STATE OF NEW JERSEY
DEPARTMENT OF TRANSPORTATION
TRENTON, NEW JERSEY 08625

METRIC SPECIFICATIONS FOR RS232 LEASED LINE MODEMS (LOW SPEED MODEL 400)

N.J. Specification No. EBM-LEASED-400 Effective Date: July 1, 2001

New Jersey Department of Transportation Specifications for low speed RS232 modems for operation on dedicated leased lines or owned copper cable plant.

The purpose of these specifications is to describe minimum acceptable design and operating requirements for these modems.

GENERAL - I

1-1 Types

The following types of modems are defined in this specification.

A. Model 400(170) Modem Card

B. Standalone RS232 Modem

Type A modems are designed for direct insertion into a Type 170E or similar traffic controller. These are single card modems which must match the form factor and pin-out defined for the 170 internal modem slot. Type B are self contained units integrated with a power supply and DB-25 connector.

1-2 3002 Line Quality

These modems shall operate with unconditioned leased line or copper cable plant meeting the 3002 quality specifications.

1-3 202 Standards

The leased line modems shall be compatible and shall conform to Bell 202 transmission standards.

1-4 Environment

These modems shall be designed for outside plant operation and shall operate in the temperature range of -37 °C to +74 °C and in the humidity range of 0 to 95% humidity, non condensing. The manufacturer must supply certification by an independent technical laboratory confirming that the equipment complies with these environmental specifications.

MODEL 400 MODEM CARD - II

2-1 Form Factor and Card Edge

The Model 400 modem shall be a single printed circuit card designed for direct insertion into the 170 controller internal modem slot. Card edge pin-out shall be compliant with these requirements.

2-2 Data Rate and Interface

The modem shall be capable of operating baud rates from 0 to 1 200 bits per second, serial asynchronous by bit. The modem shall meet EIA RS-232C and CCITT V.24 standards.

2-3 Carrier Frequencies

A. Mark = 1 200 hertz

B. Space = 2 200 hertz

C. Soft Carrier = 900 hertz

2-4 Receiver Characteristics

A. Dynamic Range = +3 dBm to -48 dBm

B. Carrier Detect = -42 dBm ± 3 dBm

2-5 Transmit Levels

-8 dBm to 0 dBm adjustable via switch on potentiometer

2-6 Timing

A. RTS/CTS = 6 or 12 milliseconds (Switch Selectable)

B. Car Delay = 4 or 8 milliseconds (Switch Selectable)

C. Soft Car = 5 or 10 milliseconds (Switch Selectable)

D. Anti Str. = Enable/Disable

2-7 Duplex

A. Full (4 Wire) or Half (2 Wire) Switch Selectable

B. Soft Carrier Disabled for Half Duplex Operation

2-8 LED Indicators

A. XMT (Transmit)

B. RCV (Receive)

C. RTS (Request to Send)

D. CTS (Clear to Send)

E. CAR (Carrier Detect)

2-9 Extender Board

An extender board shall be supplied with every five (5) modems delivered.

STANDALONE RS232 MODEM - III

3-1 General

The standalone version of the modem must comply with all of the Section II requirements, with the exception of meeting the form factor and mechanical pin-out requirements. The standalone version shall be fully compatible with the circuit board version.

3-2 Electrical Power

The modems must operate on standard 120 volt AC electrical service. The equipment shall operate over a voltage range of 105 to 125 volts AC at 60 hertz. The unit must be supplied with an internal or external power supply. The power supply must be equipped with a minimum of a 1.8 meter power cord terminating in a standard 2 or 3 prong line plug. Maximum power requirements must not exceed 200 watts for each modem.

3-3 RS232 Port

The modem shall be configured with a DB-25 Female connector configured for DCE operation. The connector shall be firmly mounted on the chassis.

3-4 Modular Phone Cord

The modem shall have a 4-wire modular phone jack and be supplied complete with a 1.8 meter minimum modular phone cord terminated on lugs.

3-5 Indicators

The standalone version shall have all indicator lights called out in Subsection 2-8 visible from the outside of the case.

3-6 Power On/Off

A power on/off switch shall be mounted on the chassis.

3-7 Mechanical

The modem shall not exceed the dimensions of 305 by 152 by 51 millimeters and shall be mounted in a metal or high impact plastic case. The case shall provide mounting holes to secure the modem to a wooden or metal surface.

TRAINING - IV

Prior to the acceptance of the first unit of each type, training shall be provided for the Department's engineering, maintenance and operations staff, at a facility provided by the Department. The training shall include all material and manuals required for each participant. The training shall be as follows:

4-1 Maintenance Training

The training shall be provided for a minimum of 16 hours for at least five (5) personnel with an electronics background. The training shall include operation instructions, theory of operation, circuit description, field adjustments, preventive maintenance procedures, troubleshooting and repair of all components.

4-2 Engineering Training

The training shall be provided for a minimum of 8 hours for at least twenty (20) engineering and operations personnel. The training shall include a complete demonstration of the operation and capabilities of the equipment. This session should include a complete review of any field adjustments or calibration of the modems, explanation of the status indicators, and trouble shooting procedures and should stress day-to-day operation and isolation of problems down to the unit level. For example, procedures should be discussed of identifying a faulty module in the field, as opposed to board level repairs covered in Subsection 4-1.

TESTING - V

All equipment defined in this specification shall be subject to factory testing as subsequently described. The factory test shall demonstrate or provide confirmation that all of the equipment operates over the specified environmental range for each component. In addition, the test shall verify that the leased line modems are capable of reliably transferring data (BER of 10 X -5 over a 3002 compliant line) at both extremes of the temperature specifications. Certification shall be supplied to verify that the modem is on the CALTRANS QPL (Qualified Product List). The test shall utilize a metallic connection of at least 1.6 kilometers in length with simulated dB losses approaching the maximum requirement.

The Supplier shall be responsible for submitting a test plan which has been designed to exercise and monitor the equipment for the purpose of determining compliance with the specifications.

INSTRUCTIONS AND GUARANTEES - VI

6-1 One set of complete schematics and operations/maintenance manuals for the modem and power supply shall be supplied with each five assemblies furnished. Maintenance manuals shall include complete sub-component parts listing. Complete operations and protocol manuals shall also be provided with each assembly.

6-2 No changes or substitutions in these requirements will be acceptable unless authorized in writing. Inquiries regarding this specification shall be addressed to the Manager, Office of ITS Engineering, New Jersey Department of Transportation, P.O. Box 613, 1035 Parkway Avenue, Trenton, New Jersey 08625.

6-3 All components shall carry a two-year guarantee from the date of acceptance against any imperfections in workmanship or materials.

6-4 The manufacturer agrees upon the request of the Manager, Office of ITS Engineering to deliver to the Office, a sample of each assembly to be supplied in compliance with these specifications for inspection and test before acceptance. After completion of the test, the sample shall be returned.

6-5 The Supplier shall furnish any and all equipment which they deem necessary for safe and reliable field operation of the modems as part of the quoted price for the specified equipment.

6-6 All components furnished under this specification must be current production equipment and of recent manufacturer, identical models of which are in field operation in not less than 100 locations in the United States or Canada. Untried or prototype units shall not be considered for acceptance.

6-7 All major components shall be identified with a metal plate containing the serial number with a bar code identification.

6-8 Any repairs made by a manufacturer or representative shall be documented and returned with units when warranty repaired. This documentation shall include an explanation of the exact repairs made and identification of parts replaced by part number and circuit number. All warranty repairs must be completed within thirty days of delivery of the equipment to the designated repair depot.