# *Application Note*
# SPECTROTILT™ Dyna - *Communication Protocols*

The **SPECTROTILT™ Dyna** – *Single Axis Dynamic Electronic Inclinometer,* p/n SSY0247-HDS, can be equipped with one of two communication protocols, 9 bit addressing mode or Modbus. It is possible to communicate via a standard RS232 port by use of an external RS232 to RS485 converter module.

**Memory Map**

2 reserved
4 serial number
6 offset for sensor
8 reserved
10 offset for temp sensor
12 reserved
14 reserved
16 module 's address
18 reserved
20 offset for pwm output
22 baud rate
38400 - 7
28800 - 10
19200 - 15
9600 - 32
4800 - 64

100 .. 280 reserved

## *1st Protocol*

**Data format:**
Baud rate* *(see memory map, 22)*
Data width = 8 bits plus one bit to indicate data or address (see Visual basic code)
1 stop bit
Module address = 0 (factory set)

**Commands**
Should be sent in (ASCII) format

0 (48) // Reset processor
3 (51) // read eeprom
A (65) // read sensor
C (67) // read temperature
E (69) // write to eeprom
F (70) // Sends firmware revision

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All commands sent to the unit end with ‘carriage return’ and ‘line feed’. After a command, the unit returns with ‘carriage return’ and ‘line feed’.

EXAMPLES:

‘Reset the Processor’

00 address bit is set
48 cmd reset processor
cr carriage return
lf line feed

‘Read Sensor Data’

00 address module
65 cmd 'A'
cr
lf

‘Unit Returns 1001’

10
01
cr
lf

‘Write to EEPROM’

00 address
69 cmd 'E'
34 address 34 note the address has to even number
44 delimits address and data can be a space or "," or ":" or tab
25
01 write 2501 in memory
cr
lf

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## Communicating via the RS232 port of PC *(RS232 to RS485 converter required)*

The address for the **SPECTROTILTtm Dyna** is in nine bit format. As RS232 is an eight bit format, we use the parity bit as the missing ninth bit, toggling it 'on' when sending the unit address, and 'off' when sending data. The following is an example of the code in Visual Basic.

### *RS232 Communication - Code Example*

```
' Set serial port
mhSerialPort.Open(Port, 28800, 8, Rs232.DataParity.Parity_None, 1, 200)

    '**********************************
    ' Function: Open
    '
    ' Parameter: ByVal Port As String
    '            ByVal InitStr As String
    ' Return:    Boolean
    '
    ' Purpose:   Open serial port and display message on the main status bar
    '**********************************
    Public Function Open(ByVal Port As String, _
       ByVal BaudRate As Integer, ByVal DataBit As Integer, _
       ByVal Parity As Rs232.DataParity, ByVal StopBit As Rs232.DataStopBit) As Boolean
       Try
          mhSerialPort.Port = getPortNum(Port)
          mhSerialPort.BaudRate = BaudRate
          mhSerialPort.DataBit = DataBit
          mhSerialPort.Parity = Parity
          mhSerialPort.StopBit = StopBit
          mhSerialPort.BufferSize = 4095
          Open = Open()
       Catch ex As Exception
          LastMsg = "Unable to connect to Serial Port"
          Return False
       End Try
    End Function

' The buf() contains only the data the address is defined by bAddress
' bAdrress can be between 0 and 255
'
 Public Sub Write(ByVal buf() As Byte, ByVal ilen As Integer)
       Dim bByte As Byte
       Dim addr() As Byte = {bAddress}
       Dim i As Integer
       Try
             ' Send address
          If (cBit.CountBitOn(bAddress) Mod 2 = 0) Then
             mhSerialPort.SetParitybit(Rs232.DataParity.Pariti_Odd)
          Else
             mhSerialPort.SetParitybit(Rs232.DataParity.Parity_Even)
          End If
          mhSerialPort.Write(addr)

          System.Threading.Thread.Sleep(1)
             ' Send data
          For i = 0 To ilen - 1
             If (cBit.CountBitOn(buf(i)) Mod 2 = 0) Then
                mhSerialPort.SetParitybit(Rs232.DataParity.Parity_Even)
             Else
```

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```
            mhSerialPort.SetParitybit(Rs232.DataParity.Pariti_Odd)
            End If
            mhSerialPort.Write(buf(i))
            System.Threading.Thread.Sleep(1)
        Next i
    Catch ex As Exception
    End Try
End Sub
```

## Modbus protocol

*NOTE: To select this protocol set config 1 to 0x21*
This simplifies the communication by eliminating the need to toggle the parity bit, and it adds a check for the communication with the LRC.
The LRC is calculated by adding all the bytes in the message except the "**:**" at the beginning, and the lf and cr at the end of the message. The addition is done ignoring the carry. Then the result is negated in 2's complement format.

8 bits even parity 1 stop for modbus protocol (standard modbus is 7 bits)

The command starts with a ":" then the address of the
module from 1 to 250 then the cmd and then data
after the data the Longitudinal Redundancy Check (lrc) then the CR and LF
All the data are sent in ASCII format on an Hex base.

example
write 355 to location 100 in the eeprom of module 2
:0268006401639C cr lf
the module returns
:026830 cr lf

0x65 reset the board
send back :Address65LRC

0x66 read the sensor

0x67 read temperature

0x68 write to eeprom address and data in HEX
Address(2B)68EEPROMLocation(4)Data(4)LRC(2)
send back :Address68LRC

0x69 read eeprom
ADDRESS(2Bytes)69EEPROMLocation(4bytes)LRC(2bytes)

0x6A send revision

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Examples:
Write 15 to location 22 in module address 1
:01680016000F74 cr lf
Read Sensor
:016633 cr lf
Read location 2 on module address 20
:146900026A cr lf

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