10-3.__ FIBER OPTIC DATA MODEM

The fiber optic data modem (FODM) shall be RS-232 compatible fiber optic modem with dual optics for drop/insert capability which can be configured as master or local(slave) in either daisy chain or fault tolerant dual redundant (counter rotating) ring network architecture. These four modes of operations shall be selectable via an external Mode DIP-switch. All signals received via an optical port and retransmitted via fiber or via an expansion port shall be retimed to 0.01 percent pulse width accuracy by a crystal controlled timebase, eliminating pulse width distortion and eliminating virtually unlimited repeating. The FODMs shall have anti-streaming circuitry for both the optical fiber and the electrical (RS-232) sides. On RS-232 side, when enabled, the anti-streaming shall limit the amount of time an external device is allowed to transmit data onto the network for each Request to Send (poll). On the fiber side, the anti-streaming shall disable an optical receiver in the event that the receiver output stays high longer than maximum allowable time thus preventing the whole fiber network from being disabled by a continuous "on" failure by receiver or optical emitter. External (TIMEOUT) DIP-switch shall allow user to disable or select the timeouts for both the optical side anti-streaming feature and the RS-232 side anti-streaming feature as well as to enable or disable the "Fiber Activity CTS Disable" feature. LED indicators to display power "on", anti-streaming "Fault" time-out and RS-232 fiber optic activity (selectable via dual function switch).

The FODMs at the field element shall be stand-alone type and shall be securely fastened on a EIA-310 rack-mount shelf. At the hub location, the FODMs shall be rack-mount type installed in card cage assembly. The card cage assembly shall be EIA-310 rack mount type with at least 14 slots and with two power supplies for redundancy.

The FODM shall meet the following requirements:

Electrical Signaling:	EIA RS-232 with full handshake control signals
Electrical Power:	115 V(ac), 60 Hz
Operating Temperature	-40 to 70°C
Operating Mode:	1. Daisy chain Master mode 2. Daisy chain Local mode 3. Fault tolerant Master mode 4. Fault tolerant Local mode
Emitter type:	Laser
Wavelength	1310 nm
Minimum coupled transmit power into: 9/125μm at 25°C(75°C)	-11(-9.5) dBm
Output Variation	-0.015 dB/°C
Minimum receiver input power for 10^{-9} BER	-40 dBm
Maximum receiver input	-11 dBm
Optical port type	ST
RS-232 connector type	DB25 female
Data Rates (auto)	1200 baud to 57.6 kbaud
Bit Error Rate:	10^{-9}
Link Budget(Range) via singlemode 1310 nm	31 dB for (56 km)

FODMs shall be tested as follows:

Each optical modem shall be functionally tested by looping back optical transmit connector to the optical receive connector using a variable optical attenuator with measured optical loss at 31 dB at 1310 nm. A test set shall be connected to the modem and set for RS-232 communication testing. Fifteen minutes BER test burn-in test shall be error free.

After performing the 15 minutes BER test, at least two modems shall be tested for receiver dynamic range. The following procedure shall be followed: First, the optical attenuation shall be increased to the point at which the data test just begins to register bit errors. The optical receive power into the modem shall be measured and recorded. The optical atttenuation shall be then decreased until data test once again register errors. At no time shall the optical power into the receiver exceed the manufacturer's specified saturation level. The optical receive levels shall once again be measured and recorded. These minimum and maximum receiver power levels define modem receiver's dynamic range and shall meet or exceed the manufacturer's specifications.

One pair of modem shall be interconnected using optical patch cords and attenuators with a loss of 31 dB in each direction. The RS-232 interface shall be looped back onto one modem and a test set connected to the RS-232 interface of the other modem. A bit error rate of less than 10^{-9} shall be demonstrated.