



# Eye-BERT Gen2 Software Programming Guide

## Overview:

The Eye-BERT Gen2 allows remote control and monitoring via USB or optional Ethernet connection. Once a connection is made to the Eye-BERT using one of these interfaces, all command and control is the same regardless of which interface is used.

## USB Interface:

In order for Windows to recognize the Eye-BERT Gen2 USB port the USB driver must first be installed, after which the Eye-BERT Gen2 appears as an additional COM port on the computer. Currently Windows XP, Vista, 7, and 8 are supported. Windows 7 requires the extra step listed below; Windows 8 requires additional steps which can be found in the following application note:

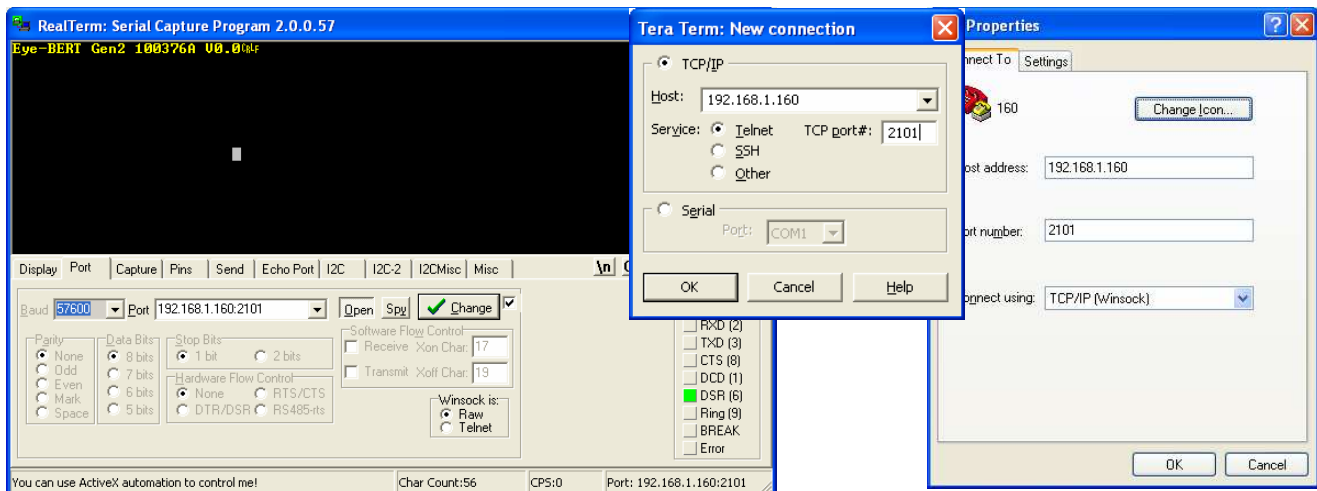
<http://www.spectronixinc.com/Downloads/Installing%20Under%20Windows%208.pdf>

1. Copy the file “cdc\_NTXPV764.inf” from the supplied CD to the hard drive.
2. Plug the Eye-BERT Gen2 into a free USB port. When the hardware installation wizard asks for the driver location, browse to the “cdc\_NTXPVista.inf” file on the hard drive.
3. After the driver has been installed right click “my computer” and select “properties”. In the properties window select the “hardware” tab. Click on “device manager” and expand the “Ports (COM & LPT)” item. Locate the “Spectronix, Inc.” entry and note the assigned COM number, (ie “COM4”). This is the COM port that the software will use to communicate with the Eye-BERT Gen2.

Note, on some operating systems such as Window 7, manual USB driver installation may be necessary. If the hardware installation wizard fails, go to “My Computer” > “Properties” > “Hardware” > “Device Manager”, and find the “Spectronix” or “SERIAL DEMO” entry under “Other Devices” and select “Update Driver”. At this point you will be able to browse to the location of the driver.

## Optional Ethernet Interface:

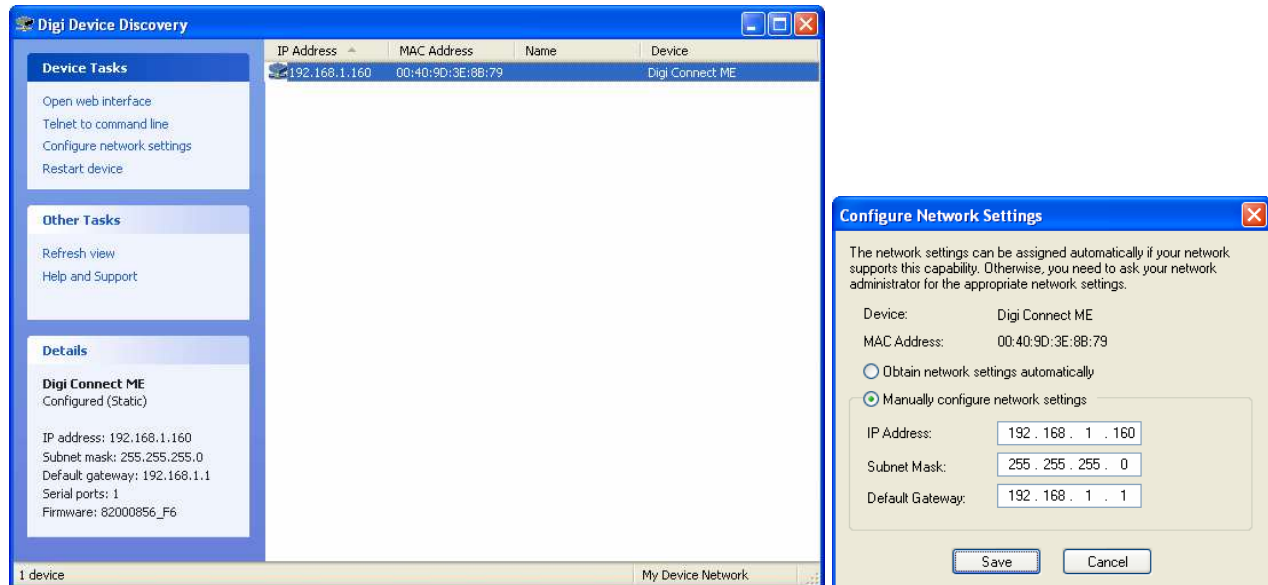
The Eye-BERT Gen2 communicates using TCP/IP on port number 2101 and is shipped with a default IP address of 192.168.1.160. Connection to this port is illustrated below using HyperTerminal, TeraTerm, and RealTerm.



## Changing the IP Address

The Digi Device Discovery utility allows the user to retrieve and change the Eye-BERT IP address. The installation program “40002265\_G.exe” can be found on the Spectronix or Digi web sites.

After installing the utility, disable Windows Firewall and any other virus or firewall programs and start the program. The program will report the IP and MAC addresses of all compatible devices on the network. Right click on the device and select “Configure Network Settings” to change the network settings.



## **Updating the Firmware:**

It is possible for the user to update the Eye-BERT Gen2 firmware over the USB (V 1.10 and above) or Ethernet port (if supplied) using the Spectronix Bootloader application which can be found on the included CD or downloaded from the Spectronix web site. With the unit powered off press and hold the power button, the LED will blink rapidly and after several seconds it will turn solid. With the OEM version (no LCD) press and hold the power button while connecting the power source. Release the button and follow the bootloader user’s manual for instructions on loading the firmware.

## **Commands:**

The Eye-BERT Gen2 uses ASCII data to communicate with a host computer; the tables below list the individual commands, parameters, and responses from the Eye-BERT Gen2.

### Notes:

1. All communication is initiated by the host.
2. Commands are not case sensitive.
3. A space or equal sign should be inserted between the command and any parameters.
4. All commands should be terminated with a <CR> <LF>.
5. Responses from the Eye-BERT Gen2 are terminated with <CR> <LF> <0x00>.

| Get Unit Information |                       |
|----------------------|-----------------------|
| Command:             | Parameters:           |
| "?"                  | (none)                |
| Response:            | Parameters:           |
| Unit name            | Eye-BERT Gen2 100376A |
| Firmware Rev         | V0.6                  |
| Termination          | CR/LF <0x00>          |
| Notes:               |                       |

| Set the data rate |  |
|-------------------|--|
| Command:          | Parameters:  |
| "SetRate"         | "#####" (Bit Rate in Kbps)   |
| Response:         | Parameters:  |
| (none)            |  |
| Notes:            | Sets to the closest standard bit rate<br>Example: "setrate=15000000" for 155.52Mbps. |

| Set the pattern (generator and detector) |  |
|--|--|
| Command:                                 | Parameters:  |
| "SetPat"                                 | "7" (PRBS $2^7-1$ )<br>"3" (PRBS $2^{31}-1$ )<br>"x" (K28.5 pattern)<br>"y" (K28.7 pattern)<br>"m" (mixed frequency pattern)<br>"1" (loopback, repeater mode) New in Version 1.7 |
| Response:                                | Parameters:  |
| (none)                                   |  |
| Notes:                                   | Example: "setpat=7"  |

| Selects the input source |   |
|--------------------------|---|
| Command:                 | Parameters:                               |
| "SetInput"               | "O" (optical SFP)<br>"E" (electrical SMA) |
| Response:                | Parameters:                               |

|               |                              |
|---------------|------------------------------|
| <b>(none)</b> |                              |
| Notes:        | <i>Example: "setinput=E"</i> |

| Selects the input polarity |  |
|----------------------------|--|
| Command:                   | Parameters:  |
| <b>"SetInPol"</b>          | "+" (noninverted)<br>"- " (inverted)   |
| Response:                  | Parameters:  |
| <b>(none)</b>              |  |
| Notes:                     | <i>Example: "SetInPol +". The input polarity applies to both the SFP and SMA inputs.</i> |

| Controls the SFP Output |  |
|-------------------------|--|
| Command:                | Parameters:  |
| <b>"SetSFP"</b>         | "0" (output off)<br>"1" (output on)<br>"+" (output not inverted)<br>"- " (output inverted) |
| Response:               | Parameters:  |
| <b>(none)</b>           |  |
| Notes:                  | <i>Example: "SFP=1" turns on the SFP output</i>  |

| Controls the SMA Output |  |
|-------------------------|--|
| Command:                | Parameters:  |
| <b>"SetSMA"</b>         | "0" (output off)<br>"1" (output on)<br>"+" (output not inverted)<br>"- " (output inverted) |
| Response:               | Parameters:  |
| <b>(none)</b>           |  |
| Notes:                  | <i>Example: "SMA=0" turns off the electrical output</i>                                    |

| Set the wavelength (V 1.7 and above) |                               |
|--------------------------------------|-------------------------------|
| Command:                             | Parameters:                   |
| <b>"SetWL"</b>                       | "####.###" (Wavelength in nm) |

|               |                                 |
|---------------|---------------------------------|
| Response:     | Parameters:                     |
| <b>(none)</b> |                                 |
| Notes:        | <i>Example: "setwl=1550.12"</i> |

| Reset error counters, BER, and test timers |               |
|--|---------------|
| Command:                                   | Parameters:   |
| <b>"Reset"</b>                             | <i>(none)</i> |
| Response:                                  | Parameters:   |
| <b>(none)</b>                              |               |
| Notes:                                     |               |

| Read the status and settings    |  |
|---------------------------------|--|
| Command:                        | Parameters:  |
| <b>"Stat"</b>                   | <i>(none)</i>  |
| Response:                       | Parameters:  |
| Command Echo                    | <b>STAT :</b>  |
| SFP Tx power (dBm) and polarity | <b>-2.3+</b><br>Power (dBm) followed by polarity   |
| SFP Tx wavelength (nm)          | <b>1310.00</b>   |
| SFP temperature (°C)            | <b>42</b>  |
| SMA output and polarity         | <b>-</b><br><i>"+" = not inverted, "-" = inverted, "x" = disabled</i>  |
| Bit rate (bps)                  | <b>2500000000</b>  |
| Pattern                         | <b>3</b><br><i>(per "setpat" command)</i>  |
| Termination                     | <b>CR / LF &lt;0x00&gt;</b>  |
| Notes:                          | All parameters are separated by "," and the message is terminated with CR/LF<br><i>Example:</i><br><b>STAT: -2.3+, 1310.00, 42, -, 2500000000, 3</b> |

| Read the measurements |               |
|-----------------------|---------------|
| Command:              | Parameters:   |
| <b>"meas"</b>         | <i>(none)</i> |

|                      |  |
|----------------------|--|
| <u>Response:</u>     | <u>Parameters:</u>   |
| Command Echo         | <b>MEAS :</b>  |
| BERT Input           | <b>E</b><br>"O"= optical SFP, "E"= electrical SMA  |
| SFP Rx power (dBm)   | <b>-21.2</b>   |
| SMA Rx amplitude (%) | <b>64</b>  |
| Lock Status          | <b>Lock</b><br>"Lock" or "LOL"   |
| Error count          | <b>2.354e04</b>  |
| Bit count            | <b>1.522e10</b>  |
| BER                  | <b>1.547e-06</b>   |
| Test Time (seconds)  | <b>864</b>   |
| Termination          | <i>CR/LF</i> <0x00>  |
| Notes:               | All parameters are separated by "," and the message is terminated with CR/LF<br><br><i>Example:</i><br><b>MEAS: E, -21.2, 64, Lock, 2.354e04, 1.522e10, 1.547e-06, 864</b> |

| Prints Transceiver Register Information and Values |  |
|--|--|
| <u>Command:</u>                                    | <u>Parameters:</u>   |
| <b>"PrintSFP"</b>                                  |  |
| <u>Response:</u>                                   | <u>Parameters:</u>   |
| <b>SFP information</b>                             | <i>(ASCII text formatted information about the SFP including: Vendor, Model, Serial Number, Power Levels, and data from both the ID and Diagnostic registers)</i>  |
| Notes:   | <pre> SFP Vendor:  OPNEXT, INC. Part Number: TRS2001EN-0065 SN:          L12E15424 Date Code   07-06-12 Diagnostics: Internal Calibration Media:      50um, 80 m Wavelength: 850.00 nm Speed Range: 10300.00 Mbps to 10300.00 Mbps  Temperature: 31 C Rx Power:    -40.0 dBm Tx Power:    -2.6 dBm  SFP Information Registers:   00 01 02 03 04 05 06 07 08 09 0a 0b 0c 0d 0e 0f -----+----- 00  03 04 07 10 00 00 00 00 00 00 06 67 00 00 00 10  08 03 00 1e 4f 50 4e 45 58 54 2c 20 49 4e 43 2e 20  20 20 20 20 00 00 0b 40 54 52 53 32 30 30 31 45 30  4e 2d 30 30 36 35 20 20 41 31 41 20 03 52 00 60 40  00 1a 00 00 4c 31 32 45 31 35 34 32 34 20 20 20 50  20 20 20 20 31 32 30 37 30 36 20 20 68 b0 03 79 </pre> |

|             |  |
|-------------|--|
|             | <pre> 60  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 70  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 80  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 90  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 a0  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 b0  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 c0  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 d0  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 e0  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 f0  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  SFP Diagnostc Registers:   00 01 02 03 04 05 06 07 08 09 0a 0b 0c 0d 0e 0f ----- 00  55 00 f6 00 50 00 fb 00 8c a0 74 04 87 8c 79 18 10  1d 4c 01 f4 1b 58 02 58 37 2d 03 7b 22 d1 05 85 20  37 2d 00 fb 22 d0 01 8e 00 00 00 00 00 00 00 00 30  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 40  00 00 00 00 00 3f 80 00 00 00 00 00 00 01 00 00 50  01 00 00 00 01 00 00 00 01 00 00 00 00 00 00 0b 60  21 00 80 76 0e 16 15 74 00 00 00 00 00 00 02 00 70  00 40 00 00 00 40 00 00 41 54 53 31 00 00 00 00 80  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 90  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 a0  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 b0  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 c0  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 d0  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 e0  00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 f0  00 00 00 00 00 00 00 00 ff ff ff ff ff ff ff ff </pre> |
| Termination | <b>CR / LF &lt;0x00&gt;</b>  |

| Read SFP Register                            |  |
|--|--|
| <b>Command:</b>                              | <b>Parameters:</b>   |
| <b>"RdSFP"</b>                               | <p>"t" "#": register type – either "I" for information or "D" for diagnostic, "#": register number in hex</p> <p><i>Example: "RdSFP I 0x44"</i></p> <p><i>Reads the first byte of the serial number from the information register at address 0x44</i></p>  |
| <b>Response:</b>                             | <b>Parameters:</b>   |
| <b>Register type, register number, value</b> | <p><i>Example: "a0:44 = 35"</i></p> <p><i>(information register (0xA0), register number (0x44), value (5 ASCII))</i></p>   |
| Termination                                  | <b>CR / LF &lt;0x00&gt;</b>  |
| Notes:                                       | <p><i>The physical address of the information register is 0xA0 and the physical address of the diagnostic register is 0xA2. All values passed in and returned are in hex, preceding "0x" is optional. Input parameters should be separated by a space. Note, not all SFP vendors support reading and writing all locations. See SFF-8472 for more information.</i></p> |

| Write SFP Register, then respond with read back value |  |
|---|--|
| <b>Command:</b>                                       | <b>Parameters:</b>   |
| <b>"WrSFP"</b>  | <p>"t" "#": register type – either "I" for information or "D" for diagnostic, "#": register number in hex, "v": value to be written in</p> |

|  |   |
|--|---|
|  | <p>hex.</p> <p>Example: "<b>WrSFP D 0x80 0x55</b>"</p> <p>Writes 0x55 to the first byte of the user writable EEPROM area at register at address 0x80.</p>   |
| <u>Response:</u>                             | <u>Parameters:</u>  |
| <b>Register type, register number, value</b> | <p>Example: "<b>a2:80 = 55</b>"</p> <p>(diagnostic register (0xA2), register number (0x80), value read back (0x55))</p>   |
| <u>Termination</u>                           | <u>CR / LF &lt;0x00&gt;</u>   |
| <u>Notes:</u>                                | <p>The physical address of the information register is 0xA0 and the physical address of the diagnostic register is 0xA2. All values passed in and returned are in hex, preceding "0x" is optional. Input parameters should be separated by a space. Note, not all SFP vendors support reading and writing all locations. See SFF-8472 for more information.</p> |

| Pulse SFP Optical Output (V 0.6 and above) |  |
|--|--|
| <u>Command:</u>                            | <u>Parameters:</u>   |
| <b>"Pulse"</b>                             | <p><b>"PW" "Per"</b> "PW": is the pulse width in uS and "Per" is the period in uS. The valid range for PW is 1 to 65000uS (6.5mS) and the valid range for Per is 1 to 1,000,000 (1 second).</p> <p>Example: "<b>Pulse 10 1000</b>"</p> <p>Produces a 10uS pulse with a 1mS period.</p>   |
| <u>Response:</u>                           | <u>Parameters:</u>   |
| <b>none</b>                                |  |
| <u>Notes:</u>                              | <p>The pulse command modulates the optical output signal by controlling the transmit enable pin on the SFP, therefore the optical output signal will be switched between the current rate/pattern and no light. To approximate a CW signal it is recommended to set the BERT to 11.3Gb, PRBS31. The modulation will continue until any input is received on either the Ethernet or USB ports. The turn on / off time of the laser in the SFP will affect the minimum pulse width of the actual optical output; this will vary with SFP model and manufacturer.</p> |