VT-MODEM with Ci Technologies' Citect HMI Perform Scheduled Dial-Outs and Alarm Dial-Backs to PLCs or other Remote Stations

Abstract: This document explains the procedure for performing scheduled dial-out and unsolicited dial-back telephone communications between Citect and remote stations (such as a PLC) using SIXNET industrial modems (VT-MODEM-#) and the Modbus ASCII protocol.

Citect from Ci Technologies can perform scheduled dial-outs over telephone modems to remote stations and periodically poll PLCs, RTUs, or other devices remotely connected via telephone lines. Citect can also accept incoming (dial-back) telephone messages from remote stations. This allows remote stations to immediately dial-back to Citect to report alarms or other conditions. SIXNET's industrial modems make the perfect partner to Citect to perform these operations. SIXNET has successfully tested these capabilities with our industrial modems (VT-MODEM), a VersaTRAK RTU (which for the purposes of this tech note may be considered the remote "generic PLC"), and the Modbus ASCII protocol. This technical note details the tests that were performed.

Software Used:
- Ci Technologies' Citect v5.21 with Modbus ASCII driver
  (Note: In a real application, simply use the appropriate Citect driver for your PLC or remote device.)
- SIXNET VT-MODEM Setup Wizard v1.15
- Windows NT 4.0 OS with Service Pack 5
- SIXNET's Plant Floor v2.56 (for configuring the VersaTRAK)

Hardware Used:
- (1) PC with two serial ports and each connected to a VT-MODEM-1 via a VT-CABLE-MDM
  (Note: One modem for dialing out and one for receiving calls.)
- (3) VT-CABLE-MDM (modem cables)
- (3) RJ11 telephone cables
- (1) ST-CABLE-PF between the VersaTRAK and the PC was used to configure the VersaTRAK
- VersaTRAK (VT-A2-222-44P) connected to a VT-MODEM-2 via a VT-CABLE-MDM (Note: For the purpose of this test the VersaTRAK is being used in place of a PLC. In a real application you can use any PLC in conjunction with a VT-MODEM-2 to get dial-back capability.)

Cable Pin-outs:

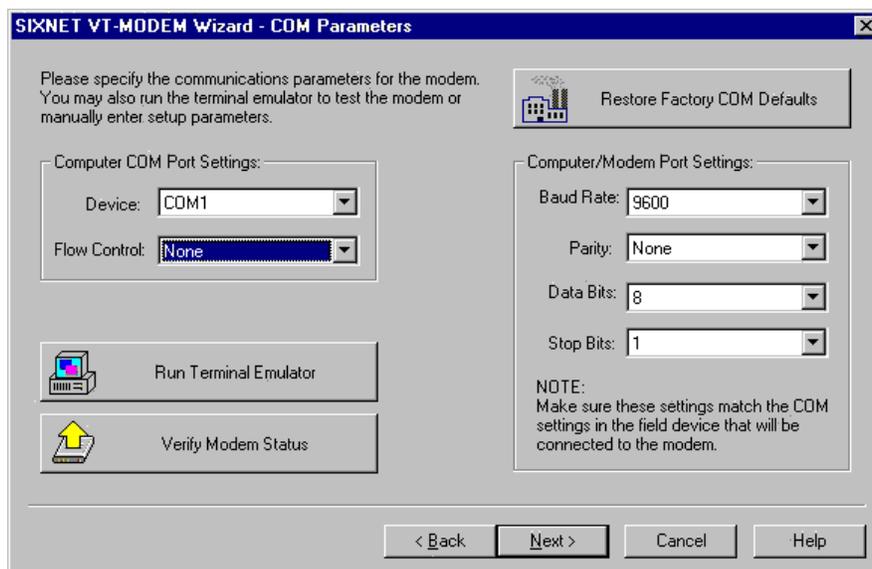| VT-CABLE-MDM					ST-CABLE-PF			
DB9 Female to PC (DTE)		DB9 Male to modem (DCE)			DB9 Female to PC (DTE)		DB9 Female to RTU (DTE)	
1	←	1	DCD out		Pins 1, 4, & 6 tied together on both ends			
2	←	2	RD out		2	←	3	TD out
3	→	3	TD in		3	→	2	RD in
4	→	4	DTR in					
5	–	5	GND		5	–	5	GND
6	←	6	DSR out					
7	→	7	RTS in		7	→	8	CTS in
8	←	8	CTS out		8	←	7	RTS out
9	←	9	RI out		No connection to pin 9 on either end			

Configuring the Hardware:

- **VersaTRAK RTU** – The VersaTRAK's Plant Floor RS232 port was connected to the PC's serial port via the ST-CABLE-PF. Using the Plant Floor software the VersaTRAK was configured to be station #1. The main port on the VersaTRAK was configured to be a Modbus ASCII slave. See screen shot 1. Refer to Plant Floor's on-line help for details on configuring SIXNET stations.
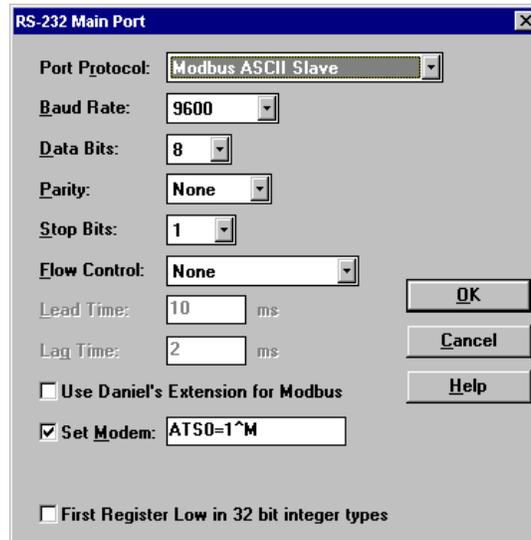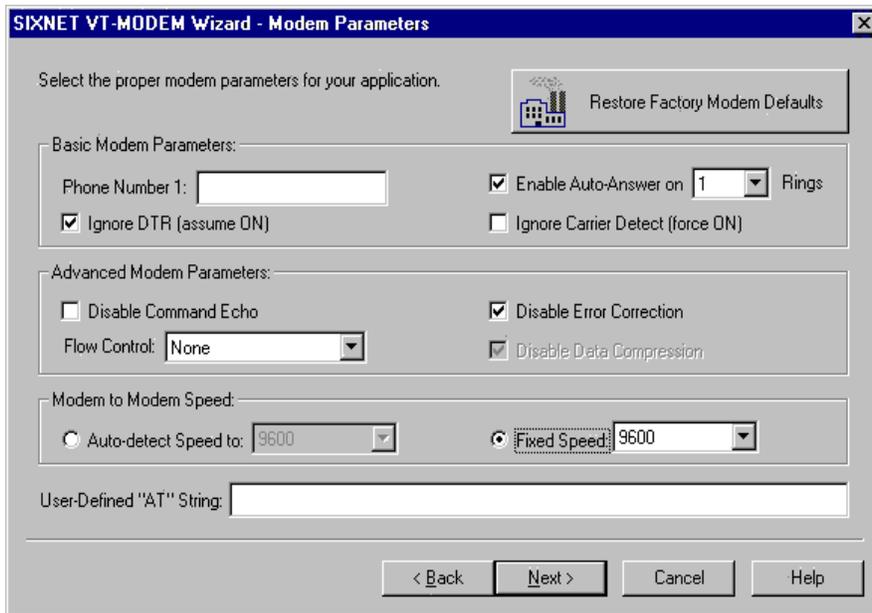
Screen Shot 1

- **VT-MODEM-1** – One at a time the two VT-MODEM-1's were connected to the PC via the VT-CABLE-MDM. Using the VT-MODEM Setup Wizard the modems were configured for 9600 bps, 8 data bits, No parity, 1 stop bit, no flow control, no error correction, no data compression, and ignore DTR. See screen shot 2 and 3. (Note: In this test, two modems were used with the PC. One dedicated to dialing out and one for receiving incoming calls. This is the recommended setup. One modem could have been used but obviously you can't have outgoing and incoming links at the same time.)
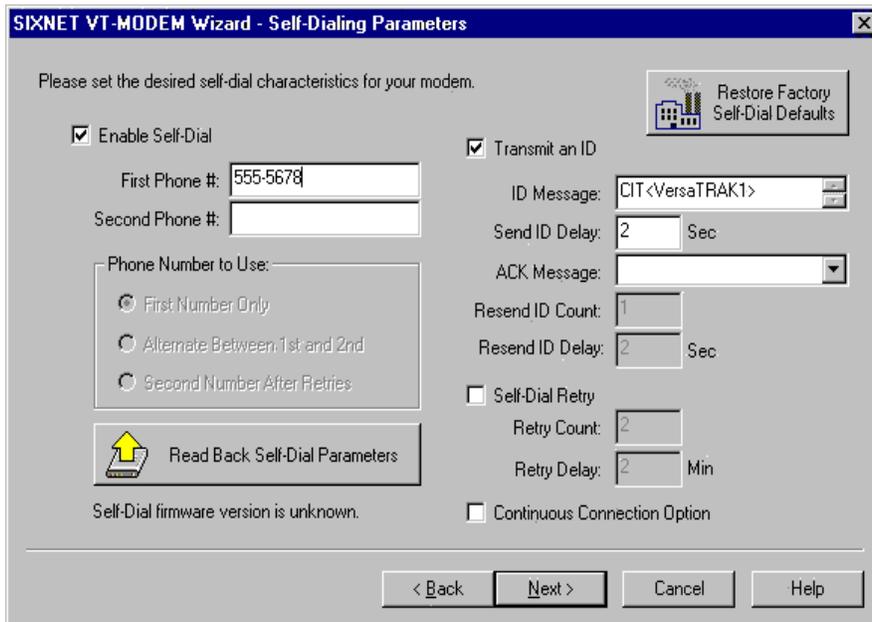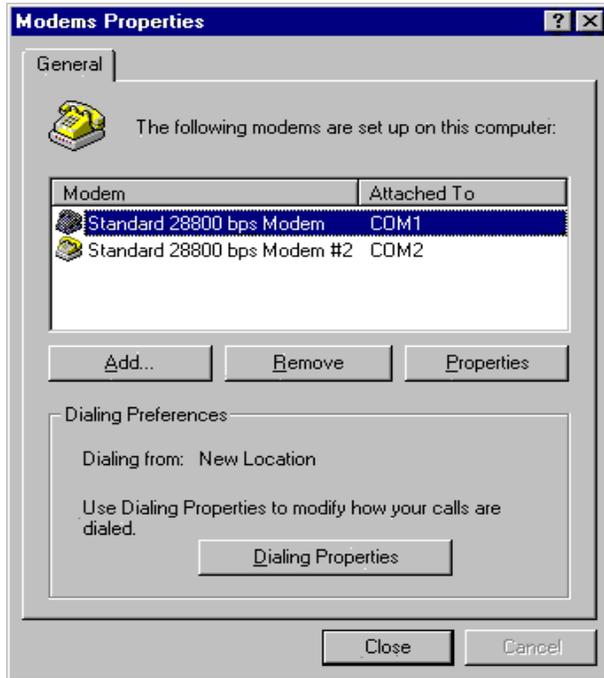
Screen Shot 2

Screen Shot 3

- **VT-MODEM-2** – The VT-MODEM-2's RS232 port was connected to the PC's serial port via the VT-CABLE-MDM. Using the VT-MODEM Setup Wizard the modem was configured to auto-dial when its input goes high and to send the string "CIT<VersaTRAK1>". See screen shots 2, 3, and 4. Note that the ID message is "CIT<VersaTRAK1>" (screen shot 4) whereas in Citect you just enter "VersaTRAK1" (screen shot 14). Refer to Setup Wizard's on-line help for details on configuring SIXNET modems.
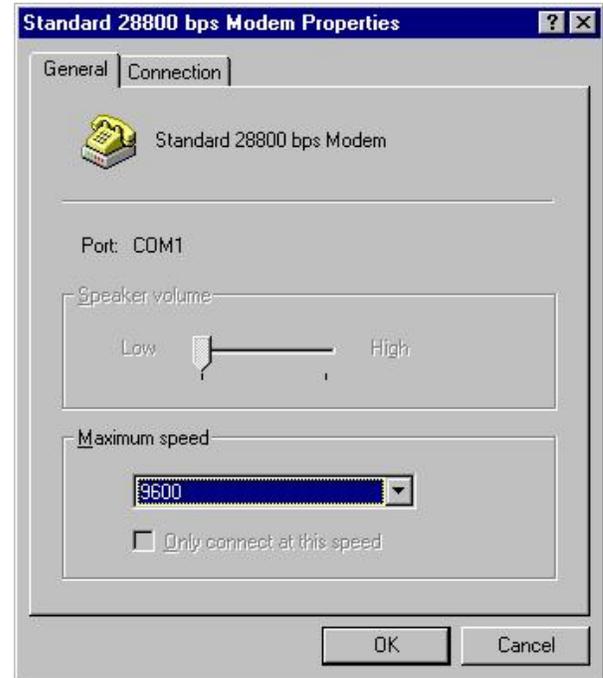

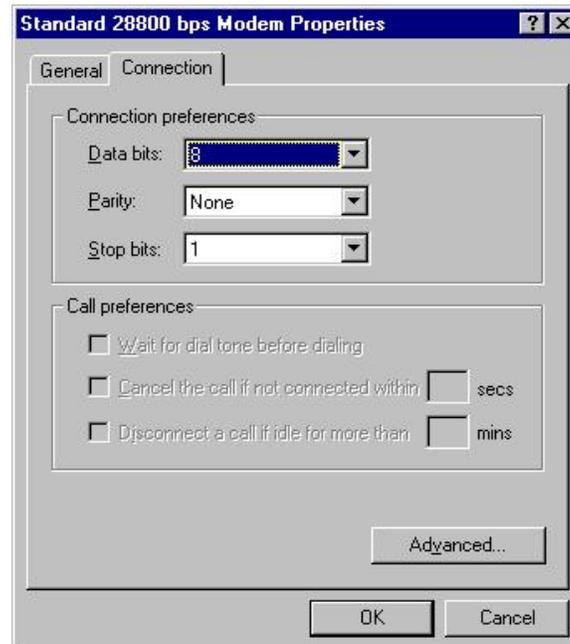**Screen Shot 4**

PC and VT-MODEM-1 Windows Setup:
Once the VT-MODEMs were configured they were connected via VT-CABLE-MDMs to com port 1 and com port 2 of the PC. They then were added to the Modem setup under Window's Control Panel. Make sure to manually select "Standard 28800 bps Modem" for the modem type. Refer to screen shots 5, 6, and 7 for details of how the modems were configured.

Screen Shot 5

Screen Shot 6

Screen Shot 7

VersaTRAK and VT-MODEM-2 Setup:
Once the VersaTRAK and VT-MODEM-2 were configured they were connected via a VT-CABLE-MDM between the VersaTRAK's main RS232 port and the VT-MODEM-2's RS232 port. A toggle switch was wired between the VT-MODEM-2's discrete input and 24 VDC. This is to simulate an alarm signal from the remote station (i.e. PLC). Normally this input would be connected to an output on the remote station.

Note: With a VersaTRAK, you can use a VT-MODEM-1 instead of a VT-MODEM-2. The VT-MODEM-2 is designed for devices (such as many PLCs) that can't easily send AT commands and ASCII strings in order to initiate dialup communications. The VersaTRAK along with ISaGRAF programming can easily and directly control a VT-MODEM-1 without needing the auto-dial feature of the VT-MODEM-2.

Phone Connections:
All three modems were then connected to an internal analog phone system using standard RJ11 telephone cable.
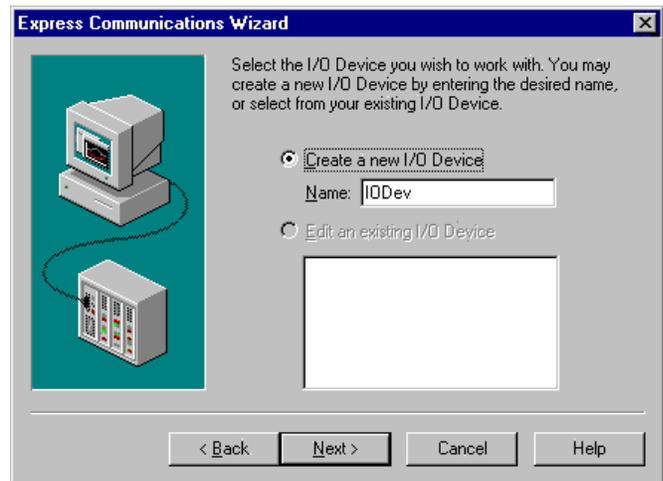
Citect Configuration:
Here are the steps used to configure Citect for scheduled dial-out and incoming dial-back telephone communications.
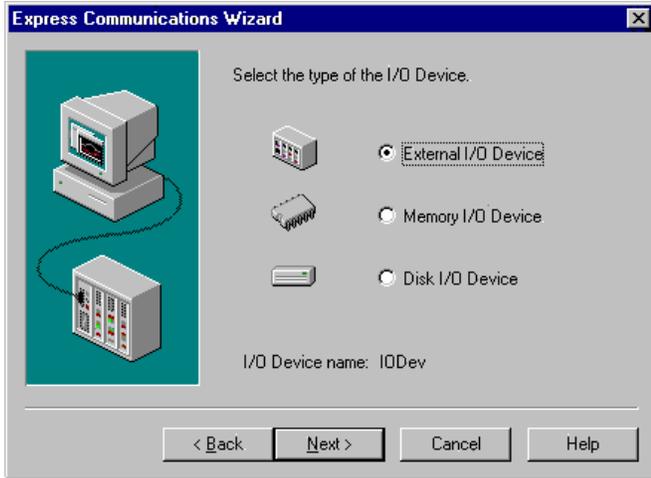1. Started Citect.
2. Created a new project.
3. Ran the Express Communications Wizard (or Express I/O Device Setup). Citect was configured to start at 2:37 PM and dial up the remote station every 5 minutes. Also, a caller id of "VersaTRAK1" was assigned to allow the remote station to dial in. Refer to screen shots 8 – 14.
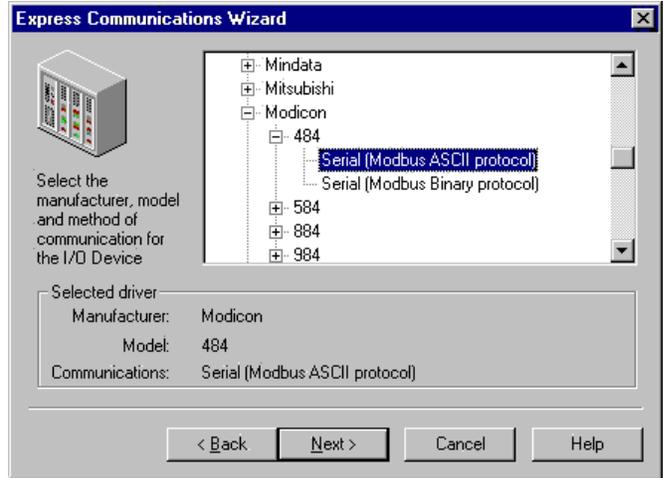

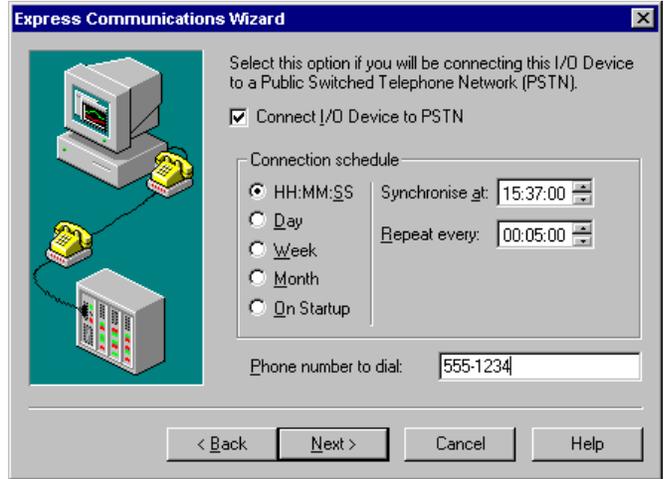**Screen Shot 8**

Screen Shot 9

Screen Shot 10

Screen Shot 11
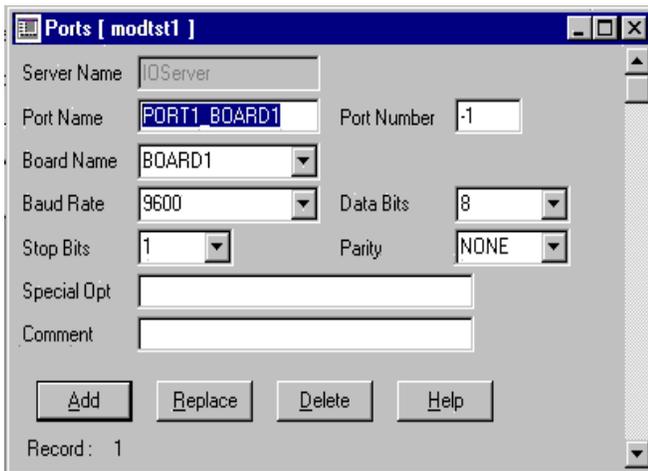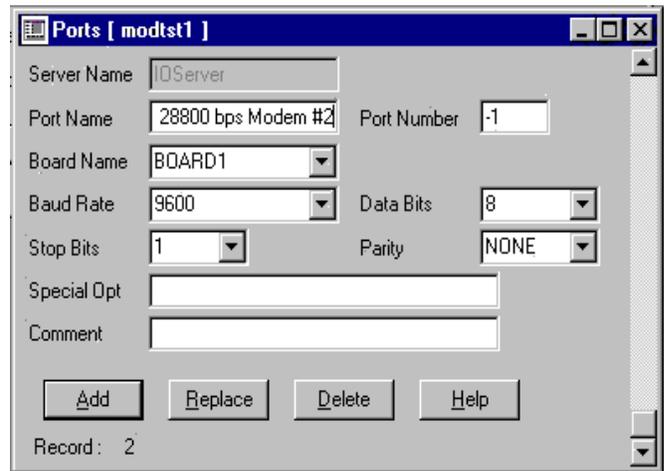

Screen Shot 12

Screen Shot 13

Screen Shot 14

4. Ran the Ports configuration window and changed the com parameters to 9600 and parity to none. Remember to click Replace. This port configuration will handle the dialing out. Then created a new port configuration for the dial-back modem by editing the Port Name and making it the name of the 2**nd** modem listed under the Window's Control Panel – Modems. For the test the name was "Standard 28800 bps Modem #2". Remember to click Add. Refer to screen shots 15 and 16.
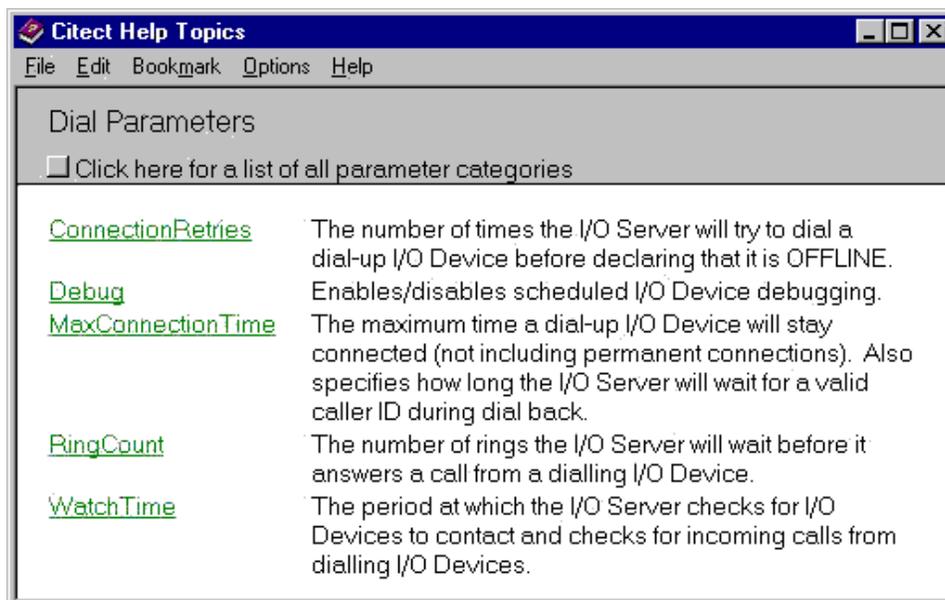

Screen Shot 15

Screen Shot 16

5. Set the Debug Dialing option to 1 so that the details of dialing would show up in Citect's debugging Kernel. This is not required but helps troubleshoot problems. All other dialing parameters were left at their defaults. See screen shot 17. (Note: To change dialing parameters you need to find the Dialing Parameters topic in Citect's help system and edit them there.)

Screen Shot 17

6. Defined some Modbus tags in the Variable Tags window. See screen shot 18 for an example.
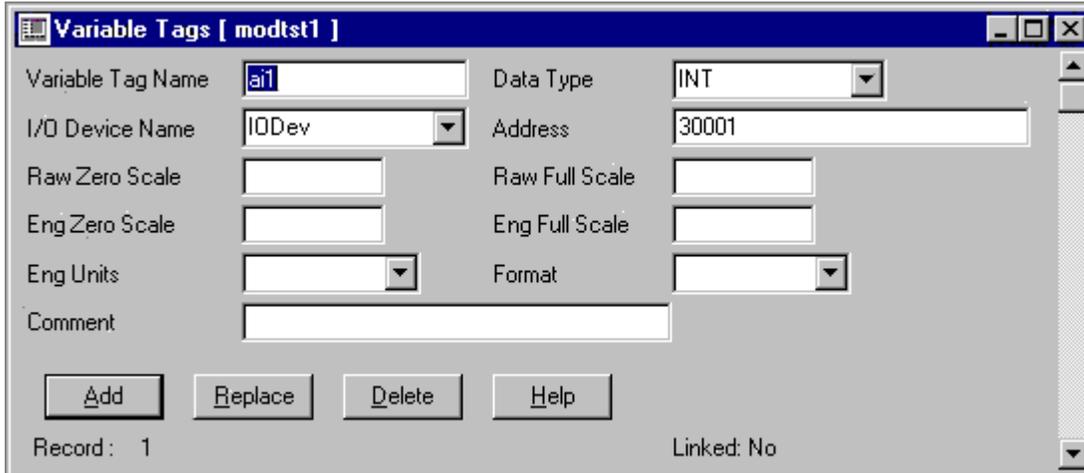
Screen Shot 18

7. Packed the project.
8. Created a graphics page.
9. Linked variable tags to some items on this graphics page.
10. Compiled project.
11. Ran project.
12. For the purposes of the testing the scheduled dial-outs were set to occur every 5 minutes. Proper operation of these scheduled dial-outs was witnessed and they occurred on the first modem. Every 5 minutes Citect would dial and make a connection to the remote station. Citect then polled the station just once and hung up the connection.
13. The dial-backs were triggered by toggling the switch, connected to the VT-MODEM-2, to the ON position. This would cause the VT-MODEM-2 to auto-dial the second modem connected to the PC and then send the ID string "CIT<VersaTRAK1>". Citect would see the call coming in, wait for a connection, and then check the ID string. Citect then polled the station just once and hung up the connection. The switch was then toggled back to the OFF position. Normally, the RTU or PLC would control the input to the VT-MODEM-2. The VT-MODEM-2 also has a discrete output that indicates when there is or isn't a connection. In a real application, make sure that the input to the VT-MODEM isn't dropped until it has detected that the connection has been terminated or lost.

Conclusion:
This test successfully performed scheduled and dial-back telephone communications between Citect and a VersaTRAK RTU using VT-MODEMs and the Modbus ASCII protocol.

Troubleshooting Tips:

- Make sure you configure the VT-MODEM to be connected to the remote station using the same baud rate (and other com parameters) that the remote is configured for. For example, if the remote station is configured 9600, 8, N, 1 then set the VT-MODEM Setup Wizard (see screen shot 2) to the same settings when configuring the modem.
- If your ID string in Citect is "My_Station" then in the VT-MODEM Setup Wizard you need to specify "CIT<My_Station>".
- After creating your Citect project you may need to run through Citect's Computer Setup wizard and enable Events.
- If you need to make changes to your configuration in Citect's Express Communications wizard then you may need to re-create it from scratch. If your dial-outs or dial-backs don't seem to be working then try deleting your IOserver configuration (which deletes all your communication settings), re-pack your project, and then run through the Express wizard again.
- Of course, if all else fails then contact SIXNET or Ci Technologies for technical assistance.

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