FFC-100 Fiber Frequency Comb Quick Start Guide

Model No. FFC-100-100 and FFC-100-200
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Please read Limited Warranty and General Warnings and Cautions prior to operating the FFC-100.

Fig. 1: The FFC-100 Fiber Frequency Comb

Useful Links

Click here for the Vescent manuals page.
Click here for the FFC-100 API.
Click here for the SLICE-FPGA-II Locking Manual
Click here for the FFC-100 web page.
Please check back for added functionality. Contact sales [at] vescent [dot] com for questions and corrections, or to request added functionality.

Notice

	Do not block the airflow vents on the side of the chassis or the fan inputs & outputs on either the FFC-100 or the SLICE-FPGA.
	The mode-lock indicator on the GUI front panel cannot detect CW breakthrough. Keep the oscillator current within the range specified in your product's final test documentation or CoC.

Operating the FFC

This document provides instructions on how to operate the Vescent Photonics FFC-100 when controlled by the Vescent SLICE-FPGA or SLICE-FPGA-II.

Purchase Includes

- FFC-100 rack-mountable Fiber Frequency Comb
- Power cord for your country (if known)

- Certificate of Conformance

Absolute Maximum Ratings and Power Input

Note: Reported specs are under laboratory conditions. Performance degradation can occur in deployed operation depending on the environment

Parameter	Rating
Environmental Temperature	15°C<T<30°C
Environmental Humidity	<60%
Environmental Dew Points	<15°C
Maximum AC Line Input Current	2 A

Tab. 1: Absolute Maximum Ratings

The FFC-100 employs a proprietary design hybrid power supply that is both low noise and capable of accepting a range of AC input line voltages. It will accept input line voltages within the ranges shown in table 2.

Parameter	Value	Units
Input Line Voltage	100-240	VAC
Frequency	50-60	Hz
Phase	1 phase	
User-serviceable fuse[1)]	T 2.0 A L 250V	

Tab. 2: Input Voltage Specifications

Proper Usage

If this instrument is used in a manner not specified by the manufacturer in this manual or other relevant literature, protection provided by the instrument may be impaired.

Successful implementation of the FFC-100 depends critically on the design of the whole system: FFC-100, phase locking electronics, and any references to which the FFC is locked or *vice versa*.

Initial Set-up

1. Ensure all cables and fibers are connected according to the connection diagram figure 2.[2)]
2. Ensure the RF input amplitudes to the FPGA are between -30 dBm and -15 dBm. If power levels are higher than -15 dBm, utilize an appropriate RF attenuator.
3. Turn on the power to the Fiber Frequency Comb (FFC) and the FPGA, as well as the reference laser.
4. Ensure the optical input power to the ƒOPT input port is < 1.5 mW.

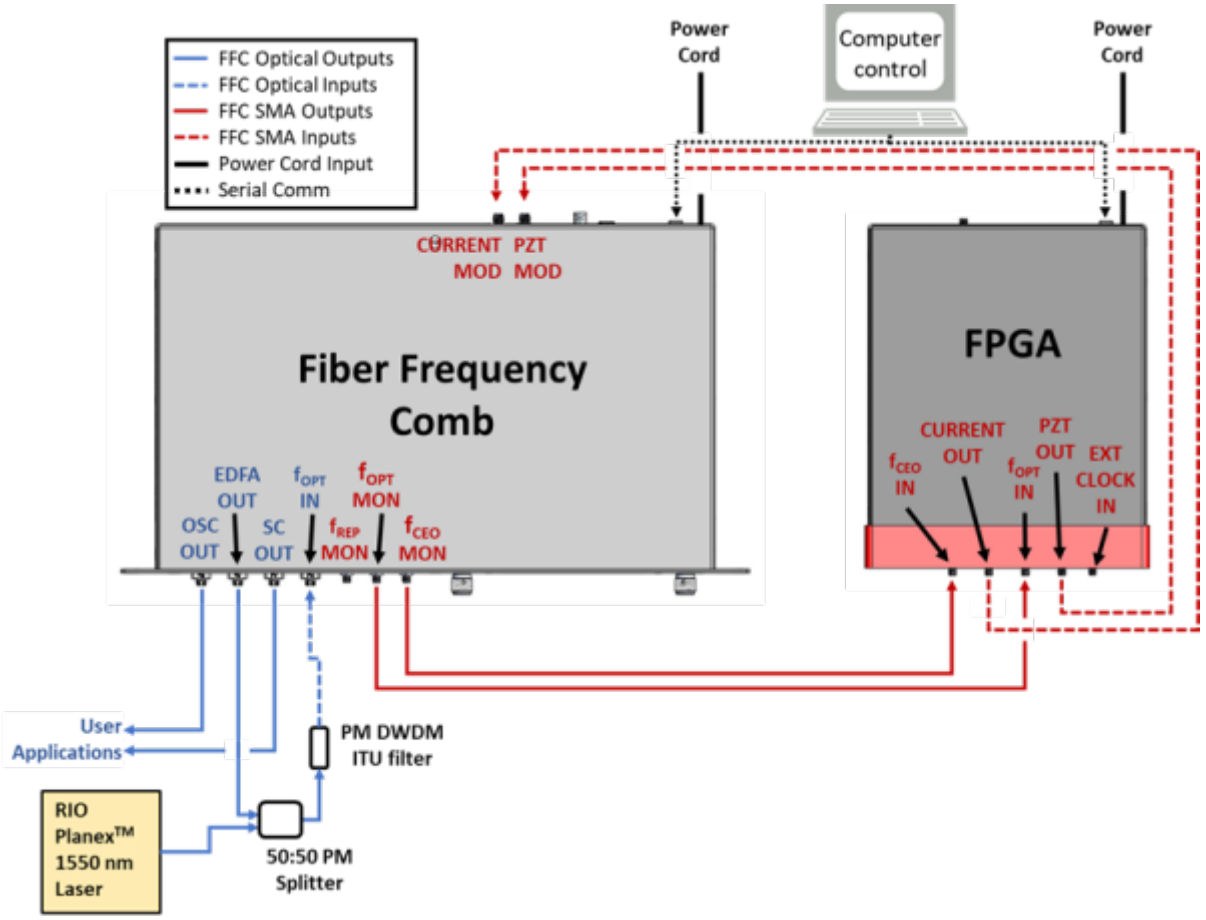

Fig. 2: FFC-100 electrical and optical connection diagram (Click for larger image)

Parameter	Rating
f_{opt} Power Input	<1.5 mW max

Tab. 3: Operating Parameters

FFC-100 Operation

FFC Start Up GUI

1. Touch the “System Off” button at the top of the front panel screen (figure 3) to bring up a drop-down menu. Select “Standby” (figure 4) to turn on temperature control of the pump diodes and oscillator cavity. Temperatures will appear yellow as they approach stability, and turn green when stabilized within a predefined temperature range around the setpoint.

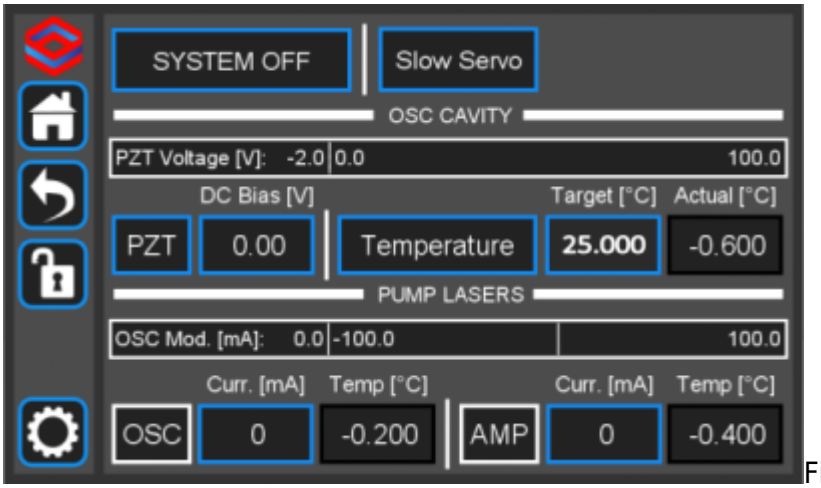

Fig. 3: The FFC-100 GUI in off state

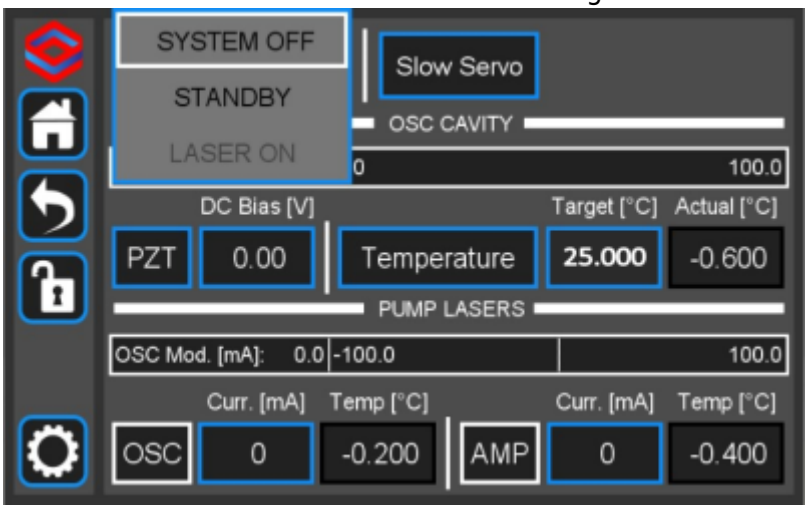

Fig. 4: Select Standby laser state

2. Once the temperature servos have stabilized and “Standby” has stopped blinking, touch the “Standby” drop-down menu (figure 5) and select “Laser On” (figure 6). The FFC should commence lasing and the Mode-locked indicator should turn green (figure 7).

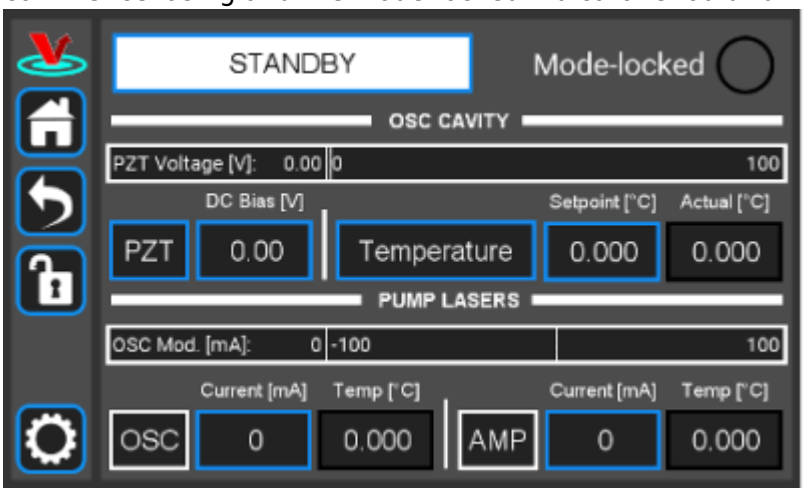

Fig. 5: The FFC-100 GUI: in Standby mode

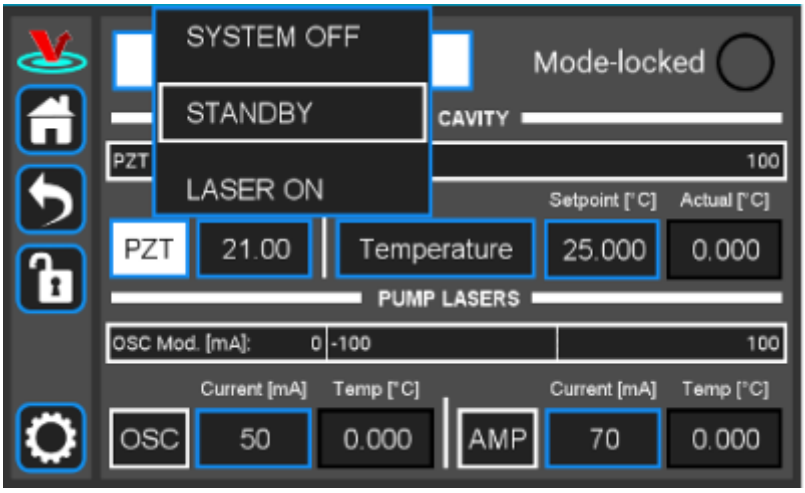

Fig. 6: The FFC-100 GUI: Standby to System On

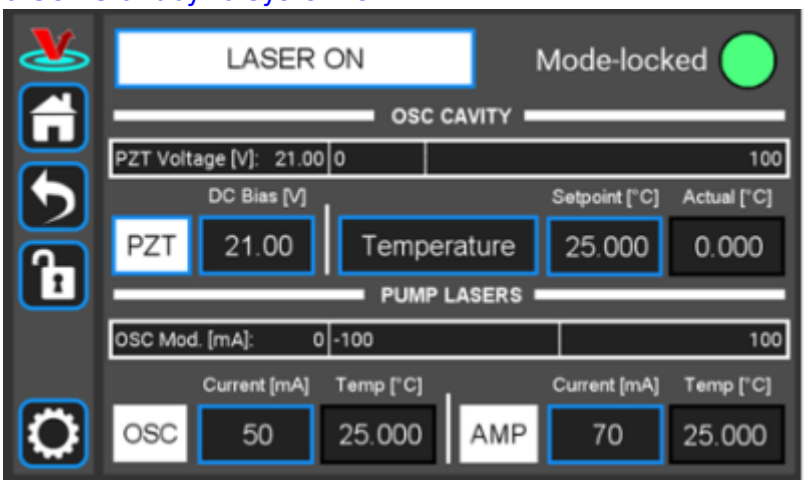

Fig. 7: System On

3. Touch the “PZT” touch screen button (figure 8) to bring up a drop-down menu and select “Full Range x10” to enable the PZT servo.

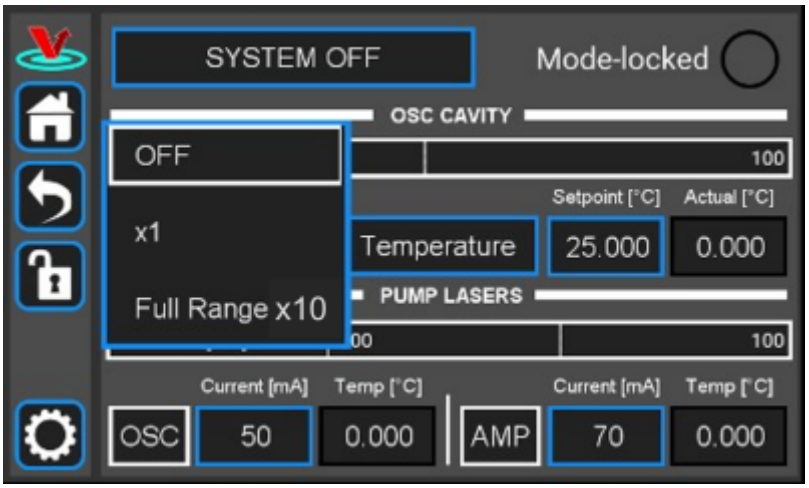

Fig. 8: Select PZT Gain

FPGA Control

The SLICE-FPGA dual-channel Offset Phase Lock Servo can be used to phase lock f_{CEO} to a reference (TBD) and f_{opt} to a reference laser such as the Rio Planex.

For locking the FFC-100 with the Vescent SLICE-FPGA-II Module, click here.

If using the SLICE-FPGA, click here.

Slow Loop Feedback

Slow servo functionality is designed to allow indefinite FOPT locking times despite long-term drifts in the reference laser's frequency outside the dynamic range of the FFC's PZT feedback. This is achieved by slow temperature feedback to the oscillator of the FFC, which locks the PZT output voltage to a setpoint voltage near the middle of its dynamic range. To enable the slow servo, first lock FOPT normally, with the DAC 1 slider as close to centered as possible. Next, navigate to the home screen of the FFC-100 and press the "Slow Servo" button at the top of the screen (figure 9 and figure 10).

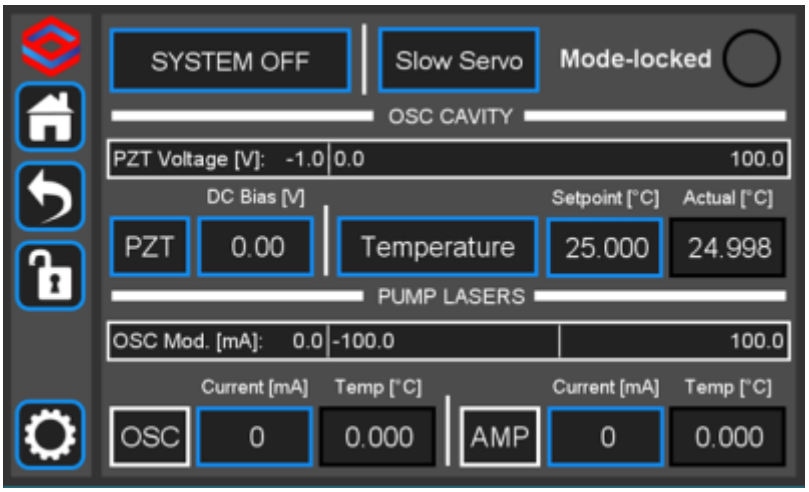

Fig. 9: The slow servo button is located on the home screen to the right of the System Off/Laser On button.

This will activate the slow servo but does not turn on the feedback. You can tell that the slow servo has been activated by the blue background on the "Setpoint [°C]" button.

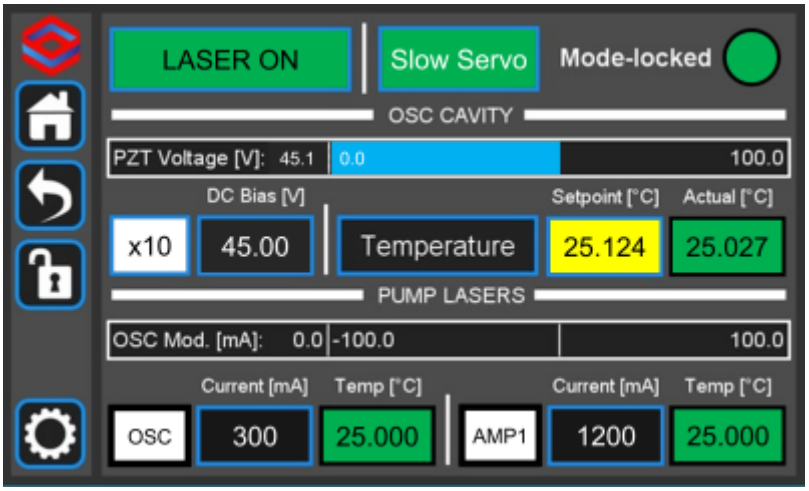

Fig. 10: When the slow servo is activated, the slow servo button will turn green, and the temperature "Target [°C]" and "Actual [°C]" buttons will turn yellow or green according to the current state.

This will activate the slow servo. On the FPGA software under the "Optical Lock" tab, the "DAC 1" slider should be gradually pushed and eventually stabilize in the center of its dynamic range. The gain of the slow servo comes preconfigured for each unit but can be adjusted via a menu accessed by pressing and holding the "Slow Servo" button on the FFC GUI (figure 11) **(We do not advise**

changing the gain without input from the Vescent technical staff).

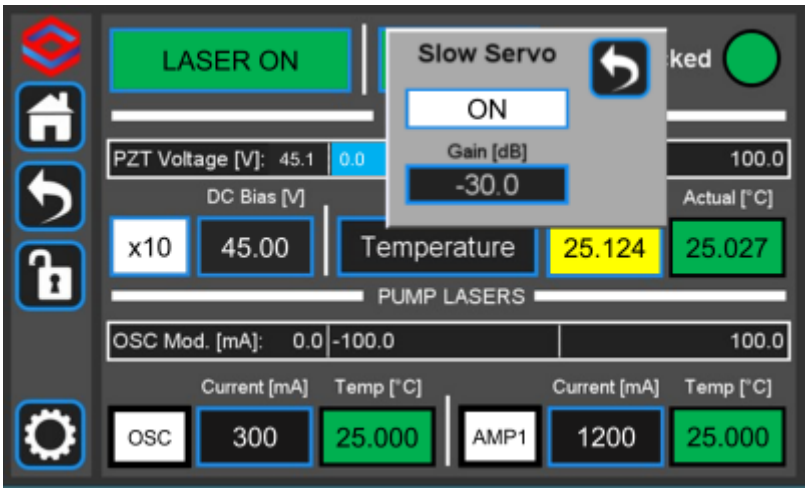

Fig. 11: The slow servo menu allows the user to change the setpoint, gain, and polarity of the servo, and also to turn it on or off.

While the slow servo is on, the color of the “Setpoint [°C]” button will change as the slow servo adjusts the temperature setpoint. A yellow color indicates that the PZT voltage is > 6V away from the setpoint (30V) and the temperature setpoint is being changed to compensate. This box will turn green when the PZT voltage is within the range of ±6V of the voltage setpoint. The color of the “Actual [°C]” box may also momentarily turn yellow as the temperature control servo corrects the cavity temperature when the temperature setpoint changes.

Remember to shut off the slow servo by pressing the On/Off button in the slow servo menu, when unlocking the FFC-100.

1)

Located in power receptacle on rear panel

2)

Single frequency reference laser: for instance a RIO Planex™ 1550 nm laser.