

MODIFIED SPECIAL PROVISION APPROVAL REQUEST
(REV 11-02-15)

Date: 11/02/2015 **District:** 5 **Type:** Project Specific

Letting Month: March 2016 **FPID Number:** 435443-2-52-01

Requested by: Mark Herring **Office/Phone:** 386-943-5165

Specification being modified: 684 Network Devices

Affected Pay Items: 684-2-1

***Expected Cost Impact to this project: less than \$5,000 (for 11 Device Servers)**

* Give an estimate of dollar impact (added cost or cost savings) to the project if this Modified Special Provision is used in lieu of the corresponding statewide implemented specification.

Project Description: Active Arterial Management: Design active arterial management devices along several state roads in Orange County, Seminole County and City of Orlando.

Background Data: For Device Server, FDOT specifications doesn't specify wireless communication option using cellular network. The District can benefit from a significant improvement and flexibility with this communications mode at a minor price difference, especially at locations where serial data communication is needed and fiber optic cable is not available. So the standard Device Server specification is updated to provide cellular communication functions.

***Name and PE Number of PE signing and sealing the Modified Special Provision:**

* Project Specific Modifications to the Standard Specifications or Workbook Specifications must be signed and sealed by the Professional Engineer responsible for this Special Provision under the following statement and kept in the Project Files maintained in the District.

PE Name: Bo Gao

PE Number: 76395

I hereby certify that this Specification was prepared under my responsible charge, and that it has been reviewed in accordance with procedures adopted and implemented by the Florida Department of Transportation.

NETWORK DEVICES

(REV 11/02/2015)

SECTION 684 of the Standard Specifications is deleted and the following substituted:

SECTION 684

NETWORK DEVICES

684-1 Managed Field Ethernet Switch

Meet the requirements of FDOT Specification 684.

684-2 Device Server.

684-2.1 Description. Furnish and install a wired or wireless device server as shown in the plans. Provide a device server that allows connection of serial devices with EIA-232, EIA-422, and EIA-485 connections to an Ethernet network or a cellular network which provides Ethernet connection from field ITS devices to the Traffic Management Center (TMC). All cellular data service will be provided by the FDOT statewide cellular data service provider agreement. Use only equipment and components that meet the requirements of these minimum specifications, and are listed on the APL if applicable

684-2.2 Materials:

684-2.2.1 General: Ensure that the wired device server provides a TCP/IP interface to one or more field devices using EIA-232/422/485 standard connections. Ensure that the device server supports TCP/IP, User Datagram Protocol (UDP)/IP, Dynamic Host Configuration Protocol (DHCP), Address Resolution Protocol (ARP), Internet Control Message Protocol (ICMP), Simple Network Management Protocol (SNMP), Hypertext Transfer Protocol (HTTP), and telnet.

Ensure that both wired and wireless device server provides 99.999% error-free operation and EIA-compatible Ethernet data communication by way of a Category 5E copper or fiber optic transmission medium, as shown in the plans.

Ensure that both wired and wireless device server is resistant to all electromagnetic interference.

Use a wired device server having an encryption feature that provides data security and prevents interception or “sniffing” of transmitted information by unauthorized parties. Data security will comply with Version 2 of the Secure Shell Protocol (SSHv2), or the NIST requirements as defined in the Federal Information Processing Standard (FIPS) Publication (PUB)-197 for the Advanced Encryption Standard (AES).

Ensure that both wired and wireless device server has a minimum mean time between failures (MTBF) of 10 years, or 87,600 hours.

Ensure that the final equipment selection, procurement and provision be coordinated with FDOT District 5 staff.

684-2.2.2 Serial Interface: Ensure that both wired and wireless device server provides a minimum of one serial data interface and DB 9 connector as specified in the plans that conforms to EIA-232/422/485 standards. Ensure that the serial interface supports 2-wire and 4-wire EIA-485 connections. Ensure that the serial ports support data rates up to 230 kbps; error detection procedures utilizing parity bits (i.e., none, even, and odd); and stop bits (1 or 2).

Ensure that both wired and wireless device server provides flow control (request to send [RTS]/clear to send [CTS] and transmit on/transmit off [XON/XOFF]), as well as allow control of the data terminal ready (DTR), data carrier detect (DCD), data set ready (DSR), CTS, and RTS signals. Ensure that the device server supports RTS toggle for half-duplex emulation.

684-2.2.3 Network Interface: Ensure that the wired 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 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.

Ensure that the wireless device server meets the following requirements:

1. Multi-Carrier (Verizon, AT&T, and Sprint) support by software configuration;
2. 3G/4G LTE cellular network support;
3. License-free enterprise software supporting advanced routing protocols, VPN, logging/authentication, and stateful firewall;
4. Dual SIMs provide redundant connections;
5. 2 X 50 Ohm SMA (Center pin: female) antenna connectors;
6. Cellular Antenna:
 - (1) Antenna type to be used at each site is to be determined by the Contractor to maximize cellular coverage.
 - (2) 50 Ohm SMA male connector.
 - (3) Provide an antenna cable with required adapters per the manufacturer's recommendation. Signal loss due to cable length must be minimized in order to meet throughput requirements.
 - (4) Minimum Antenna gain of 2 database interface (dBi).
 - (5) Install and secure antenna(s) outside the signal cabinet. Cabinet wall penetrations will be approved by the Engineer.

684-2.2.4 Configuration and Management: Provide a wired or wireless device server that supports local and remote configuration and management, which must include access to all user-programmable features, including but not limited to addressing, port configuration, device monitoring, diagnostic utilities, and security functions. Ensure that the wired device server supports configuration and management via serial login, SNMP, telnet login, and browser-based interface. Ensure that the wireless device server supports configuration and management via login, SNMP, telnet login, browser-based interface, FTP, SFTP, and NTP/SNTP.

684-2.2.5 Mechanical Specifications: Ensure equipment is permanently marked with manufacturer name or trademark, part number, date of manufacture and serial number.

Do not use self-tapping screws on the exterior of the assembly.

Ensure that all parts are made of corrosion-resistant materials, such as plastic, stainless steel, anodized aluminum, brass, or gold-plated metal.

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

684-2.2.6 Electrical Specifications: Verify that all wiring meets applicable NEC requirements and that the device server operates using a nominal input voltage of 120 volts

alternating current (V_{AC}). The input voltage range will be 89 to 135 V_{AC}. If the device requires nominal input voltage of less than 120 V_{AC}, furnish the appropriate voltage converter. Verify that the maximum power consumption does not exceed 12 watts.

Ensure that the wired device server has diagnostic LEDs, including link, TX, RX, and power LEDs.

Ensure that the wireless device server has LED indicators for power, cellular link/activity and signal strength.

684-2.2.7 Environmental Specifications: Ensure both wired and wireless device server performs all required functions during and after being subjected to the environmental testing procedures described in NEMA TS2, Sections 2.2.7, 2.2.8, and 2.2.9.

684-2.3 Installation Requirements: Mount the wired device server securely in a location in the equipment cabinet that allows the unit to be fully accessible by field technicians. Ensure that all unshielded twisted pair/shielded twisted pair Ethernet network cables are compliant with the EIA/TIA-568-B standard.

For wireless device server installation, conduct a cellular site survey and submit to the Engineer for acceptance prior to the procurement of materials. The purpose of the survey is to measure the signal strength and throughput of cellular coverage at the project locations. Testing must include upload/download speeds, latency, and received signal strength to show that the equipment will meet the minimum requirements shown on the plans or as described in the Special Provision. Alert the Engineer of any sites that do not have adequate signal strength or upload/download speeds. Testing is incidental to the cellular device server and will not be paid for separately. Ensure the wireless device server no larger than 5.2 inches in length, 3.9 inches in width, and 1.3 inches in depth.

684-2.4 Testing:

684-2.4.1 General: Subject both wired and wireless Device Server to field acceptance tests (FATs). Develop and submit a test plan for FATs to the Engineer for consideration and approval. The Engineer reserves the right to witness all FATs. Complete the tests within five calendar days.

684-2.4.2 Field Testing: Perform local field operational tests at device server field sites according to the test procedures stated herein.

1. Verify that physical construction has been completed as specified in the plans.
2. Verify the quality and tightness of ground and surge protector connections.
3. Verify proper voltages for all power supplies and related power circuits.
4. Connect devices to the power sources.
5. Verify all connections, including correct installation of communication and power cables.
6. Verify the network connection to the wire device server through ping and telnet session from a remote PC.
7. Verify serial data transmission through the wired device server.
8. Integrate and test the cellular device server to meet FDOT specifications for integration and as shown on the plans.

684-3 Digital Video Encoder and Decoder

Meet the requirements of FDOT Specification 684.

684-4 Media Converter

Meet the requirements of FDOT Specification 684.

684-5 Warranty.

Meet the requirements of FDOT Specification 684.

684-6 Method of Measurement.

Meet the requirements of FDOT Specification 684.

684-7 Basis of Payment.

Meet the requirements of FDOT Specification 684.