Group14 TECHNOLOGIES, LLC

# Data Sheet
# SFP+ Breakout 2

## 1 Overview

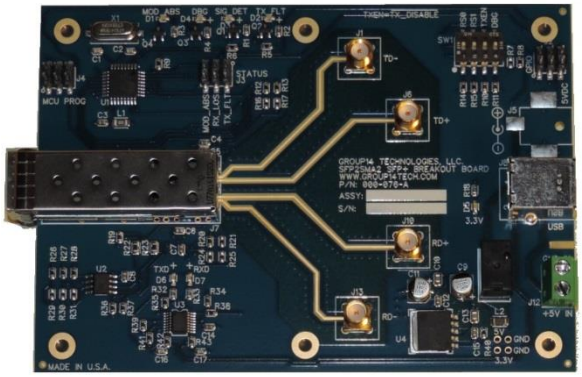
The SFP+ Breakout is an interface board designed to connect the high speed lines of an SFP or SFP+ module to SMA connectors for test and evaluation. In addition to high speed breakout, the unit can be controlled via a powerful command line interface or GUI which can control all aspects of the SFP+ module per SFF-8472 and SFF-8431. Physical switches and LED status indicators are also available for when a PC is not convenient or available. The device may be powered via its USB connection or with a 5V supply. This unit is an updated version of the SFP2SMA breakout board.

## 2 Features

- SFP & SFP+ MSA Compliant
- >10Gbps signal capable: uses Megtron6 Dielectric
- USB control with CLI and GUI support (FTDI USB RS232 transceiver)
- Manual board level control and status
- Fully scriptable CLI
- Windows and Linux Support
- SMA connections to high speed lines
- Autosensing 5V supply power or USB powered
- Current monitoring of RX and TX SFP+ power supplies
- SFF-8431 Power level III compliant

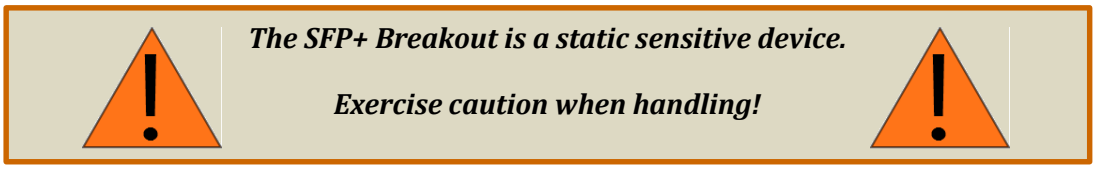
## Table of Contents

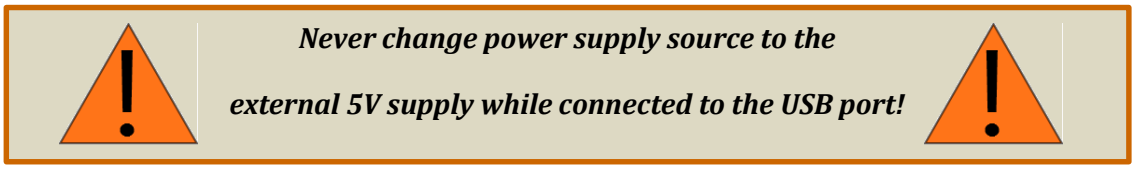




SFP+ Breakout Board 2

# 3 Getting Started




To get up and running with the SFP+ Breakout, the user need only insert an SFP+ module and apply power. Power may come from the USB port (J8) if the USB port supports high current (500mA) mode or alternatively the power may come from a 5V power supply (not included) through J12. The SFP+ Breakout will communicate with the USB controller on power up to verify it is capable of operating in high current mode.

After power is applied, the board may be controlled via switch SW1 as described in 5.4 or through PC based software control per section 6.

Note that the current draw of the SFP+ Breakout is dependent on the user's SFP+ module being tested and will draw approximately 60mA in addition to the SFP+ module power draw. The current draw by the module may be monitored by the SFP+ Breakout board, see section 6 for more details.

# 4 Electrical Description

## 4.1 Power Supply Requirements

| Parameter | Min | Typ | Max | Unit |
|---|---|---|---|---|
| Supply power | 4 | 5 | 5.5 | V |
| Supply current* | | 60 | | mA |

*Supply current is dependent on SFP+ device used. The board supply current given may be added to the SFP+ module supply requirements

## 4.2 Temperature Characteristics

| Parameter | Min | Typ | Max | Unit |
|---|---|---|---|---|
| Operating Temperature* | 0 | 27 | 70 | C |

*Operating temperature is dependent on SFP+ device used.

## 4.3 High Speed IO

The SFP+ high speed IO (RX+/- and TX+/-) are AC coupled, 50 Ohm single ended lines. The high speed dielectric used (Panasonic Megtron6) as well as high speed design techniques ensures data rate compatibility above 10.5Gbps. Connections are 50 ohm SMA.

S-Parameter plots of the SFP2SMA2 high speed lines are shown in Figure 1 and Figure 2. For the test a 0 dB SFP+ loopback was used and each +/- line of the SFP2SMA2 module tested on a VNA. The results given include both transmit and receive paths.

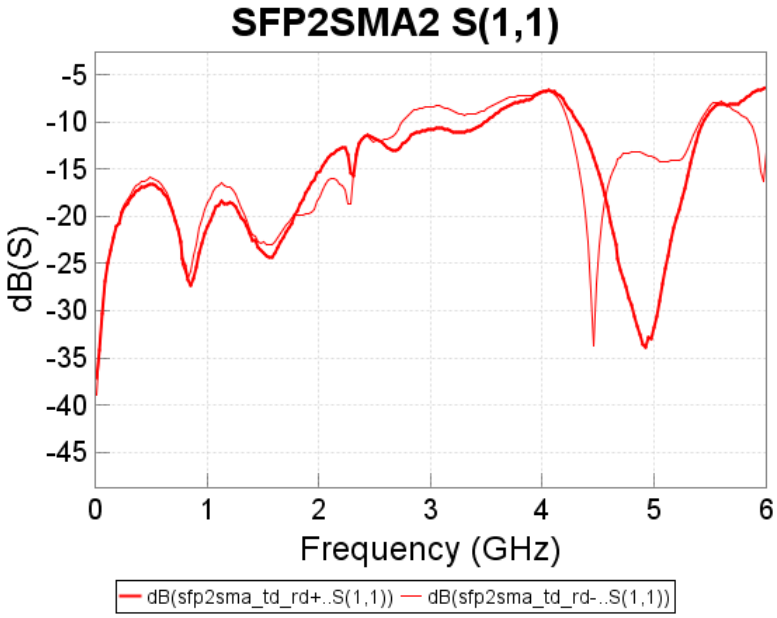



Figure 1 - SFP2SMA2 S(1,1)

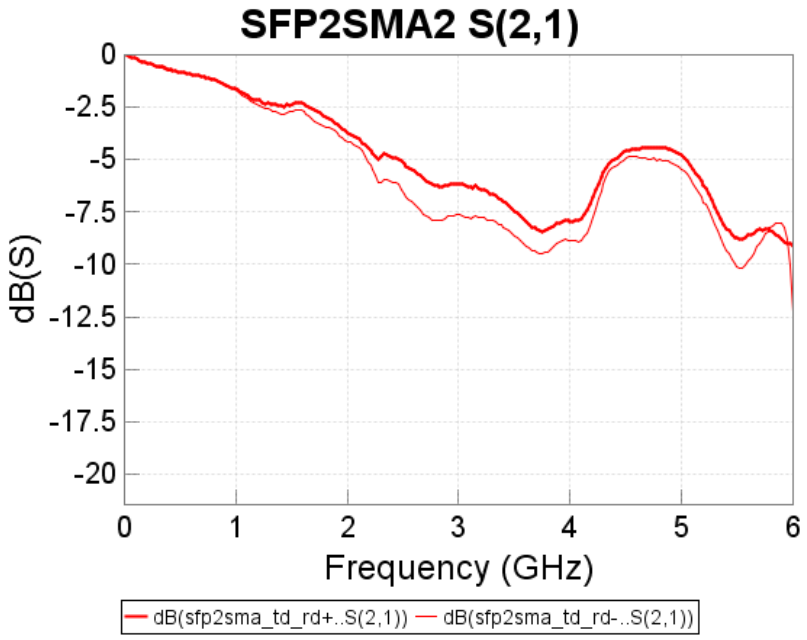



Figure 2 - SFP2SMA2 S(2,1)

## 4.4 Functional Overview

A block diagram of the electrical functions of the SFP+ Breakout is given in Figure 3. Connectors and indicators are described in section 5.

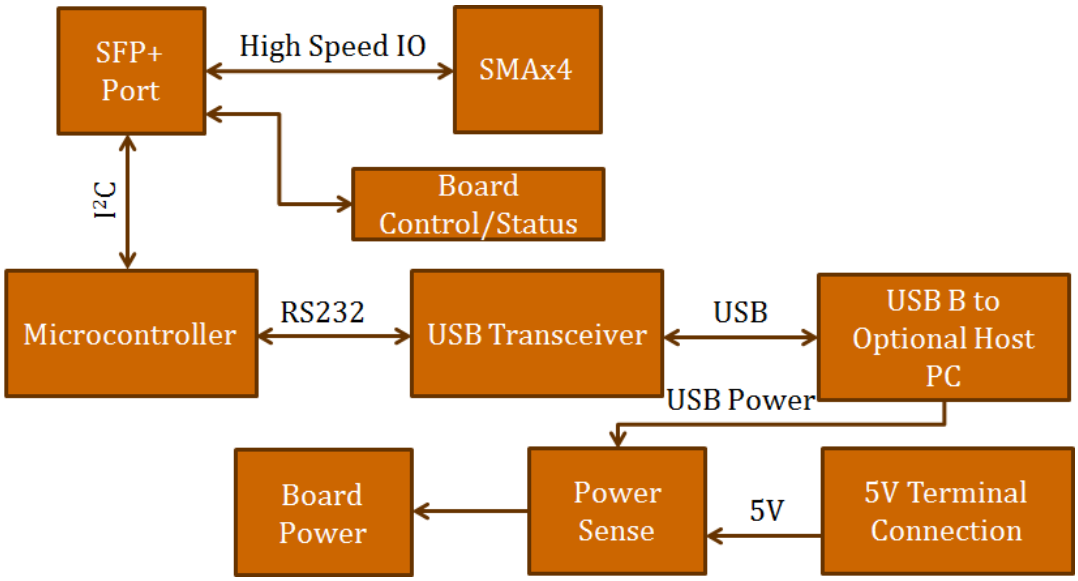



Figure 3 - SFP+ Breakout Block Diagram

# 5 Physical Description

## 5.1 Board Size & Locations

The SFP+ Breakout board is a .063" thick PCB measuring 5"x3.5". It has six .120" mounting holes with dimensions as shown in Figure 4. Rubber feet come applied below mounting holes on rear of board by default, however they may be removed with minor pressure if another mounting style is more convenient.

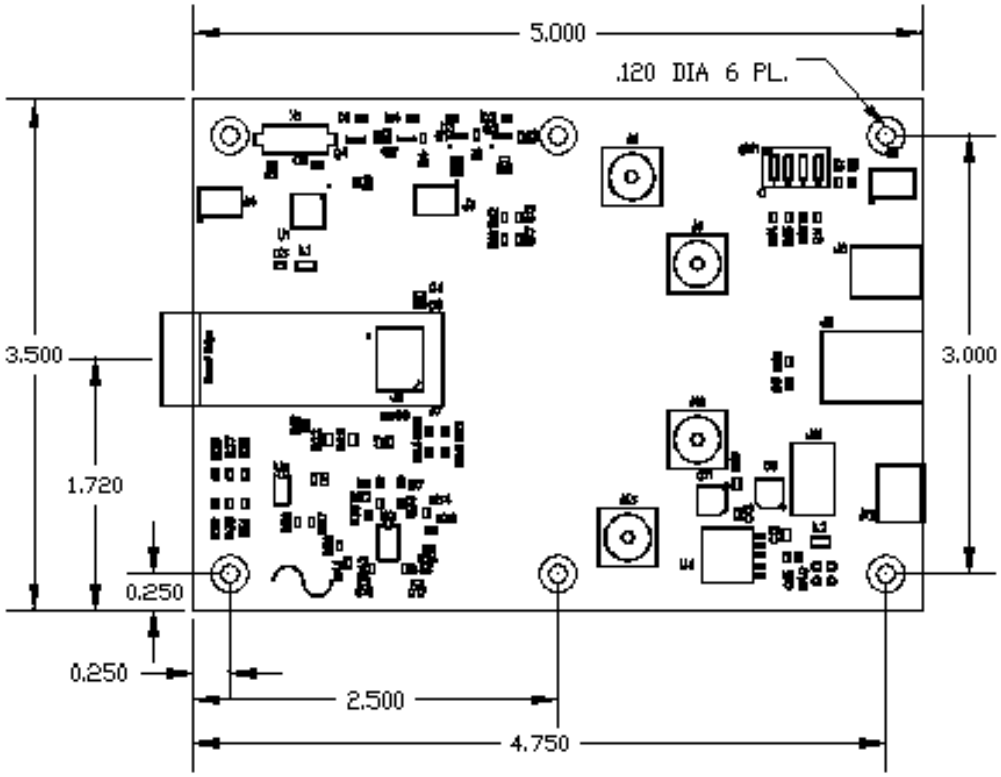



Figure 4 – SFP+ Breakout Physical Dimensions & Connections (Dimensions are in Inches)

## 5.2 Board Connections

| Connector | Pin | Description |
|---|---|---|
| J12 | 1 | Board 5V in bench power |
| J12 | 2 | GND |
| 4 | 1 | Microcontroller programming – MISO |
| 4 | 2 | Microcontroller programming – SCK |
| 4 | 3 | Board 3.3V out |
| 4 | 4 | Microcontroller programming – MOSI |
| 4 | 5 | Microcontroller programming – Reset# |
| 4 | 6 | GND |
| J6 | N/A | SFP+ TX+ (AC coupled) |
| J1 | N/A | SFP+ TX- (AC coupled) |
| J10 | N/A | SFP+ RX+ (AC coupled) |
| J13 | N/A | SFP+ RX- (AC coupled) |
| J2 | 1 | Board 3.3V out |
| J2 | 2 | Microcontroller GPIO2 |
| J2 | 3 | Microcontroller GPIO1 |
| J2 | 4 | Microcontroller GPIO3 |
| J2 | 5 | Microcontroller GPIO0 |
| J2 | 6 | GND |
| J8 | N/A | PC USB data & power |
| J9 | All | SFP+ connection |
| J7 | All | SFP+ cage (GND) |
| J3 | 1 | TX_LOS from SFP+ |
| J3 | 2 | GND |
| J3 | 3 | RX_LOS from SFP+ |
| J3 | 4 | GND |
| J3 | 5 | MOD_ABS from SFP+ |
| J3 | 6 | GND |

## 5.3 Board Indicators

| Indicator | Description |
|---|---|
| D2 | SFP+ TX fault |
| D3 | SFP+ Signal detect |
| D4 | Microcontroller debug (reserved) |
| D6 | USB transceiver RS232 RXD |
| D7 | USB transceiver RS232 TXD |
| D1 | SFP+ MOD ABS |
| D5 | 3.3V Board power enabled |

## 5.4 Board Controls

| Switch | On Description | Off Description |
|---|---|---|
| SW1.1 | SFP+ RS0 high | SFP+ RS0 low |
| SW1.2 | SFP+ RS1 high | SFP+ RS1 low |
| SW1.3 | SFP+ Transmit disable low | SFP+ Transmit disable high |
| SW1.4 | Microcontroller Program mode enable | Microcontroller Program mode disable |

## 5.5 User Modifications

For advanced users, two hardware level configuration options are provided. Note that damage to the board by end users will void the warranty.

### 5.5.1 External 3.3V Power

To use an external power supply, L5 may be removed and 3.3V power may be provided through the 3.3V and GND test points.

### 5.5.2 Isolated TWI Bus

The SFP+ may be isolated on the TWI bus by removing R22 and R23. With these resistors installed (default configuration) the TWI PROM and power supply monitor devices are also present on the bus which may conflict with modules not adhering to the applicable SFP+ standards.

# 6 Serial Interface Guide

The SFP+ Breakout Board has two levels of software interface. The lower level text based interface is provided via a serial interface. The higher level GUI interface relies on the serial interface. Section 6 discusses the serial interface.

The serial interface to the SFP+ Breakout Board supplies the user a text based interface to the EEPROMs and GPIO of the SFP/SFP+ module installed in the breakout board.

Serial communication is accomplished via FTDI drivers and a terminal program of your choice. The installation of the FTDI driver is discussed in Sections 6.1. Communication via a terminal program is discussed in Section 6.2. User control is provided by set of command described in Section 6.3.

## 6.1 Installation

Use of the serial interface to the SFP+ Breakout Board requires installation of the FTDI Virtual COM Port (VCP) driver. Downloads and installation guides are provided on the FTDI website:

Installation Guides: http://www.ftdichip.com/Support/Documents/InstallGuides.htm
VCP Downloads: http://www.ftdichip.com/Drivers/VCP.htm

The driver for the Windows OSes is the Combined Driver Model (CDM). This includes the VCP and D2XX direct driver. This is covered in the FTDI installation guides.

### 6.1.1 Verifying Installation – Windows 7 Example

Verifying the installation of the FTDI drivers can be done through the Windows Device Manger. Figure 5 shows a portion of the Device Manger listing after plugging in the USB connection of the SFP+ Breakout Board *before* installing the FTDI drivers. The SFP+ Breakout Board is shown as an unknown USB Serial Port device.

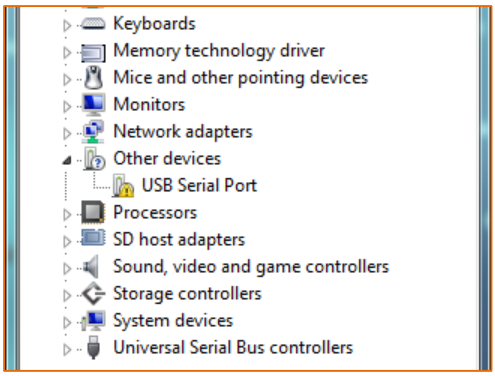



**Figure 5 - SFP+ Breakout Board Before FTDI Driver Installation**

Figure 6 shows a protion of the Device Manger listing *after* the installation of the FTDI drivers while the SFP+ Breakout Board is connected to the host PC. The SFP+ Breakout Board is shown under the *Ports (COM & LPT)* listing as a USB Serial Port device with an assigned COM port.

Using the Windows Device Manager is also the suggested method to determine the COM port assigned to the SFP+ Breakout Board (COM4 in Figure 6).

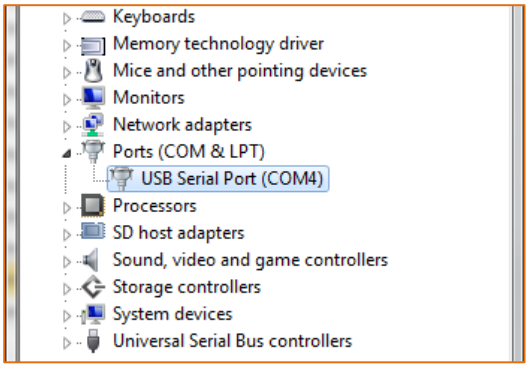



**Figure 6 - SFP+ Breakout Board After FTDI Driver Installation**

## 6.2 Serial Communication

Serial communication utilizes the values in Table 1, below.

**Table 1 - Serial Communication Parameters**

| Parameter | Value |
|---|---|
| Speed | 230400 (baud) |
| Data Bits | 8 |
| Stop Bits | 1 |
| Parity | None |
| Flow Control | None |

In Windows, the COM port of the SFP+ Breakout Board is determined by examining the Device Manger, as shown in the previous section.

Communication has been tested with Putty[1] and Termite[2] on Windows OS and Minicom on Linux OS.

## 6.3 Serial Interface Commands

Commands for use with the breakout board via the serial interface are given next.

### 6.3.1 Overview

Given next is a quick overview of topics common to the set of serial interface commands.

#### *Syntax Convention*

The syntax of each command is given in the following sections. The convention used to define the command syntax is as follows:

| | |
|---|---|
| `cmd` | command, text is literal text required |
| `<parameter>` | parameter, text is descriptive of value required |
| `[<parameter>]` | optional parameter |

[1] http://www.chiark.greenend.org.uk/~sgtatham/putty/
[2] http://www.compuphase.com/software_termite.htm

#### *TWI Addresses*

Several of the serial interface commands require a Two Wire Interface (TWI) address. Valid address and the corresponding device on the SFP+ Breakout Board are listed in Table 2.

**Table 2 - TWI Addresses**

| Addresses | Device |
|---|---|
| 0xA0 | SFP Interface |
| 0xA2 | SFP Diagnostics |
| 0xAE | Board PROM |

#### *Toggle Value*

Many serial interface commands accept a toggle or tri-state toggle value. These values are used to set or display the current state of a corresponding signal.

Toggle values are either 0 or 1. The meaning is command dependent.

Tri-state values are only used for signals with a hardware switch on the SFP+ Breakout Board (i.e. RS0, RS1, and Transmit Enable/Disabled). Tri-state toggle values are either 0, 1, or 2.

Supplying 0 or 1 to command requiring a tri-state toggle sets the corresponding signal to 0 or 1, independent of the current hardware switch state. Supplying a 2 to a command requiring a tri-state toggle set the corresponding signal to be controlled by the hardware switch state.

All values displayed by commands are either 0 or 1, never 2. If the hardware switch currently controls the signal state, the current signal state is still displayed.

### 6.3.2 About

#### *Syntax*

```
about
```

#### *Description*

Display version information of the embedded software.

### 6.3.3 Current – Receiver

#### *Syntax*

```
iccr
```

#### *Description*

Display the current, maximum, and minimum receiver current (IccR), in that order, on three separate lines.

#### *Example*

```
:> iccr
60 mA
61 mA
28 mA
```

### 6.3.4 Current – Transmitter

***Syntax***

```
icct
```

***Description***

Display the current, maximum, and minimum transmitter current (IccT), in that order, on three separate lines.

### 6.3.5 Help

***Syntax***

```
help
```

***Description***

Display a list of available commands.

### 6.3.6 Module Absent

***Syntax***

```
mabs
```

***Description***

Display 0 if the module absent, 1 if the module is present

### 6.3.7 Rate Select 0

***Syntax***

```
rs0 [<tri-state toggle>]
```

***Description***

If no value is given, the command displays the current value of the SFP/SFP+ RS0 rate select pin (0 or 1).

If a tri-state toggle value is given, values of 0 or 1 are used to assign a value to RS0. A value of 2 is used to set the microcontrollers output to hi-z, allowing the hardware switch to select the value of the RS0 pin.

### 6.3.8 Rate Select 1

***Syntax***

```
rs1 [<tri-state toggle>]
```

***Description***

If no value is given, the command displays the current value of the SFP+ RS1 rate select pin (0 or 1).

If a tri-state toggle value is given, values of 0 or 1 are used to assign a value to RS1. A value of 2 is used to set the microcontrollers output to hi-z, allowing the hardware switch to select the value of the RS1 pin.

The `rs1` command cannot be used to set the value of the RS1 pin while in SFP operation mode (versus SFP+ operation mode). *Setting the RS1 pin high with a SFP module installed can cause damage to the microcontroller installed on the breakout board*. See 6.3.10 for more information.

### 6.3.9 Receiver Loss of Signal

***Syntax***

```
rxlos
```

***Description***

Display the value of the SFP/SFP+ module LOS pin. The LOS pin is set by the module to 0 during proper operation and 1 on error.

### 6.3.10 SFP/SFP+ Operation Mode Select

***Syntax***

```
sfp+ [<toggle>]
```

***Description***

The breakout board maintains a user controlled state for determining if the board is in SFP or SFP+ operation mode. A state of 0 indicates SFP operation mode. A state of 1 indicates SFP+ operation mode. On power up, the board defaults to SFP operation mode.

In SFP operation mode, the user is unable to use the `rs1` command to set the value of the RS1 pin. This is done to prevent damage to the microcontroller on the breakout board. SFP modules do not have a RS1 pin. The corresponding pin on the SFP module may be wired to ground. Setting the RS1 pin high could result in damage to the microcontroller.

In SFP+ operation mode, the user is able to use the `rs1` command to set the value of the RS1 pin.

If a toggle value is not given to the `sfp+` command, the current SFP/SFP+ stat value will be displayed.

### 6.3.11 Status

***Syntax***

```
status
```

***Description***

Display a human readable list of the current state of several. Below is an example output.

```
RS0: 1
RS1: 1
Rx-LOS: 0
Tx-Disabled: 0
Tx-Fail: 0
Module-Absent: 0
SFP+: 1
```

### 6.3.12 TWI Dump

***Syntax***

```
twidmp <device addr> <byte addr> <byte count - 1>
```

***Description***

Dump the selected memory contents from a two-wire-interface memory location. Each line of the memory dump is in the following format: `<byte addr> <value>`. Notice that the byte count given in the command is subtracted by one.

***Example***

The following example is a dump of the first eight bytes of the "Two-write interface ID: Data Fields" of a SFP+ module.

```
:> twidmp 0xa0 0 7
0x00 0x03
0x01 0x04
0x02 0x07
0x03 0x10
0x04 0x00
0x05 0x00
0x06 0x00
0x07 0x20
```

### 6.3.13 TWI Force Dump

***Syntax***

```
twifdmp <device addr> <byte addr> <byte count - 1>
```

***Description***

New to version 1.1.105.

Dump the selected memory contents from a two-wire-interface memory location. Each line of the memory dump is in the following format: `<byte addr> <value>`. Notice that the byte count given in the command is subtracted by one. The device address and byte address is not validated.

### 6.3.14 TWI Read

***Syntax***

```
twird <device addr> <byte addr>
```

***Description***

Read a single byte value from a two-wire-interface memory location.

***Example***

Read the Encoding field (byte 11) from the "Two-write interface ID: Data Fields" of a SFP+ module.

```
:> twird 0xA0 11
0x0B 0x06
```

### 6.3.15 TWI Force Read

***Syntax***

```
twifrd <device addr> <byte addr>
```

***Description***

New to version 1.1.105.

Read a single byte value from a two-wire-interface memory location. The device address and byte address is not validated.

### 6.3.16 TWI Rate Select

***Syntax***

```
twisel [<rate index>]
```

***Description***

New to firmware version 1.3.

If no value is given, the current selection is displayed.

To set the TWI bus speed, provide an index as shown in Table 3. Rates are approximate. The default bus speed on startup is 400 KHz (conforming to SFF-8431, Table 22).

800 KHz bus speed is not supported. This bus speed is faster than officially supported by the components of the SFP+ Breakout board.

**Table 3 - TWI Rate Selection**

| Index | Bus Speed (KHz) |
|---|---|
| 0 | 100 |
| 1 | 400 |
| 2 | 800 |

### 6.3.17 TWI Write

***Syntax***

```
twiwr <device addr> <byte addr> <byte value>
```

***Description***

Write a single byte value to a two-wire-interface memory location. Can only write to "safe" addresses as shown in Table 4.

**Table 4 - TWI Writable Addresses**

| Addresses | Device | Writable Byte Addresses |
|---|---|---|
| 0xA0 | SFP Interface | none |
| 0xA2 | SFP Diagnostics | 128 to 247 |
| 0xAE | Board PROM | 0 to 255 |

### 6.3.18 TWI Force Write

***Syntax***

```
twifwr <device addr> <byte addr> <byte value>
```

***Description***

New to version 1.1.104.

Write a single byte value to a two-wire-interface memory location. Will write to any device and byte address. Care must be taken by the user when using this command.

### 6.3.19 Transmit Disabled

***Syntax***

```
txd [<tri-state toggle>]
```

***Description***

If no value is given, display the value of the SFP/SFP+ module transmitter disable pin.

If a tri-state toggle value is given, values of 0 or 1 are used to assign a value to transmitter disable pin. A value of 2 is used to set the microcontrollers output to hi-z, allowing the hardware switch to select the value of the transmitter disable pin.

The pin is set to 0 to enable the transmitter and is set to 1 to disable the transmitter.

### 6.3.20 Transmit Fault

***Syntax***

```
txf
```

***Description***

Display the value of the SFP/SFP+ module transmitter fault pin. The module sets the pin to 0 during normal operation and 1 to indicate an error.

### 6.3.21 Voltage – 3.3V

***Syntax***

```
v33
```

***Description***

Display the current, maximum, and minimum 3.3 V supply voltage, in that order, on three separate lines.

***Example***

```
:> v33
3300 mV
3300 mV
3300 mV
```

### 6.3.22 Voltage – 5.0V

***Syntax***

```
v5
```

***Description***

Display the current, maximum, and minimum 5.0 V supply voltage, in that order, on three separate lines.

### 6.3.23 Voltage – Receiver

***Syntax***

```
vccr
```

***Description***

Display the current, maximum, and minimum receiver voltage (VccR), in that order, on three separate lines.

***Example***

```
:> vccr
3300 mV
3300 mV
3300 mV
```

### 6.3.24 Voltage – Transmitter

***Syntax***

```
vcct
```

***Description***

Display the current, maximum, and minimum transmitter voltage (VccT), in that order, on three separate lines.

# 7 GUI Software Guide

The user can interact with SFP+ Breakout Board through the SPF+ Breakout GUI. The SFP+ Breakout GUI is a portable Java application and has been tested on Windows 7 and Linux (Ubuntu 12.04).

The advantage of the SFP+ Breakout GUI versus the serial interface discussed in Section 6 is the automatic decoding of the SFP+ Digital Diagnostic EEPROMs. This development is based on SFF-8472, Specification for Diagnostic Monitoring Interface for Optical Transceivers, Rev 11.0, September 14, 2010[3]. Questions concerning the meaning of the many fields of the GUI not answered by this document can be answered by consulting this reference.

## 7.1 Installation and Startup

### 7.1.1 Installation

The SFP+ Breakout GUI is a Java application. The application is distributed as a JAR file without an installer. Simply place the distributed folder containing the JAR file and the related dependencies in the location of your choice.

### 7.1.2 Dependencies

#### *Java Runtime Environment*

The SFP+ Breakout GUI application was built and tested using Oracle Java version 1.7[4]. The Oracle Java runtime environment (JRE 7) must be installed on your system for proper operation.

#### *FTDI Virtual COM Port Driver*

The SFP+ Breakout GUI runs over the serial communication described in Section 6. As such, the GUI requires the installation of the FTDI Virtual COM port driver. The driver installation is described in Section 6.1.

#### *RxTx Java Library*

The application depends on the RxTx Java Library[5] for serial communication. The RxTx Java library relies on a native library (i.e. librxtxSerial.dll or librxtxSerial.so). The proper RxTx native library must be available for the Java Runtime Environment to load for proper operation of the SFP+ Breakout GUI. This setup is handled by the startup scripts described in the following section.

### 7.1.3 Startup

To ease in the process of starting the SFP+ Breakout GUI due to the RxTx library requirements, four startup scripts are provided to start the application. The proper startup script is selected based on your Operating System (Windows or Linux) and your installed Java Runtime Version (32-bit or 64-bit). Run "`java -version`" at your terminal to check the installed Java Runtime on your system.

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[3] ftp://ftp.seagate.com/sff/SFF-8472.PDF
[4] http://www.oracle.com/technetwork/java/javase/downloads/index.html
[5] http://rxtx.qbang.org/wiki/index.php/Main_Page

### 7.1.4 Common Errors

***32 vs. 64 Bit Error***

On 64-bit operating systems, a 32-bit Java Runtime may be installed. Ensure you select the correct startup script. The SFP+ Breakout GUI application will throw a java.lang.UnsatisfiedLinkError exception on the first attempt to use access the serial ports if the incorrect startup script is used.

***JRE Version Error***

The SFP+ Breakout GUI application will throw a java.lang.UnsupportedClassVersionError when attempting to launch the application on a system with an earlier version of the Java Runtime Environment installed. The SFP+ Breakout GUI depends on Oracle JRE 7.

## 7.2 Usage

The following sections describe the usage of the SFP+ Breakout GUI. This includes three dialogs, multiple tab panels, toolbars, and a status bar.

### 7.2.1 Connecting

Connecting to the SFP+ Breakout GUI to a SFP+ Breakout Board is a two-step process. First, the correct COM port is set by using the Connection Options Dialog (Figure 7). The dialog is accessed by the Connection → Port Select menu item. The drop down menu is automatically populated with all active COM ports on your computer. The correct COM port will not be available until the SFP+ Breakout Board is connected to your computer.

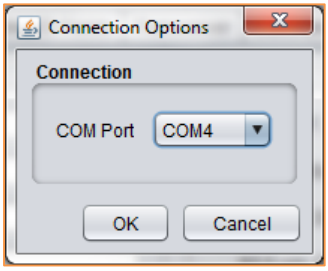


**Figure 7 – Connection Options Dialog**

After selecting the correct COM port, the connection to the SFP+ Breakout Board is controlled by the Connection → Connect and Connection → Disconnect menu items.

Attempts to access the Connection Options Dialog without properly referencing the native RxTx library will result in the application throwing a java.lang.UnsatisfiedLinkError exception. Use the correct startup script to prevent this issue.

### 7.2.2 Refresh Rates Dialog

While the SFP+ Breakout GUI is connected to the SFP+ Breakout Board, real time diagnostics (e.g. temperature) and bit fields (e.g. RS0) are updated at a regular interval. This interval can be altered by the user using the Refresh Rates Dialog (Figure 8). The dialog is accessed by the Settings → Refresh Rates dialog.

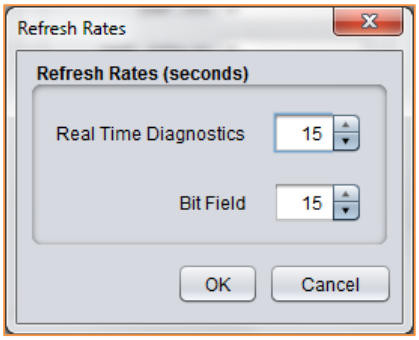


Figure 8 - Refresh Rates Dialog

### 7.2.3 About

The About Dialog is accessed by Help → About menu item. The dialog reports the version number of the SFP+ Breakout GUI. If an error in the SFP+ Breakout GUI needs to be reported, please include this version number.


Figure 9 - About Dialog

### 7.2.4 Tab Panels

#### *Base ID Fields*

The Base ID Fields Tab contains the many of the values listed as Base ID Fields by Table 3.1 of SFF-8472. This includes basic identification, link length, and vendor identification information.

The Base ID Fields Tab does not include transceiver compatibility information. This information is given on the Transceiver Tab.

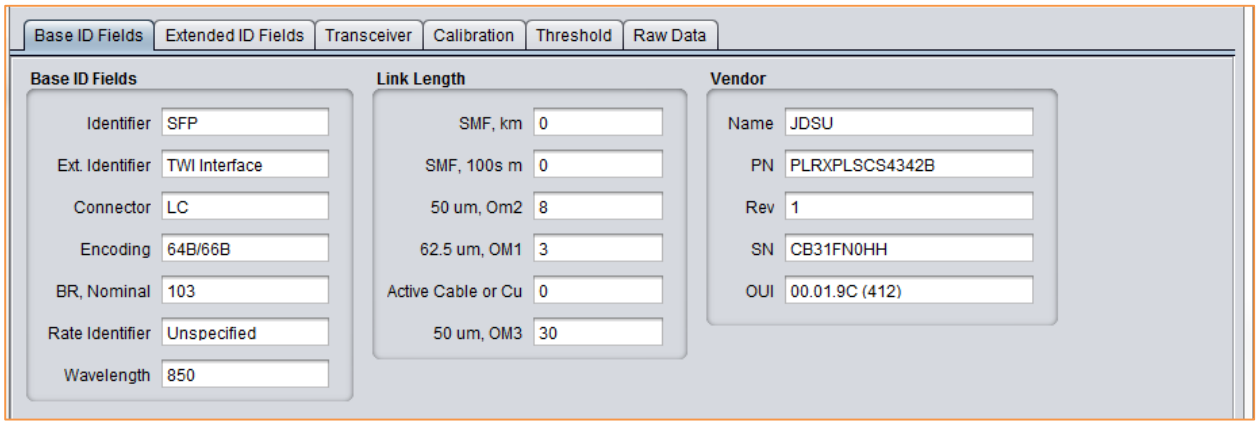


Figure 10 - Base ID Fields Tab

## *Extended ID Fields*

The Extended ID Fields Tab contains the many of the values listed as Extended ID Fields by Table 3.1 of SFF-8472. This includes extended identification, optional options implemented, optional diagnostics monitoring implemented, and enhanced options implemented.

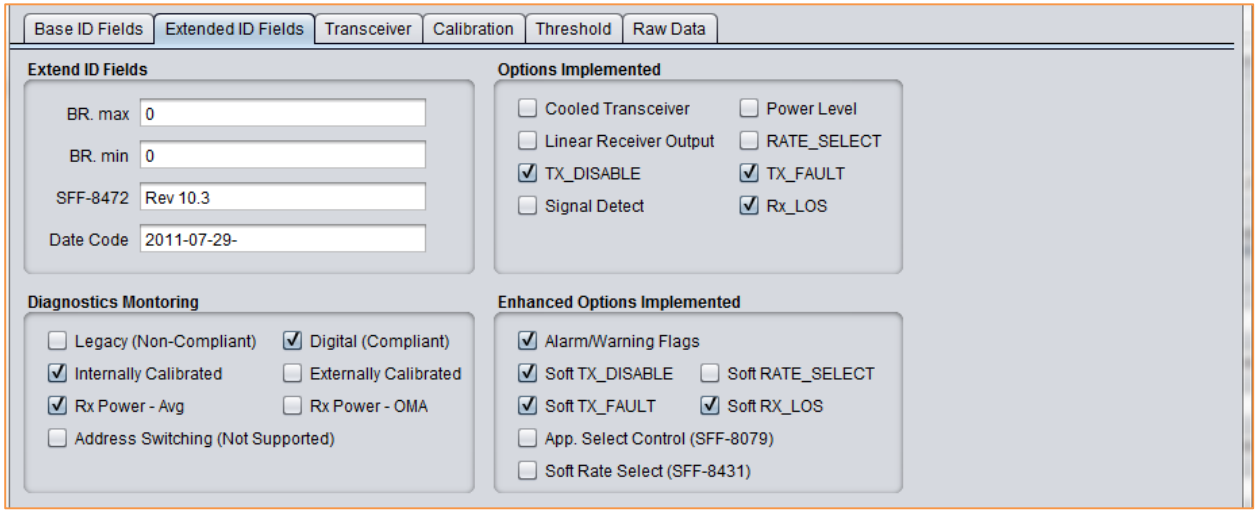


Figure 11 - Extended ID Fields Tab

The Extended ID Fields Tab does not include the vendor serial number. This value can be found on the Base ID Fields Tab with the other vendor identification information.

### *Transceiver*

The Transceiver Tab lists the decoded bit fields of the Transceiver Codes described by Table 3.5 of SFF-8472. The bit fields define the electronic or optical interfaces that are supported by the transceiver.

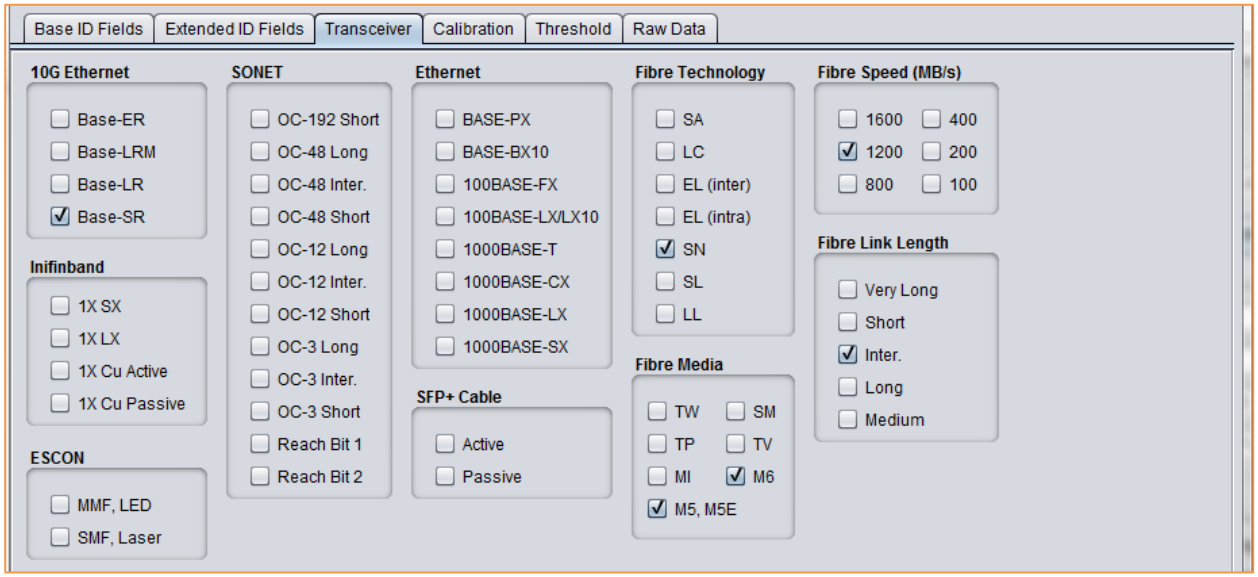


Figure 12 - Transceiver Tab

### *Calibration*

The Calibration Tab lists the decoded values of the Calibration Constants for External Calibration Option described by Table 3.16 of SFF-8472. The values are only used for externally calibrated devices.. The values for an internally calibrated device are shown in Figure 13.

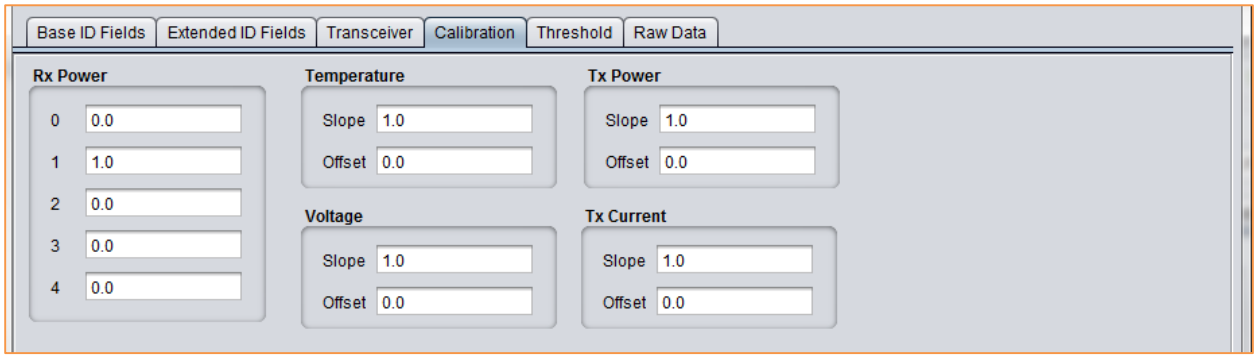


Figure 13 - Calibration Tab

### *Threshold*

The Threshold Tab lists the decoded values of the Diagnostic Flag Alarm and Warning Thresholds described by Table 3.15 of SFF-8472. Warning and alarm threshold values are given for temperature, voltage, bias, transmit power, and received power.

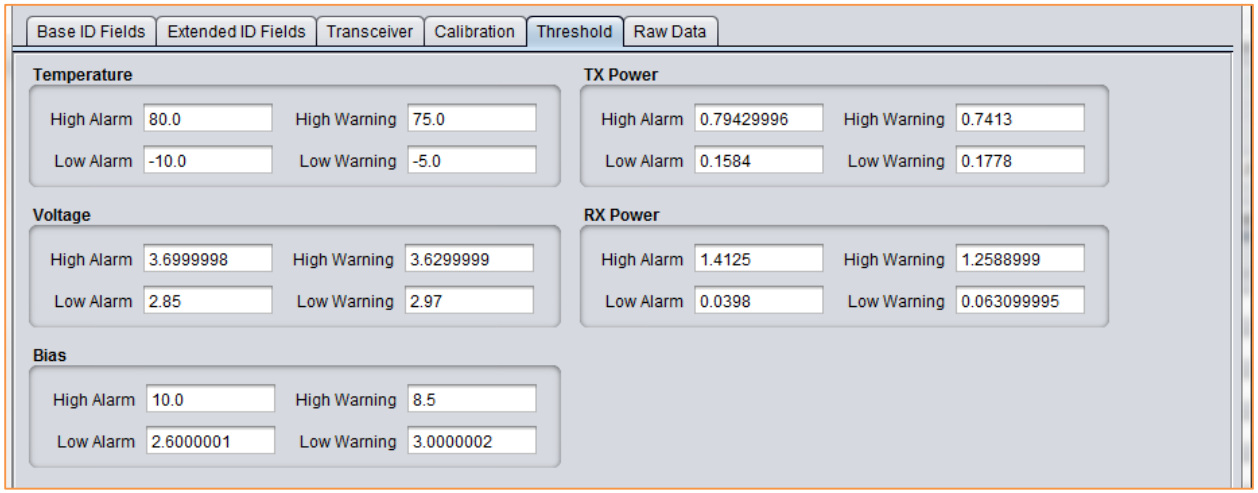


**Figure 14 - Threshold Tab**

The fields of the threshold tab currently do not support externally calibrated devices.

### *Raw Data*

The Raw Data tab has two tables. The tables list the data of the Digital Diagnostic Memory Map described in SFF-8372.

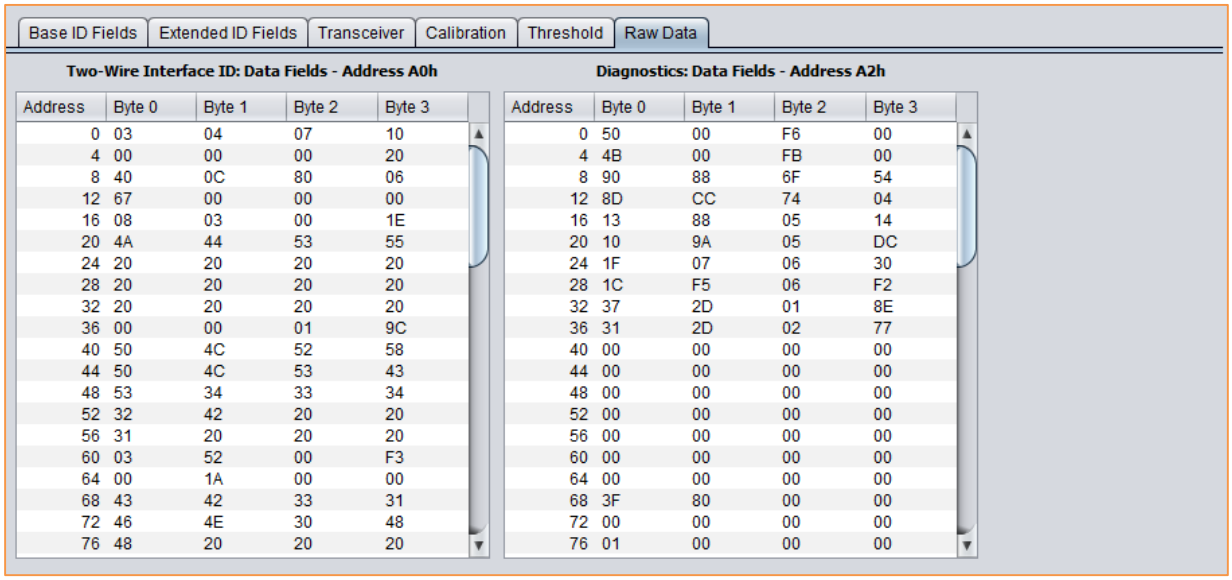


**Figure 15- Raw Data Tab**

### 7.2.5 Real Time Diagnostics Toolbar

The Real Time Diagnostics Toolbar is located at the top of the SFP+ Breakout GUI. The toolbar displays temperature, Vcc voltage, Tx Bias, Tx Power, and Rx Power. The display currently only supports internally calibrated diagnostic data values.

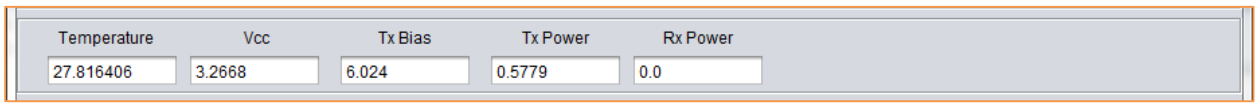


**Figure 16 - Real Time Diagnostics Toolbar**

The refresh rate of the diagnostics data values is controlled by the user using the Refresh Rates Dialog (see Section 7.2.2).

The fields of the Real Time Diagnostics Toolbar currently do not support externally calibrated devices.

### 7.2.6 Bit Status and Control Toolbar

The Bit Status and Control Toolbar is located at the top of the SFP+ Breakout GUI.

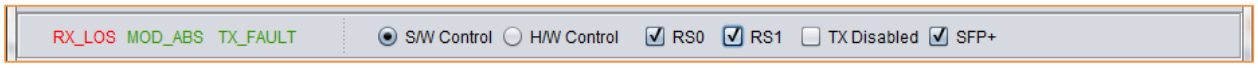


**Figure 17 - Bit Status and Control Toolbar**

Bit status is given on the left for RX_LOS, MOD_ABS, and TX_FAULT signals. These signals are red when active, green when non-active, and gray when the GUI is not connected to a SFP+ Breakout Board.

Bit control is given on the right for rate select (RS0 and RS1), Tx Disabled, and SFP+. If HW Control is selected, the status of the RS0, RS1, and Tx Disabled bits is controlled by the switches on the SFP+ Breakout Board (SW1[1-3]). If SW Control is selected, the status of the RS0, RS1, and Tx Disabled bits is controlled by the GUI checkboxes. Control of RS1 is disabled until the user confirms the module installed is an SFP+ module by selecting the SFP+ checkbox.

The refresh rate of the all bit values is controlled by the user using the Refresh Rates Dialog (see Section 7.2.2).

### 7.2.7 Status Bar

The Status Bar is located at the bottom of the SFP+ Breakout GUI. It includes information about the current selected COM port, connection status, and current refresh rates.

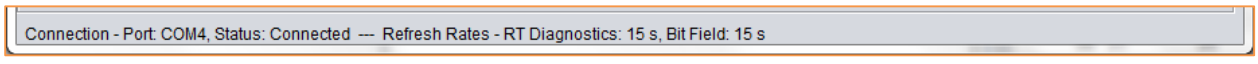


**Figure 18 - Status Bar**

# 8 Ordering Information

- SFP+ Breakout part number: *SFP2SMA2*
- Sales phone: (937) 985-4140
- Sales email: contactus@group14tech.com
- Website: http://www.group14tech.com

# 9 Disclaimer & Warranty

All information contained in this document is believed to be accurate but subject to change without notice. Group14 Technologies, LLC products are not warranted or authorized for use in applications where their use may cause loss of life or injury.

All Group14 Technologies, LLC products carry a one year warranty from date of purchase. Product support will be provided for one year from date of purchase with further support provided on an "as available" basis.

# 10 Revision History

| Date | Revision | Description |
|---|---|---|
| 2014-05-27 | DS106.0 | Initial release |
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