



# MIC3003

## Evaluation Board

### General Description

This evaluation board allows for testing the MIC3003 and checking the proper function of all the features implemented in the controller. There are two versions of the board, one with the soldered device onboard and the second with a mounted socket, which allows for the evaluation and programming of the part without soldering it to the board.

The only differences between the two boards are the socket and a few components that are mounted on the backside of the board.

The board features additional circuitry to provide loads to the outputs from the device and current or current feedback to emulate the behavior of a common cathode or common anode TOSA and ROSA of a FOM.

The board can be self-powered from a computer through the USB interface and an on-board 5V to 3.3V converter.

Datasheets and support documentation can be found on Micrel's web site at: [www.micrel.com](http://www.micrel.com).

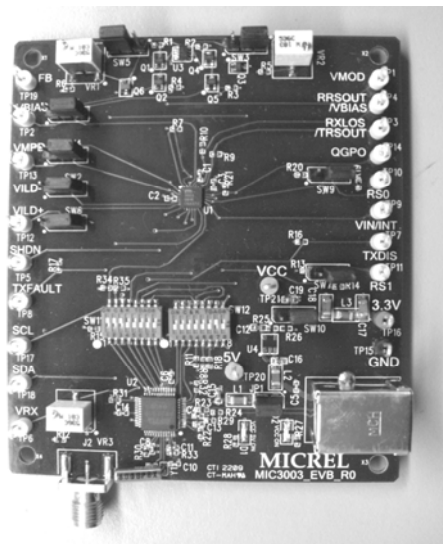
### Features

- Loads and feedback circuits to emulate common anode and common cathode TOSA
- Open loop or close loop operation
- Self powered via USB interface

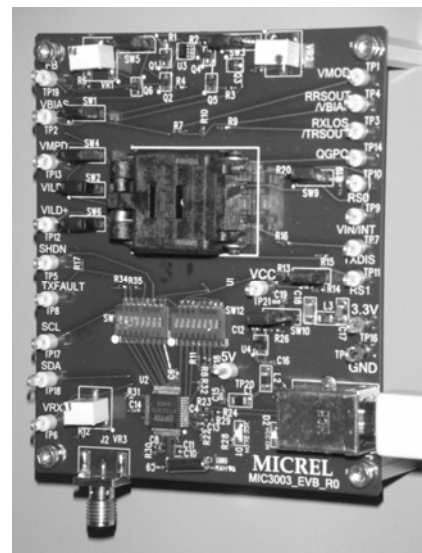
### Related Support Documentation

- MIC3003 Datasheet
- MIC3003 Software Installation Guide
- MIC3003 Evaluation Software

### Evaluation Board



Board with Device Soldered



Board with Socket

## Evaluation Board Setting and Operation

### Serial Interface and Power

The communication between the computer and the MIC3003 can be done in two ways:

1. Through the parallel port of the computer by connecting the CLK and DATA to TP17 and TP18 respectively and opening positions 1 and 2 of SW11. If this option is chosen, the board must be powered with an external 3.3V source and a jumper installed between pin 2 and pin 3 of SW10.
2. Through the USB port of the computer that connects to the on-board USB type B receptacle. If this option is chosen, the board can be powered by an external 3.3V or can be powered using the 5V voltage from the USB interface. The USB 5V supplies the chip, which make the USB-I2C conversion and provide a 3.3V source by using the onboard 5V-to-3.3V LDO. The jumper on SW10 must be installed between pin 1 and pin 2 to select the converted onboard 3.3V instead of the external power supply.

### Loading and Launching the Software

To install the MIC3003 software and the evaluation board drivers for the first time, please consult the *MIC3003 Evaluation Software Setup Guide*. It can be found online or in the zipped installation package.

### Checking and Preparing the Board

The board comes with the following default positions of the jumpers:

SW#	Jumper Position	Function
SW1	Pin2-Pin3	VBIAS to drive NPN transistor
SW2	Pin2-Pin3	VILD- connected to GND
SW3	Pin1-Pin2	Unity gain in the bias -to-VMPD feedback
SW4	Pin2-Pin3	VMPD connected to the collector of Q3
SW6	Pin2-Pin3	VILD+ connected to the emitter of Q5
SW7	Pin2-Pin3	RS1 low
SW9	Pin2-Pin3	RS0 low
SW10	Pin1-Pin2	3.3V converted from USB 5V selected
SW11	1 ON 2 ON 3 ON	CLK from USB used SDA from USB used TXDISABLE low
SW12	7 ON	FB connected to VMPD

**Table 1. Jumper Positions**

### Warning!

When installing the device into the socket, make sure that pin 1 of the device corresponds to pin 1 of the socket marked with a dot in the lower left corner.

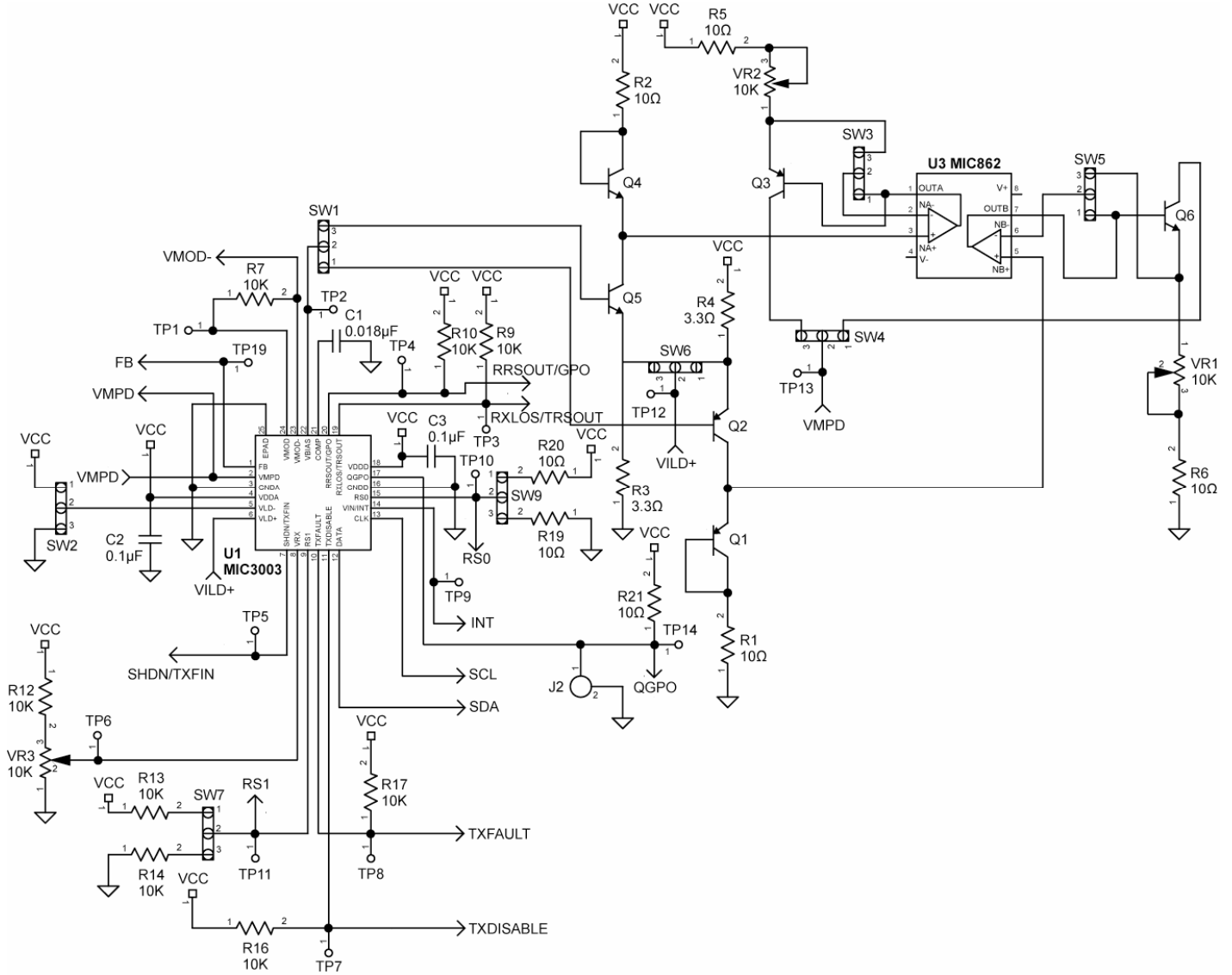
Before powering the board by installing the jumper on SW10, it is important to check that the jumpers on SW1, SW2, SW4, and SW6 are all in the default setting positions indicated in the table above. In that setting, the bias and feedback to FB/VMPD are referenced to GND which corresponds to driving a common anode laser. To set the bias and FB/VMPD reference to VCC corresponding to driving a common cathode laser, all those positions must be changed together to avoid any surge of current on the board.

To proceed to any change in the board setting, first VMOD and VBIAS must be disabled by using enable/disable bit, or by inserting DXDISABLE high (SW11-3 off), then program the MIC3003 to the new setting (see OEMCFG0-2 panel) before enabling VMOD and VBIAS again.

### MIC3003 Initialization and Testing

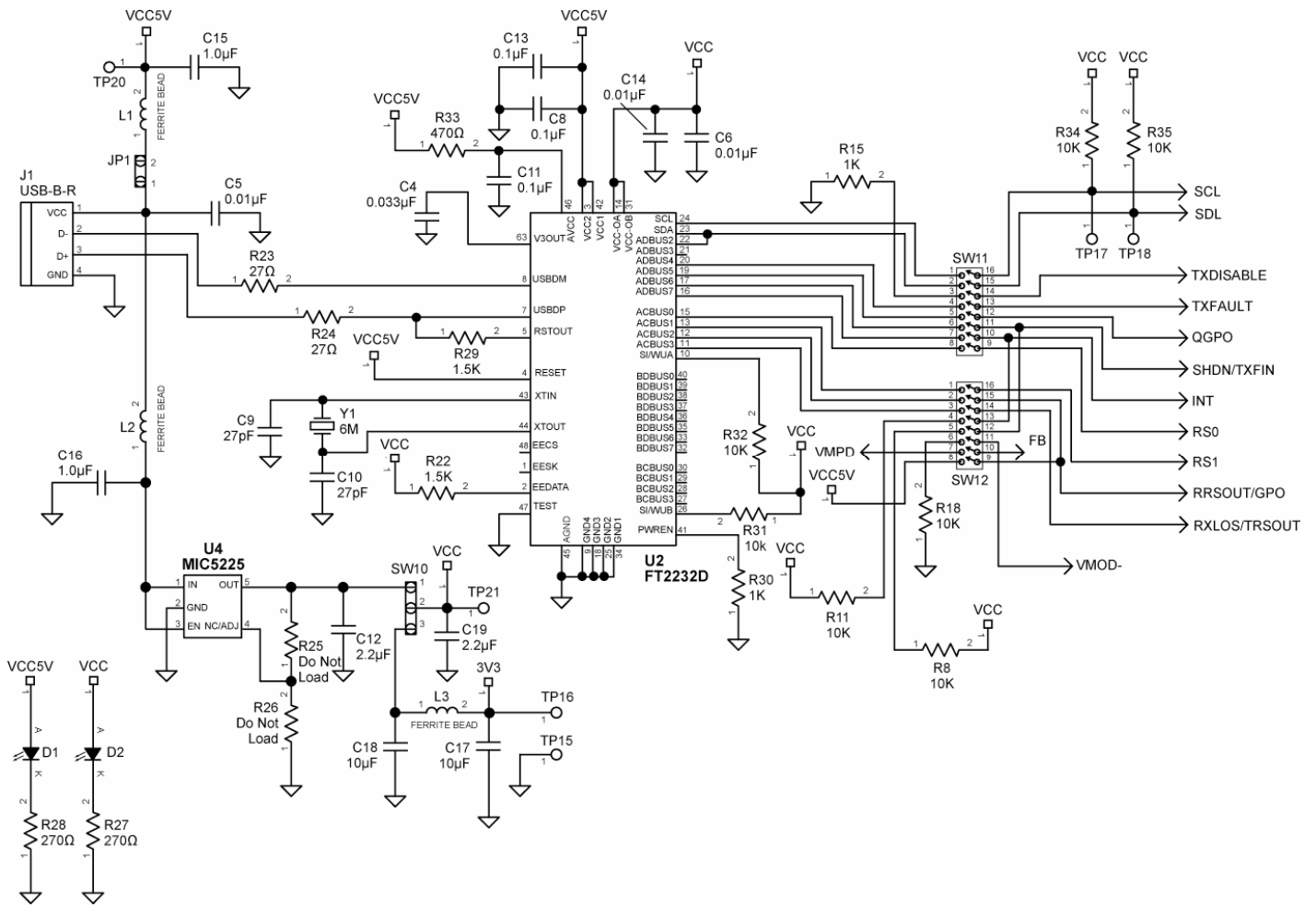
Please follow the steps outlined in the MIC3003 Evaluation Software Manual found at page 8 of this document.

# Evaluation Board Schematics



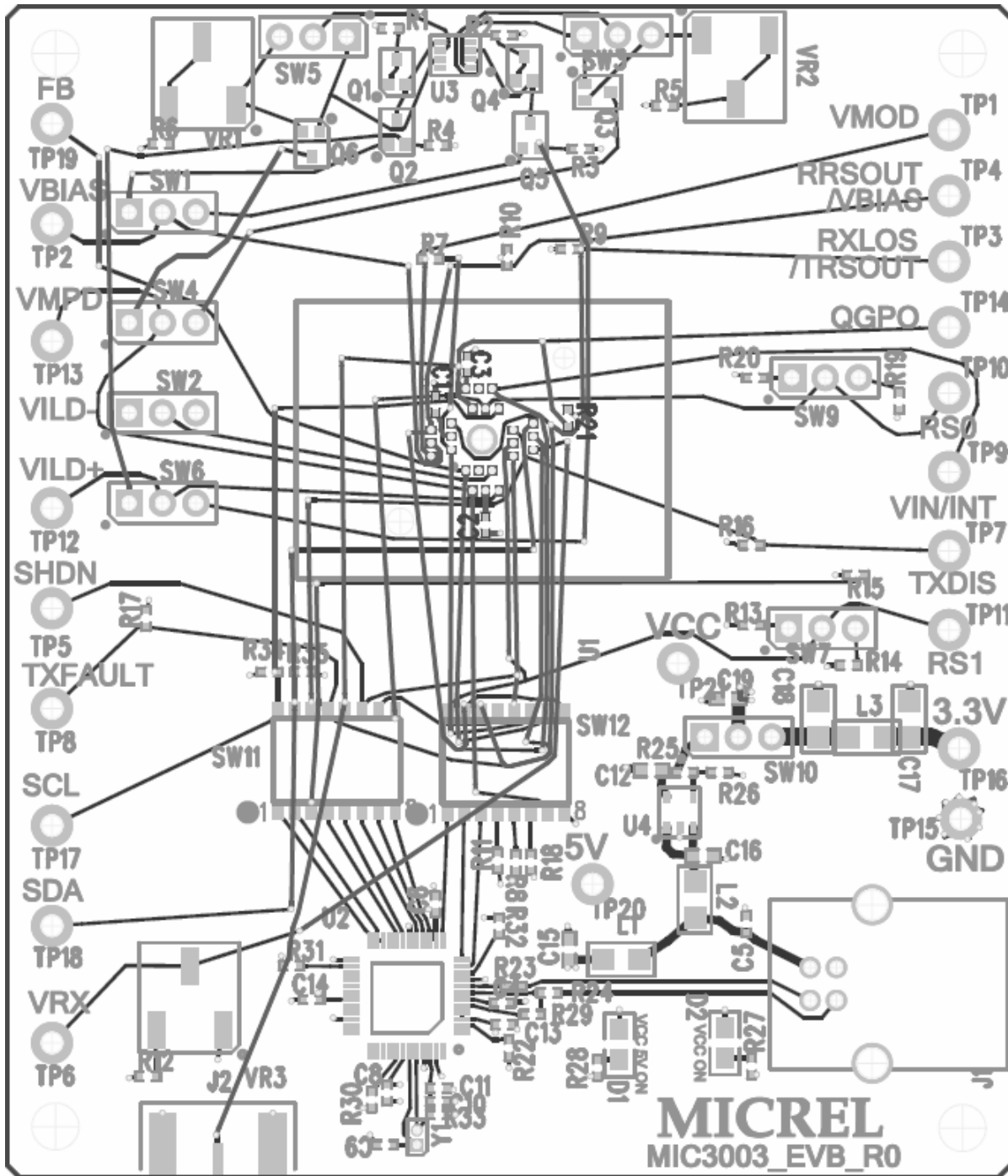
Schematic 1 of 2

### Evaluation Board Schematics



Schematic 2 of 2

### PCB Layout/Assembly



## Bill of Materials

Item	Part Number	Manufacturer	Description	Qty.
C1		Vishay <sup>(1)</sup>	0.018 $\mu$ F Ceramic Capacitor, Size 0402	1
C2-3, C8, C11, C13		Vishay <sup>(1)</sup>	0.1 $\mu$ F Ceramic Capacitor, Size 0402	5
C4		Vishay <sup>(1)</sup>	0.033 $\mu$ F Ceramic Capacitor, Size 0402	1
C5-6, C14		Vishay <sup>(1)</sup>	0.01 $\mu$ F Ceramic Capacitor, Size 0402	3
C9-10		Vishay <sup>(1)</sup>	27pF Ceramic Capacitor, Size 0402	2
C12, C19		Vishay <sup>(1)</sup>	2.2 $\mu$ F Ceramic Capacitor, Size 0402	2
C15-16		Vishay <sup>(1)</sup>	1 $\mu$ F Ceramic Capacitor, Size 0402	2
C17-18	ECSH0GY106R	Panasonic <sup>(2)</sup>	10 $\mu$ F, Y, Tantalum Solid Electrolytic Capacitor	2
D1	516-1425-1-ND	Digikey <sup>(3)</sup>	Green LED	2
J1	67068-8010	Molex <sup>(4)</sup>	USB Type B Receptacle Connector	1
J2	142-0701-851	Johnson Components <sup>(5)</sup>	SMA End Launch Receptacle Connector	1
L1-3		Vishay <sup>(1)</sup>	1.2 $\mu$ H Ferrite Bead Inductor, Size 1206	3
Q1-3	MMTB3906WT1	ON Semiconductor <sup>(6)</sup>	PNP Transistor	3
Q4-6	MMTB3904WT1	ON Semiconductor <sup>(6)</sup>	NPN Transistor	3
R1-2, R5-6	CRCW040210R0F	Vishay <sup>(1)</sup>	10 $\Omega$ Resistor	4
R3-4	CRCW04023R30F	Vishay <sup>(1)</sup>	3.3 $\Omega$ Resistor	2
R7-12, R17-18, R21, R31-32, R34-35	CRCW04021002F	Vishay <sup>(1)</sup>	10k $\Omega$ Resistor	13
R13-16, R19-20	CRCW04021000F	Vishay <sup>(1)</sup>	100 $\Omega$ Resistor	6
R22, R29	CRCW04021501F	Vishay <sup>(1)</sup>	1.5k $\Omega$ Resistor	2
R23-24	CRCW040227R0F	Vishay <sup>(1)</sup>	27 $\Omega$ Resistor	2
R27-28	CRCW04022700F	Vishay <sup>(1)</sup>	270 $\Omega$ Resistor	2
R30	CRCW04021001F	Vishay <sup>(1)</sup>	1k $\Omega$ Resistor	3
R33	CRCW04024700F	Vishay <sup>(1)</sup>	470 $\Omega$ Resistor	1
SW1-10	TSW-1-3-07-G-S	Samtec <sup>(7)</sup>	Header, 3 Positions	4
SW11-12	TDA08H0SB1	CK-Components <sup>(8)</sup>	8 Positions Ultra Miniature Dip Switch	2
TP1-14, TP17-21	5014	Keystone <sup>(9)</sup>	Color Coded PCB Test Point, Yellow	19
TP15	5011	Keystone <sup>(9)</sup>	Color Coded PCB Test Point, Black	1
TP16	5010	Keystone <sup>(9)</sup>	Color Coded PCB Test Point, Red	1
VR1, VR2, VR3	3269 W-1-503 GLF	Bourns <sup>(10)</sup>	50K SMD Trimming Potentiometer	3
Y1	Q21CA3100xxxx00	Epson Toyocom <sup>(11)</sup>	6MHz Crystal	1
U1	24QN50K14040-0	Plastronics <sup>(12)</sup>	MLF-24 Socket	1
U2	FT2232D	FTDI Chip <sup>(13)</sup>	USB to Serial UART	1
U3	<b>MIC862</b>	<b>Micrel, Inc.</b> <sup>(14)</sup>	Dual Op Amp	1
U4	<b>MIC5225</b>	<b>Micrel, Inc.</b> <sup>(14)</sup>	LDO	1

### Notes:

1. Vishay: [www.vishay.com](http://www.vishay.com)
2. Panasonic: [www.panasonic.com](http://www.panasonic.com)
3. Digikey: [www.digikey.com](http://www.digikey.com)

4. Molex: [www.molex.com](http://www.molex.com)
5. Johnson components: [www.johnsoncomponents.com](http://www.johnsoncomponents.com)
6. ON Semiconductor: [www.onsemi.com](http://www.onsemi.com)
7. Samtec: [www.samtec.com](http://www.samtec.com)
8. CK-Components: [www.ck-components.com](http://www.ck-components.com)
9. keystone: [www.keyelco.com](http://www.keyelco.com)
10. Bourns: [www.bourns.com](http://www.bourns.com)
11. Epson Toyocom: [www.epsontoyocom.co.jp](http://www.epsontoyocom.co.jp)
12. Plastronics: [www.Plastronics.com](http://www.Plastronics.com)
13. FTDI Chip: [www.ftdichip.com](http://www.ftdichip.com)
14. **Micrel, Inc.:** [www.micrel.com](http://www.micrel.com)

## MIC3003 Evaluation Software Manual

Thank you for choosing to evaluate the MIC3003 FOM Management IC. This manual will outline the features of the MIC3003 Evaluation Software as well as the steps to setting up your MIC3003. Before reading this document, you should make sure the MIC3003 Evaluation Software is installed and the board can be properly interfaced. If not, please read the *MIC3003 Evaluation Software Setup Guide* first. For the *MIC3003 Evaluation Software Setup Guide*, please visit Micrel's Website or look inside the software package. To ensure the software runs smoothly, please close other background applications.

If you have any questions or encounter any issues, please contact Micrel HBW Helpline at (408) 955-1690 or email at [hbwhelp@micrel.com](mailto:hbwhelp@micrel.com).

Make sure a valid MIC3003 chip is mounted on the evaluation board. Choose either Single Chip or Multi-chip operation. If Single chip operation is chosen, the user needs to input MIC3003 Base Address. The default base address is A0. If Multi-chip operation is chosen, the program will scan all the address on the BUS to locate available MIC3003 devices.  
**Note:** this could take over a minute



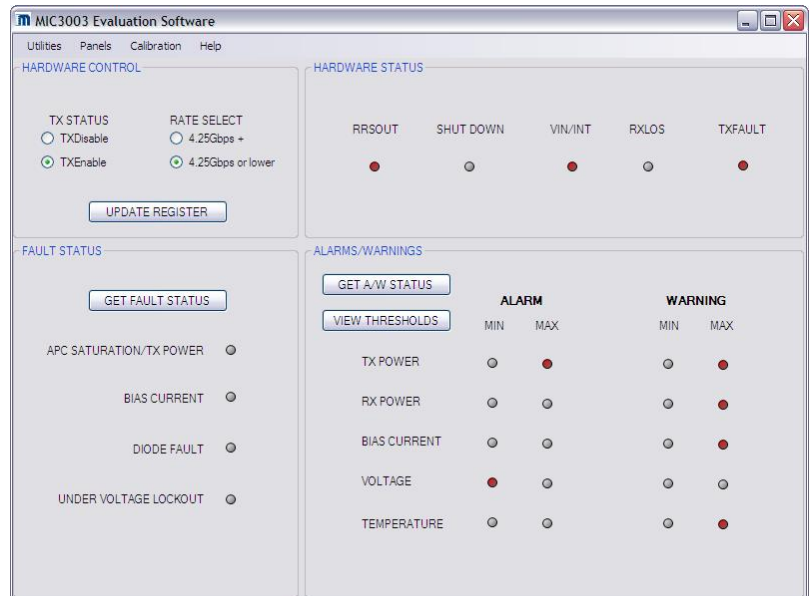
Choose which MIC3003 device to be programmed and click the GO button.





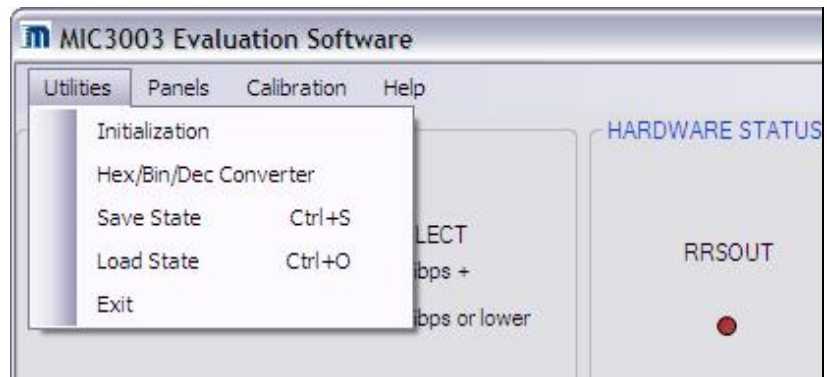
This is the Main screen of the MIC3003 program. The LEDs are either lit [RED] or dim [GRAY]. Lit LEDs usually indicate some alarm/warning or fault has been asserted and could be a sign of a problem.

The top menu bar is broken into 4 main drop-down menus. **Utilities, Panels, Calibration, and Help.**



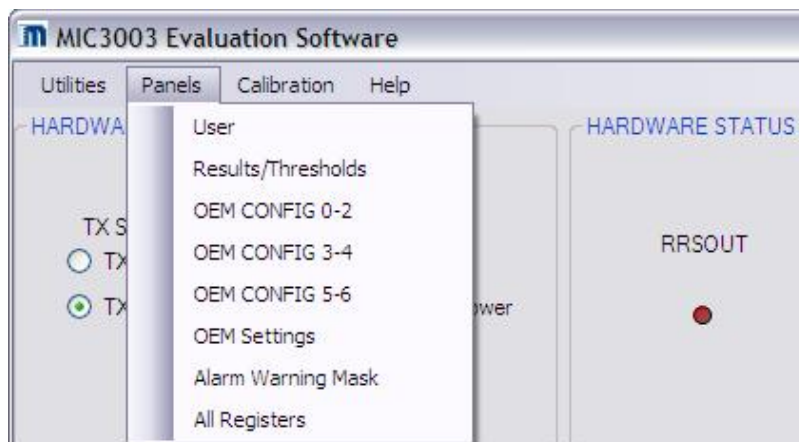
**Utilities:**

- **Initialization** – Allows parts to be initialized. Registers are read into the program
- **Hex/Bin/Dec Converter** – A handy tool to convert one number format to another
- **Save and Load State** – Saves registers into a \*.mic and loads \*.mic files into the registers, respectively
- **Exit** – Prompts you to save then exit the program



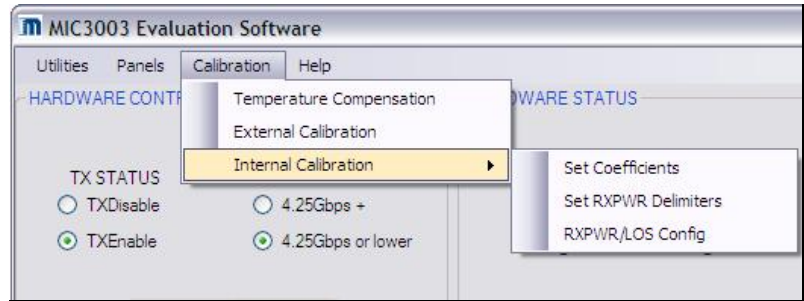
**Panels:**

- **User** – Can read/update various Control and Status Registers
- **Results/Thresholds** – Displays real-time measured results. Also allows the user to set the Alarm/Warning thresholds
- **OEM 0-2/3-4/5-6** – Allows the user to read/update OEM Registers 0 to 6 with different settings for various applications
- **OEM Settings** – To set the APC/MOD setpoints as well as the thresholds for various Fault conditions
- **Alarm Warning Mask** – The user can chose which alarm/warning to mask as to not assert the Interrupt signal
- **All Registers** – Can set and display any registers



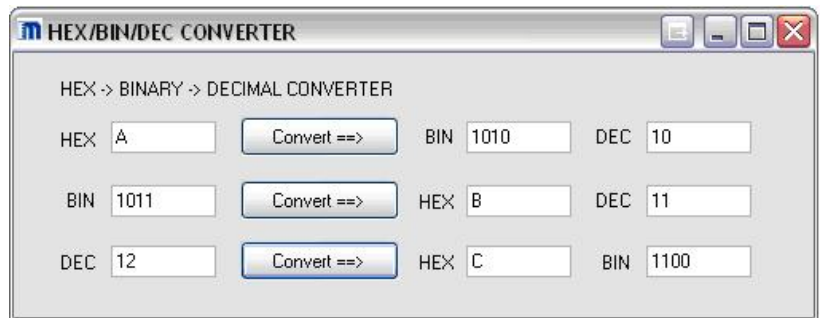
**Calibration:**

- **Temp Comp** – Sets user/auto-calculated LUT values to compensate for 4 temperature-affected parameters
- **External Calibration** – If Ext. Calib. option is chose, sets coefficients for external calibration of the ADC results
- **Set Coefficients** – Set coefficients for internal calibration of the ADC results
- **Set RXPWR Delimiters** – If custom delimiter option is chosen, saves the user’s delimiters in registers
- **RXPWR/LOS** - Sets the calibration values for the RX PWR based on the delimiters.



Now let’s go through the panels one-by-one.

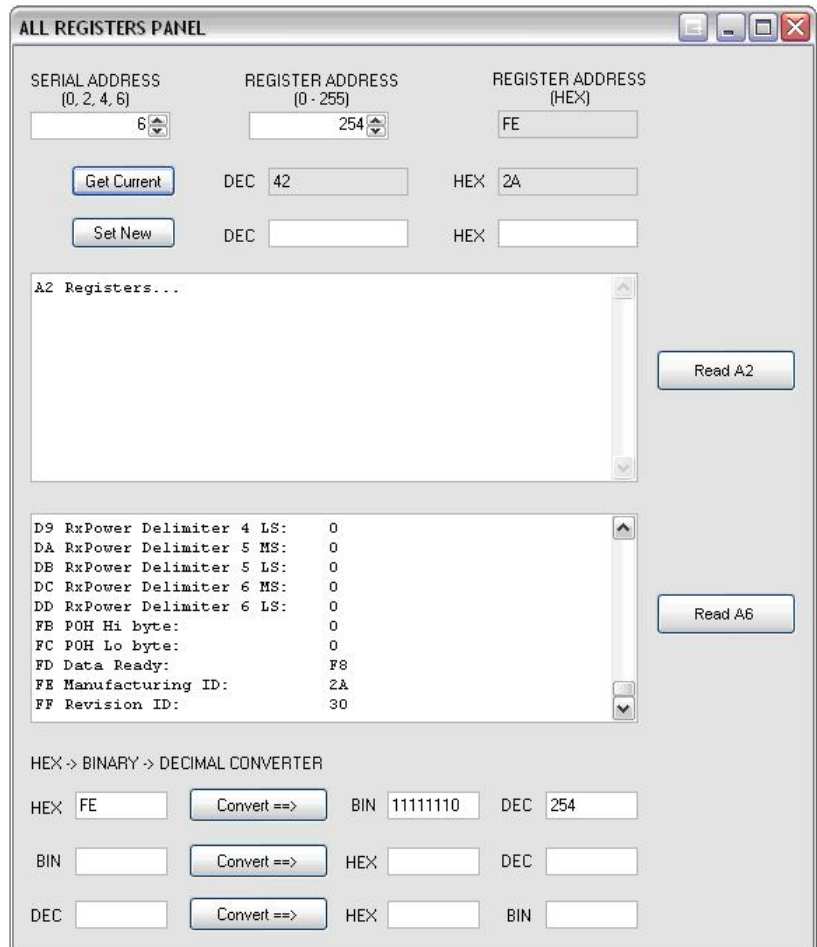
One of the useful tools built into the program is the HEX/BIN/DEC converter. It converts a number between those three formats. This tool can be found in the Utilities menu or under All Registers panel in Panels menu.



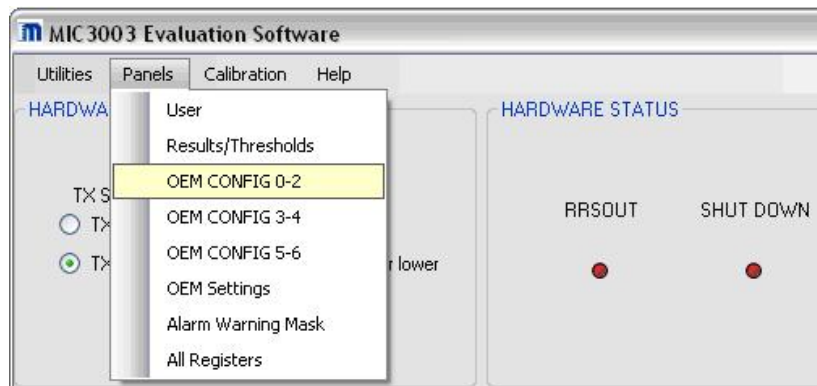
**All Registers** panel allows the user to read and write into any specific register by using the Serial and Register address. For example, to read the MFG ID, the Serial address would be 6 and Register address would be 254. Click “Get Current” will read the specified register and “Set New” will set a new value if the register is writeable.

“Read A2” and “Read A6” buttons will read the respective memory banks and display all user-related registers in an easy to read manner with description of each register.

To change any specific register entry, the user can use the textboxes in the “Set New” section.



To start setting up the MIC3003, go to **Panels** menu and select **OEM CONFIG 0-2**. This will allow the user to modify the OEM Configuration Registers 0 – 2.



**OEM CONFIG 0-2** panel allows the user to alter the OEM Configuration Register settings by selecting the desired option and clicking "Update Register ..."

#### OEM Register 0:

- Set VMOD Reference to:
  - VDD** if the SY89307V is used as the driver OR a common cathode VCSEL laser is used.
  - GND** if a FP/DFB or a common anode VCSEL is used (without the SY89307V).

#### OEM Register 1:

- Set APC OP-AMP to: **Emitter Follower**
- Set Feedback Voltage to: **1.22V**
- Set Bias Reference and VBIAS Drive to:
  - GND** and **Source (NPN)** if a FP/DFB or common anode VCSEL is used
  - VDD** and **Sink (PNP)** if a common cathode VCSEL is used
- Set Internal Feedback Resistor to: **Any Value** that converts the photodiode current to a voltage within 400-800mV to avoid APC saturation.

#### OEM Register 2:

- The MIC3003 address can be modified.
- Set TRSTCLR Time to: **Any Time** to control the delay between QGPO de-assert and RESETOUT clearing.

#### OEM Register 0:

- Set Output Enable to: **Enable**

**OEM CONFIG 3-4** panel in **Panels** menu allows the user to alter the OEM Configuration Registers 3 & 4 by selecting the desired option and clicking “Update Register ...”

The user can select any of options based on individual applications. A sample selection could be:

**External Calibration**

**Enable RXLOS**

**SHDN**

**Active Low**

**Latched Alarms**

**Latched Warnings**

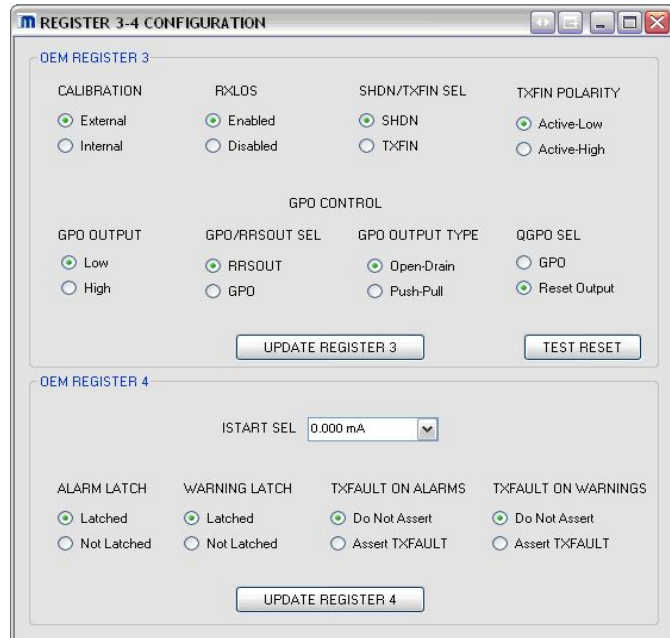
**Do Not Assert TXFAULT on Alarms**

**Do Not Assert TXFAULT on Warnings**

ISTART can be set to different values to speed up the APC loop during laser Turn-On after a FAULT occurrence.

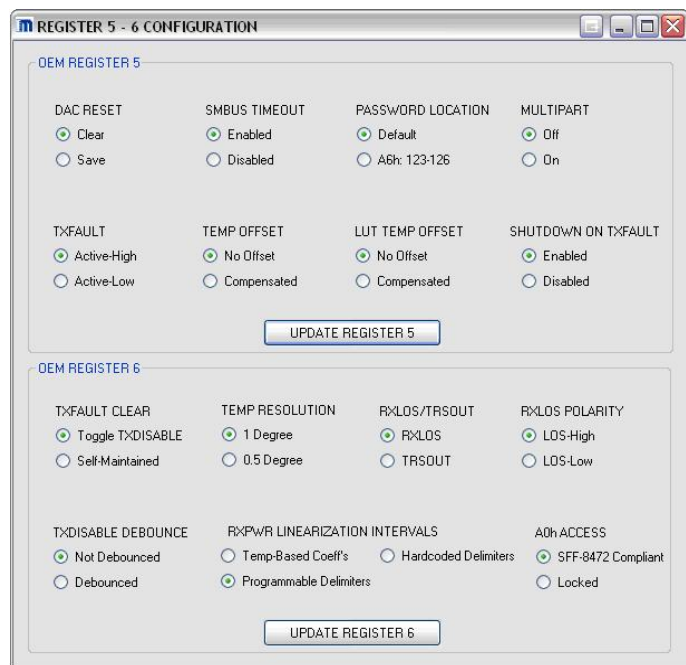
QGPO settings will depend on the user’s application.

“Test Reset” is provided to evaluate the Reset signal. Hit the button to send a Reset pulse from the MIC3003. Hit Okay to the information box that follows.



**OEM CONFIG 5-6** panel in **Panels** menu allows the user to alter the OEM Configuration Registers 5 & 6 by selecting the desired option and clicking “Update Register ...”

Please refer to the MIC3003 Datasheet to determine the desired settings.



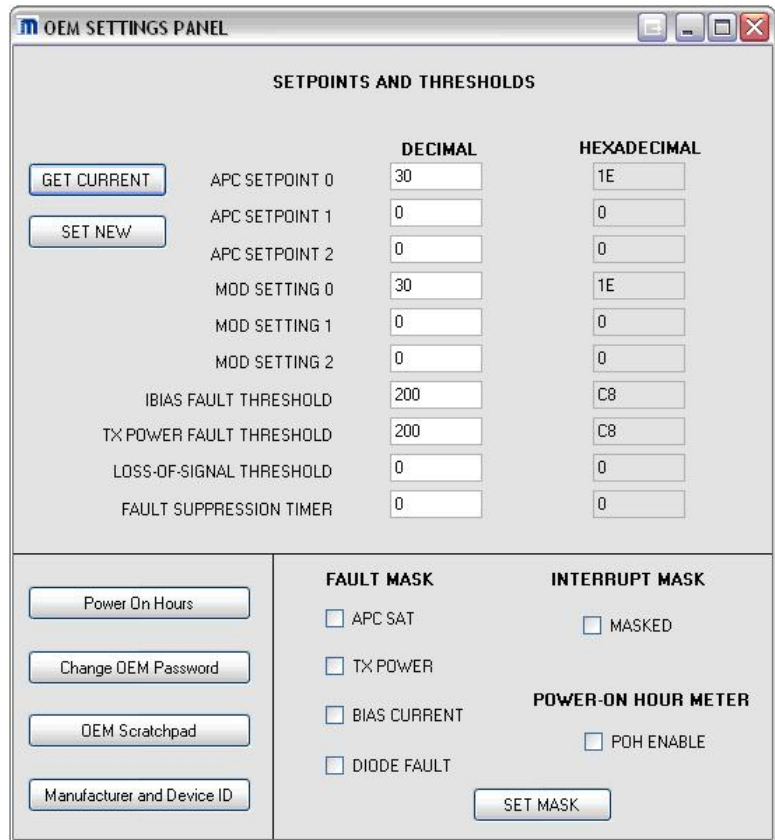
Select **OEM SETTINGS** panel in **Panels** menu to enter the setpoints and thresholds. Valid DAC values are between 0 and 255. Hit "Set New" to store any changes.

APC setpoints sets the bias of the laser. The three APC setpoints can be used to set three levels of bias current. Only one can be used at a time. APC setpoint 0 is selected by default.

MOD settings work with the MOD current of the laser.

To change which setpoint is used, go to **USER** panel in **Panels** menu.

Various **FAULT** and **INTERRUPT** masks can be set here as well. A fault shuts down the bias and modulation of the laser. When masking a fault, be aware that the bias and modulation currents can go too high and damage the board/laser. To avoid any damage, the fault should be masked for a short time only. Once the fault is identified, unmask the faults and fix the problem.



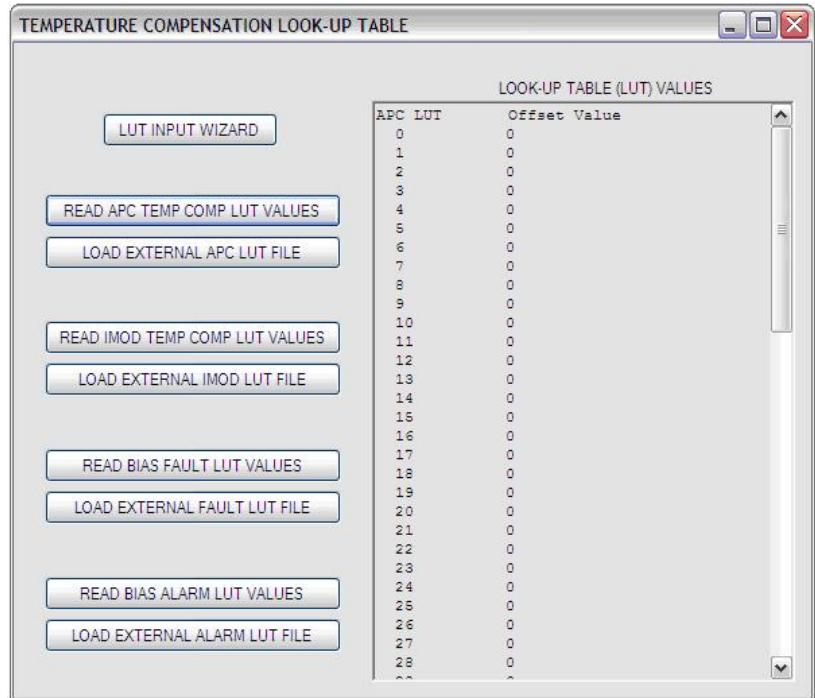
Under **Panels** menu, select **Alarm Warning Masks** to set the bits that mask the alarm or warning source of INTERRUPT



Under **Calibration** menu, select **Temperature Compensation** to load/create various Compensation Look-Up Tables.

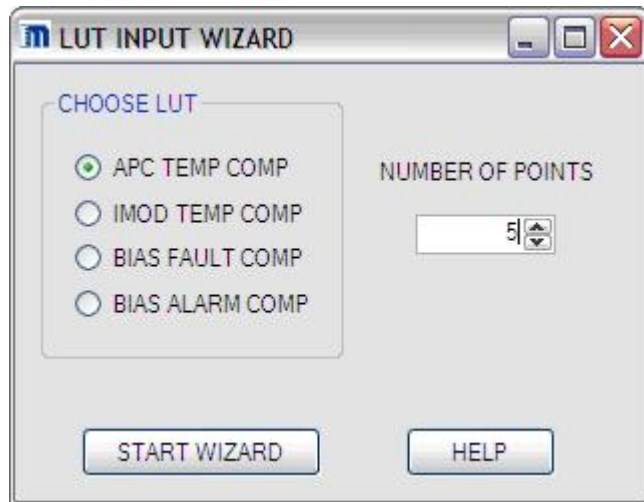
The “Read ... LUT Values” buttons will read the content of the respective LUT from memory and display the values on the right.

The “Load ... LUT Values” buttons will prompt the user to locate and read in an existing LUT file. The file should be in note pad format containing two columns of numbers separated by a TAB. The left column represents the temperature index, ranging from 0 to 75, corresponding to the 150°C temperature range. The right column is the delta to be applied to the parameter value at that particular temperature.

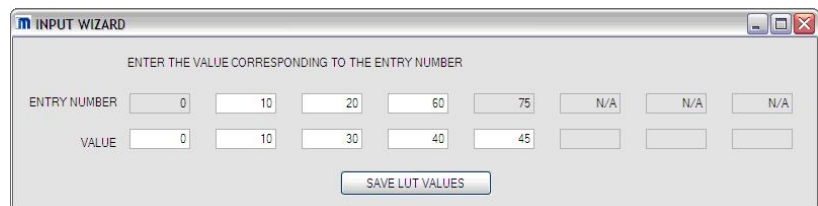


If the user wishes for a simple way to populate the respective LUT without having to create 75 entries, the MIC3003 software provides the LUT Input Wizard.

To use the Wizard, click on “LUT Input Wizard” on **Temperature Compensation** panel. Choose which LUT should be automatically filled, then choose how many delta points should be predefined. The program will automatically generate the rest of the LUT values linearly between the specified points. The Wizard needs a minimum of 2 points and a maximum of 8 points.

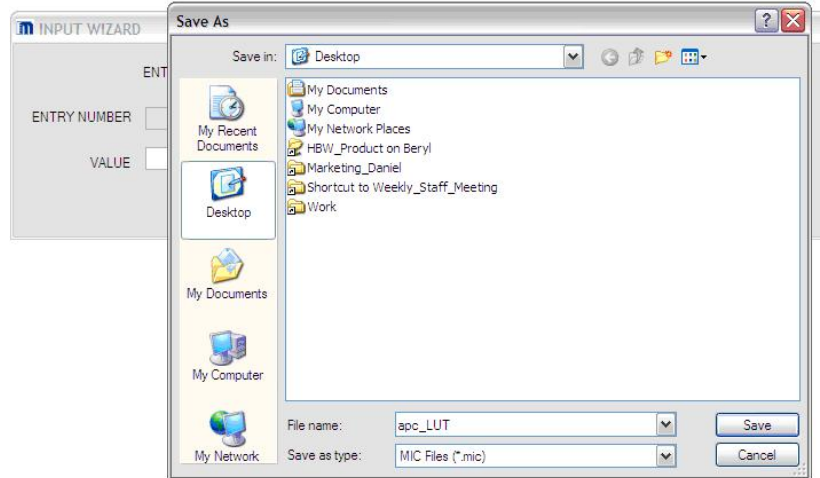


For example, if 5 points are picked, the program will ask for 3 index values (0 and 75 are always required) and 5 LUT values.

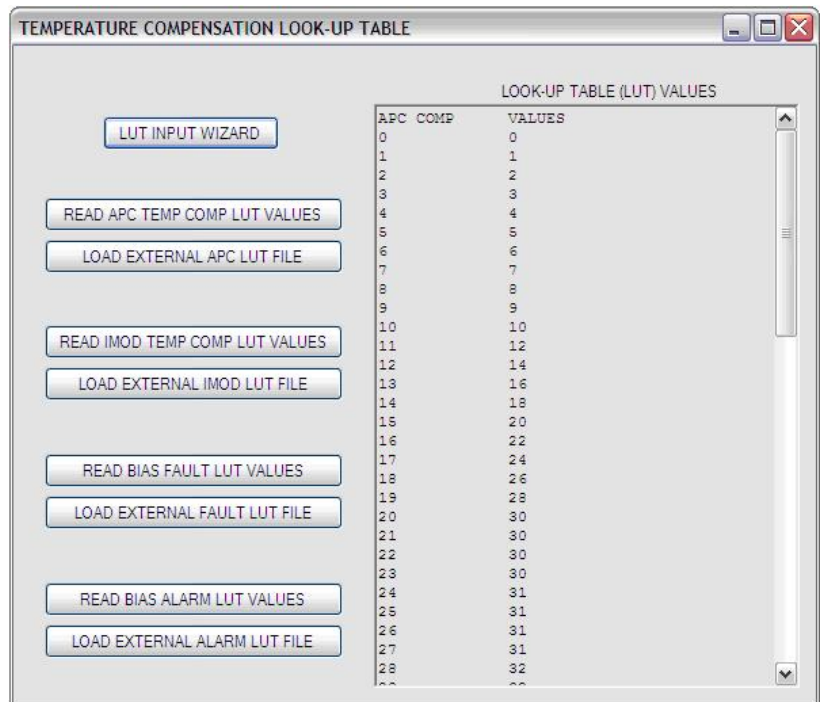




The program will save the LUT values in a separate file so it can be used multiple times without having to repeat the Wizard. The user can click “Load...LUT values” button to read in these files in the future.



The LUT values are generated automatically and saved to the MIC3003.

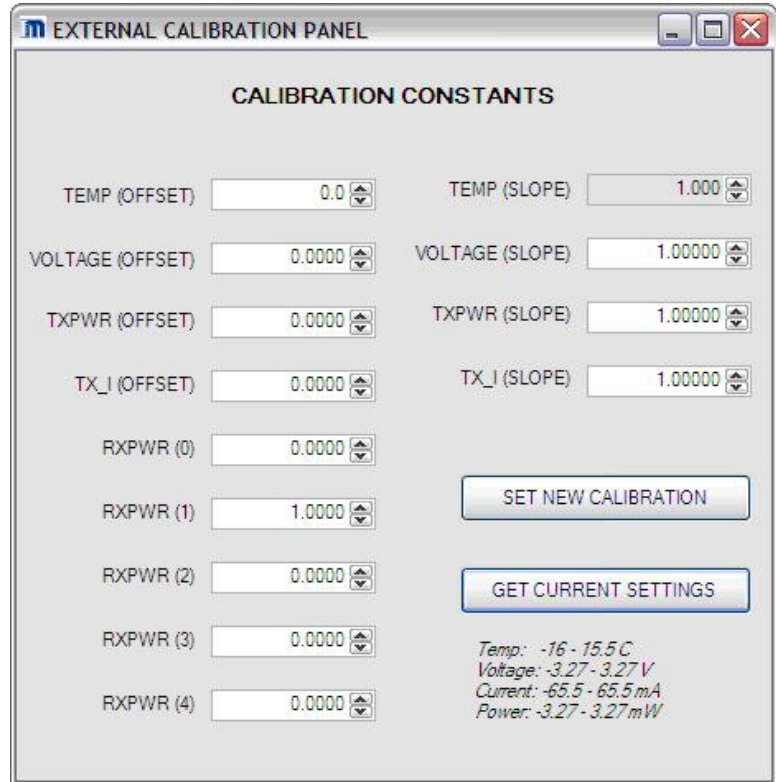


On **Calibration** menu, select **External Calibration** to adjust offsets and slopes constants. These constants are used if External Calibration is selected in OEM Configuration Register 3.

For quick start:

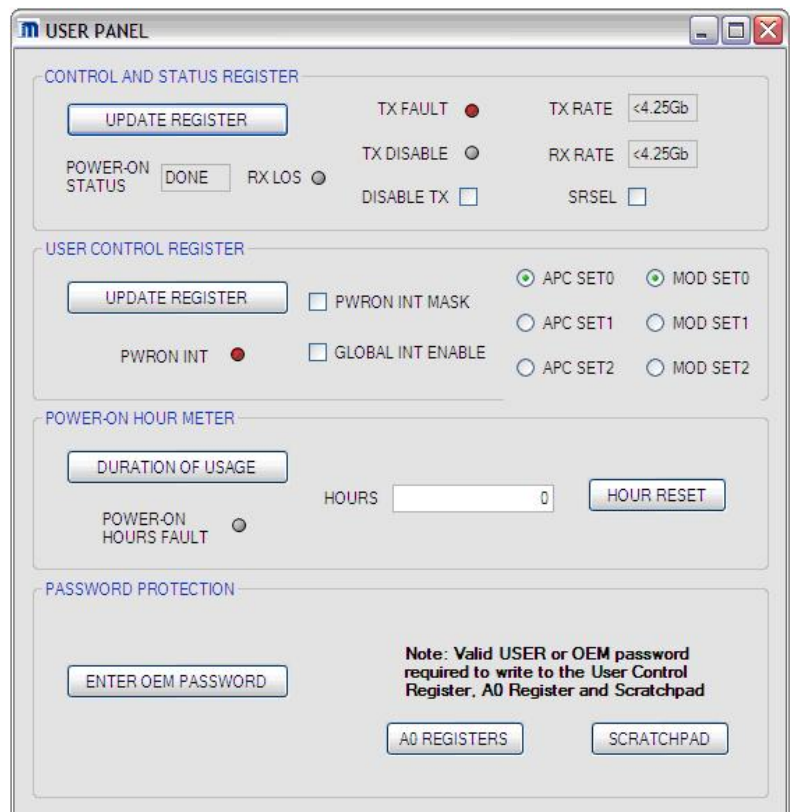
- Set all offsets to **0** and slopes to **1**
- Set RX\_PWR(1) to **1**

These parameters might need to be changed later to correct the measured values.



On **Panels** menu, select **User** to change user options.

Here the various APC and MOD setpoints can be selected. APC SET0 and MOD SET0 are selected by default.



**Thresholds and Results** panel can be found under **Panels** menu or by clicking "View Thresholds" button on the main window.

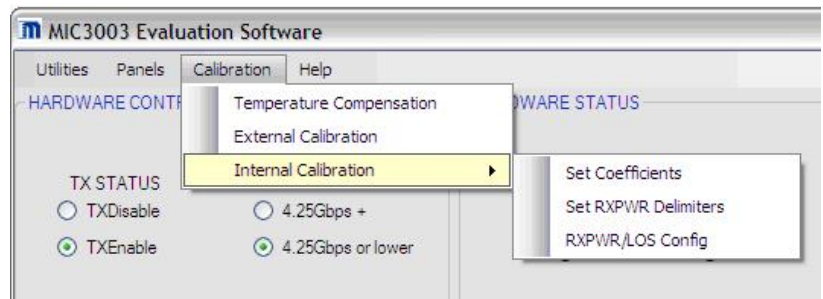
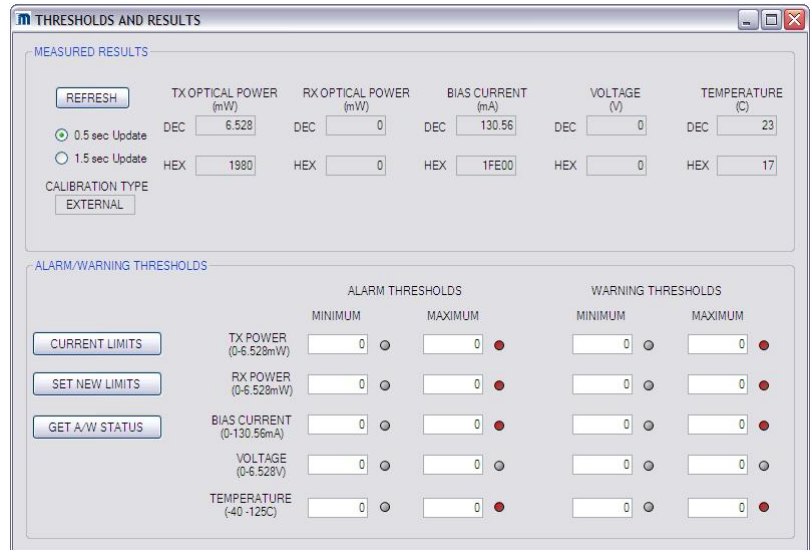
The calibration type is displayed as well as measured results from the MIC3003 evaluation board. The user can toggle between auto-refreshing the results every 0.5 seconds or every 1.5 seconds.

The LEDs in the bottom section signal if any Alarm/Warning threshold has been violated. To set new limits, type in the desired values and hit "Set New Limits". The LED's should respond to the new limits automatically.

Hit "Current Limits" to read the limits currently stored in the chip

Hit "Get A/W Status" to refresh the LEDs if they don't update automatically.

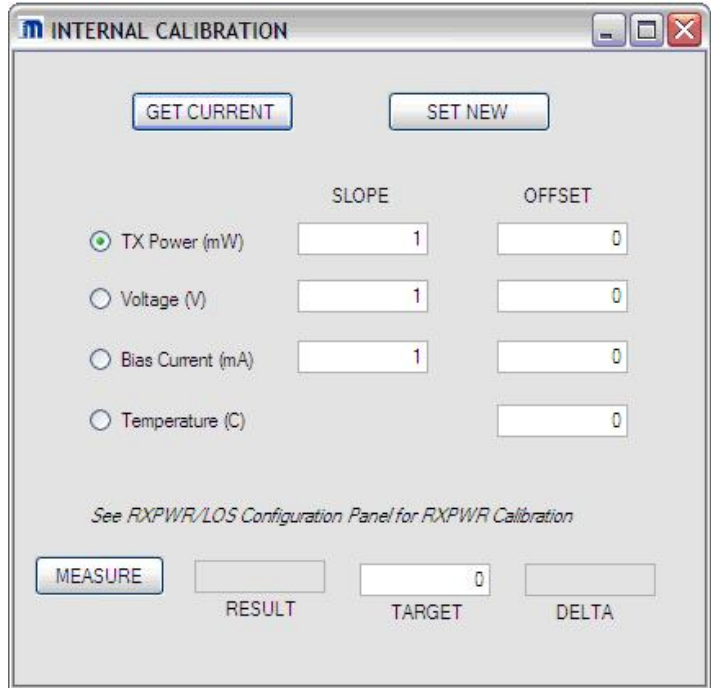
If the user requires Internal Calibration, there are three panels to complete. **Set Coefficients, Set PXPWR Delimiters and RXPWR/LOS Configuration**



The **Set Coefficient** panel will allow the user to set the Slope and Offset coefficients for internal calibration.

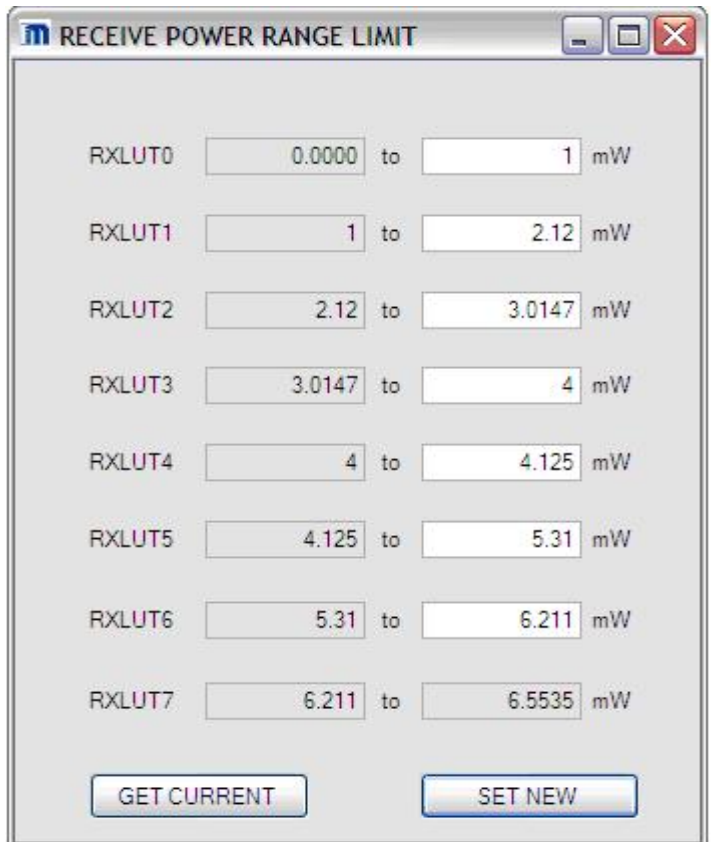
For quick start:

- Set Slopes to 1 and Offset to 0



If Internal Calibration is selected in **OEM Configuration Register 3**, the Receive Power is calibrated by applying slope and offsets tailored to separate ranges of the Receive Power.

On the **Receive Power Range Limits**, the user can enter the delimiter values to specify the receive power linearization intervals. These delimiters will be used if “Programmable Delimiters” option is selected in **OEM Configuration Register 5**.



To apply slope and offset for each of the eight (8) RXLUT segments, select **RXPWR/LOS Config on Internal Calibration** submenu.

RXPOT ratio can be set here as well. Refer to datasheet for desired settings.

The delimiters on the right will correspond to whichever selected option in **OEM Configuration Register 5**.

LOS Assert and De-assert levels can be set here as well.

The MIC3003 setup is complete. Depending on the specific application, your settings may vary from those listed above. For detailed descriptions of settings, please consult the datasheet. Please contact Micrel if there are any technical or software issues

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