753-400003 | Revision A

Tunable Filter Development Kit | **2018.10.31**

Micron Optics Inc.
1852 Century Place NE
Atlanta, GA 30345

phone 404.325.0005
fax 404.325.4082
www.micronotics.com

TABLE OF CONTENTS

1. Introduction

Micron Optics' Tunable Filter Controller Development Kit is an electronic piezoelectric actuator driver specially designed for the FFP Tunable Filter (TF or TF2) or Scanning Interferometer. The Development Kit can be used in several modes of operation.

- Manual DC Voltage Driver
- Manual DC + AC Voltage Driver (bias, amplitude and frequency controls)

Features

- Capable of being controlled with both software and board mounted buttons
- Active frequency and voltage are displayed on the integrated display
- Simple UI to control input signal, frequency, and applied voltage
- Supplies a user selectable triangle wave to the FFP device which allows tuning over more than 50 volts
- SMA drive signal and sync/trigger

The Tunable Filter Controller Development Kit is an excellent tool for first time users of fiber Fabry-Perot filters to become familiar with filter technology and operations. It also can be used as a lab bench tool in the research of advanced capabilities of tunable filters.

**The Tunable Filter Development Kit is intended for laboratory demonstrations of FFP filter characteristics and general modes of operation. It is not intended for field applications.*

2. Specifications

Description	Specification
Waveform	Symmetric Triangle
Drive Output	~ 0.5 – 57.5 V
DC Offset	~ 0.5 – 30.5 V
AC Amplitude [1]	~ 0 – 57 V
Scan Rate	1, 10, 100, 1000 Hz (selectable)
Drive Noise	< 1 mV_{rms}
Drive Linearity [2]	< 1% at scan rates <= 100 Hz, < 5% at 1 kHz
Trigger	3.3 V, 100 Ω load
Trigger Rising Edge	Start of increasing voltage ramp, End of decreasing voltage ramp
Trigger Falling Edge	End of increasing voltage ramp, Start of decreasing voltage ramp
Power Supply	100 - 240 VAC input, 18 VDC output (included)
Communications	Ethernet

Table 1. Specifications

[1] Amplitude range is reduced to ~ 38 V at 1 kHz scan rate.

[2] Over 90% of the scan range

3. Board Layout

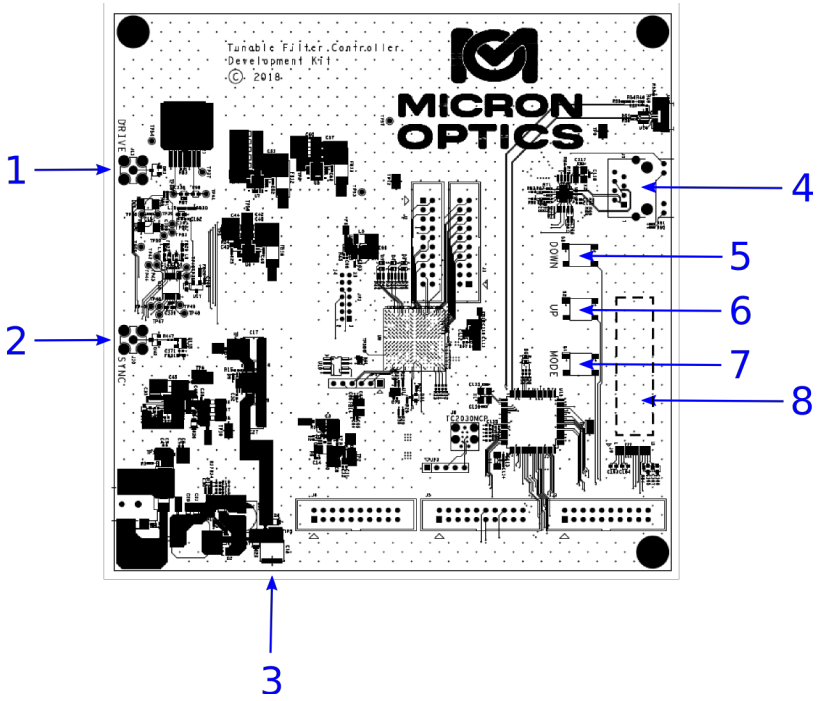

Figure 1. Board layout and location of controls and connections.

1. **Drive** Signal – Output drive signal (SMA)
2. **Sync/**Trigger – Sync/Trigger signal (SMA)
3. **Power Supply Connection**
4. **Ethernet Connection** – For communication with application or programming interface
5. **"Down" pushbutton** – For interaction with on board display [1]
6. **"Up" pushbutton** – For interaction with on board display [1]
7. **"Mode" pushbutton** – For interaction with on board display [1]
8. **On Board Display**

[1] See section 6 for information on the Board User.

4. Contents of Kit

This Tunable Filter Development Kit contains everything a user needs to begin actuating any of Micron Optics PZT-based tunable filters.

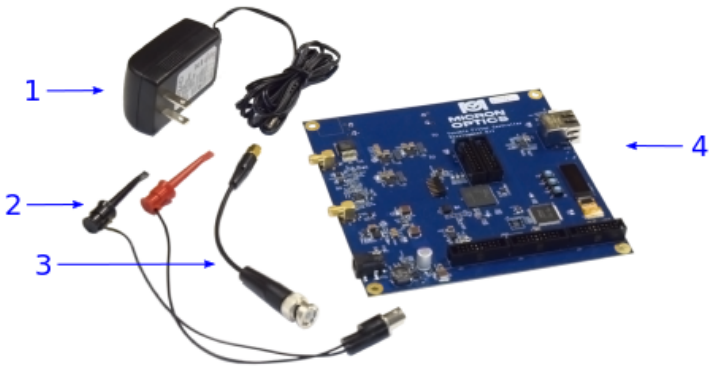

Figure 2. Contents of Tunable Filter Development Kit

1. Power Supply
2. Hybrid female BNC to clip leads, 6” cable
3. Hybrid male SMA to male BNC, 6” cable
4. Development Board

5. Getting Started

Users can start using this development kit immediately without the need of a PC. This procedure can be used to check the operation of the development kit or for regularly interacting with the kit.

5.1. Check packaging for the following materials

Development board
Power Supply
Male SMA-to-Male BNC Hybrid 6" Cable
Female BNC-to-Clip Leads 6" Cable

5.2. Additional Equipment (Not Included)

Oscilloscope
Male SMA-to-Male BNC Cable (x2)
Micron Optics Tunable Filter
SMA Tee Adapter (Female-Female-Male)

5.3. Procedure

1. Check and ensure all materials are included in kit.
2. Connect the SMA Tee adapter to the **DRIVE** connector on the development board.
3. Connect one of the Male SMA-to-Male BNC cables from the Tee adapter to channel 1 of the oscilloscope.
4. Connect the Male SMA-to-Male BNC 6" cable to the Female BNC-to-Clip Leads 6" cable.
5. Connect the assembly from the previous step to the Tee adapter connected to the development board.
6. Connect the clip leads from the from the previous step to the drive pins of a Micron Optics Tunable Filter. Ensure the red clip is connected to the (+) terminal, and the black clip is connected to the (-) terminal

CAUTION Applying negative potential to the filter will damage the component.

7. Connect the **SYNC** SMA connector on the board to channel 2 of the oscilloscope.
8. Turn on the oscilloscope
9. Set Channel 1 to high impedance input and 10 V/div.
10. Set Channel 2 to high impedance input and 2 V/div.
11. Set the time resolution to 4 ms/div.
12. Trigger off of Channel 2 at 1 V.
13. Plug the power supply into the development board and plug the power supply into a wall supply.

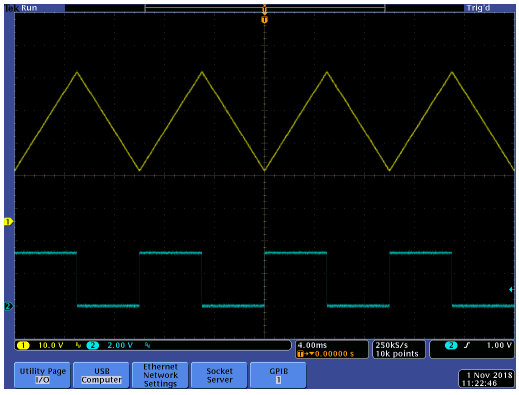

Figure 3. Typical output signals from development board. (Yellow) DRIVE signal with DC offset and AC amplitude of 30 V. (Blue) 3.3 V SYNC signal.

6. Board User Interface

The development board includes a number of on-board user interface components including 3 pushbuttons and a display. These components can be used to adjust the operation of the board.

6.1. Setting the IP mode

The board can be set to either Static or Dynamic IP modes.

To set to Static IP Mode:
1. Press the **MODE** button until the top line of the display reads `IP Type (UP/DOWN to edit).`
2. Press the **UP** or **DOWN** button to enter the edit screen.
3. Press the **UP** or **DOWN** button to until the bottom line displays `Static IP`.
4. Press the **MODE** button to save.

If the Static IP mode is used, a static IP address must be set.

To set the Static IP address:
1. Press the **MODE** button until the top line of the display reads `IP Address (UP/DOWN to edit).`
2. Press the **UP** or **DOWN** button to enter the edit screen.
3. Press the **UP** or **DOWN** button to adjust the first byte of the IP address.
4. Press the **MODE** button to cycle to the next byte.
5. Repeat steps 3 and 4 for the next three bytes of the IP address.
6. Press the **MODE** button to save.

NOTE In order to use the static IP mode and static IP address, the **board must be power cycled**.

To set to Dynamic (DHCP) IP Mode:
1. Press the **MODE** button until the top line of the display reads `IP Type (UP/DOWN to edit).`
2. Press the **UP** or **DOWN** button to enter the edit screen.
3. Press the **UP** or **DOWN** button to until the bottom line displays `DHCP – 0.0.0.0`.
4. Press the **MODE** button to save.

NOTE In order to use the dynamic IP mode, the **board must be power cycled**. Once power cycled, the board can be connected to a DHCP enable network and the assigned IP address will be displayed.

6.2. Setting the DC Offset

1. Press the **MODE** button until the top line of the display reads `Bias (UP/DOWN to edit).`
2. Press the **UP** or **DOWN** button to enter the edit screen.
3. Press or hold either the **UP** or **DOWN** button to adjust the DC offset. The bottom of the display will show a hexadecimal number ranging from `0x0000` to `0x8000` indicating the minimum and maximum DC offset respectively.
4. Press the **MODE** button to save.

NOTE The DC offset is displayed in terms of DAC counts and not voltage.

6.3. Setting the Amplitude

1. Press the **MODE** button until the top line of the display reads `Amplitude (UP/DOWN to edit).`
2. Press the **UP** or **DOWN** button to enter the edit screen.
3. Press or hold either the **UP** or **DOWN** button to adjust the amplitude. The bottom of the display will show a hexadecimal number ranging from `0x0000` to `0xFFFF` indicating the minimum and maximum amplitude respectively.
4. Press the **MODE** button to save.

NOTE The AC amplitude is displayed in terms of DAC counts and not voltage.

6.4. Setting the Scan Rate/Frequency

1. Press the **MODE** button until the top line of the display reads `Frequency (UP/DOWN to edit).`
2. Press the **UP** or **DOWN** button to enter the edit screen.
3. Press the **UP** or **DOWN** button to cycle through the available amplitudes.
4. Press the **MODE** button to save.

7. Windows Application

A Windows application is provided to control the development kit from a Windows PC. The application can be downloaded from www.micronoptics.com.

7.1. Installing the application (Windows 7 or Windows 10)

1. Download the installation package from www.micronoptics.com.
2. Unzip the package (if necessary) and navigate to and run the `setup.exe` file.
3. Follow the on-screen instructions to complete the installation.
4. Once installed, the application will automatically start.

NOTE The application can also be run in the future by navigating to the `Micron Optics` folder from the start menu or searching for "`Tunable Filter Controller Development Kit`" from the search bar in the start menu.

7.2. Application operation

Open the application by navigating to the `Micron Optics` folder from the start menu or searching for "`Tunable Filter Controller Development Kit`" from the search bar in the start menu and clicking the Micron Optics icon.

The following start up screen is displayed.

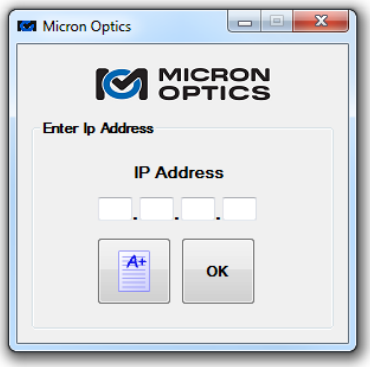

Figure 4. Startup screen

From the screen the IP address of the development board is entered in the `IP Address` field. Enter the IP address and click the `connection check button (A+)` on the left to check the communications to the board.

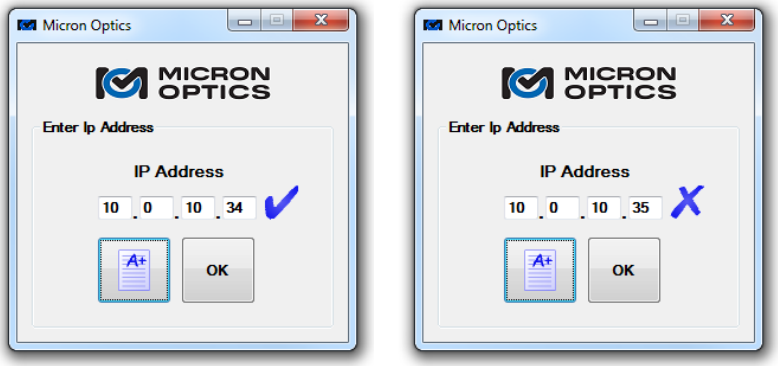

Figure 5. Successful communication check (left). If the check fails, a blue 'X' will appear (right).

Once connected, the bias (DC offset), the amplitude, and scan rate can be adjusted.

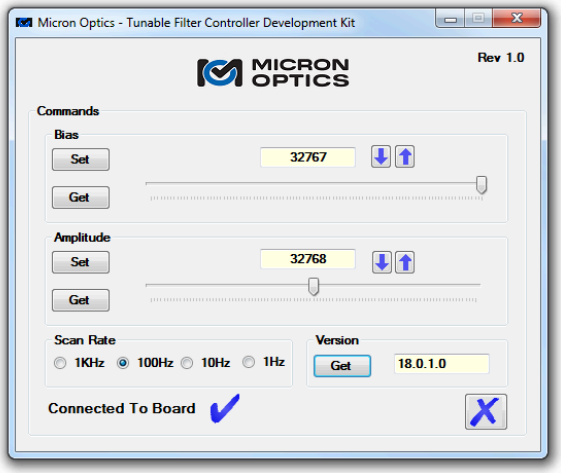

Figure 6. Application main window.

It is often useful to monitor the drive signal with an oscilloscope in real time while interacting with the application.

To close the window, click the blue 'X' button in the lower right.

8. Programming Interface

8.1. LabVIEW 2017 API

A LabVIEW API is provided to communicate with the development board within the LabVIEW development environment.

Two sets of files are included in the LabVIEW distribution.

8.1.1. LabVIEW Library

The organization of the LabVIEW library is illustrated in the following figure.

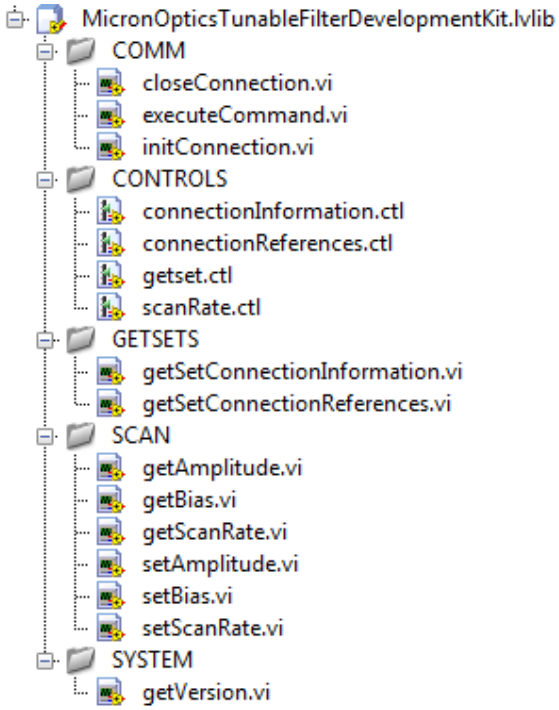

Figure 7. Organization of LabVIEW library.

The LabVIEW methods are organized into 5 groups: COMM, CONTROLS, GETSETS, SCAN, and SYSTEM. A simple open, execute, close flow is illustrated in the following figure.

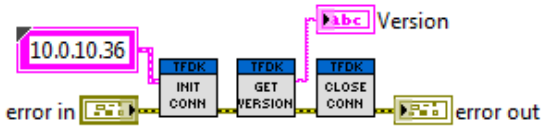

Figure 8. Simple example on executing an API command.

An example program similar to the Windows Application is included with the LabVIEW API. It can serve both as a method of interacting with the development board and an example of API usage.

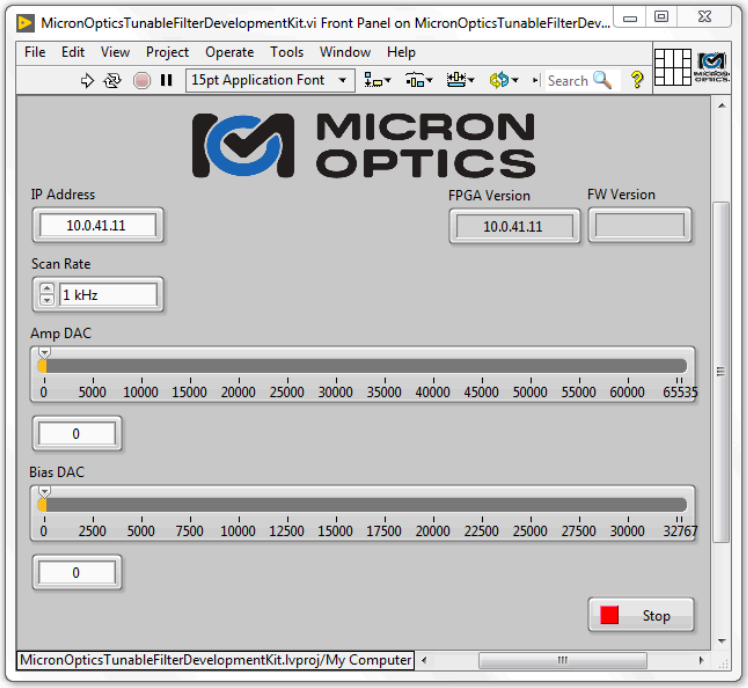

Figure 9. Example application written with the LabVIEW API.

The source code is included in the LabVIEW distribution.

8.2. Python v3 API

A python API, written and tested in python v3.5, is provided. An example script is provided to illustrate the usage of the API.

This, along with all of the software and documentation, can be found at www.micronoptics.com under the Tunable Filter Development Kit product page.