USER'S GUIDE

DWDM Tunable Laser

Model TLB-390X

Use of controls or adjustments, or performance of procedures other than those specified herein, may result in hazardous radiation exposure.

NEW FOCUS®

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Warranty

New Focus, Inc. guarantees its products to be free of defects for one year from the date of shipment. This warranty is in lieu of all other guarantees, expressed or implied, and does not cover incidental or consequential loss.

Document Number 390117 Rev. A

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Introduction

Overview

The tunable laser modules in the 10-mW Model TLB-3901 and 20-mW Model TLB-3902 use proprietary packaging technology to deliver high efficiency in a smaller form-factor than was previously possible.

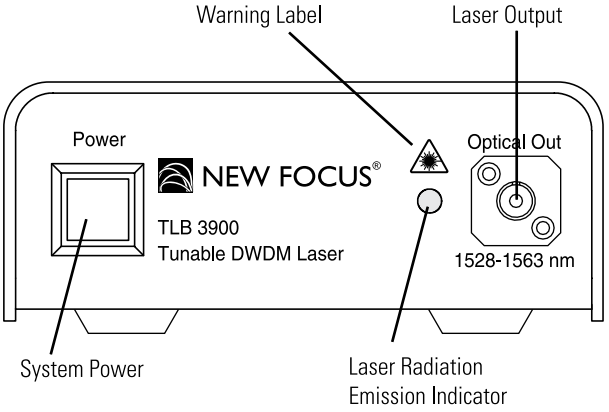
Ideally suited for use in a wide variety of DWDM systems, the new Model TLB-390X provides the best combination of performance features available, offering high optical powers, wide tunability of 36 nm over the C band, and stability in harsh environments. The module includes an integrated wavelength locker, simple serial electrical interface, and a uniquely stable and reliable design including a built-in thermoelectric cooler (TEC).

For your operating convenience, these proprietary tunable laser modules are packaged in a rack-mountable box with an FC/PC fiber output, RS-232 communication port, power switch, status light, and an internal heat sink.

Laser Safety

The New Focus Model TLB-390X is a CDRH Class I certified laser system. It is equipped with a laser radiation emission indicator and an appropriate warning label.

Figure 1: Front panel of the TLB-390x



The lasers described in this manual emit invisible laser light (1528–1563 nm) from the Laser Output aperture while the active indicator light is on. They are safe to operate, provided users follow all standard laser safety precautions:

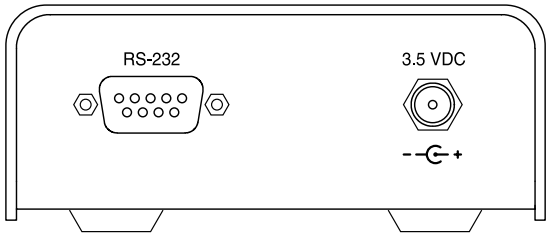
- If you operate the laser without a fiber in the **Optical Out** port, do not place your eye directly in front of the port.
- If you bring the laser beam into free space through a fiber termination, be mindful that it is possible to achieve higher power densities than Class I limits through the use of focusing lenses.

Operation

Connecting the Laser

1. Connect the provided power supply to the **3.5 VDC** power connector at the back of the unit.

Figure 2: Back panel of the TLB-390x

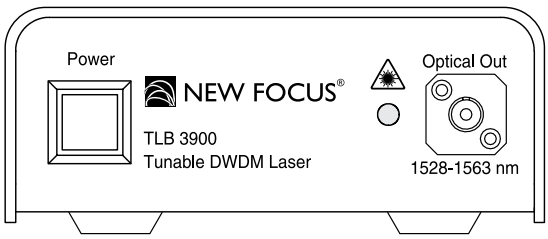


2. Connect the other end of the power adapter to a suitable grounded outlet (AC 100 ~ 240 V, ~0.7 A, 47–63 Hz).
3. Connect the supplied straight RS-232 cable to the **RS-232** connector on the back of the unit.

Note: *If you need to use a different cable, make sure it is a straight RS-232 cable.*

4. Connect the other end of the RS-232 cable to the serial port of your computer or other controller.

Figure 3: Front panel of the TLB-390x



5. Attach an FC/PC compatible optical fiber to the **Optical Out** connector on the front panel. Make sure the other end of the fiber is properly connected or terminated.

6. Depress the **Power** button on the front of the laser. This button will light up when the unit is on.

Note: *The unit will have power, but no laser light will be emitted until the command is given over the serial interface. Once the laser is powered on, give it a few minutes for the TEC to stabilize the module temperature.*

Do not look directly into the laser. Laser radiation is hazardous to the eyes. When the laser is in operation but the beam is not in use, block the aperture with the supplied plastic cap. Avoid direct exposure to the beam.

Computer Control

The **RS-232** 9-pin connector on the back of the Model TLB390X allows for remote operation through any software that supports serial port communication. To use the RS-232 port, attach a standard, shielded straight RS-232 cable to the connector.

To communicate with the laser, set your software to the serial port where the laser is connected, and make sure the communication settings are set to 8 data bit, no parity checking, 1-stop bit, and no flow control. The baud rate should be set to 19,200 bps.

The laser supports two commends: Set channel and Turn Off Laser Beam.

Set Channel

Syntax	`c <channel>`
Actions	Tunes the laser to the specified channel and turns on the laser beam.
Argument	<channel> range: 17.50 to 63.00, in 0.25 steps. See page 17 for a table of supported channels and their corresponding wavelengths, frequencies, and ITU channels.
Example	Tune to channel 22.50 (192.25 THz): `c 22.50`

Turn Off Laser Beam

Syntax	`cx`
Actions	Turns off the laser beam. To turn off power to the entire laser module, use the **Power** button.
Example	Turn off the laser beam: `cx`

Installing the New Focus Software

For your convenience, software is available on the New Focus web site for controlling the laser.

1. Download the TLB-390X software from the Support section of the New Focus web site.
2. Extract all of the files from the compressed file that you downloaded.
3. Run the **Setup.exe** file that was extracted. The installation software will take you through the remaining steps of installing the software.
4. Follow the directions included with the software to operate the laser.

Specifications

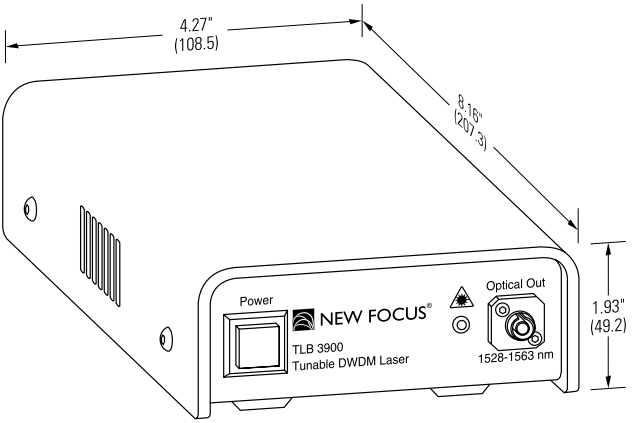
Operating Specifications

	Model 3901	Model 3902
Output Power	10 mW	20 mW
Power Variation (over wavelength)	-0.5 to 0.5 dB	-0.5 to 0.5 dB
Power Variation (over temperature)	-0.5 to 0.5 dB	-0.5 to 0.5 dB
Wavelength Tuning Range	35 nm (min.) 36 nm (typical)	35 nm (min.) 36 nm (typical)
Channel Spacing (minimum)	25 GHz (ITU Grid)	25 GHz (ITU Grid)
Wavelength Range	1528.77–1563.05	1528.77–1563.05
Wavelength Switching Speed (typical)	3 seconds	3 seconds
Spectral Linewidth (FWHM)	3 to 10 MHz	3 to 10 MHz
Wavelength Accuracy (over life, steady state)	-1.5 to 1.5 GHz	-1.5 to 1.5 GHz
Side-Mode Suppression Ratio	40 dB (minimum) 50 dB (typical)	40 dB (minimum) 50 dB (typical)
Optical Isolation	30 dB	30 dB
Relative Intensity Noise (20 MHz to 10 GHz)	-135 dB/Hz (max.) -145 dB/Hz (typical)	-135 dB/Hz (max.) -145 dB/Hz (typical)
Polarization Extinction Ratio (E-field along slow axis)	20 dB	20 dB
Fiber Type	Fujikura Panda PM	Fujikura Panda PM

	Model 3901	Model 3902
Fiber Connector	FC/PC R type (narrow key)	FC/PC R type (narrow key)
Key Alignment	Slow Axis	Slow Axis
Supply Voltage (relative to ground)	3.3 V (nominal) 3.5 V (max.)	3.3 V (nominal) 3.5 V (max.)
Peak Supply Current (while tuning)	3 Amps	3 Amps
Total Power Dissipation	2 W (typical)	2 W (typical)
Serial/RS-232 Connector	DB-9 (female)	DB-9 (female)
Operating Temperature	10–40 °C	10–40 °C

Mechanical Dimensions

Figure 4: Dimensions of the TLB-390X



Customer Service

Technical Support

Information and advice about the operation of any New Focus product is available from our technical support engineers.

Engineers are on duty from 8:00–5:00 PST, Monday through Friday (excluding holidays). For quickest response, ask for "Technical Support" and know the model number and serial number for your laser (these numbers are located on the label on the back of the laser.

Phone: (408) 919-1500
Fax: (408) 980-8883

Support is also available by email:
techsupport@newfocus.com

We typically respond to email within one business day.

Service

In the event that your laser malfunctions or becomes damaged, please contact New Focus for a return authorization number and instructions on shipping the unit back for evaluation and repair.

Appendix

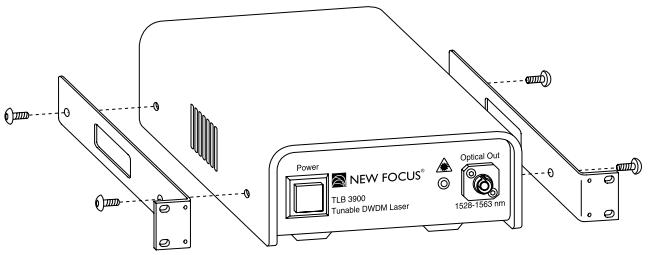
Rack Mounting

The Model TLB-390X lasers may be mounted into a rack using one of the rack mounting kits available from New Focus (sold separately).

To Attach the Rack Mounting Kit to One Laser:

1. Turn off the laser and disconnect the power cable.
2. Use a 5/64 ball driver to remove the two screws from the left side of the laser.
3. Position one of the mounting brackets against the left side of the laser and attach it to the laser using the screws that were removed in step 2.
4. Repeat steps 2 and 3 for the right side of the laser.
5. Reconnect the power supply.

Figure 5: Installing the rack mounting kit on one laser



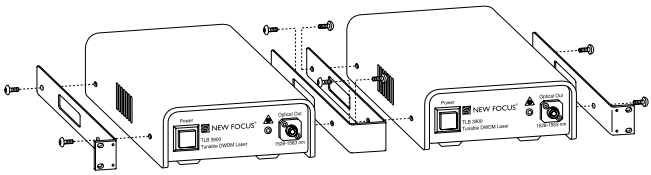
WARNING

With the screws removed from the sides of the case, be careful not to remove the cover. Removing the cover may expose you to harmful laser radiation and will void the warranty.

To Attach the Two-Laser Rack Mounting Kit:

1. Turn off the lasers and disconnect the power cables.
2. Use a 5/64 ball driver to remove the two screws from the left side of the first laser.
3. Position one of the "L" shaped mounting brackets against the left side of the laser and attach it to the laser using the screws that were removed in step 2.
4. Remove the two screws from the right side of the first laser.
5. Position the "U" shaped mounting bracket against the right side of the first laser and attach it using the two screws from step 4. (The bottom of the "U" should face towards the front of the laser.)
6. Remove the two screws from the left side of the second laser.
7. Position the "U" shaped mounting bracket against the left side of the second laser and attach it using the two screws from step 6. (The bottom of the "U" should face towards the front of the laser.)
8. Repeat steps 2 and 3 for the right side of the second laser.
9. Reconnect the power supplies for the two lasers.

Figure 6: Installing the rack mounting kit for two lasers



WARNING

With the screws removed from the sides of the case, be careful not to remove the cover. Removing the cover may expose you to harmful laser radiation and will void the warranty.

Channel to Wavelength Conversions

The following table lists all of the supported channels for the Model TLB-390X laser, along with their corresponding wavelengths, frequencies, and ITU channels.

Note: *ITU does not currently recognize 25-GHz channel spacing.*

390X Channel	Wvlngth. (nm)	Freq. (THz)	ITU Channel
17.50	1563.45	191.750	8.0
17.75	1563.25	191.775	NA
18.00	1563.05	191.799	8.5
18.25	1562.85	191.825	NA
18.50	1562.64	191.850	9.0
18.75	1562.44	191.875	NA
19.00	1562.23	191.900	9.5
19.25	1562.03	191.925	NA
19.50	1561.83	191.949	10.0
19.75	1561.63	191.974	NA
20.00	1561.42	192.000	10.5
20.25	1561.22	192.025	NA
20.50	1561.01	192.050	11.0
20.75	1560.81	192.075	NA
21.00	1560.61	192.099	11.5
21.25	1560.41	192.125	NA
21.50	1560.20	192.150	12.0
21.75	1560.00	192.175	NA
22.00	1559.79	192.200	12.5
22.25	1559.59	192.225	NA
22.50	1559.39	192.250	13.0
22.75	1559.19	192.275	NA
23.00	1558.98	192.300	13.5
23.25	1558.78	192.325	NA
23.50	1558.58	192.350	14.0
23.75	1558.38	192.375	NA
24.00	1558.17	192.400	14.5
24.25	1557.97	192.425	NA
24.50	1557.77	192.450	15.0
24.75	1557.57	192.475	NA

390X Channel	Wvlngth. (nm)	Freq. (THz)	ITU Channel
25.00	1557.36	192.500	15.5
25.25	1557.16	192.525	NA
25.50	1556.96	192.550	16.0
25.75	1556.76	192.575	NA
26.00	1556.55	192.600	16.5
26.25	1556.35	192.625	NA
26.50	1556.15	192.650	17.0
26.75	1555.95	192.675	NA
27.00	1555.75	192.699	17.5
27.25	1555.55	192.725	NA
27.50	1555.34	192.750	18.0
27.75	1555.14	192.775	NA
28.00	1554.94	192.800	18.5
28.25	1554.74	192.825	NA
28.50	1554.54	192.849	19.0
28.75	1554.34	192.875	NA
29.00	1554.13	192.900	19.5
29.25	1553.93	192.925	NA
29.50	1553.73	192.950	20.0
29.75	1553.53	192.975	NA
30.00	1553.33	193.000	20.5
30.25	1553.13	193.024	NA
30.50	1552.93	193.049	21.0
30.75	1552.73	193.075	NA
31.00	1552.52	193.100	21.5
31.25	1552.32	193.125	NA
31.50	1552.12	193.150	22.0
31.75	1551.92	193.175	NA
32.00	1551.72	193.200	22.5
32.25	1551.52	193.225	NA

390X Channel	Wvlngth. (nm)	Freq. (THz)	ITU Channel
32.50	1551.32	193.250	23.0
32.75	1551.12	193.275	NA
33.00	1550.92	193.300	23.5
33.25	1550.72	193.324	NA
33.50	1550.52	193.349	24.0
33.75	1550.32	193.374	NA
34.00	1550.12	193.399	24.5
34.25	1549.92	193.424	NA
34.50	1549.72	193.449	25.0
34.75	1549.52	193.474	NA
35.00	1549.32	193.499	25.5
35.25	1549.12	193.525	NA
35.50	1548.91	193.550	26.0
35.75	1548.71	193.575	NA
36.00	1548.51	193.600	26.5
36.25	1548.31	193.625	NA
36.50	1548.11	193.650	27.0
36.75	1547.92	193.675	NA
37.00	1547.72	193.699	27.5
37.25	1547.52	193.724	NA
37.50	1547.32	193.749	28.0
37.75	1547.12	193.774	NA
38.00	1546.92	193.799	28.5
38.25	1546.72	193.824	NA
38.50	1546.52	193.849	29.0
38.75	1546.32	193.875	NA
39.00	1546.12	193.900	29.5
39.25	1545.92	193.925	NA
39.50	1545.72	193.950	30.0
39.75	1545.52	193.975	NA
40.00	1545.32	194.000	30.5
40.25	1545.12	194.025	NA
40.50	1544.92	194.050	31.0
40.75	1544.73	194.075	NA
41.00	1544.53	194.099	31.5
41.25	1544.33	194.124	NA
41.50	1544.13	194.150	32.0
41.75	1543.93	194.175	NA
42.00	1543.73	194.200	32.5
42.25	1543.53	194.225	NA

390X Channel	Wvlngth. (nm)	Freq. (THz)	ITU Channel
42.50	1543.33	194.250	33.0
42.75	1543.14	194.275	NA
43.00	1542.94	194.299	33.5
43.25	1542.74	194.324	NA
43.50	1542.54	194.350	34.0
43.75	1542.34	194.375	NA
44.00	1542.14	194.400	34.5
44.25	1541.95	194.425	NA
44.50	1541.75	194.449	35.0
44.75	1541.55	194.474	NA
45.00	1541.35	194.500	35.5
45.25	1541.15	194.525	NA
45.50	1540.95	194.550	36.0
45.75	1540.76	194.575	NA
46.00	1540.56	194.599	36.5
46.25	1540.36	194.625	NA
46.50	1540.16	194.650	37.0
46.75	1539.97	194.675	NA
47.00	1539.77	194.699	37.5
47.25	1539.57	194.725	NA
47.50	1539.37	194.750	38.0
47.75	1539.18	194.775	NA
48.00	1538.98	194.799	38.5
48.25	1538.78	194.825	NA
48.50	1538.58	194.850	39.0
48.75	1538.39	194.875	NA
49.00	1538.19	194.899	39.5
49.25	1537.99	194.925	NA
49.50	1537.79	194.950	40.0
49.75	1537.60	194.975	NA
50.00	1537.40	194.999	40.5
50.25	1537.20	195.025	NA
50.50	1537.00	195.050	41.0
50.75	1536.81	195.075	NA
51.00	1536.61	195.100	41.5
51.25	1536.42	195.124	NA
51.50	1536.22	195.149	42.0
51.75	1536.02	195.175	NA
52.00	1535.82	195.200	42.5
52.25	1535.63	195.225	NA

390X Channel	Wvlngth. (nm)	Freq. (THz)	ITU Channel
52.50	1535.43	195.250	43.0
52.75	1535.24	195.274	NA
53.00	1535.04	195.299	43.5
53.25	1534.84	195.325	NA
53.50	1534.64	195.350	44.0
53.75	1534.45	195.375	NA
54.00	1534.25	195.400	44.5
54.25	1534.06	195.425	NA
54.50	1533.86	195.449	45.0
54.75	1533.67	195.474	NA
55.00	1533.47	195.499	45.5
55.25	1533.27	195.525	NA
55.50	1533.07	195.550	46.0
55.75	1532.88	195.575	NA
56.00	1532.68	195.600	46.5
56.25	1532.49	195.625	NA
56.50	1532.29	195.650	47.0
56.75	1532.10	195.675	NA
57.00	1531.90	195.700	47.5
57.25	1531.71	195.724	NA
57.50	1531.51	195.749	48.0
57.75	1531.32	195.774	NA
58.00	1531.12	195.799	48.5
58.25	1530.92	195.825	NA
58.50	1530.72	195.850	49.0

390X Channel	Wvlngth. (nm)	Freq. (THz)	ITU Channel
58.75	1530.53	195.875	NA
59.00	1530.33	195.900	49.5
59.25	1530.14	195.925	NA
59.50	1529.94	195.950	50.0
59.75	1529.75	195.975	NA
60.00	1529.55	196.000	NA
60.25	1529.36	196.025	NA
60.50	1529.16	196.050	NA
60.75	1528.97	196.075	NA
61.00	1528.77	196.100	NA
61.25	1528.58	196.125	NA
61.50	1528.39	196.149	NA
61.75	1528.20	196.174	NA
62.00	1528.00	196.199	NA
62.25	1527.81	196.224	NA
62.50	1527.61	196.249	NA
62.75	1527.42	196.274	NA
63.00	1527.22	196.299	NA