

**SPECIAL SPECIFICATION**

**1133**

**Fiber Optic Video Data Transmission Equipment**

**1. Description.** Furnish and install fiber optic video data transmission equipment in designated equipment cabinets in the field and in the Satellite Control Center as shown on the plans, as detailed in the special specifications, and as directed.

**A. Submittal Components.** As a minimum, the submittal for this Item is to completely address the following:

Transmitting device	Data link signal parameters	Optical detector device
Operating wavelength	Optical fiber compatibility	Transmitter video/data input parameters
Power requirements	Transmitter optical output power	Surge suppression
Receiver optical sensitivity	Receiver automatic gain control	Receiver video/data output parameters
Connectors c. Data	a. Optical d. Power	b. Video e. Gold Plating
Modulation method	Signal to noise ratio	Linearity
Tilt	Differential phase	Modular design
Differential gain	Housing	Baseband frequency response
Environmental parameters	Data link frequency response	Power Supply

**2. Material.** Ensure the materials furnished, assembled, fabricated, or installed under this Item are new, corrosion resistant, and in strict accordance with the details shown on the plans and in the specifications.

**A. Functional Requirements.** Furnish fiber optic video data transmission equipment (transmitter and receiver system) that transmits video from the field video camera and receives pan, tilt, and zoom (PTZ data communications link) data simultaneously for video camera controls. This unit operates with one single mode fiber and utilizes "FC" fiber optic connectors.

Furnish a video fiber optic transmitter that generates optical signals modulated by the baseband video signal from the video camera output in the form of pulse frequency modulation.

Furnish a video fiber optic receiver that detects the optical signal and converts it to baseband video signal. The operating optical wavelength is 1300 nm.

Ensure each fiber optic link meets RS-250B medium haul video requirements.

Furnish both the video fiber optic transmitter and receiver from the same manufacturer.

## **B. Electrical/Optical Requirements.**

- 1. Transmitter Video Input.** Ensure the transmitter video input is 75 Ohms nominal, 1.0 Volt peak to peak RS-170 NTSC standard between sync tip to 100% white level (minus 40 IRE to plus 100 IRE).
- 2. Transmitting Device.** Ensure the transmitting device is a light emitting diode (LED) or LASER diode which has a MTBF of 100,000 hours at 160°F ambient.
- 3. Transmitter Optical Output.** Ensure the transmitter optical output provides output power to 8/125 single mode glass fiber at a wavelength of 1300 nm sufficient to accommodate a link loss budget of 20 db or more. No optical spacers or optical "doughnuts" are allowed for compensation of optical link operational dynamic range.
- 4. Optical Detector.** Ensure the optical detector of the receiver is an APD diode, a PIN, or a device approved by the Engineer.
- 5. Receiver Optical Sensitivity.** Ensure the receiver input has a minimum sensitivity of 20 db below the transmitter output level and operates within the parameters of this specification. No optical spacers or optical "doughnuts" are allowed for compensation of optical link operation dynamic range.
- 6. Receiver Automatic Gain Control.** Ensure the receiver has Automatic Gain Control (AGC) circuitry to provide the receiver with the required dynamic range from transmitter receiver spacing of 1 to 20 db.
- 7. Receiver Video Output.** Ensure the receiver video output is 75 Ohms nominal, 1.0 Volt peak to peak between sync tip and 100% white level.
- 8. Modulation.** Provide pulse frequency modulation.
- 9. Signal to Noise Ratio.** Ensure the system Signal to Noise Ratio (SNR), measured as peak to peak white to blanking, to rms noise (ppwb/rms) in a 10 KHz to 5 MHz bandwidth, is better than 60 db.
- 10. Linearity.** Provide linearity better than 1%.
- 11. Tilt.** Provide tilt less than 2%.
- 12. Differential Phase.** Ensure differential phase is less than 0.5 degrees at 10% to 90% Average Picture Level (APL).
- 13. Differential Gain.** Ensure differential gain is less than 2% at 10% to 90% Average Picture Level (APL).
- 14. Frequency Response.** Ensure the video signal frequency response is  $\pm 0.1$  dB, 10 Hz to 0.5 MHz;  $\pm 0.2$  db, 0.5 MHz to 4.2 MHz. The 3 dB bandwidth is 10 MHz.

- 15. Data Link Frequency Response.** Ensure the data link frequency response is DC-100KHz.
- 16. Data Link Communications Compatibility.** Ensure the data communications link is field programmable by shorting straps or dip switch settings of the video fiber optic transmission equipment. Furnish a data link that is compatible with RS-232, RS-422, RS485, two wire Manchester, BI-Phase, NRZ, and NRZI digital encoding with better than ten to the minus ninth Bit Error Rate with more than a 20 db link loss. Furnish a data link compatible with a DB 9, a DB 25 connector, or a terminal block connector.
- 17. Optical Fiber Compatibility.** Ensure optical fiber compatibility to be 8/125 micron single mode glass fiber.
- 18. Power Requirements.** Provide transmitters and receivers that operate on standard 115 VAC electrical service. Operate the equipment over a voltage range of 115 VAC,  $\pm 20$  VAC at 60 HZ. Supply modular units (stand alone) with an internal or low voltage external wall-mounted power supply with a minimum of a 6 ft. power cord terminating in a standard 2 or 3 prong line plug. Ensure maximum power requirements do not exceed 5 Watts for each transmitter or receiver.  
  
Ensure the equipment operation is not affected by transient voltages, surges, and sags normally experienced on commercial power lines. Assume responsibility to check the local power service to determine if any special design is needed for the equipment. If a special design is required, include the extra cost in the bid of this Item.
- 19. Surge Protection.** Install surge protectors in the equipment cabinet for the coaxial cable connection to the video camera.
- 20. Power Service Transients.** Provide equipment that meets the requirements of Sec. 2.1.6, "Transients, Power Service" of the NEMA Standard TS-2-2003, latest revision.
- 21. Wiring.** Furnish line wiring that meets the requirements of the National Electric Code. Cut wires to proper length. Provide cable slacks to facilitate removal and replacement of assemblies, panels, and modules. Do not double back wires to take up slack. Neatly lace wires into cable with nylon lacing or plastic straps. Secure cables with clamps.
- 22. Power Service Protection.** Provide equipment containing readily accessible, manually re-settable or replaceable circuit protection devices (such as circuit breakers or fuses) for equipment and power source protection.
- 23. Fail Safe Provision.** Design the equipment such that the failure of the equipment does not cause the failure of any other unit of equipment.

### **C. Mechanical Requirements.**

- 1. Modular Design.** Design modular equipment such that major portions may be readily replaced in the field.

Mechanically key modules of unlike functions to prevent insertion into the wrong socket or connector.

Clearly identify modules and assemblies with name, model number, serial number, and any other pertinent information required to facilitate equipment maintenance.

- 2. Connectors and Harness.** Make external connections by means of connectors. Key the connectors to preclude improper hookups. Color code and appropriately mark the wires to and from the connectors.

Furnish video input and output connectors of the BNC type.

Plate every conductive contact surface or pin with a minimum of 50 microns of gold.

Use optical input and output connectors of the "FC" type with stainless steel housing and ceramic ferrule.

Provide a connecting harness of appropriate length and terminate it with matching connectors for interconnection with the video cameras, video switcher, video multiplexer, and the fiber optic network.

- 3. Housing.** Provide receiver and transmitter packages that are suitable for rack mounting, shelf mounting, or stand alone packages. Equip card cages for rack mounting of equipment with a power supply capable of supplying power to a fully loaded card cage. Rack mount the card cage on a standard EIA 19-in. rack.

**D. Environmental Design Requirements.** Furnish equipment that meets its specified requirements during and after subjecting to any combination of the following requirements:

- Ambient operational temperature range of -30°F to 165°F
- Relative humidity range of 0% to 95%

- 3. Construction.** Use equipment that is designed and constructed to utilize the latest available techniques with a minimum number of parts, subassemblies, circuits, cards, and modules to maximize standardization and commonality.

Design the equipment for ease of maintenance and so that the component parts are readily accessible for inspection and maintenance. Provide test points for checking essential voltages and waveforms.

**A. Electronic Components.** Ensure the electronic components comply with Special Specification Item, "Electronic Components."

**B. Mechanical Components.** Use stainless steel external screws, nuts, and locking washers; do not use self-tapping screws unless approved by the Engineer.

Furnish parts that are made of corrosion resistant material, such as plastic, stainless steel, anodized aluminum, or brass.

Protect the materials used in construction from fungus growth and moisture deterioration.

Separate dissimilar metals by using an inert dielectric material.

- C. Testing, Documentation and Warranty.** Test the fiber optic video data transmission equipment in compliance with Article 2, of the Special Specification, "Testing, Training, Documentation, Final Acceptance, and Warranty."

Provide documentation for the fiber optic video data transmission equipment in compliance with Article 4, of the Special Specification, "Testing, Training, Documentation, Final Acceptance, and Warranty."

Provide a warranty for the fiber optic video data transmission equipment in compliance with Article 6, of the Special Specification, "Testing, Training, Documentation, Final Acceptance, and Warranty."

- 4. Measurement.** This Item is measured as each unit furnished, installed, made fully operational, and tested in accordance with these Special Specifications or as directed.
- 5. Payment.** The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" are paid for at the unit price bid for "Fiber Optic Video Data Transmitter" or "Fiber Optic Video Data Receiver." This price is full compensation for equipment described under this Item with cables and connectors; for documentation and testing; and for furnishing labor, materials, training, equipment, and incidentals.