Technical Note #70

Broadcast Time Syncronization Utility

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Subject: Installation of the Broadcast Time Synchronization utility.

The Broadcast Time Synchronization Utility was written for a very specific application containing PQM's on a single com port and was not intended to provide much flexibility. The customer requirement for this app was that the PQM's should be time-synced to within 50ms of each other (PC clock not included/not relevent). It is basically a one-shot program that performs the following sequence of steps:

1. Get the current time
2. Formulate a Broadcast Modbus Message to send time to address 0x00F0
3. Open COM1 at 19.2Kb
4. Send Message
5. Terminate

Originally, the program synced both date and time, but since the PQM stores date in EEPROM memory, it was modified to provided only time sync to prevent shortening the life of the date cells.

The devices for this project were arranged in a multi-port Ethernet Gateway configuration. Since a broadcast command can only be sent to one port at a time, the secondary ports of the PQM's were daisy-chained in a single RS-485 line and brought back to the host to COM 1 via a Multilin Converter. That way, the devices received the sync message at virtually the same time, and it is not necessary to suspend the DDE Server.

To install the utility:

- Unzip the files in TimeSync.zip
- TimeSync.exe can be placed in whichever folder is convenient for your application
- Msvbvm50.dll and mscomm32.ocx must be placed in the \winnt\system32 directory
- Next, register the Active-X control by typing the following at the Start… Run… prompt:

Regsvr32 mscomm32.ocx

- You should get a message that the registration was completed successfully.
- To implement it, simply call the program from the Cimplicity application using the shell command whenever you want to time-sync the devices. No parameters are necessary, and the program self-terminates after thesync.

It is also recommended to disable DDE Server time-syncing to these devices when implementing the broadcast tool. To do this, simply change the PQM's Start Address for Time Download to 540,

and adjust the time download period in the server .ini file to 999999999. These parameters are contained within the GE32MODB.ini or GE32ENET.ini file.

For Convenience, the source code is listed here.

```
**********************************************************************************

' Time Sync Utility

' Copyright 1998 General Electric Industrial Systems


Dim Packet As Byte

Private Sub Transmit(Packet)

' Communications port settings.

MSComm1.CommPort = 1

MSComm1.Settings = "19200,N,8,1"


' Open the communications port.

On Error Resume Next

MSComm1.PortOpen = True

If Err Then

MsgBox "COM1: not available. Change the CommPort property to another port."

Exit Sub

End If


' Flush the input buffer.

MSComm1.InBufferCount = 0


' Dial the number.

MSComm1.Output = Packet
```

```
' Close the port.

MSComm1.PortOpen = False

End Sub


Function BuildCRC(ModbusQry() As Byte, wLen As Integer) As Long


Dim byCksHi As Byte

Dim byCksHiInt As Long

Dim byCksLo As Byte

Dim byCksLoInt As Long

Dim nLoopCnt As Integer

Dim nIndex As Integer

Dim byCksHiTable As Variant

Dim byCksLoTable As Variant


byCksHiTable = Array( _

&H0, &HC1, &H81, &H40, &H1, &HC0, &H80, &H41, &H1, &HC0, &H80, &H41, &H0,
&HC1, &H81, _

&H40, &H1, &HC0, &H80, &H41, &H0, &HC1, &H81, &H40, &H0, &HC1, &H81, &H40, &H1
&HC0, _

&H80, &H41, &H1, &HC0, &H80, &H41, &H0, &HC1, &H81, &H40, &H0, &HC1, &H81,
&H40, &H1, _

&HC0, &H80, &H41, &H0, &HC1, &H81, &H40, &H1, &HC0, &H80, &H41, &H1, &HC0,
&H80, &H41, _

&H0, &HC1, &H81, &H40, &H1, &HC0, &H80, &H41, &H0, &HC1, &H81, &H40, &H0,
&HC1, &H81, _

&H40, &H1, &HC0, &H80, &H41, &H0, &HC1, &H81, &H40, &H1, &HC0, &H80, &H41, &H1
&HC0, _

&H80, &H41, &H0, &HC1, &H81, &H40, &H0, &HC1, &H81, &H40, &H1, &HC0, &H80,
&H41, &H1, _
```

```
&HC0, &H80, &H41, &H0, &HC1, &H81, &H40, &H1, &HC0, &H80, &H41, &H0, &HC1,
&H81, &H40, _

&H0, &HC1, &H81, &H40, &H1, &HC0, &H80, &H41, &H1, &HC0, &H80, &H41, &H0,
&HC1, &H81, _

&H40, &H0, &HC1, &H81, &H40, &H1, &HC0, &H80, &H41, &H0, &HC1, &H81, &H40, &H1
&HC0, _

&H80, &H41, &H1, &HC0, &H80, &H41, &H0, &HC1, &H81, &H40, &H0, &HC1, &H81,
&H40, &H1, _

&HC0, &H80, &H41, &H1, &HC0, &H80, &H41, &H0, &HC1, &H81, &H40, &H1, &HC0,
&H80, &H41, _

&H0, &HC1, &H81, &H40, &H0, &HC1, &H81, &H40, &H1, &HC0, &H80, &H41, &H0,
&HC1, &H81, _

&H40, &H1, &HC0, &H80, &H41, &H1, &HC0, &H80, &H41, &H0, &HC1, &H81, &H40, &H1
&HC0, _

&H80, &H41, &H0, &HC1, &H81, &H40, &H0, &HC1, &H81, &H40, &H1, &HC0, &H80,
&H41, &H1, _

&HC0, &H80, &H41, &H0, &HC1, &H81, &H40, &H0, &HC1, &H81, &H40, &H1, &HC0,
&H80, &H41, _

&H0, &HC1, &H81, &H40, &H1, &HC0, &H80, &H41, &H1, &HC0, &H80, &H41, &H0,
&HC1, &H81, _

&H40)

byCksLoTable = Array( _

&H0, &HC0, &HC1, &H1, &HC3, &H3, &H2, &HC2, &HC6, &H6, &H7, &HC7, &H5, &HC5,
&HC4, _

&H4, &HCC, &HC, &HD, &HCD, &HF, &HCF, &HCE, &HE, &HA, &HCA, &HCB, &HB,
&HC9, &H9, _

&H8, &HC8, &HD8, &H18, &H19, &HD9, &H1B, &HDB, &HDA, &H1A, &H1E, &HDE,
&HDF, &H1F, &HDD, _

&H1D, &H1C, &HDC, &H14, &HD4, &HD5, &H15, &HD7, &H17, &H16, &HD6, &HD2,
&H12, &H13, &HD3, _

&H11, &HD1, &HD0, &H10, &HF0, &H30, &H31, &HF1, &H33, &HF3, &HF2, &H32, &H36,
&HF6, &HF7, _

&H37, &HF5, &H35, &H34, &HF4, &H3C, &HFC, &HFD, &H3D, &HFF, &H3F, &H3E, &HFE,
&HFA, &H3A, _

&H3B, &HFB, &H39, &HF9, &HF8, &H38, &H28, &HE8, &HE9, &H29, &HEB, &H2B, &H2A,
&HEA, &HEE, _
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&H2E, &H2F, &HEF, &H2D, &HED, &HEC, &H2C, &HE4, &H24, &H25, &HE5, &H27,
&HE7, &HE6, &H26, _

&H22, &HE2, &HE3, &H23, &HE1, &H21, &H20, &HE0, &HA0, &H60, &H61, &HA1, &H63,
&HA3, &HA2, _

&H62, &H66, &HA6, &HA7, &H67, &HA5, &H65, &H64, &HA4, &H6C, &HAC, &HAD,
&H6D, &HAF, &H6F, _

&H6E, &HAE, &HAA, &H6A, &H6B, &HAB, &H69, &HA9, &HA8, &H68, &H78, &HB8,
&HB9, &H79, &HBB, _

&H7B, &H7A, &HBA, &HBE, &H7E, &H7F, &HBF, &H7D, &HBD, &HBC, &H7C, &HB4,
&H74, &H75, &HB5, _

&H77, &HB7, &HB6, &H76, &H72, &HB2, &HB3, &H73, &HB1, &H71, &H70, &HB0, &H50,
&H90, &H91, _

&H51, &H93, &H53, &H52, &H92, &H96, &H56, &H57, &H97, &H55, &H95, &H94, &H54,
&H9C, &H5C, _

&H5D, &H9D, &H5F, &H9F, &H9E, &H5E, &H5A, &H9A, &H9B, &H5B, &H99, &H59, &H58
&H98, &H88, _

&H48, &H49, &H89, &H4B, &H8B, &H8A, &H4A, &H4E, &H8E, &H8F, &H4F, &H8D, &H4D
&H4C, &H8C, _

&H44, &H84, &H85, &H45, &H87, &H47, &H46, &H86, &H82, &H42, &H43, &H83, &H41,
&H81, &H80, _

&H40)

' ************************************************************************\

' Calculate the checksum. Use the CRC tables initialized in this module.

' Algorithm for CRC computation is taken from Modicon Modbus Protocol

' Reference Guide

' ************************************************************************/

byCksHi = &HFF

byCksLo = &HFF

For nLoopCnt = 0 To (wLen)

nIndex = byCksHi Xor ModbusQry(nLoopCnt)

byCksHi = byCksLo Xor byCksHiTable(nIndex)

byCksLo = byCksLoTable(nIndex)
```

```
Next
' ****************************************************************\
' To avoid swapping checksum again in calling routine, a swapped
' checksum is returned
' ****************************************************************/
byCksLoInt = CInt(byCksLo) * 2 ^ 8
byCksHiInt = byCksHi
BuildCRC = byCksLoInt Or byCksHiInt
End Function

Private Sub Form_Load()

Dim modbusMessage(12) As Byte
Dim crcCopy(10) As Byte
Dim crcCalc As Long
Dim crcCalcHi As Long
Dim crcCalcLo As Long
Dim i As Integer
Dim currentTime
Dim hiYear As Byte
Dim loYear As Byte
Dim minString As String
Dim secString As String
Dim seconds As Long

' Setting InputLen to 0 tells MSComm to read the entire
```

```
' contents of the input buffer when the Input property
' is used.

MSComm1.InputLen = 0

currentTime = Now
hiYear = ((Val(Format(currentTime, "yyyy"))) And &HFF00) / (2 ^ 8)
loYear = ((Val(Format(currentTime, "yyyy"))) And &HFF)

modbusMessage(0) = &H0 ' Modbus Broadcast Command
modbusMessage(1) = &H10 ' Modbus Function Code (store multiple setpoints)
modbusMessage(2) = &H0 ' Starting address HIBYTE
modbusMessage(3) = &HF0 ' Starting Address LOBYTE
modbusMessage(4) = &H0 ' Number of Setpoints HIBYTE
modbusMessage(5) = &H2 ' Number of Setpoints LOBYTE
modbusMessage(6) = &H4 ' Number of Bytes to Transmit
modbusMessage(7) = Val(Format(currentTime, "h")) 'Hours

minString = Format(currentTime, "h:mm")
minString = Right(minString, 2)
modbusMessage(8) = Val(minString) 'Minutes

secString = Format(currentTime, "h:mm:ss")
secString = Right(secString, 2)
seconds = (Val(secString)) * 1000 'convert to milliseconds
modbusMessage(9) = (seconds And &HFF00) / (2 ^ 8) ' Millisecond HIBYTE
```

```
modbusMessage(10) = (seconds And &HFF) ' Millisecond LOBYTE


' Removed writing of date to preserve EEPROM life span.
' Time is held in normal RAM, so no problem
' modbusMessage(11) = Val(Format(currentTime, "m")) 'Month
' modbusMessage(12) = Val(Format(currentTime, "d")) 'Day
' modbusMessage(13) = hiYear 'Year
' modbusMessage(14) = loYear


For i = 0 To 10
crcCopy(i) = modbusMessage(i)
Next
crcCalc = BuildCRC(crcCopy, 10)
crcCalcHi = (crcCalc And &HFF00) / (2 ^ 8)
crcCalcLo = crcCalc And &HFF
modbusMessage(11) = CByte(crcCalcLo)
modbusMessage(12) = CByte(crcCalcHi)
Transmit (modbusMessage)


End
End Sub
```

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