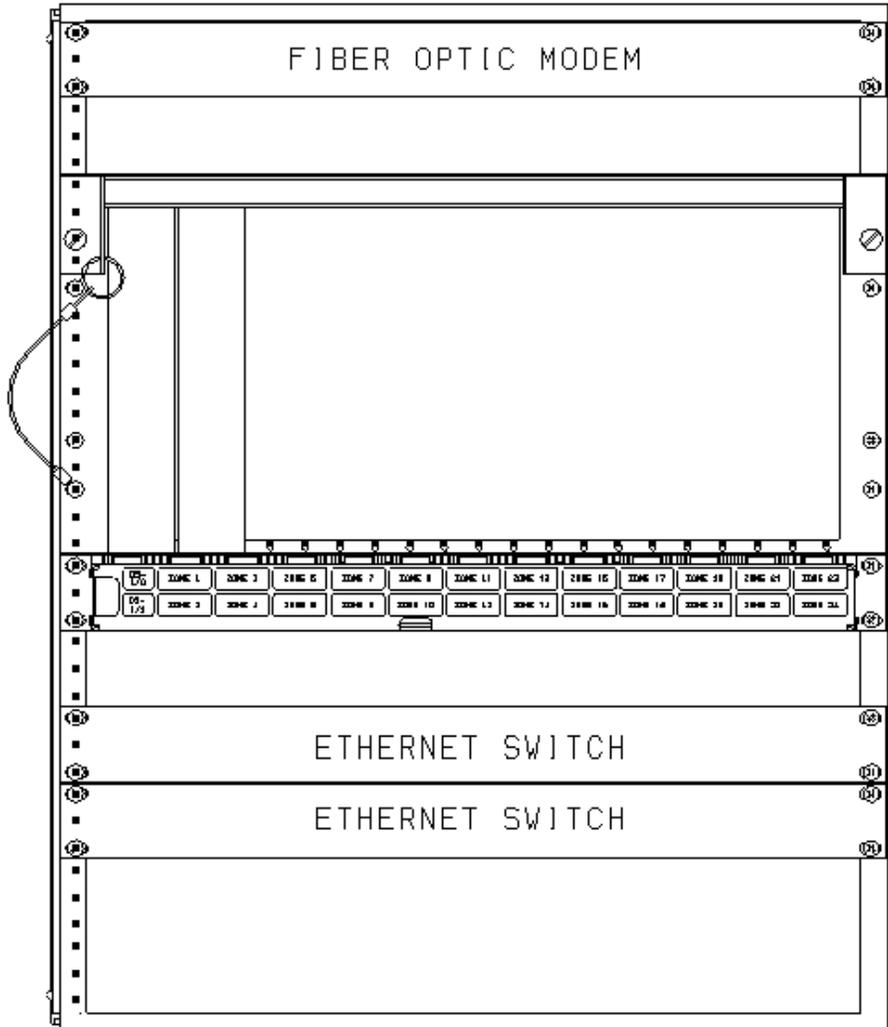


Figure 5 - Front Elevation

Figure 6 shows the rear elevation of the BAM.

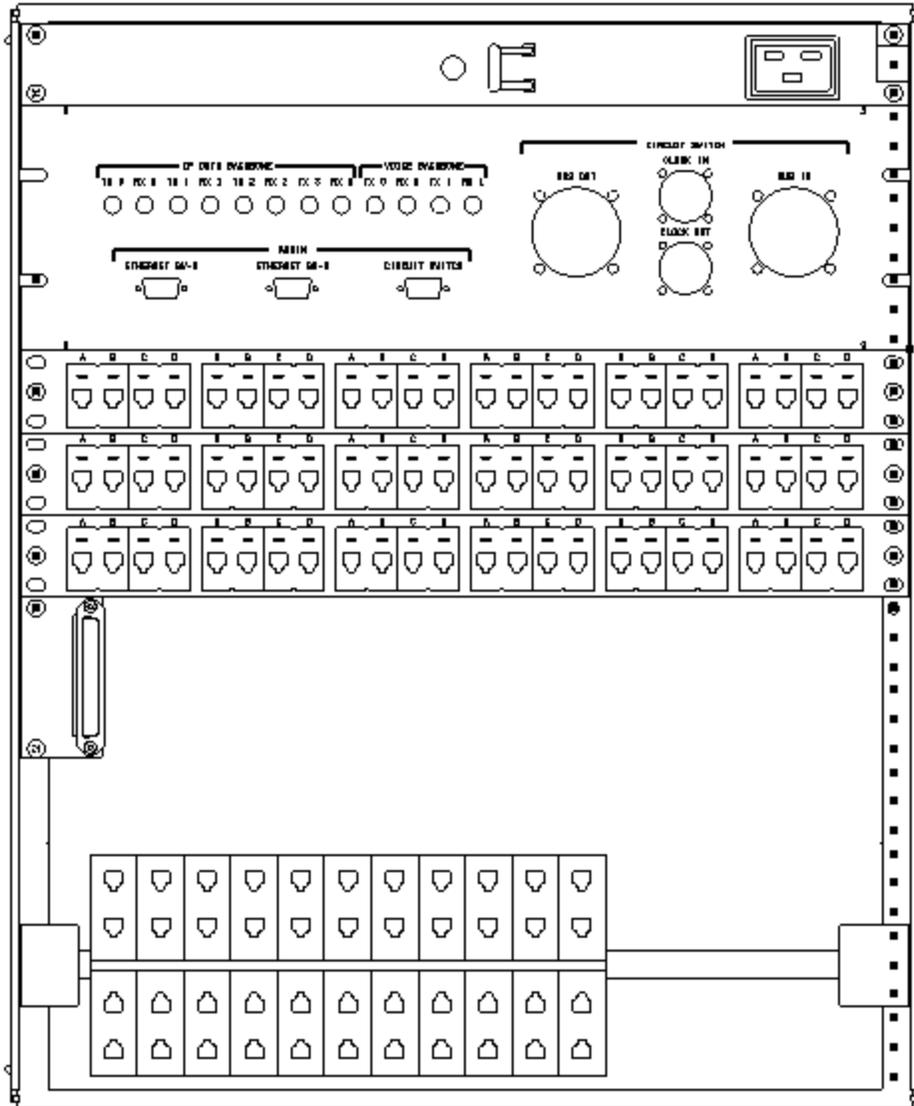


Figure 6 - Rear Elevation

6.3 Cable Diagrams

Table 14 - Cable Listing

Wire No.	Part Number	Manufacturer	Description
W1	93011060.0102061.2	Panel Components	Power Cable PS1 Transformer
W2	93011060.0103122.2	Panel Components	Power Cable A1 Switch
W3	AM6015	Az Components	Switch Admin Cable
W4	AM6263	Az Components	Remote Zone Cable
W5&W58	MOTO-0028	Fiber Systems Inc	T1 Voice Backbone
W6-W49	AM6060-6083&AM6271-6290	Az Components	10/100BASET CABLE
W50&W51	AM6100	Az Components	Ethernet Switch Admin Cable
W52	93011060.0103076.2	Panel Components	Power Cable Ethernet Switch-A4
W53	93011060.0103076.2	Panel Components	Power Cable Ethernet Switch-A5
W54-W57	MOTO-0079	Fiber Systems Inc	Ethernet Data Backbone
W59	AMXXXX	Az Components	Admin Modem Cable
	742-110	Kent Datacomm	Admin cable, Laptop to DF (stored in Pouch)
	MOTO-0024	Fiber Systems Inc	Inter-module fiber optic cable (stored in pouch)

Cable W1 (93011060.0102061.2)
 PS1 Transformer Power Cable
 Pin Assignments

IEC-320 Receptacle PS1 Transformer Power	IEC-320 Plug Power Conditioner- A5 Power
---	---

	Signal	Direction	
1	Line	-----	1
2	Neutral	-----	2
3	GND	-----	3

Cable W2 (93011060.0103122.2)
 Switch-A1 Power Cable
 Pin Assignments

IEC-320 Receptacle Switch-A2 (MSU0/1) Power	IEC-320 Plug Power Conditioner- A5 Power
--	---

	Signal	Direction	
1	Line	-----	1
2	Neutral	-----	2
3	GND	-----	3

Cable W3 (AM6015)
Switch Admin Cable
Pin Assignments

DB25 (MALE)	DB09F
Plug	Receptable
AMP 745496-2	AMP 745491-2
Switch MSU 0	I/O DF
Admin Port	I/O DF

	Signal	Direction	
20	DTR	→	1
			6
			7
			8
2	RxD	→	2
3	TxD	←	3
5	CTS	←	4
6	DSR		
8	DCD		
7	GND	----	5

Cable W4 (AM6263)
DB50 to Telco Conversion Cable
Pin Assignments

DB50 (Female)	Telco 50M
Receptacle	Plug
AMP 205211-2	AMP 229974-1 I/O DF
Protector Block	Zones 19-24

	Signal	Direction	
1	Ring	↔	1
26	Tip	↔	26
2	Ring	↔	2
27	Tip	↔	27
.	Ring	↔	.
.	Tip	↔	.
23	Ring	↔	23
48	Tip	↔	48
24	N/C		24
49	N/C		49

Cable W5&W58 (MOTO-0028)
Voice Backbone Fiber Optic Cable
Pin Assignments

SST	ST
Plug	Plug
Dual T1	I/O DF
FO Modem	I/O DF

	Signal	Direction	
1	Tx	→	1
2	Rx	←	2

Cable W6-W49 (AM6061-6083 and AM6271-6290)
10/100 BaseTX Cable
Pin Assignments

RJ45 (solid)	IEC-320
Plug	Plug
AMP 5-557315-3	AMP 5-557315-3
Ethernet 2924	Lighten Protection
10/100 Ethernet Port	Port

	Signal	Direction	
1	Tx(+)	→	1
2	Tx(-)	→	2
3	Rx(+)	←	3
4	N/C		4
5	N/C		5
6	Rx(-)	←	6
27	N/C		7
38	N/C		8

Cable W50-51 (AM6100)
Ethernet Switch A/B Admin Cable
Pin Assignments

RJ45 (solid) Plug AMP 5-557315-3 2924 Console Console Port	DB09F Receptacle AMP 745491-2 I/O DF I/O DF
--	---

	Signal	Direction	
1	RTS	→	8
2	DTR	→	6
3	TxD	→	2
4	GND		5
5	GND		5
6	RxD	←	3
7	DSR	←	4
8	CTS	←	7

Cable W52 (93011060.0103076.2)
Ethernet Switch – A4 Power Cable
Pin Assignments

IEC-320 Receptacle Ethernet Switch-A4 Power	IEC-320 Plug Power Conditioner-A5 Power
--	--

	Signal	Direction	
1	Line	-----	1
2	Neutral	-----	2
3	GND	-----	3

Cable W53 (93011060.0103076.2)
 Ethernet Switch – A5 Power Cable
 Pin Assignments

IEC-320 Receptacle Ethernet Switch-A5 Power	IEC-320 Plug Power Conditioner-A5 Power
--	--

	Signal	Direction	
1	Line	-----	1
2	Neutral	-----	2
3	GND	-----	3

Cable W54-W57 (MOTO-0079)
 Data Backbone Fiber Optic Cable
 Pin Assignments

SC Plug Ethernet Switch A/B 100BaseFx	ST Plug I/O DF I/O DF Tx/Rx 0
---	---

	Signal	Direction	
1	Tx	→	1
2	Rx	←	2

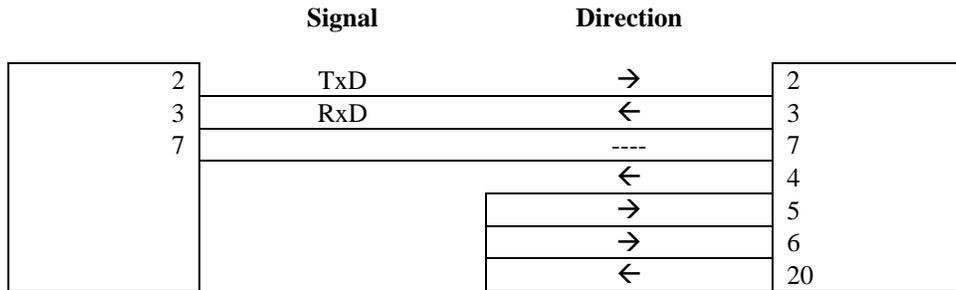
Fiber Ethernet Multimode Cable Spec

The fiber Ethernet interface operates at a wavelength of 1300 nanometers.
 Multimode fiber Ethernet cables should conform to the following:

- Standard: ISO/IEC 9314-3
- Maximum path length (all cables in a connection from end to end): 2 km
- Cabling: 62.5-micron core with an optical loss of 0 to 9 dB

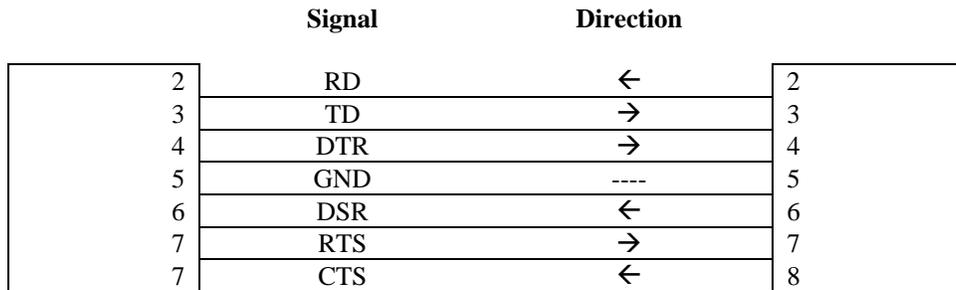
Cable W59 (AMXXXX)
Admin Modem Cable
Pin Assignments

DB25 (MALE)	DB25 (MALE)
Plug	Plug
AMP 745496-2	AMP 745496-2
Switch	Admin Modem (A6)
Admin Port	Console Port



Cable 742-110
Module Admin Cable (stored in pouch)
Pin Assignments

DB09M	DB09F
Receptacle	Plus
AMP 745491-2	AMP 745906-1
Laptop COM port	I/O DF
Terminal	Various Admin



Cable MOTO-0024
Fiber Optic Backbone Cable (stored in pouch)
Pin Assignments

ST
Plug

ST
Plug

Signal

Direction

1	Tx	→	1
2	Rx	←	2

6.4 Interconnection Diagrams

