Communication Application Tips for Modem Connection to GE Multilin Relays

GE Publication Number: GET-8468

Copyright © 2003 GE Multilin

Applicability

The document is applicable to the following GE Multilin protective relays:

- UR-series Universal Relays
- SR-series relays (469, 489, 745, 750/760)
- 269Plus Motor Management Relay
- 369 Motor Management Relay
- PQM Power Quality Meter

For additional details concerning relay operation, refer to the specific instruction manuals for these relays, available online at http://www.GEindustrial.com/multilin.

RS232/RS485 Converter Settings

DESCRIPTION

When using GE Multilin's SCI or F485 RS485-to-RS232 converter, make the dip-switch settings for modem communications shown in the following table.

See the *Using a Self-powered Converter at the Relay Modem* section at the end of this document for details on using self-powered RS232-to-RS485 converters.

TABLE 1. DIP-Switch Settings

SCI Module
SW1 = 1 and 3 ON (all others OFF)
SW2 = 2 and 4 ON (all others OFF)

SW3 = Baud Rate
   3 On = 2400 baud
   4 On = 4800 baud
   5 On = 9600 baud
   6 On = 19200 baud
(only one of the above 4 switches may be selected; all others are OFF)

F485 Module

SWITCH A = Baud Rate from A1 to A7
   1 ON = 1200 baud
   2 ON = 2400 baud
   3 ON = 4800 baud
   4 ON = 9600 baud
   5 ON = 19200 baud
(only one of the above 5 switches may be selected; all others are OFF)
   8 ON = for Modem communications

SWITCH B   RS232 to RS485 = 1 and 4 ON (all others OFF)

Modem Settings

DESCRIPTION

To properly communicate through modem to the relays, the following settings need to be made on the computer and relay modems.

COMPUTER MODEM

- No handshaking or flow control
- No error control
- Normal DTR ($\&D2$)
- Carrier detection ($\&C1$)
- Echo off ($E0$)
- Result codes enabled ($Q0$)
- No data compression

RELAY MODEM

- No handshaking or flow control
- No error control
- Ignore DTR ($\&D0$)
- Carrier detection always on ($\&C0$)
- $S0=1$ (number of rings before connection)
- No data compression
- Smart Mode OFF

Cables

PIN ASSIGNMENTS   See the below pin assignment table for the RS232 cable that must be used between the relay's modem and the RS485/RS232 converter. A standard modem cable can be used.

TABLE 2. RS232 Cable Wiring

9-pin male	25-pin male
1	8
2	3
3	2
4	20
5	7
6	6
7	4
8	5
9	22

Baud Rates

BAUD RATE SETTINGS   The relay, PC software, and RS485/RS232 converter must be set for the same baud rate. The maximum baud rate for the DOS version of 750/760PC program is 2400 baud. The maximum baud rate of all the Windows version software (PQM, 750/760, 745, 469, 489, 269Plus, 369) is 9600 baud. Typically, a baud rate of 9600 is recommended.

Example Settings for Relay Modem

DESCRIPTION   The following relay modem setting example pertains to the US Robotics Sportster 33.6k or 56K Fax modem.

DIP-SWITCH SETTINGS   Make the following dip switch settings to a new US Robotics or Black Box modem (model as listed above):

Dip switches that are DOWN   = 1 (DTR override)
                              = 3 (Suppress result codes)
                              = 6 (Carrier Detect Always ON)
                              = 8 (Enable Recognition - Smart Mode)

RELAY MODEM SETTINGS   By using the AT command, make the following changes to the relay's modem:

```
&A0 &B0 &C0 &D0 &H0 &I0 &K0 &M0 S0=2
```

GE Multilin   **3**

Use the Windows Terminal or HyperTerminal software to make the changes. For example, to enter the &A0 setting, type AT&A0 and hit enter. The OK message should be displayed if you were successful. After all the settings have been changed, type ATI4 to view the settings (some modems use AT&V). Set the number of rings on the modem by changing S0 register (S0=2 for 2 rings to answer). Type ATS0=2 and hit enter setting. Type AT&W0 to save the settings into the modem's memory. Verify that settings were changed by viewing the modem settings (use AT&V or AT&W0).

The settings for the indicated modems after all the changes were entered are as follows:

```
B0 E1 F1 M1 Q0 V1 X4 Y0
BAUD=9600 PARITY=N WORDLEN=8
DIAL=HUNT ON HOOK

&A0 &B0 &C0 &D0 &G0 &H0 &I0 &K0 &M0 &N0
&P0 &R2 &S0 &T5 &U0 &Y1

S00=002 S01=000 S02=043 S03=013 S04=010 S05=008 S06=002
S07=060 S08=002 S09=006 S10=014 S11=070 S12=050 S13=000
S15=000 S16=000 S18=000 S19=000 S21=010 S22=017 S23=019
S25=005 S27=000 S28=008 S29=020 S30=000 S31=128 S32=002
S33=000 S34=000 S36=014 S38=000
```

Example #1 for Computer Modem

DIP-SWITCHES

The following computer modem setting example pertains to the US Robotics Sportster 33.6k or 56K Fax modem.

The following modem dip-switch positions are set to DOWN:

    3 (Suppress result codes)
   5 (Disable auto-answer)
    8 (Enable Recognition: Smart Mode)

AT SETTINGS

For the computer modem AT settings, enter the following the relevant relay PC software for use with a new US Robotics modem (model as listed in the *Example Settings for Relay Modem* section). You do not have to make modem setting changes via the AT command as earlier. Under the **Modem Setup** menu, select the proper modem from the pull-down menu and verify the initialization commands shown below:

```
E0 Q0 &A0 &H0 &I0 &K0 &M0 &C1 &D2
```

The default modem settings are shown in the following sub-section.

The URPC software automatically reads the modem setup configuration from the Windows configuration, so no modem string has to be entered for UR-series relays.
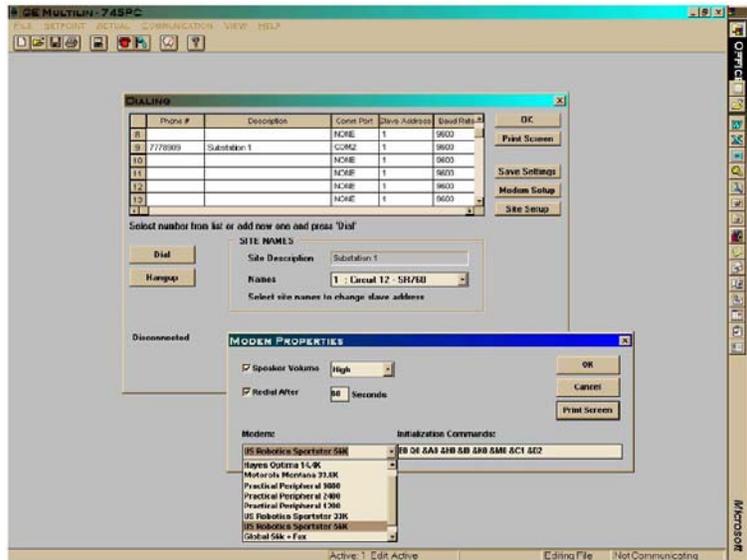
DEFAULT MODEM SETTINGS

For your reference, the default modem settings for this example are shown below. Changes to modem settings are performed via the relay's PC software.

```
B0 E1 F1 M1 Q0 V1 X4 Y0
BAUD=9600 PARITY=N WORDLEN=8
DIAL=HUNT ON HOOK

&A3 &B1 &C1 &D2 &G0 &H1 &I0 &K1 &M4 &N0
&P0 &R2 &S0 &T5 &U0 &Y1

S00=000 S01=000 S02=043 S03=013 S04=010 S05=008 S06=002
S07=060 S08=002 S09=006 S10=014 S11=070 S12=050 S13=000
S15=000 S16=000 S18=000 S19=000 S21=010 S22=017 S23=019
S25=005 S27=000 S28=008 S29=020 S30=000 S31=128 S32=002
S33=000 S34=000 S36=014 S38=000
```

Example #2 for Computers Modem

DESCRIPTION

Many modems can have different AT commands, check your specific model and enter the proper AT commands for the Computer's Modem as outlined in the *Modem Settings* section. If the "No Modem Response" error message occurs for Example #1, then your modem may not support the those AT commands and you may want to try the following settings.

AT SETTINGS

The following settings should be entered into the relay via the relay's PC software for use with a new Hayes modem:

```
E0 Q0 &K0 &C1 &D2    (see the default modem settings in the next sub-section)
```
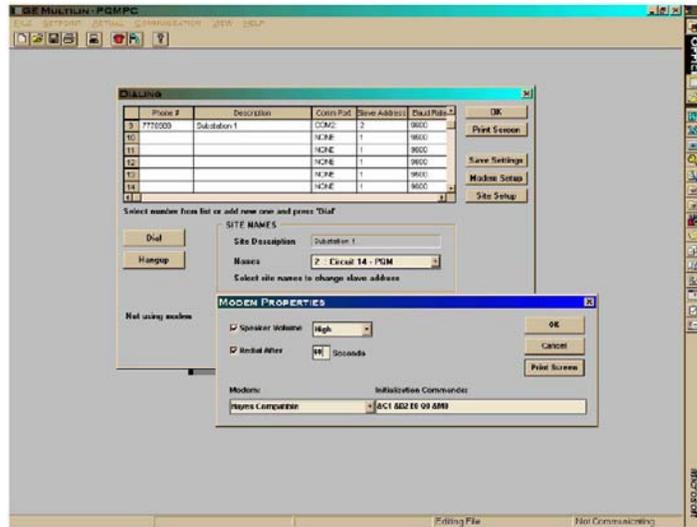
DEFAULT MODEM SETTINGS

For your reference, below are the default modem settings for this example. Changes to modem settings are performed via the relay's PC software.

Active Profile:

```
B1 E1 L2 M1 N1 Q0 T V1 W0 X4 Y0 &C1 &D2 &G0 &J0 &K3 &Q5
&R1 &S1 &T5 &X0 &Y0 ~Z0

S00:000 S01:000 S02:043 S03:013 S04:010 S05:008 S06:004
S07:045 S08:002 S09:006 S10:050 S11:095 S12:050 S18:000
S25:005 S26:001 S36:007 S37:000 S38:020 S44:020 S46:138
S48:007 S51:012 S52:012 S53:010 S54:010 S95:000
```

Stored Profile 0:

```
B1 E1 L2 M1 N1 Q0 T V1 W0 X4 Y0 &C1 &D2 &G0 &J0 &K3 &Q5
&R1 &S1 &T5 &X0

S00:000 S02:043 S06:004 S07:045 S08:002 S09:006 S10:050
S11:095 S12:050 S18:000 S36:007 S37:000 S40:168 S41:195
S46:138 S51:012 S52:012 S53:010 S54:010 S95:000
```

Stored Profile 1:

```
B1 E0 L2 M1 N1 Q0 T V0 W0 X4 Y0 &C1 &D2 &G0 &J0 &K3 &Q5
&R1 &S1 &T5 &X0

S00:000 S02:043 S06:004 S07:050 S08:002 S09:006 S10:014
S11:095 S12:050 S18:000 S36:007 S37:000 S40:168 S41:195
S46:138 S51:012 S52:012 S53:010 S54:010 S95:000
```

Various Computer Modem Initialization Strings

For your reference, modem settings required for various modems used for the computer modem are shown below. These modem strings can be entered into the relay's PC software, see the *Modem Setup* section for details.

- Practical Peripheral 9600 Modem: `AT&F&C1&D0&K0&Q6N0S37=9S0=2`
- Practical Peripheral 2400 Modem: `AT&F&C1&D0&K0&Q6N0S37=6S0=2`
- Practical Peripheral 1200 Modem: `AT&F&C1&D0&K0&Q6N0S37=5S0=2`
- Hayes Optima 14.4K Modem: `L1&C1&D2&K0E0V1Q0M1`
- US Robotics Sportster 33.6K Modem: `E0Q0&A0&H0&I0&K0&M0&C1&D2`
- US Robotics Sportster 56K Modem: `E0Q0&A0&H0&I0&K0&M0&C1&D2`
- Black Box Speedster 33.6K Modem: `E0Q0&A0&H0&I0&K0&M0&C1&D2`
- Motorola 33.6K: `E0F0M1Q0&C1&D2&K0&M0%C0\G0\N1\Q0\V1 S37=9`
- Dell Latitude LS Internal Modem (9600 baud): `E0Q0&C1&D2&K0%C0\N1S37=9`

Diagnostic Tips if Modem does not Respond or Dial

This section is not applicable to the URPC software.

1. Make sure that modem dials number and you hear a connection. If `NO RESPONSE` message appears, then check to see if all commands in modem initialization sting (`AT` commands) are recognized by the modem (see manual for modem – section AT commands).

2. If modem connects, verify that the message `CONNECT 9600` appears and baud rate matches the baud rate used. If not, you may have to alter the modem initialization string to force the modem to connect at the desired baud rate. If 9600 baud rate is desired, then add `S37=9` to the initialization string to force modem to connect at 9600 baud.

3. Ensure the relay's modem is set to the desired number of rings to answer by setting `S0` register. To set for 2 rings to answer, type `ATS0=2` and hit enter. Type `AT&W0` to save the settings into the modem's memory.

URPC Software Setup for Modem Communications

URPC software automatically reads the modem properties and settings from the Windows configuration, so no modem string has to be entered. Just select the proper baud rate and enter telephone number in the **Interface List**.
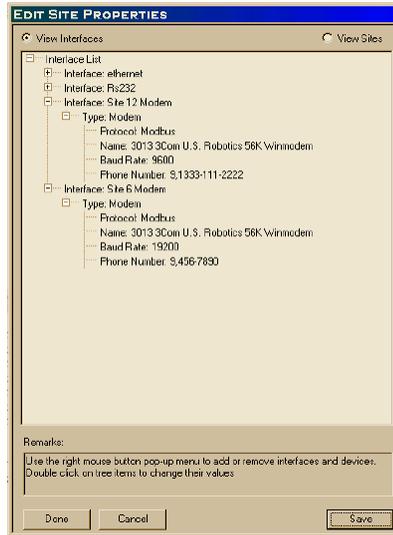
To connect to a device, select a **Device** from the Site List and desired branch item (for example **Front Panel**). To connect to the device, click on the red button to connect via modem.
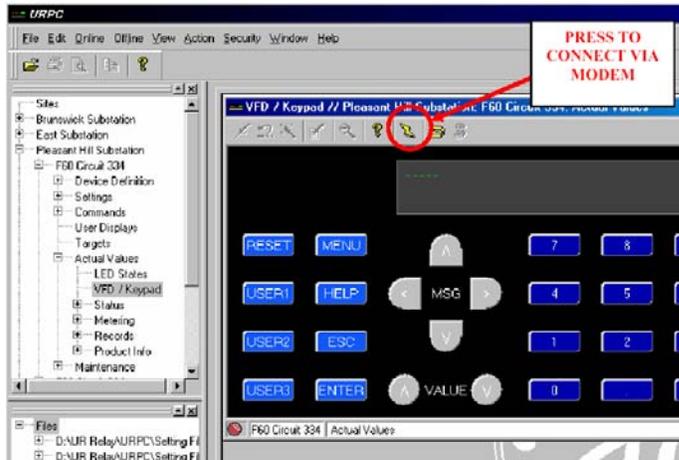
A **Connecting to Interface** dialog box will appear displaying commands and status messages of the connection.

Using a Self-powered Converter at the Relay Modem

SELF-POWERED RS232-RS485 CONVERTERS

It is recommended to use Model 485SD9TB from B & B Electronics (http://www.bb-elec.com). When using this converter, place a null modem adapter between the modem and the converter. Multiple devices can be connected to one converter by daisy chaining 2-wire shielded twisted pair wire between RS485 devices to the TDB(+) and TDA(–) terminals of the converter. Ensure the relays modem is configured as specified in the *Example Settings for Relay Modem* section.

When using this converter for direct connection to relay (no modem), a null modem adapter is not necessary.
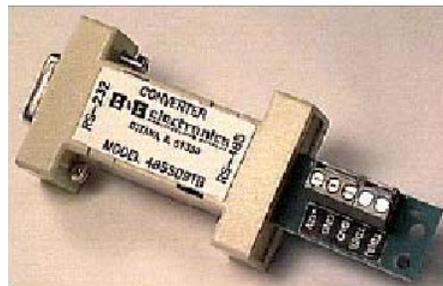

FIGURE 1. B & B Model 485SD9TB Converter