



GE Power Management Control System

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Technical Note #14

GE Power Management Control System

Phone Modem Device Support

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Subject: Use of modems to connect a PMCS host to remote devices.

Applies To: PMCS Modbus Systems with on considering phone modems.

Phone modems are used across standard two or four wire phone lines. They come in two basic types - dial-up and leased line.

Phone modems typically connect RS-232 to a phone line. A converter is required to convert the RS-232 signal to RS-485 and vice versa. A typical configuration for a single point-to-point network is shown in figure 1.

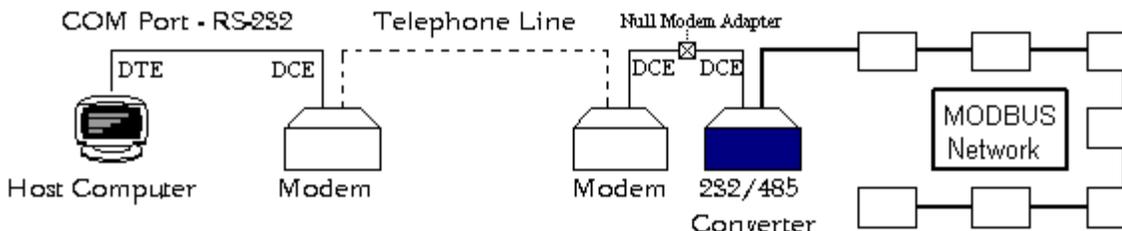


Figure 1 - Point to Point with Remote Devices

If multiple remote sites are required in point-to-point networks, then the above configuration must be duplicated for each site.

A configuration used to extend a current MODBUS network is shown in figure 2.

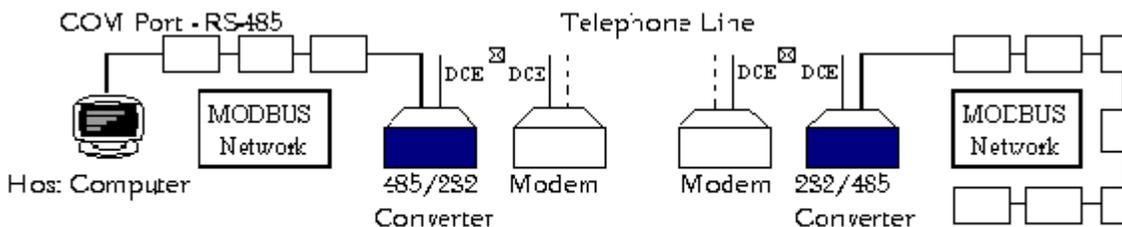


Figure 2 - Point to Point with Local and Remote Devices

Remember that all devices, including the modems, must be configured to run at the same baud rate.

NOTE: For most applications, the RS-232 cable between the computer (DTE) and the modem (DCE) will be a standard straight-through cable while the cable between a modem (DCE) and converter (DCE) will be crossover or null-modem cable. For more information regarding RS-232 cables, see Application Note 17.

Dial-Up Modem

Dial-up modems require a valid phone line with a dial tone to connect between the host and remote networks. In general, the host modem will dial up the remote modem and make a connection at the specified baud rate. As long as the connection exists, the communication should be transparent.

A dial-up modem should have the following features:

1. Baud rate sufficient to handle application (28.8 modem for 19.2kbps).
2. Asynchronous communications
3. 100% Hayes AT compatible
4. Error correction disable
5. Compression algorithm disable
6. Flow control disable
7. Auto-reconnect (optional for reliability)

WARNING: Standard dial up modems are subject to telephone line noise and power cycles. If the mode disconnects, then communication errors will result and data will be lost. If this occurs, the DDE server must be closed, the link reestablished, and the DDE server restarted. An industrial modem with auto-reconnect features can provide the higher reliability required by detecting the lost link and automatically reestablishing communications.

Both the host and remote modems must be initialized (with parameters stored in non-volatile memory to be loaded at power-up) before communications will work. In general, the initialization should disable error correction and compression algorithms and place the modem in asynchronous communications mode. The remote modem must be set up for auto-answering.

Modems use an industry standard AT command set which allows for the initialization of the modem. Dial modems which have worked successfully with the PMCS network are:

Hayes Accura 288 V.34 + Fax - P/N 08-02351 - (770) 840-9200

Hayes Optima 288 V.34 + Fax + Voice - P/N 08-02353 - (770) 840-9200

The initialization codes must be entered with either the Terminal program provided in the Windows NT Accessories Group or with a program provided with the modem. If using Terminal, make sure the correct communications options are set under the SETTINGS - COMMUNICATIONS tab. These options include the COM port, the baud rate, 8 data bits, 1 stop bit, no parity, and no flow control as shown in figure 3. Or the settings are correct, the modem may be initialized through the program.

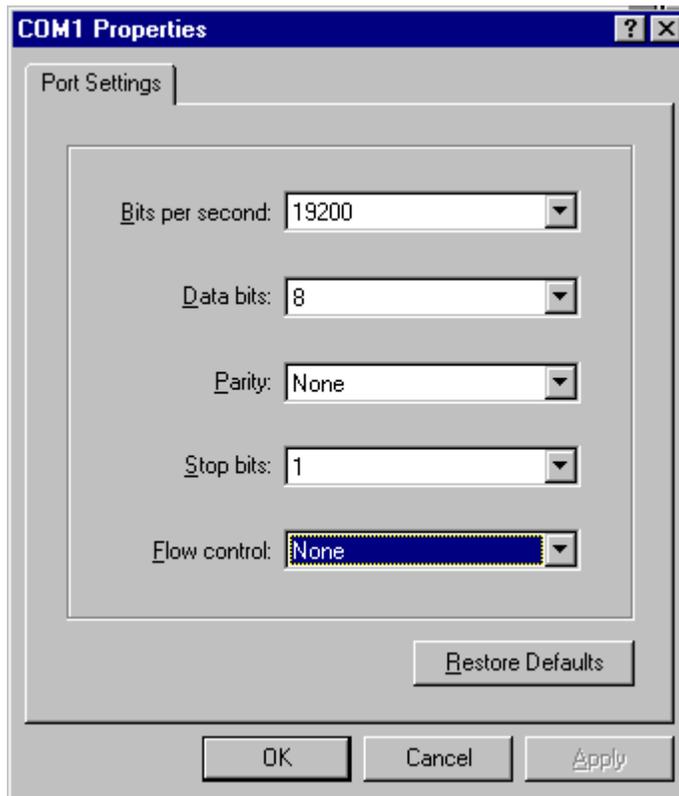


Figure 3 - Windows NT Hyper Terminal Settings Dialog Box

The initialization codes are:

Host AT&F&Q0&K0&Y&W<enter>

Remote AT&F&Q0&K0S0=1N1S37=12B65&Y&W<enter>

where,

&F - Factory defaults

&Q0 - Asynchronous mode - No error correction or compression

&K0 - No flow control

S0=1 - Answer on one ring (auto-answer)

N1 - Modulation Fall Back to a lower speed if necessary from the speed as specified in S37

S37=12 - Highest DCE line speed set to 19.2K baud.

B65 - Protocol compatibility for V.34 handshake at 9600 baud in addition to the usual default protocols, e V.34 16800-28800 baud (Hays Accura does not support B65)

&Y - Power up with user option set 1 (&Y1 for set 2)

&W - Store configuration

Additionally, the baud rate the host modems use may be set automatically using:

```
ATS37=xN0&W<enter>
```

where, S37=x - Maximum baud rate is x

x	Baud Rate
0	Use baud rate of the last AT command from Terminal. If using this option, make sure the Terminal speed is already set to the final desired baud rate
6	2400
7	4800
9	9600
12	19200

N0 - No modulation fall back, only handshake at speed defined in S37

The baud rate for the remote modem would be determined automatically (as set by N1 and S37) by the Hc DCE speed. Make sure that the remote modem's protocol compatibility option(s), B0-B81, is/are already : to match the host modem protocol and speed(s).

After the modems are initialized and are placed in the system, the host must dial the remote modem to establish a link. This may be done with either the Terminal program provided in the Windows NT Accessories Group or with a dialing program provided with the modem. Within Terminal, the remote site may be dialed by either using the PHONE - DIAL tabs or by using the appropriate AT command (ATDTxx for tone lines where xx = phone number). A confirmation of the connection should be seen either on the Terminal program (CONNECT 19200 for 19200 baud rate) or on the modem (CD light on - carrier detect)

Once the link is established, the Terminal or modem dialing program which is using the COM port must be closed before continuing (Windows NT will not allow more than one application to use the COM port at the same time). The modem setup is transparent to the PMCS and is now ready for communication with PMCS devices at the remote end. The PMCS DDE Server may now be started followed by any Clients to the Server.). Make sure the PMCS DDE server port is set for the same baud rate as the host modem. Once communications have started with the modems, the lights SD (Send Data) followed by RD (Receive Data) should light momentarily for each message transmitted and response received. If only the SD light is turned on and communication errors are being seen, check that the modem link is still active (when the host SD light is on, the remote RD light should go on), the error correction and compression algorithms are disabled and the baud rate is correct.

Dial-Up Modem with Auto-reconnect Feature

A modem with the auto-reconnect feature which works as host modem with the PMCS system is the:

Black Box Modem 3400 - P/N MD880A - (412) 746-5500

The initialization codes for Black Box model 3400 as host modem are:

```
AT&F&L1S28=0*DB1\N0\Q0Y0*AU1%B0&Y&W0<enter>
```

where, &F - Factory defaults

&L1 - 2-wire leased line. The &L1 along with *DB1 will auto dial when it recognizes there is no leased line connected.

S28=0 - Leased line look back time. A zero will keep the modem in Dial Backup Mode.

*DB1 - Automatic Dial Backup Mode. Modem will auto dial when it recognizes there is no leased line connected.

\N0 - Normal mode. No compression and error detection

\Q0 - Disable bilateral flow control

Y0 - Disable long space disconnect

*AU1 - Set auto dial to number stored at location #1

%B0 - Max DCE speed = DTE speed.

&Y - Power up with user option set 1 (&Y1 for set 2)

&W0 - Store configuration

The phone number may be stored using:

AT*CN1,xx&W0<enter> - store phone number xx in location #1

The modem, BlackBox Model 3400, should now be set up to dial automatically on power-up or after the phone disconnects for 90 seconds.

Dial Up Modem Point to Multipoint Support

With dial up modems, point to multipoint is difficult to achieve. The host computer will have a modem and will selectively dial up other modems to speak with certain devices at those locations. The capability is available, but with certain limitations.

The remote sites must not contain any Modbus Concentrators and therefore no Commnet devices. These devices require automatic server attention and therefore can not work with point to multipoint systems. Additionally, the waveform capture and event logger must not have any of these remote devices defined in the logging report since they generate occasional messages.

Wonderware InTouch may be used for point to multipoint applications. Scripts must be written to obtain the level of functionality. The scripts should be written to provide the following functionality:

1. Disable all remote devices in Wonderware so server releases COM port with modem
2. Open terminal program
3. hang up modem
4. dial new site
5. Close terminal program
6. enable only those devices at that remote location dialed

Notice that the above sequence is timing based and is initiated from InTouch. There is no feedback as to whether the connection was actually made. Therefore, adequate time between each step should be assigned.

Call GE Power Management support at 1-860-793-5138 for more information regarding the scripts involved for point to multipoint dial up modem support.

Leased Line Modem

Leased line modems require either a 2-wire or 4-wire connection to communicate between the host and remote sites. Leased line modems do not require a dial tone and do not need to dial up the remote site.

The requirements for leased line modems are similar to that for dial-up modems. However, leased line modems will reconnect automatically since no dialing is necessary. Therefore a leased line modem is much more reliable than a dial-up modem. A leased line modem should have the following features:

1. Baud rate sufficient to handle application
2. Transmit required distance while communicating at specified baud rate
3. Asynchronous communications
4. No error correction, compression, or flow control.

A Leased line modem GE has tested is:

Hayes Optima 288 V.34 + Fax + Voice - P/N 08-02353 - (770) 840-9200

This modem, since it can be either dial-up or 2 wire leased line, has the following set-up:

Host AT&F&Q0&K0&L1&Y&W<enter>

Remote AT&F&Q0&K0&L1S0=1&Y&W<enter>

where,

&F - Factory defaults

&Q0 - Asynchronous mode - No error correction or compression

&K0 - No flow control

&L1 - Leased line operation

S0=1 - Answer on one ring (auto-answer)

&W - Store configuration

Additionally, the baud rate the modems use may be set automatically using:

ATS37=xN0&W<enter>

where,

S37=x - Maximum baud rate is x

x	Baud Rate
6	2400
7	4800
9	9600
12	19200

N0 - Only connect at speed defined in S37

The modems must be placed in a no command state after they are initialized using AT%DUMB1. After the modems are connected and power cycled, they should automatically communicate with each other within seconds. To re-enter the command state, power cycle the modems and type AT%DUMB0 within 20 seconds. Notice the characters will not be echoed to the screen. If completed correctly (and at the correct

baud rate) the modem will respond with OK.

Another leased line modem GE has tested with the PMCS network is:

Black Box Async/Sync Short Haul Modem - P/N ME475A - (412) 746-5500.

This modem works only with 4 wire systems. As with most leased line modems, there is no software configuration. However, this unit does have three banks of dip switches, S1, S2, and S3. The baud rate use dip switches S1-1 to S1-4 for configuring the baud rate and S2-3 should be changed from Off to On for proper operation. The following represents this setup:

Switch	12345678	
S1 - Closest to center of modem	11101110	19200 baud
	10011110	9600 baud (default)
	11011110	4800 baud
	10111110	2400 baud
S2 - Middle	00111000	
S3 - Bottom	10010000	

Keywords

Phone; Phone Modem; Leased Line; Modem

Related Notes

[Application Note 17: RS-232 Cables for Modem Support](#)

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