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## Remote Control/Monitoring of Digiquartz® Intelligent Instruments

by  
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### 1. Purpose:

The purpose of this application note is to demonstrate how to use the available tools to control/monitor Digiquartz® Intelligent Instruments remotely over the phone lines. You can control Digiquartz® Intelligent Instruments remotely to read environmental pressure, temperature and humidity as well as the internal coefficients of an Intelligent Instrument. With the available tools and some programming, you can also change the configuration parameters of an instrument remotely. The following paragraphs explain the details of how to implement this project.

### 2. Why do you need to monitor/control Digiquartz® Intelligent Instruments remotely?

Because of the nature of your business, you may need to monitor the ambient pressure, temperature and/or humidity values. It may not be convenient for you to go physically from one location to another to make these measurements or you may need to monitor a wide area simultaneously for a long period of time.

### 3. What are the tools you need for remote control/monitoring?

The tools you need to monitor a remote site are;

- Two computers with modems (one local, one remote)
- A phone connection (cable or satellite) between the local and remote site
- Windows™ terminal software (comes with Windows® 95)
- Remote Server software

### 4. How do you do it?

Setting up one/multiple remote stations is fairly simple. The main connection among the components will be as illustrated in Figure 1. There will be one computer locally used to communicate with the remote computer(s).

**The local computer** can be any computer, which is capable of making a connection to a remote site via the phone lines. You will need a modem for this task. The modem converts (modulates) the digital signals from the computer to analog signals which can travel over the phone lines. You can access your modem via any terminal program or write your own terminal program. From this terminal program, you send commands to the remote computer to read data or to configure the remote Digiquartz® Intelligent Instrument.

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**The remote computer** needs to be connected to a phone line via a modem too. This modem converts (demodulates) the analog phone signals to digital signals which the computer can understand.

The remote phone link can be a cellular phone connection in remote areas. The remote computer can be on all the time or you can build an auto turn on/off mechanism to turn this computer on/off periodically. The remote computer needs two RS-232 ports. One is for the modem the other is for the Digiquartz® Intelligent instrument. If you have an internal modem, you will only need one port.

The remote computer runs a server program, which can interpret the commands for Digiquartz® Instruments and send them to the instrument(s) connected to one of the serial ports. The remote server program sends the appropriate response to the local computer. The core structure and code of the remote server software (in Visual Basic) is as in listing 1. This code can be improved to implement some error recovery to make it smarter. You can also read the real time value from the remote value to time stamp the data you read remotely. As the remote data come in, you can plot this data or log it in a file.

The communication connection between the two modems is controlled by the modems. You don't have to worry about the details of the connection. Unless you are going to read data continuously, you don't need to use handshaking between the two modems. You may prefer to increase the port buffer size instead of using handshaking. Handshaking should be a concern if you are going to read data at a high speed with a slow computer.

The order of events for the local site;

1. By using a Windows® based terminal or application program, dial the phone number of the remote site (modem).
2. Send a command to perform an action at the remote site.
3. Wait for a response.
4. Receive the response, process the response string and display the response.

The order of events for the remote site;

1. Wait for an incoming ring from the modem. If there is one, answer the call and make a connection with the local modem. Set the auto-answer mode to "On" on the modem.
2. Wait for a command string from the local site.
3. If there is a command string from the local site, check the validity of the command string, if the string looks healthy send it to the Digiquartz® Intelligent Instrument and wait for a response. If the string is not a valid command or there is not response from the instrument(timeout), send the appropriate response to the local site.
4. The remote server software must be capable of doing some maintenance tasks, rebooting the computer, adjusting the system time, etc.

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The simple version of the remote server software is as below:

Declare the following variables in a module.

```
Dim Response As String
Dim Command As String
Dim Answer As String
```

'In the FormLoad event initialize your modem. Set the autoanswer "On" on the modem.

```
Sub Form_Load ()
    ModemComPort.PortOpen = True 'Open the serial port
    ModemComPort.Output = "ATZ" + Chr$(13) 'Clear the modem
    ModemComPort.Output = "ATQ0" + Chr$(13) 'Tell the modem to return result
    ModemComPort.Output = "ATM0" + Chr$(13) 'Turn speaker on.
    ModemComPort.Output = "ATV1" + Chr$(13) 'Tell the modem to display result
    codes as words.
    ModemComPort.Output = "ATA" + Chr$(13) '
    StartCycle
End sub

Sub StartCycle ()
Do
    If ModemComPort.InBufferCount > 0 Then
        Response = ModemComPort.Input
        textbox.Text = textbox.Text & Response
        If Response = "*" Then
            Command = Response
            Do While Response <> Chr$(10)
                If ModemComPort.InBufferCount > 0 Then
                    Response = ModemComPort.Input
                    Command = Command & Response
                    textbox.Text = textbox.Text & Response
                End If
                DoEvents
            Loop
            textbox.Text = textbox.Text & "Received a command " &
Command & _vbCrLf
            ModemComPort.Output = "Received a command=" & Command
            & vbCrLf
            Response = ""
            'Now you got the command. Send it to the instrument
            InstrumentComPort.PortOpen = True
            textbox.Text = textbox.Text & "Opening the instrument port" &
vbCrLf
            InstrumentComPort.Output = Command
            textbox.Text = "Command was sent to the instrument." & vbCrLf
        End If
    End If
End Do
```

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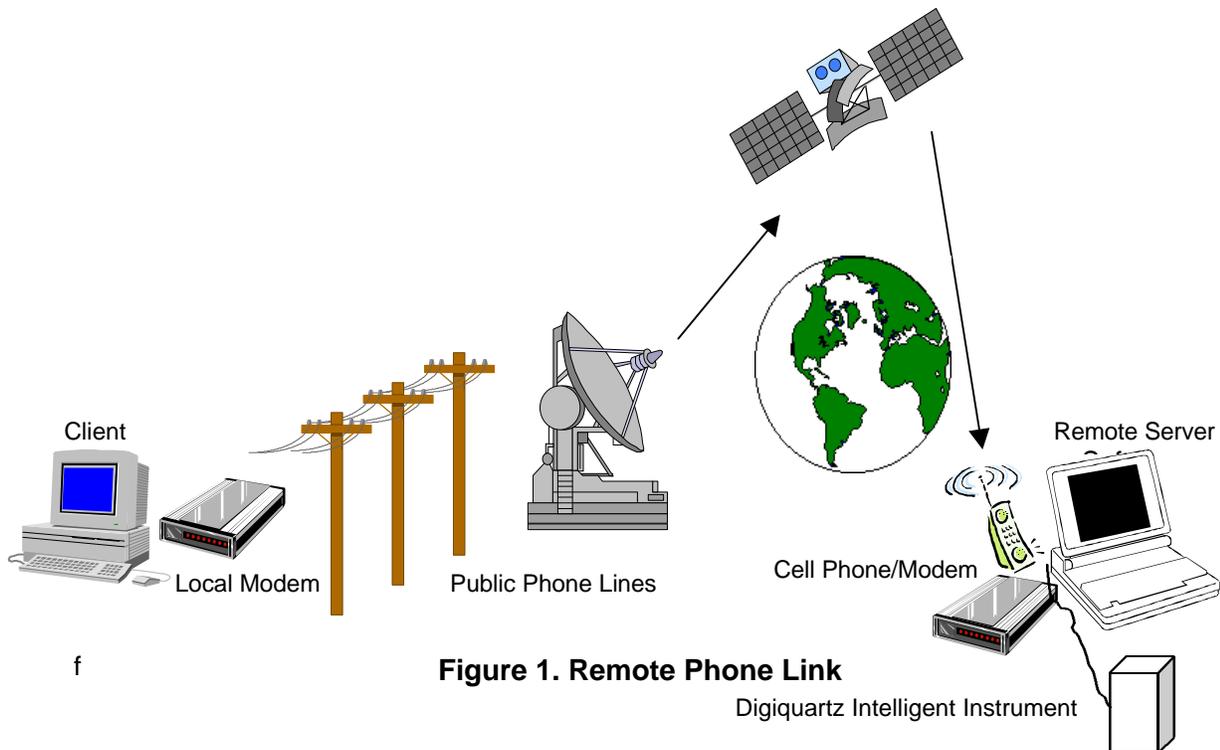
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```
ModemComPort.Output = "Command is sent to the instrument." & vbCrLf
Command = ""
'Sleep. Declare the Sleep API function in a module.
Sleep (2000)
Answer = InstrumentComPort.Input
textbox.Text = textbox.Text & "Response is " & Answer
InstrumentComPort.PortOpen = False
textbox.Text = textbox.Text & "Sending data to the remote station" & vbCrLf
ModemComPort.Output = "The response is " & Answer
End If
End If
DoEvents
Loop
End Sub
```

Listing 1. Source Code for the remote server program.



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**Figure 1. Remote Phone Link**

Digiquartz Intelligent Instrument