SECTION 683

VIDEO OPTICAL TRANSCEIVER WITH BI-DIRECTIONAL DATA CHANNEL

DESCRIPTION

683.01.01 GENERAL

A. The Contractor shall furnish the designated quantity of Video Optical Transceiver (VOTR) pairs that interface the Closed Circuit Television (CCTV) cameras with the central control system over Single Mode Fiber Optic (SMFO) cable.
   1. Each VOTR pair delivered shall provide 1 unidirectional National Television Standards Committee (NTSC) color video channel from the CCTV field location to another designated point and 1 bi-directional data channel between both locations.
   2. There shall be a designated video transmitter and a video receiver.
   3. The devices shall be International Fiber Systems (IFS) Model No. VT4930WDM and IFS Model No. VR4930WDM, or equivalent, as approved by the Freeway and Arterial System of Transportation (FAST) Director or designee.

B. This specification is for equipment only, no installation, to be delivered to the FAST Traffic Management Center (TMC) for testing and approval prior to final acceptance.
   1. No partial shipments will be accepted.
   2. All equipment supplied on this project shall be delivered during a single delivery, and shall be labeled clearly with the project and location designation.

C. The VOTR shall be able to be connected to each end of 1 single mode optical fiber with Straight Tip (ST) connections to establish a point-to-point communication topology for the locations shown on the drawings. VOTRs designed for mounting in card cages shall be hot swappable.

D. All equipment selections shall be approved by the FAST Director or designee.

MATERIALS/EQUIPMENT

683.02.01 GENERAL

A. All equipment supplied shall have a full manufacturer’s warranty.

683.02.02 MECHANICAL

A. The VOTR shall be a surface mount device (field) or rack-mount (hub) configuration, when specified.
   1. The field mounted VOTR shall be enclosed in corrosion resistant housing that protects the internal circuitry from the environment.
   2. The housing shall be provided with suitable holes for mounting to a flat surface.

B. When it is specified, the rack-mounted VOTR shall occupy no more than 4 rack units (RU; 7 inches of space), be of the same manufacturer, and be compatible with the 19-inch rack-mountable card cage. The rack-mounted VOTRs shall obtain all necessary power from the card cage assembly without the use of external power cables.

C. All VOTRs shall have labeling as follows:
1. External, silk screened, labeling consisting of the device type, model number, part number, serial number, light emitting diode (LED) status indicators, connector functions, and manufacturer on the front panel and/or the housing.

2. Internal labeling shall be provided to clearly identify all dip switches and jumper positions.

D. The VOTR shall have LED status indicators for presence of video carrier, input power, and data transmission.

683.02.03 OPTICAL
A. The optical component shall have the following features:
   1. Laser both directions (wavelength 1310/1550 nm) over 1 single mode fiber.
   2. Link loss budget of 23 dB minimum.
   3. ST connectors only.
   4. Minimum connection of 2 feet of cable with no optical attenuation.

683.02.04 DATA
A. The data component shall have the following features:
   1. Bi-directional data communications (simplex and full duplex operating modes).
   2. Selectable Electronic Industry Association (EIA)-232, EIA-422, or 2-wire EIA-485 interfaces.
   3. Data rates from DC to 100 kbps.
   5. Data receiver output (EIA-232/422) defaults to a low state in the event of a fiber break or failed data transmitter.

683.02.05 VIDEO
A. The video component shall have the following features:
   1. NTSC Color, compliant with EIA/TIA-250-C for Medium-Haul Transmission and EIA-170 Video Standards.
   2. Bandwidth range of 5 Hz to 6.5 MHz.
   3. Signal-to-Noise Ratio > 60 dB.
   4. Differential Gain < 3 percent.
   5. Differential Phase < 3 degrees.
   6. Tilt < 1 percent.
   7. BNC Connection.

683.02.06 POWER
A. The VOTR shall operate to specification when supplied with 120 VAC ±15 VAC, 60 Hz ±3 Hz single-phase power.
B. The use of transformers to reduce the 120 VAC prime power input to a lower level used by the VOTR is acceptable. This transformer shall be supplied if necessary.

683.02.07 ENVIRONMENTAL
A. The VOTR shall be designed to operate from -40 degrees F to 165 degrees F) with no cooling airflow, 0-95 percent relative humidity, non-condensing.

683.02.08 19-INCH RACK MOUNTED CARD CAGE
A. When required at a hub location, the VOTR shall be able to be installed in a 19-inch rack mounted card cage.
   1. The cage height shall not exceed 4 RU.
   2. The cage shall contain a fault tolerant power converter compatible with VOTR module power requirements.
   3. The cage shall include provisions for interconnecting cabling and be designed to accommodate a minimum of 7 VOTR modules that shall be easily mountable and removable from the cage.
B. When installed in the cage, the VOTR modules shall be securable.
   1. The module's maintenance indications shall not be distributed after being mounted in the drawer.
   2. A failure of 1 VOTR module shall not impact the operation of other VOTR modules installed within rack-mounted cage.

683.02.09 FIBER OPTIC JUMPER CABLES
A. Four fiber optic jumper cables shall be delivered with each transceiver supplied.
B. The fiber optic jumper cables shall meet the following requirements:
   1. 250 µm buffering of each fiber.
   2. 900 µm buffering of each fiber applied after the initial 250 µm buffering.
   3. Maximum factory measured insertion loss of 0.5 dB in accordance with EIA/Telecommunications Industry Association (TIA)-455--171.
   4. Less than 0.2 dB loss when subjected to EIA/TIA-455-1B, 300 cycles, 0.5 kg.
   5. Aramid yarn strength member.
   6. Rugged 0.12 inch (approximate) Polyvinyl Chloride (PVC) sheathing.
   7. Minimum bend radius of 12 inches following installation, 25 inches during installation.
   8. Minimum tensile strength of 444N (100 pounds).
   9. ST connectors that are factory terminated with strain relief.
683.03.01 GENERAL

A. Though no physical construction is part of this deliverable, the Contractor shall furnish all mounting hardware (i.e., machine screws, nuts, locking washers) to install the VOTRs securely in the cabinet.
   1. Mounting methods using tape, Velcro, and sticky back material will not be permitted.
   2. All necessary power adapters and cabling needed to obtain power from the power distribution assembly shall be provided and secured.

B. As noted above, the Contractor shall also supply the 1 simplex fiber optic jumper cable needed to be installed from the field termination panel (field mounted) or from the fiber optic patch panel (rack mounted) to the single optical inputs of the VOTR.

C. All VOTRs shall be provided with protective covers on all optical connectors. The Contractor shall ensure that the protective covers remain on the optical connectors at all times when each connector is not being used.

METHOD OF MEASUREMENT

683.04.01 MEASUREMENT

A. The quantity of shelf mounted VOTRs with cable will be measured for payment per each delivered, complete and operational, and successfully tested.

B. The quantity of rack mounted VOTRs with cable will be measured for payment per each delivered, complete and operational, and successfully tested.

C. The quantity of 19-inch rack mounted card cage will be measured for payment per each delivered, complete and operational, and successfully tested.

D. Mounting hardware, power conversion hardware (if required), and the VOTR rack mountable card cage in the hub is incidental to the VOTR bid item and will not be measured or paid separately.

E. The equipment delivered will be tentatively accepted pending testing by the FAST Director or designee. Only after a series of bench tests of the devices will the final acceptance be made and documented.

BASIS OF PAYMENT

683.05.01 PAYMENT

A. The accepted quantity of shelf mounted VOTRs with cable delivered complete will be paid for at the contract unit price bid per each, which shall be full compensation for the VOTR(s), SMFO cable, housing(s), 4 fiber optic jumper cables per video transceiver, hardware, 1 simplex fiber optic jumper cable per video transceiver, warranty, and delivery to the FAST Director or designee.

B. The accepted quantity of rack mounted VOTRs with cable delivered complete will be paid for at the contract unit price bid per each, which shall be full compensation for the VOTR(s), SMFO cable, 4 fiber optic jumper cables per video transceiver, hardware, 1 simplex fiber optic jumper cable per video transceiver, warranty, and delivery to the FAST Director or designee.
C. The accepted quantity of 19-inch rack mounted card cage delivered complete will be paid for at the contract unit price bid per each, which shall be full compensation for the rack mounted card cage, hardware, warranty, and delivery to the FAST Director or designee.

D. Payment will be made under:

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<tr>
<th>PAY ITEM</th>
<th>PAY UNIT</th>
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<tbody>
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<td>Shelf Mounted Video Optical Transceivers with Cable</td>
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<tr>
<td>Rack Mounted Video Optical Transceivers with Cable</td>
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<tr>
<td>19-Inch Rack Mounted Card Cage</td>
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