

### 10-3. DIAL-UP MODEM

The dial-up modem unit shall be Hayes compatible and directly connect to Model 170 [or 2070](#) controller unit. The unit allows communication between the controller and a host computer over the public switched telephone network. The unit shall offer up to 2400 baud communication, auto-dial answer, speed detect and Hayes command set compatibility.

Modems provided shall not be prototype units, but of current standard production units, new and not previously used. Each modem ordered shall be provided with a manual and meet the following specifications:

- A. Compatibility to automatically adapts to calling or called modem at the following baud rates:

|                |           |
|----------------|-----------|
| CCITT V.22 bis | 2400 baud |
| CCITT V.22     | 1200 baud |
| Bell 212A      | 1200 baud |
| Bell 103       | 300 baud  |

- B. Serial Data Format -

Character asynchronous.

7 data bits with any parity type +1 or 2 stop bits.

8 data bits with mark or no parity +1 or 2 stop bits.

- C. Line conditioning shall be compatible with the public switched telephone network.
- D. Line interface shall meet FCC Part 68 requirements with the maximum transmit level of -9 dBm at 600  $\Omega$  and be configured for 2-wire full duplex (Tip and Ring) operation.
- E. Operation shall be capable of either: (i.) Asynchronous full or half duplex, and (ii.) Automatic and manual for call originate and answer.
- F. Modulation shall be capable of producing either: (i.) V.22 bis - Quadrature Amplitude Modulation (QAM), (ii.) V.22 and 212A - Differential Phase Shift Keying (DPSK), and V.21 and 103 - Frequency Shift Keying (FSK).
- G. NVRAM memory that allows storage of two user profiles and four 36-digit dial strings.
- H. Command set shall be industry standard Hayes "AT" 2400B and 2400.
- I. Equalization shall be: (i.) Fixed compromise equalization in transmitter, and (ii.) Adaptive equalizer for 1200 and 2400 bits per second (bps).
- J. Performance shall have a bit error rate less than 1:100,000 bits for a Signal to Noise (S/N) ratio of 10 dB for TXD and 45 dB for RXD.
- K. Interface signals shall be RS232C levels with CCITT V.24 protocols.
- L. Autodialer type shall be DTMF or pulse type dialing, specified in commands.

- M. DTMF tone pair balance shall be greater than 3 dB.
- N. DTMF tone duration and spacing shall be variable from 50 ms to 255 ms (Register S11) with a default duration of 95 ms.
- O. Command buffer size shall be 40 characters maximum with "AT" spaces and <CR><LF> not counted.
- P. Guard tones of 1800 Hz or 550 Hz is transmitted by the answering modem, for echo suppression. Guard tone will not be transmitted in Bell 212A or 103 modes. Default mode shall have no guard tone.
- Q. Result codes shall have the ability to limit, abbreviate, or suppress codes.
- R. Receive carrier detection levels shall be:

|                     |                   |
|---------------------|-------------------|
| off-to-on Threshold | -43 dBm           |
| on-to-off Threshold | -48 dBm           |
| Hysteresis          | Greater than 2 dB |

- S. Timing for carrier detect response time shall be adjustable from 100 ms to 25.5 s with the default set at 600 ms.
- T. Indications for Transmitted Data (TXD), Received Data (RXD), Off Hook (OH), Data Carrier Detected (DCD), Auto Answer (AA), and High Speed (HS) shall be mounted on the front edge of PCB.
- U. Power requirements shall be:

|               |                             |
|---------------|-----------------------------|
| Input Voltage | Maximum current consumption |
| +12 VDC       | 200 mA                      |
| -12 VDC       | 200 mA                      |

- V. Environmental operating temperature ranges shall be between -37°C to +74°C with 95 percent non-condensing humidity.