

ORIGINATION FORM

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(The person who receives or originates the issue and needs to forward the issue for action.)

Specification: SECTION 784
Subject: Update of references and functional requirements.

Origination date: November 10, 2010
Originator: Gene Glotzbach
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Problem statement: There are a number of minor updates required to content in 784 in order to clarify statements, update references, and align requirements with current technology.

Proposed solution: This modification is being submitted to clarify, update, and/or improve content based upon project use. These include updates to MFES functional requirements, clarification of Device Server optical connector requirements, update Ethernet cable termination standard.

Information source: Traffic Engineering and Operations Office

Recommended Usage Note:

Estimated fiscal impact, if implemented: None

Implementation of these changes, if and when approved, will begin with the July 2011 letting.

For State Specifications Office Use Only

Begin date:
File Number:
Scheduled completion date:
Implementation date:
Implementation team member:
Usage Note:

Notes:



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M E M O R A N D U M

DATE: December 1, 2010

TO: Specification Review Distribution List

FROM: Rudy Powell, Jr., P.E., State Specifications Engineer

SUBJECT: Proposed Specification: 7840102 Intelligent Transportation Systems – Network Devices

In accordance with Specification Development Procedures, we are sending you a copy of a proposed specification change.

The changes are proposed by Gene Glotzbach to clarify, update, and/or improve content based upon project use. These include updates to MFES functional requirements, clarification of Device Server optical connector requirements, update Ethernet cable termination standard.

Please share this proposal with others within your responsibility. Review comments are due within four weeks and should be sent to Mail Station 75 or to my attention via e-mail at SP965RP or rudy.powell@dot.state.fl.us. Comments received after **December 29 2010** may not be considered. Your input is encouraged.

RP/ft
Attachment

INTELLIGENT TRANSPORTATION SYSTEMS–NETWORK DEVICES.

(REV ~~11-120-10~~) (~~FA 1-27-10~~) (~~7-10~~)

SUBARTICLE 784-1.2.1 (of the Supplemental Specifications) is deleted and the following substituted:

784-1.2 Materials:

784-1.2.1 General: Ensure that the ITS network administrator will be able to manage each MFES individually ~~or and~~ as a group/~~cluster~~ for switch configuration, performance monitoring, and troubleshooting. ~~These specifications require additional minimum management intelligence (i.e., Layer 2+) typical of most current industrial Ethernet deployments.~~ Ensure that the MFES includes Layer 2+ capabilities, ~~including providing architecture standardization, open connectivity (i.e., interoperability), bandwidth management, QoS, IGMP,~~ rate limiting, security filtering, and general ~~integration management of an advanced Ethernet switching architecture.~~

Ensure that the furnished MFES is fully compatible and interoperable with the ITS trunk Ethernet network interface, and that the MFES supports half and full duplex Ethernet communications.

Furnish an MFES that provides 99.999% error-free operation, and that complies with the Electronic Industries Alliance (EIA) Ethernet data communication requirements using single-mode fiber optic transmission medium and Category 5E copper transmission medium. Provide a switched Ethernet connection for each remote ITS field device.

Ensure that the MFES has a minimum mean time between failures (MTBF) of 10 years, or 87,600 hours, as calculated using the Bellcore/Telcordia SR-332 standard for reliability prediction.

784-1.2.2 Networking Standards: Ensure that the MFES complies with all applicable IEEE networking standards for Ethernet communications, including but not limited to:

1. IEEE 802.1D standard for media access control (MAC) bridges used with the Spanning Tree Protocol (STP).
2. IEEE 802.1Q standard for port-based virtual local area networks (VLANs).
3. IEEE 802.1P standard for Quality of Service (QoS).
4. IEEE 802.1w standard for MAC bridges used with the Rapid Spanning Tree Protocol (RSTP).
- ~~5. IEEE 802.1s standard for MAC bridges used with the Multiple Spanning Tree Protocol.~~
65. IEEE 802.3 standard for local area network (LAN) and metropolitan area network (MAN) access and physical layer specifications.
76. IEEE 802.3u supplement standard regarding 100 Base TX/100 Base FX.
87. IEEE 802.3x standard regarding flow control with full duplex operation.

784-1.2.3 Optical Ports: Ensure that all fiber optic link ports operate at 1,310 or 1,550 nanometers in single mode. Verify that the optical ports are Type ST, SC, LC, or FC only, as specified in the plans or by the Engineer. Do not use mechanical transfer registered jack (MTRJ) type connectors.

Provide an MFES having a minimum of two optical 100 Base FX ports capable of transmitting data at 100 megabits per second. Each optical port shall consist of a pair of fibers; one fiber will transmit (TX) data and one fiber will receive (RX) data. The optical ports shall have an optical power budget of at least 15 dB.

784-1.2.4 Copper Ports: Provide an MFES that includes a minimum of four copper ports. All copper ports shall be Type RJ-45 and shall auto-negotiate speed (i.e., 10/100 Base) and duplex (i.e., full or half). All 10/100 Base TX ports shall meet the specifications detailed in this section and shall be compliant with the IEEE 802.3 standard pinouts.

All Category 5E unshielded twisted pair/shielded twisted pair network cables shall be compliant with the EIA/TIA-568-~~BA~~ standard.

784-1.2.5 Management Capability: Ensure that the MFES supports all Layer 2 management features and certain Layer 3 features related to multicast data transmission and routing. These features shall include, but not be limited to:

1. An STP healing rate that meets or exceeds specifications published in the IEEE 802.1D standard.
2. An RSTP healing rate that meets or exceeds specifications published in the IEEE 802.1w standard.
3. An MFES that is a port-based VLAN and supports VLAN tagging that meets or exceeds specifications as published in the IEEE 802.1Q standard, and has a minimum 4-kilobit VLAN address table.
4. A forwarding/filtering rate that is a minimum of 14,880 packets per second for 10 megabits per second and 148,800 packets per second for 100 megabits per second.
5. A minimum 4-kilobit MAC address table.
6. Support of Traffic Class Expediting and Dynamic Multicast Filtering.
7. Support of, at a minimum, Version 2 of the Internet Group Management Protocol (IGMP).
8. Support of remote and local setup and management via telnet or secure Web-based GUI and command line interfaces.
9. Support of the Simple Network Management Protocol (SNMP). Verify that the MFES can be accessed using the resident EIA-232 management port, a telecommunication network, or the Trivial File Transfer Protocol (TFTP).
10. Port security through controlling access by the users. Ensure that the MFES has the capability to generate an alarm and shut down ports when an unauthorized user accesses the network.
11. Support of remote monitoring (RMON) of the Ethernet agent and the ability to be upgraded to switch monitoring (SMON), if necessary.
12. Support of the TFTP, the Network Time Protocol (NTP), or the Simple Network Time Protocol (SNTP). Ensure that the MFES supports port mirroring for troubleshooting purposes when combined with a network analyzer.

784-1.2.6 Mechanical Specifications: Ensure that all wiring complies with NEC requirements and standards. Furnish and identify all equipment and appurtenances by name, model number, serial number, technical support and warranty telephone numbers, and any other pertinent information required to facilitate equipment maintenance.

Ensure that every conductive contact surface or pin is gold-plated or made of a noncorrosive, nonrusting, conductive metal.

Ensure that all external screws, nuts, and locking washers are *†Type 304 or 316 passivated* stainless steel. Do not use self-tapping screws ~~unless the Engineer provides prior approval.~~

All parts shall be made of corrosion-resistant materials, such as plastic, stainless steel, anodized aluminum, brass, or gold-plated metal.

784-1.2.7 Electrical Specifications: Ensure that the MFES operates and power is supplied with 115 volts of alternating current (V_{AC}). Ensure that the MFES has a minimum operating input of 85 V_{AC} and a maximum operating input of 265 V_{AC} . If the device requires operating voltages other than 120 V_{AC} , supply the required voltage converter. Ensure that the maximum power consumption does not exceed 50 watts.

Ensure that the MFES has diagnostic light emitting diodes (LEDs), including link, TX, RX, speed (for Category 5E ports only), and power LEDs.

784-1.2.8 Environmental Specifications: Ensure that the MFES performs all of the required functions during and after being subjected to an ambient operating temperature range of -30 degrees ($^{\circ}$) to 165 $^{\circ}$ Fahrenheit (F) as defined in the environmental requirements section of the NEMA TS 2 standard, with a noncondensing humidity of 0 to 95%.

Verify that the MFES manufacturer certifies their device has successfully completed environmental testing as defined in the environmental requirements section of the NEMA TS 2 standard. Verify that vibration and shock resistance meet the requirements of Sections 2.1.9 and 2.1.10, respectively, of the NEMA TS 2 standard.

Ensure that the MFES is protected from rain, dust, corrosive elements, and typical conditions found in a roadside environment.

SUBARTICLE 784-2.2.3 (of the Supplemental Specifications) is deleted and the following substituted:

784-2.2.3 Network Interface: Ensure that the device server includes a minimum of one Ethernet port, which must provide a 10/100 Base-TX or a 10/100 Base-FX connection as specified in the plans. Verify that all Category 5E, unshielded twisted pair/shielded twisted pair network cables and connectors comply with the EIA and Telecommunications Industry Association (TIA) requirements as detailed in the EIA/TIA-568-~~AB~~ standard. Verify that all copper-based network interface ports utilize registered jack (RJ)-45 connectors. *- Verify that the optical ports are Type ST, SC, LC, or FC only, as specified in the plans or by the Engineer. Mechanical transfer registered jack (MTRJ) type connectors are not allowed.*
~~Provide fiber optic cable and connectors for fiber optic cable compliant with Section 783.~~

SUBARTICLE 784-2.2.5 (of the Supplemental Specifications) is deleted and the following substituted:

784-2.2.5 Mechanical Specifications: Ensure that all parts are made of corrosion-resistant materials, such as plastic, stainless steel, anodized aluminum, brass, or gold-plated metal. Ensure that all exposed fasteners are *†Type 304 or 316 passivated* stainless steel.

Ensure that the dimensions of the device server accommodate the unit's installation in a control cabinet as specified in the plans.

SUBARTICLE 784-3.2.10 (of the Supplemental Specifications) is deleted and the following substituted:

784-3.2.10 Network Interface: Ensure that the DVE/DVD local area network (LAN) connection supports the requirements detailed in the IEEE 802.3 standard for 10/100 Ethernet connections. Provide a DVE/DVD having a minimum of one Ethernet port, which shall be a 10/100 Base-TX connection or a 100 Base-FX ST, SC, LC or FC interface capable of multi-hop configuration using two sets of optical ports (e.g., Tx¹, Rx¹, Tx², Rx²). Ensure that the connector complies with applicable EIA and TIA requirements. Provide copper-based network interface ports that utilize RJ-45 connectors. Ensure that all fiber-based ports are single mode and provide a link budget of 30 dB or greater.

Ensure that all Category 5E, unshielded twisted pair/shielded twisted pair network cables are compliant with the EIA/TIA-568-B-A standard. Ensure that the network communication conforms to User Datagram Protocol (UDP), Version 4 of the Internet Protocol (IP) and Version 2 of the Internet Group Multicast Protocol (IGMP).

SUBARTICLE 784-3.3 (of the Supplemental Specifications) is deleted and the following substituted:

784-3.3 Installation Requirements: Ensure that the DVE is shelf- and/or rack-mountable, and designed for use in roadside control cabinets without climate control. Ensure that the dimensions of the DVE allow installation in a control cabinet as specified in the plans. Ensure that front panel status indicators remain unobstructed and visible. Use only *Type 304 or 316 passivated* stainless steel external screws, nuts, and locking washers. All parts shall be made of corrosion-resistant materials, such as plastic, stainless steel, anodized or painted aluminum, brass, or gold-plated metal.

Because a DVD may be hardware or software-based, these mechanical specifications apply only to hardware-based DVDs. Field-hardened DVDs shall be shelf- and rack-mountable, and designed for use in roadside control cabinets without climate control. The dimensions of the DVD shall allow installation in a control cabinet as specified in the plans. ~~All external screws, nuts, and locking washers shall be stainless steel. All parts shall be made of corrosion resistant materials, such as plastic, stainless steel, anodized or painted aluminum, brass, or gold-plated metal.~~

Non-hardened DVDs shall be shelf- and rack-mountable, and designed for use in a climate-controlled TMC. The rack-mounted DVD shall be designed to fit in a standard EIA 19 inch rack and shall not require shielding from other electronic devices, such as power supplies and other communication equipment. The dimensions of the DVD shall allow installation as specified in the plans.

Due to the nature of the equipment, complexity of the electronics, and harsh environmental conditions at installation locations, use DVEs and DVDs that can be replaced immediately when defective or damaged units must be removed and replaced. The Department shall return damaged units to the manufacturer for warranty repair or replacement.