

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 dialback 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 Cited
- (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-C	ABI	LE-PF		
DB9 Female to PC (DTE)		DB9 Male to	modem (DCE)	DB9 F	emale to PC (DTE) DB9 Female to RTU (ORTU (DTE)
1	←	1	DCD out		Pins 1, 4, & 6 tied together on both ends			ls
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 pir	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.

RS-232 Main Port		×
Port P <u>r</u> otocol:	Modbus ASCII Slave	•
<u>B</u> aud Rate:	9600 💽	
<u>D</u> ata Bits:	8 🗾	
Parity:	None 💽	
<u>S</u> top Bits:	1	
<u>Flow</u> Control:	None	
Lead Time:	10 ms	<u> </u>
Lag Time:	2 ms	<u>C</u> ancel
🗆 Use Daniel'	s Extension for Modbus	<u>H</u> elp
⊠ Set <u>M</u> odem:	ATS0=1 [^] M	
🗖 First Registe	er Low in 32 bit integer types	
	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.)

SIXNET VT-MODEM Wizard - COM Parameters	×
Please specify the communications parameters for the modem. You may also run the terminal emulator to test the modem or manually enter setup parameters.	Restore Factory COM Defaults
Computer COM Port Settings: Device: COM1	Computer/Modem Port Settings: Baud Rate: 9600
Run Terminal Emulator	Stop Bits: 1
< <u>B</u> ack	Next > Cancel Help

Screen Shot 2

SIXNET VT-MODEM Wizard - Modem Parameters Select the proper modem parameters for your application.	
Basic Modem Parameters:	Finalle Auto-Answer on 1 Rings
Ignore DTR (assume ON)	Ignore Carrier Detect (force ON)
Advanced Modern Parameters: Disable Command Echo Flow Control: None	Disable Error Correction Disable Data Compression
Modem to Modem Speed:	€ Fixed Speed 9600
User-Defined "AT" String:	
< <u>B</u> ack	Next > Cancel Help
Screen S	hot 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.

SIXNET VT-MODEM Wizard - Self-Dialing Param	neters X
Please set the desired self-dial characteristics for your	modem. Restore Factory
🔽 Enable Self-Dial	Transmit an ID
First Phone #: 555-5678	ID Message: CIT <versatrak1></versatrak1>
Second Phone #:	Send ID Delay: 2 Sec
Phone Number to Use:	ACK Message:
First Number Only	Resend ID Count: 1
C Alternate Between 1st and 2nd	Resend ID Delay: 2 Sec.
O Second Number After Retries	Self-Dial Retry
	Retry Count: 2
Read Back Self-Dial Parameters	Retry Delay: 2 Min
Self-Dial firmware version is unknown.	Continuous Connection Option
<	Back Next> Cancel Help
Scree	en 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.

Modems Properties	Standard 28800 bps Modem Properties 🛛 🔋 🗙
General	General Connection
The following modems are set up on this computer:	Standard 28800 bps Modem
Modem Attached To	
Standard 28800 bps Modem COM1	Port: COM1
	- Speaker volume
Add <u>R</u> emove <u>P</u> roperties	Low High
Dialing Preferences Dialing from: New Location	Maximum speed
Use Dialing Properties to modify how your calls are	9600
dialed.	Only connect at this speed
Lioșe Cancel	UK Lancel

Screen Shot 5

Screen Shot 6

eral Lonne	ction		
Connection p		_	
<u>D</u> ata bits:		<u> </u>	
<u>P</u> arity:	None	-	
<u>S</u> top bits:	1	-	
🗖 Discor	nect a call if idle for m	ore than	mins
		Adv	anced
			dillood

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.

Express Communications Wizard	Express Communications Wizard
Select the I/O Server you wish to work with. You may create a new I/O Server by entering the desired name, or select from your existing I/O Servers. Image: Communications wizer Image: Communications wizer	Select the I/O Device you wish to work with. You may create a new I/O Device by entering the desired name, or select from your existing I/O Device. Select the I/O Device with the desired name, or select from your existing I/O Device. Select the I/O Device with the desired name, or select from your existing I/O Device. Select the I/O Device with the desired name, or select from your existing I/O Device. Select the I/O Device with the desired name, or select from your existing I/O Device. Select the I/O Device with the desired name, or select from your existing I/O Device. Select the I/O Device with the desired name, or select from your existing I/O Device. Select the I/O Device with the desired name, or select from your existing I/O Device. Select the I/O Device with the desired name, or select from your existing I/O Device. Select the I/O Device with the desired name, or select from your existing I/O Device. Select the I/O Device with the desired name, or select from your existing I/O Device. Select the I/O Device with the desired name, or select from your existing I/O Device. Select the I/O Device with the desired name, or select from your existing I/O Device. Select the I/O Device with the desired name, or select from your existing I/O Device. Select the I/O Device with the desired name, or select from your existing I/O Device. Select the I/O Device with the desired name, or select from your existing I/O Device. Select the I/O Device with the desired name, or select from your existing I/O Device. Select the I/O Device with the desired name, or select from your existing I/O Device. Select the I/O Device with the desired name, or select from your existing I/O Device. Select the I/O Device with the desired name, or select from your existing I/O Device. Select the I/O Device with the desired name, or select from your existing I/O Device. Select the I/O Device with the desired name, or select from your existing I/O Device. Select the I/O Device with the desired name, or select from your exis
Screen Shot 8	Screen Shot 9

Express Communica	tions Wizard	Express Communications Wizard
	Select the type of the 1/0 Device.	Select the manufacturer, model and method of the I/O Device Selected driver Manufacturer: Modicon Model: 484 Communications: Serial (Modbus ASCII protocol)
E	< <u>B</u> ack <u>N</u> ext > Cancel Help	< <u>B</u> ack <u>N</u> ext > Cancel Help
	Screen Shot 10	Screen Shot 11
Express Communica	tions Wizard	Express Communications Wizard
	You need to provide an address for your I/O Device. Press the Driver Address Help button for help on the address of the driver you have selected.	Select this option if you will be connecting this I/O Device to a Public Switched Telephone Network (PSTN). Connect I/O Device to PSTN Connection schedule HH:MM:SS Synchronise at: 15:37:00
<u>A</u> ddress:	Enter an address below or accept the default.	○ Day ○ Week ○ Month
Manufacturer: Manufacturer: Model: Communications:	Modicon 484 Serial (Modbus ASCII protocol)	Phone number to dial: 555-1234
	< <u>B</u> ack. <u>N</u> ext > Cancel Help	< <u>B</u> ack <u>N</u> ext > Cancel Help

Screen Shot 12

Screen Shot 13

Express Communication	s Wizard 🛛 🔀
	Any I/O Device that is connected to a PSTN and needs to dial in must have a unique identifier. Caller ID: VersaTRAK1 You can also specify commands to be executed when the connection is established and/or terminated. Event commands On connect: On disconnect:
<[Back Next Cancel Help

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.

🛄 Ports [modtst1]			_ 🗆 ×	🛄 Ports [ma	odtst1]			_ 0	×
Server Name 10Se	erver			-	Server Name	IOServer				-
Port Name POR	RT1_BOARD1	Port Number	·1	-	Port Name	28800 bps Modem #2	Port Number	-1		
Board Name BOA	RD1 🔻				Board Name	BOARD1				
Baud Rate 9600) 🔹	Data Bits	8	•	Baud Rate	9600 💌	Data Bits	8	•	
Stop Bits 1	T	Parity	NONE	•	Stop Bits	1 💌	Parity	NONE	•	
Special Opt					Special Opt					
Comment					Comment					
<u>A</u> dd <u>R</u> eplace <u>D</u> elete <u>H</u> elp Record: 1			Add Record: 2	<u>R</u> eplace <u>D</u> e	ete <u>H</u> i	elp	Ī	•		
	Screen	Shot 15				Screen S	Shot 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.)

🤣 Citect Help Topics				
<u>File E</u> dit Book <u>m</u> ark <u>O</u> ption	ns <u>H</u> elp			
Dial Parameters				
Click here for a list of all parameter categories				
<u>ConnectionRetries</u>	The number of times the I/O Server will try to dial a dial-up I/O Device before declaring that it is OFFLINE.			
Debug	Enables/disables scheduled I/O Device debugging.			
MaxConnectionTime	The maximum time a dial-up I/O Device will stay connected (not including permanent connections). Also specifies how long the I/O Server will wait for a valid caller ID during dial back.			
<u>RingCount</u>	The number of rings the I/O Server will wait before it answers a call from a dialling I/O Device.			
<u>WatchTime</u>	The period at which the I/O Server checks for I/O Devices to contact and checks for incoming calls from dialling I/O Devices.			



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

🛄 Variable Tags [modtst1]					
Variable Tag Name ail	Data Type	INT 💌 🔺			
I/O Device Name IODev 💌	Address	30001			
Raw Zero Scale	Raw Full Scale				
Eng Zero Scale	Eng Full Scale				
Eng Units	Format				
Comment					
<u>A</u> dd <u>R</u> eplace <u>D</u> elete <u>H</u> elp					
Record: 1		Linked: No			

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), repack 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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