CONTENTS

Paragraph		Page
1.	SCOPE	1
1.1	Scope	1
1.2	Classification	1
2.	APPLICABLE DOCUMENTS	1
2.1	Sources	3
	FAA Specifications	3
2.1.2	Federal and Military Specifications	3
2.1.3	CCITT Recommendations	3
2.1.4	EIA Standards	3
2.1.5	FCC Rules and Regulations	3
3.	Requirements	3
3.1	Equipment Characteristics	3
3.1.1	Operating Characteristics	3
3.1.1.1	General Characteristics for Types I, II and III Statistical Multiplexers	3
3.1.1.1.1	Protocol Compatibility	3
3.1.1.1.2	Performance Characteristics	3
3.1.1.1.2.1	Digital Interfaces	4
3.1.1.1.2.1.1	Interface Options	4
3.1.1.1.2.2	Input Channel Specifications	4
3.1.1.1.2.3	Composite Link Specifications	4
3.1.1.1.2.4	Other Specifications	4
3.1.1.1.2.5	Controls and Status Indicators	5
3.1.1.1.2.5.1	Controls	5
3.1.1.1.2.5.2	Status Indicators	5
3.1.1.2	Type I Statistical Multiplexers	5
3.1.1.2.1	Input Channel Specifications	5
3.1.1.2.2	Composite Link Specifications	5
3.1.1.3	Type II Statistical Multiplexers	5
3.1.1.3.1	Input Channel Specifications	5
3.1.1.3.2	Composite Link Specifications	6
3.1.1.4	Type III Statistical Multiplexers	6
3.1.1.4.1	Input Channel Specifications	6
3.1.1.4.2	Composite Link Specifications	6
3.1.1.4.3	Other Specifications	6
3.1.1.4.4	Controls and Status Indicators	6
3.1.1.4.4.1	Controls	6
3.1.1.4.4.2	Status Indicators	[illegible]
3.1.1.4.5	Optional Statistical Multiplexer Features	[illegible]
3.1.1.4.5.1	Monitor	7
3.1.1.4.5.2	Packet Switch Interface	[illegible]
3.1.1.4.5.3	Split Bandwidth	7
3.1.1.4.5.4	Switching and Control	7
3.1.1.4.5.5	Protocol Conversion	8
3.1.1.4.5.6	Diagnostics	8

Page

3.1.1.5 Ancillary Equipment 8
3.1.1.5.1 Cables 8
3.1.1.5.2 Racks 8

3.1.2 Physical Characteristics 8
3.1.2.1 Mounting 8
3.1.2.1.1 Rack Mounting 8
3.1.2.1.2 Free-standing 8
3.1.2.3 Power Supply 8
3.1.2.3.1 Free Standing Statistical Multiplexers 8
3.1.2.3.2 Rack-mounted Statistical Multiplexers 9
3.1.3 Reliability 9
3.1.4 Maintainability 9
3.1.4.1 Operational Availability 9
3.1.5 Environmental Conditions 9
3.1.5.1 Ambient Temperature 9
3.1.5.2 Altitude 9

3.2 Design and Construction 10
3.2.1 General 10
3.2.2 Finishes 10
3.2.3 Electromagnetic Interference and Susceptibility 10
3.2.4 Grounding 10
3.2.5 Interchangeability 10
3.2.6 Ventilation and Cooling Systems 10
3.2.7 Wire and Cable 10
3.3 Documentation 10
3.3.1 Instruction Books 10
3.4 Logistics 11
3.5 Training 11

4. QUALITY ASSURANCE PROVISIONS 11
4.1 General 11
4.1.1 Quality Control Program 11
4.1.2 Test Planning and Reporting 11
4.2 Special Verification Requirements 11
4.3 Verification Levels and Methods 11
4.3.1 Levels 11
4.3.2 Methods 11
4.4 Responsibilities for Verification 11

5. PREPARATION FOR DELIVERY 15

6. NOTES 16
6.1 Applicable Definitions 16
6.2 Abbreviations and Acronyms 18

TABLE

4.1 Verification Requirements Traceability Matrix 13

1. SCOPE

1.1 Scope. - This specification establishes the performance, design, test, manufacture and acceptance requirements for statistical multiplexers and ancillary equipment to be used for the Data Multiplexing Network (DMN) subsystem in the National Airspace System (NAS). All statistical multiplexers and ancillary equipment shall be commercial off-the-shelf equipment. Production units shall be commercially available and be installed and fully operational in a system prior to operational capability demonstration,

1.2 Classification. - The specification details three (3) distinct types of statistical multiplexers as follows:

Type I,	Low capacity statistical multiplexers
Type II,	Medium capacity statistical multiplexer
Type III,	High capacity statistical multiplexer with network mapping, automatic rerouting and supervisory control

2. Applicable Documents. The following is a list of documents pertaining to standards, specifications orders, criteria, and guidelines referenced in this specification. Unless otherwise specified, the latest issue or revision level of each document shall be applicable,

SPECIFICATIONS:

FAA

FAA-D-2494	Technical Instruction Book Manuscript: Electronic, Electrical, and Mechanical Equipment, Requirements for Preparation of Manuscript and Production of Books
FAA-E-163	Rack, Cabinet and Open Frame Types
FAA-G-2100	Electronic Equipment, General Requirements

STANDARDS:

FAA

FAA-STD-020	Transient Protection, Grounding, Bonding, and Shielding Requirements for Equipment
FAA-STD-024	Preparation of Test and Evaluation Documentation

MILITARY

DOD-STD-100	Engineering Drawing Practices
MIL-STD-461	Electromagnetic Emission and Susceptibility Requirements for the Control of Electromagnetic Interference

OTHER PUBLICATIONS:

Federal Communications Commission (FCC)

Rules & Regulations, Part 15, Subpart J

Electronic Industries Association (EIA)

EIA-530	General Purpose 25-position Interface Between Data Terminal Equipment and Data Circuit Terminating Equipment
RS-232C or D	Interface between Data Terminal Equipment and Data Communication Equipment Employing Serial Binary Data Interchange

Consultative Committee on International Telegraph and Telephone (CCITT) Recommendations

V.41	Code-Independent Error-Control System
X.25	Interface Between Data Terminal Equipment (DTE) and Data Circuit-Terminating Equipment (DCE) for Terminals Operating in the Packet Mode on Public Data Networks (PDN)

2.1 Document sources

2.1.1 FAA specifications. - Copies of this specification and other applicable FAA specifications and standards may be obtained from the Contracting Officer in the office issuing the invitation for bids or request for proposals, Requests should fully identify material desired,, i.e., specification, standard, and order numbers and dates, Requests should cite the invitation for bids, request for proposals, or the contract involved or other use to be made of the requested material.

2.1.2 Federal and military specifications, - Single copies of applicable Federal and Military specifications and standards may be obtained from the Naval Publications and Forms Center (NPFC), Philadelphia, Documents may be ordered by writing Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia Pennsylvania 19120, or calling (215) 697-3321, Monday through' Friday, from 8:00 a.m. to 4:30 p.m.

2.1.3 CCITT recommendations. - For ordering copies of CCITT standards in the U.S., contact: United States Department of Commerce, National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161.

2.1.4 EIA standards. - Information for ordering copies of the EIA standards may be obtained from the Electronic Industries Association, Engineering Department, 2001 I Street, N.W., Washington, D.C. 20006.

2.1.5 FCC Rules and Regulations. Copies of FCC Rules and Regulations may be obtained from U.S. Government Printing Office, Washington, D.C. 20402.

3. REQUIREMENTS

3.1. Equipment characteristics. - Equipment characteristics shall be set forth in the following paragraphs. The characteristics are (1) operating, (2) physical, (3) reliability, (4) maintainability, and (5) environmental conditions,

3.1.1. Operating characteristics.

3.1.1.1 General characteristics for types I, II and III statistical multiplexers.

3.1.1.1.1. Protocol compatibility. - The statistical multiplexers shall be compatible with existing Paradyne DCX series statistical multiplexers (DCX 815/2030, 825, 840, 850) at the link level and with the USO-20 module.

3.1.1.1.2. Performance characteristics. - All statistical multiplexers (Types I-III) shall operate in a fullduplex mode of transmission and shall be in accordance with the following requirements, A statistical multiplexer, as defined herein, shall denote a device which accepts asynchronous and/or synchronous information from multiple digital input ports and converts them into one or more digital synchronous composite links,

3.1.1.1.2.1. Digital interfaces. - The digital ports for low speed and composite channels of all statistical multiplexers (Types I, II and III) shall be in accordance with RS-232C or D.

3.1.1.1.2.1.1. Interface options. - Interfaces shall be convertible between RS-232C or D and EIA-530 electrical characteristics and pin configurations, Conversion may be implemented internally or externally. For internal conversion, an FAA technician shall be able to complete the conversion at the FAA location in 1 hour or less,

3.1.1.1.2.2. Input channel specifications

(a) Port Format: Asynchronous (character oriented) and/or synchronous

(b) Data rates: Includes data rates of 50 and 75×2^n bps, where n is an integer from 0 to 8.

(c) Character format: 5, 7 or 8 data bits; 1, 1.5 or 2 stop bits format where applicable

(d) Parity: Odd, even, none.

3.1.1.1.2.3. Composite link specifications

(a) Format: synchronous

(b) Error detection and retransmission: Automatic repeat request (ARQ) using cyclic redundancy check per CCITT Recommendation V.41

(c) Protocol: The link level protocol of the statistical multiplexers shall be transparent to the data.

3.1.1.1.2.4. Other specifications

(a) Terminal flow control: Selectable in-band (X-on/X-off or ACK/NAK) or out-of-band (DTR) required

(b) Flyback buffering to allow for printer carriage delay

(c) Split transmit/receive data rate capability

(a) Multiplexing type: Statistical time division character interleaved

(e) Buffer overflow protection: Inhibit data input by in-band (X-on/X-off or ACK/NAK) or out-of-band flow control

(f) Dynamic buffer allocation

(g) Compatibility with other statistical multiplexer types specified herein.

(h) T-pause option to support operation of Tandem equipment.

3.1.1.2.5. Controls and status indicators .

3.1.1.2.5.1. Controls.- All statistical multiplexers shall have the following control switches or their equivalents:

(a) Low speed channel local and remote loopback control

(b) Composite link loopback control

3.1.1.2.5.2. Status indicators - All statistical multiplexers shall have the following control switches or their equivalents:

(a) Buffer overflow indicator

(b) Composite link error monitor

(c) Normal operation indicator

(d) Data loss indicator

3.1.1.2. Type I statistical multiplexers.- In addition to the requirements of 3.1.1.1, Type I statistical multiplexers shall conform to the following requirements.

3.1.1.2.1. Input channel specifications.-

(a) Channel capacity: minimum of 4 channels, maximum of 8 channels

(b) Total buffer capacity: minimum capability of 2048 (2K) bytes

3.1.1.2.2. Composite link specifications.-

(a) Minimum number of Composite links: 1
(b) Link speed: Up to 19.2 Kbps

3.1.1.3. Type II statistical multiplexers.- In addition to the requirements of 3.1.1.1, Type II statistical multiplexers shall conform to the following requirements.

3.1.1.3.1. Input channel specifications:

(a) Channel capacity: minimum of 8 channels, maximum of 32 channels

(b) Onward link capability: Type II statistical multiplexers shall combine multiple synchronous composite links from remote Type I statistical multiplexers with local asynchronous inputs into one composite output. Type II statistical multiplexers shall have the capability to accept 3 onward links from Type I statistical multiplexers.

(c) Total buffer capacity: Minimum capability of 16,384 (16K) bytes

3.1.1.3.2. Composite link specifications:

(a) Minimum number of Composite links: 1
(b) Link speed: Up to 19.2 Kbps

3.1.1.4. Type III statistical multiplexers.- In addition to the requirements of 3.1.1.1, Type III statistical multiplexers shall conform to the following requirements:

3.1.1.4.1. Input channel specifications:

(a) Input channel capacity: Minimum of 240 channels

(b) Total buffer capacity: 16K to 256K bytes

(c) Channel mapping capability: Shall map any asynchronous channel from a composite link or local input channel to any other composite link or local input channels of the multiplexer.

3.1.1.4.2. Composite link specifications:

(a) Composite links: Configurable from 1 to 14 links
(b) Link speed: Up to 56/64 Kbps

3.1.1.4.3. Other specifications:

(a) Type III statistical multiplexers shall provide reconfiguration capability with built-in storage of primary and alternate multiplexer configuration.

(b) Type III statistical multiplexers shall provide remote reconfiguration capability to allow remapping of another Type III statistical multiplexer anywhere in the network.

3.1.1.4.4. Controls and status indicators

3.1.1.4.4.1. Controls.- Type III statistical multiplexers shall provide the following control switches or their equivalents:

(a) Mode Switch: Allow reconfiguration from a remote or local location

(b) Low speed channel loopback control for selected channels

(c) Network map control switches including:

(1) Network configuration data entry
(2) Network configuration editing

3.1.1.4.4.2. Status indicators.- Type III statistical multiplexers shall provide the following status indicators or their equivalents:

(a) Individual Port RS-232C or D or EIA-530 (when available) status indicator for selected channels
(b) Buffer utilization indicator
(c) Port utilization indicator
(d) Composite and local loopback indicators for selected channels.

3.1.1.4.5. Optional statistical multiplexer features.- The features described in the following paragraphs shall be available for incorporation in Type III statistical multiplexers.

3.1.1.4.5.1. Monitor.- This option shall enable statistical multiplexer operators to passively monitor the data, control codes or both for any channel in the network.

3.1.1.4.5.2. Packet switch interface - This option shall enable the Type III statistical multiplexer to interface with an X.25 packet switching network. It shall allow multiples of data communications exchange (DCX) low speed channels to be allocated to the packet switching network. This option shall not interfere with normal network operation.

3.1.1.4.5.3. Split bandwidth. This option shall provide the Type III statistical multiplexers with a bandwidth splitting capability to allow for synchronous operation. A synchronous channel will be allocated certain bandwidth capacity and the remaining asynchronous channels use dynamic bandwidth allocation. Synchronous speeds supported shall be 2400, 4800, 7200, and 9600 bps.

3.1.1.4.5.4. Switching and control. - Type III multiplexers shall provide intelligent switching and control options to provide the following capabilities:

(1) Port Contention
(2) Automatic Rerouting
(3) Load Balancing
(4) Network Wide Supervisory Control
(5) Logging of connection events and channel usage statistics
(6) Prioritization and restriction of selected users
(7) User control of switching on a selectable basis
(8) Call queuing if destination busy

3.1.1.4.5.5. Protocol conversion.- This option shall enable the Type III statistical multiplexers to communicate with IBM Bisync channels. This option shall also enable the multiplexers to provide appropriate polling responses to the Bisync IBM host.

3.1.1.4.5.6. Diagnostics.- This option shall provide the Type III statistical multiplexers with diagnostic capabilities including test data generation and loopback of low speed and composite channels.

3.1.1.5. Ancillary Equipment.

3.1.1.5.1. Cables. - Any cables needed for proper implementation and operation of equipment described in this specification shall be supplied by the contractor. Straight-through cables shall be available in 5, 10, 25, and 50 foot lengths. Cross-over cables shall be available in 5 foot lengths.

3.1.1.5.2. Racks. - Racks shall be provided for mounting statistical multiplexers as described in this specification. The racks shall be of the Type III cabinet rack style as specified in FAA-E-1663.

3.1.2. Physical characteristics

3.1.2.1. Mounting.- The mounting configuration of the statistical multiplexers (Types I, II, and III) shall include rack mounted and free-standing.

3.1.2.1.1. Rack mounting. - Rack mounted statistical multiplexers shall be installed in enclosures that are mountable in the racks, and all controls and indicators shall be mounted on the front panels. Statistical multiplexers in their enclosures shall be independently mounted in the rack so that any multiplexer in the rack may be removed and replaced without interrupting the operation of any other modem or multiplexer in the rack.

3.1.2.1.2. Free-standing. - Free-standing statistical multiplexers shall be installed in a, free-standing enclosure with protective feet, and all controls and indicators shall be mounted on the front panels.

3.1.2.2.3. Power supply - All power supplies shall be designed for operation from a single-phase 60 Hz grounded three-wire AC source at 120 volts in accordance with FAA-G-2100, section 3.3.2.3. A single AC supply cord will be used for each rack mounted or free-standing equipment. Voltage and frequency tolerance and variation shall be in accordance with FAA-G-2100. Filtering and regulation shall be provided for less than 10% variation in power supply outputs over the range of service conditions specified in Paragraph 3.1.5. of this specification.

3.1.2.3.1. Free standing statistical multiplexers. - Free-standing statistical multiplexers described in this specification shall employ an individual power supply.

3.1.2.3.2. Rack-mounted statistical multiplexers. - Rack mounted statistical multiplexers may employ either individual power supplies or a common power supply.. Common power supplies shall consist of a main and a standby supply connected in parallel and separated by isolation circuitry. Both the main and the standby power supplies shall independently satisfy the power requirements of the rack in which they-are contained. All power supplies in a rack shall be independently mounted in the rack so that any power supply may be removed and replaced without interrupting the operation of the equipment contained in the rack. All power supplies in a rack shall have individual AC power circuit terminals appearing at the rack terminal strip. When a single power supply is provided with the equipment, it shall be contained within the equipment enclosure. Each rack shall be equipped with a dual 120 VAC utility outlet at the bottom rear and front of the rack. Power to these outlets shall be separate from the equipment power in the rack and fed from a separate branch circuit.

3.1.3. Reliability.- All equipment described in' this specification shall'meet the following reliability requirements:

(1) The mean time between critical failures (MTBCF) for all specified equipment shall each be no less than 20,000 hours under continuous operation.

3.1.4. Maintainability - All equipment described in this specification shall meet the following maintainability requirements:

(1) The mean time to repair (MTTR) shall be no more than 30 minutes for all equipment.

3.1.4.1. Operational 'availability. Operational availability of the STDMs shall be .999876.

3.1.5. Environmental conditions.- All equipment shall meet the specified performance requirements in the natural and induced environments described below. Equipment shall be designed and constructed to meet the service condition requirements of FAA-G-2100 for storage and exposure in both operating and non-operating configuration except as specified herein.

3.1.5.1. Ambient temperature. - Equipment to be installed inside fixed facilities shall be designed and constructed to operate within specified performance at indoor operating ambient temperature up to 50 degrees C (Celsius) and down to 0 degrees C.

3.1.5.2. Altitude. - All equipment shall be designed and constructed for non-operation storage and exposure to altitudes up to 36,000 feet mean sea level (MSL) and for operation in altitudes up to 15,000 feet MSL without pressurization.

3.2. Design and construction

3.2.1. General.- All equipment must be commercial off-tile-shelf equipment. Production units must be commercially available and be installed and fully operational in a system prior to Operational Capability Demonstration.

3.2.2. Finishes - Surface finish shall be in accordance with the vendors' standard commercial practices and colors.

3.2.3. Electromagnetic interference and susceptibility - The equipment shall be designed and constructed to comply with the interference and susceptibility requirements of MIL-STD-461 parts 1 and 4 and comply with FCC Rules and Regulations, Part 15, Subpart J.

3.2.4. Grounding. - All equipment shall be grounded and protected from electrical noise and transients according to the requirements of FAA-STD-020. Signal and shield grounding 'for all RS types of interfaces shall be installed in accordance with RS-232C or D.

3.2.5. Interchangeability - Power supplies, statistical multiplexers, and modules of the same type and manufacturer provided under this contract shall be interchangeable and interoperable.

3.2.6. Ventilation and cooling systems.- No forced air cooling systems shall be required for equipment described in this specification.

3.2.7. Wire and cable.- All equipment wiring and cables shall be in accordance with FAA-G-2100.

3.3. Documentation.

3.3.1. Instruction Books. - Instruction books for each type of equipment described in this specification shall be provided in hard copy. All documentation shall meet the requirements of Appendix 1 of FAA-D-2494 and contain the following sections. All text shall also be provided on 5¼" MS DOS compatible disk media.

(a) General Information

(b) Operation

(c) Technical Description

(d) Standards and Tolerances

(e) Periodic Maintenance

(f) Maintenance Procedures

(g) Corrective Maintenance

(h) Parts List

(i) Installation, Integration, and Checkout

(j) Computer Software

(k) Troubleshooting support data to include but not be limited to the following: (1) Complete schematic diagrams for each item in accordance with DOD-STD-100, (2) schematic diagrams shall be accompanied by a circuit description. The circuit description shall be a complete narrative description of the functions and operations of the circuit(s) depicted on the schematic diagram and (3) specific part drawings of parts in the specification.

Current commercial documentation may be utilized if approved by the Government.

4. QUALITY ASSURANCE PROVISIONS

4.1 General. - Quality assurance shall be achieved by ensuring that all requirements in section 3 of this specification have been verified. All requirements will be verified as early as possible in the procurement process in order to minimize any remedial action. Verification activities shall be in accordance with Table 4.1, Verification Requirements Traceability Matrix (VRTM).

Verification levels and methods that shall be considered for all engineering requirements documents are listed in 4.3. Those that have been selected for this specification in Table 4.1 shall be considered minimal to verify the respective requirement. Definitions of verification levels and methodologies are found in 6.2.

4.1.1 Quality control program. - A quality control program shall be developed and maintained in accordance with the contract.

4.1.2 Test planning and reporting. - All aspects of the Data Multiplexing Subsystem testing shall be documented. Test documentation shall include test descriptions, test procedures, and test reports to be utilized for item and network-level testing. All test plans and test procedures shall be in accordance with FAA-STD-024.

4.2 Special verification requirements. - There are no special verification requirements imposed by this specification.

4.3 verification levels and methods.

4.3.1 Levels. - Each requirement shall be verified at one or more of the following levels, as needed:

(a) Subsystem level (as defined in 6.1.10.1)

(b) Integration level (as defined in 6.1.10.2)

(c) Site level (as defined in 6.1.10.3)

4.3.2 Methods. - Each requirement shall be verified using the method selected from the following, as appropriate:

(a) Test (T) (as defined in 6.1.11.1)

(b) Demonstration (D) (as defined in 6.1.11.2)

(c) Inspection (I) (as defined in 6.1.11.3)

(d) Analysis (A) (as defined in 6.1.11.4)

4.4 Responsibility for verification. - FAA Project Management has the responsibility of developing and implementing the verification of the requirements. FAA Project Management may delegate verification activities to other FAA organizations, independent contractors, and/or the prime contractor.

TABLE 6.1 VERIFICATION REQUIREMENTS TRACEABILITY MATRIX

SECTION 3 PARA. NO	REQUIREMENTS PARAGRAPH REFERENCE FOR DOCUMENT FAA-E-2786 TITLE	VERIFICATION LEVEL AND METHOD SUBSYS LEVEL	INTEG LEVEL	SITE LEVEL	REMARKS
3.1.1.4.5.5	PROTOCOL CONVERSION	T	D	I	
3.1.1.4.5.6	DIAGNOSTICS	T	D	D	
3.1.1.5	ANCILLARY EQUIPMENT				TITLE
3.1.1.5.1	CABLES	T	I	I	
3.1.1.5.2	RACKS	X	I	I	
3.1.2	PHYSICAL CHARACTERISTICS				TITLE
3.1.2.1	RACK MOUNTING	D	D	I	
3.1.2.2	ENCLOSURES	D	I	I	
3.1.2.3	POWER SUPPLY	T	T	I	
3.1.2.3.1	FREE STANDING STATISTICAL MULTIPLEXERS	T	T	I	
3.1.2.3.2	RACK-MOUNTED STATISTICAL MULTIPLEXERS	T	T	I	
3.1.3	RELIABILITY	T	D	X	
3.1.4	MAINTAINABILITY	D	D	X	
3.1.4.1	OPERATIONAL AVAILABILITY	D	D	X	
3.1.5	ENVIRONMENTAL CONDITIONS	T	D	X	
3.1.5.1	AMBIENT TEMPERATURE	T	D	X	
3.1.5.2	ALTITUDE	T	D	X	
3.2	DESIGN AND CONSTRUCTION				TITLE
3.2.1	GENERAL	A	A	A	
3.2.2	FINISHES	I	I	X	
3.2.3	ELECTROMAGNETIC INTERFERENCE AND SUSCEPTIBILITY	T	D	X	
3.2.4	GROUNDING	T	D	I	
3.2.5	INTERCHANGEABILITY	D	D	X	
3.2.6	VENTILATION AND COOLING	D	D	X	
3.2.7	WIRE AND CABLE	D	I	I	
3.3	DOCUMENTATION	A	I	I	

VERIFICATION METHODS: T=TEST, D=DEMONSTRATION, A=ANALYSIS, I=INSPECTION, L=VERIFIED BY LOWER LAYER RQMT, X=NOT APPLICABLE

TABLE 4.1 VERIFICATION REQUIREMENTS TRACEABILITY MATRIX

SECTION 3	REQUIREMENTS PARAGRAPH REFERENCE FOR DOCUMENT FAA-E-2786	VERIFICATION LEVEL AND METHOD			
PARA. NO	TITLE	SUBSYS LEVEL	INTEG LEVEL	SITE LEVEL	REMARKS
1.	SCOPE	X	X	X	
2.	APPLICABLE DOCUMENTS	X	X	X	
3.	REQUIREMENTS				TITLE
3.1	EQUIPMENT CHARACTERISTICS				TITLE
3.1.1	OPERATING CHARACTERISTICS				TITLE
3.1.1.1	GENERAL CHARACTERISTICS FOR TYPES I, II AND III STATISTICAL MULTIPLEXERS				TITLE
3.1.1.1.1	PROTOCOL COMPATIBILITY	T	T	D	
3.1.1.1.2	PERFORMANCE CHARACTERISTICS	T	T	D	
3.1.1.1.2.1	DIGITAL INTERFACES	T	D	I	
3.1.1.1.2.1.1	INTERFACE OPTIONS	A	D	D	
3.1.1.1.2.2	INPUT CHANNEL SPECIFICATIONS	T	T	X	
3.1.1.1.2.3	COMPOSITE LINK SPECIFICATIONS	T	T	X	
3.1.1.1.2.4	OTHER SPECIFICATIONS	T	D	X	
3.1.1.1.2.5	CONTROLS AND STATUS INDICATORS				TITLE
3.1.1.1.2.5.1	CONTROLS	T	D	X	
3.1.1.1.2.5.2	STATUS INDICATORS	T	D	X	
3.1.1.2	TYPE I STATISTICAL MULTIPLEXERS	L	L	X	
3.1.1.2.1	INPUT CHANNEL SPECIFICATIONS	T	D	X	
3.1.1.2.2	COMPOSITE LINK SPECIFICATIONS	T	D	X	
3.1.1.3	TYPE II STATISTICAL MULTIPLEXERS	L	L	X	
3.1.1.3.1	INPUT CHANNEL SPECIFICATIONS	T	D	X	
3.1.1.3.2	COMPOSITE LINK SPECIFICATIONS	T	D	X	
3.1.1.4	TYPE III STATISTICAL MULTIPLEXERS	L	L	X	
3.1.1.4.1	INPUT CHANNEL SPECIFICATIONS	T	D	X	
3.1.1.4.2	COMPOSITE LINK SPECIFICATIONS	T	D	X	
3.1.1.4.3	OTHER SPECIFICATIONS	T	D	D	
3.1.1.4.4	CONTROLS AND STATUS INDICATORS				TITLE
3.1.1.4.4.1	CONTROLS	T	D	D	
3.1.1.4.4.2	STATUS INDICATORS	T	D	D	
3.1.1.4.5	OPTIONAL STATISTICAL MULTIPLEXER FEATURES				TITLE
3.1.1.4.5.1	MONITOR	T	D	I	
3.1.1.4.5.2	PACKET SWITCH INTERFACE	T	D	I	
3.1.1.4.5.3	SPLIT BANDWIDTH	T	T	I	
3.1.1.4.5.4	SWITCHING MODE CONTROL	T	T	I	

VERIFICATION METHODS: T=TEST, D=DEMONSTRATION, A=ANALYSIS, I=INSPECTION, L=VERIFIED BY LOWER LAYER RQMT., X=NOT APPLICABLE

5. PREPARATION FOR DELIVERY

Shipment and inventory of all material and equipment required, including spare parts for the installation tit each site shall be the responsibility of the contractor.

6.

6.1 Applicable definitions

6.1.1 Channel. The term channel as used herein denotes the communication path, which consists of the transmission media and intervening equipment involved in. the transfer of digital data between data terminal equipment (DTE). A channel may include modems, multiplexers, and concentrators.

6.1.2 Enclosure. The term enclosure as used herein denotes a boxlike structure that contains all components of a device.

6.1.3 Module. The term module as used herein denotes a compact, plug-in assembly that performs a unique function in a device.

6.1.4 Repair. The term repair as used herein denotes removal and replacement of a defective module.

6.1.5 Port. - The term port as used herein denotes an interface where digital signals enter or leave a device.

6.1.6 Free standing enclosure. - A package which surrounds a device and can rest on its own support.

6.1.7 Mean Time Between Critical Failures (MTBCF). Statistical mean time between failures in an item of equipment which cause loss of service by that equipment.

6.1.8 Mean Time to Repair (MTTR). A basic measure of maintainability: the total time required to diagnose the problem. replace the LRU and subsequently check out the system divided by the number of times such maintenance actions were required.

6.1.9 Verification Requirements Traceability Matrix Definitions of Levels. The three verification levels used are as described in the following paragraphs.

6.1.9.1 Subsystem level. - This level of verification is usually accomplished at the contractors facility where functional and/or performance requirements for a subsystem of configuration item are evaluated. Use of simulators for preliminary evaluationof subsystem operability or interoperability, in preparation for complete integrated testing is common.

6.1.9.2 Integration level. - This level of verification is usually conducted at the FAATC or a key site. It will determine if the subsystem or configuration item to be deployed for site installation will operate in accordance with NAS system level functional, performance and pertinent operational requirements when it is configured or integrated in it's operational environment.

6.1.9.3 Site level. - This level of verification is conducted at the designated site(s). The Installation and Checkout process, as well as all other commissioning activities of a system, will provide for the final acceptance of a subsystem or configuration item. System level requirements addressing the entire NAS or potentially affected by local site conditions are included.

6.1.10 Verification Requirements Traceability Matrix Definitions of Methods. The four verification methods used are as described in the following paragraphs.

6.1.10.1 Test. Test is a method of verifying performance requirements of subsystem/system or configuration items by quantitative measurements of controlled functional or environmental stimuli. These dynamic measurements are made using standardized laboratory equipment, procedures or other services, then analyzed to determine their compliance.

6.1.10.2 Demonstration. Demonstration is a method of verifying subsystem/system or configuration item requirements by observing their functional response to dynamic exercising. This qualitative evaluation is made using criteria from technical procedures, excluding measurements. Acceptance is based on pass/fail results.

6.1.10.3 Inspection. - Inspection is a method of verifying acceptability of hardware, software or technical documentation by determining it's compliance to requirements by visual examination of it's condition or content. The criteria for examination is obtained from standards, schematics or affidavits consisting of static-state measurements, inventories or conformance features. The success criteria is pass/fail.

6.1.10.4 Analysis. - Analysis is a method of verifying requirements for hardware or software design by comparing it mathematically (modeling) or otherwise with known scientific and technical principles, procedures and practices. Results of the comparison are used to estimate the capability of the proposed design to meet the system and mission requirements. Justification for analysis is inaccessibility for testing and for determining probabilities or percentiles.

6.2 ABBREVIATIONS AND ACRONYMS

A	Analysis
AC	Alternating Current
ACK	Acknowledge
ARQ	Automated Repeat Request
BPS	Bits Per Second
C	Celsius
CCITT	Consultative Committee on International Telegraphy and Telephony
CTS	Clear to Send
D	Demonstration
DCE	Data Circuit-Terminating Equipment
DCX	Data Communications Exchange
DMN	Data Multiplexing Network
DOD	Department Of Defense
DTE	Data Terminal Equipment
DTR	Data Terminal Ready
EIA	Electronic Industries Association
FAA	Federal Aviation Administration
FAATC	FAA Technical Center
FCC	Federal Communications Commission
FED	Federal
Hz	Hertz
I	Inspection
Kbps	Kilobits per second
MIL	Military
MSL	Mean Sea Level
MTBCF	Mean Time Between Critical Failures
MTTR	Mean Time to Repair
NAM	Negative Acknowledge Character/Not Acknowledge
NAS	National Airspace System
NPFC	Naval Publications and Form Center
PDN	Public Data Network
STD	Standard
STDM	Statistical Time Division Multiplexer
T	Test
V	Volts
VRTM	Verification Requirements Traceability Matrix

FAA-E-2860

U.S. Department of Transportation

Federal Aviation Administration

Specification

DATA MULTIPLEXER NETWORK

STATISTICAL MULTIPLEXERS