

Testing report, WT&T reference number: LE-4-x

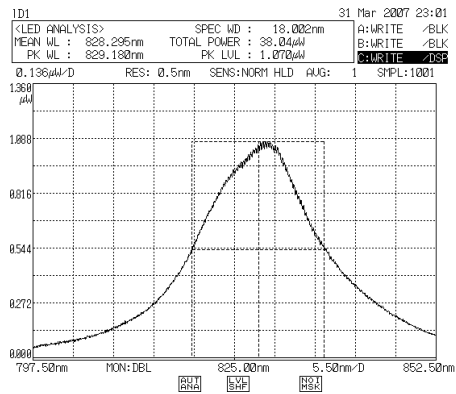
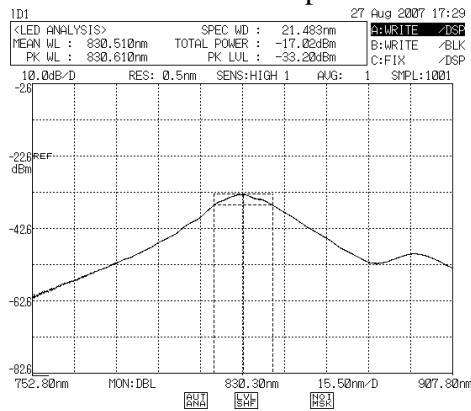


Date: 2.04.2007

**FC/PC connectorized LED module LE-4-830**  
**Testing report**

Part Number:	LE-4-830
Unit Number:	WLE1R041
Package type	OEM_
Temperature stabilization	ACTIVE
Output fiber type	GI 62.5/125 mm fiber
Adapter	FC/PC
Number of output channels	1
ASE ripple, dB	<0.75
Mean wavelength nm	~828
Effective spectral width , nm	18
Power instability, dB*	~ ±0.01
Long-term (10 hrs) operating wavelength drift, nm	±0.5
Ambient temperature, °C	25
Optical power, measured at source output *, μW	~ 60
Optical power, measured after 1 m of multi-mode (62.5/125) fiber patch-cord*, μW	~ 55
Operating voltage:	12 V DC

Power measured at the output FC/PC receptacle output after 5 min of module operation



LE-4-830 source spectra in LOG and linear scale, measured at the output of FC/PC connectorized pigtail, using an OSA. The OSA resolution is 0.5 nm

**WARNING: USE ONLY FC/PC CONNECTORIZED PATCH-CORDS, when connecting to the source. If coiling, keep fiber coil diameter >10 cm.**  
Keep LED output connector clean and covered with dust cap to avoid optical damage.  
**STATICS SENSITIVE DEVICE!** Do not pull or twist optical fiber pigtail!

**Testing report, WT&T reference number: LE-4-x**

Module has been tested using following equipment:

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OSA:	AQ-6315A (ANDO)
Wavelength meter:	TQ8325c (Advantest)
Optical power meter:	ML910B (Anritsu)
Temperature measurement	Multiscan 1200 (Omega)
Optical splitter	ODB-1 (WT&T)
Photo receiver:	TIA-500 (TTI)
T&M/Quality control:	Operator 2

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Note: module output POWER is sensitive to the fiber pigtail handling.  
Device has been burn-in tested for ~ 24 hrs before shipping.

Testing report, WT&T reference number: LE-4-x

## FC- CONNECTORIZED LED MODULE MODEL LE-4-X

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### Getting started (notes)



- Please read the entire note prior to use
- Please keep this notes with LE-4-x

Issue 1.3

November 2006



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
[www.wttechnology.com](http://www.wttechnology.com)

## 1. Safety Information

The following safety instructions must be observed whenever compact FC- connectorized LED modules (LE-4-x) is operated, serviced or repaired. Failure to comply with any of these instructions or with any precaution or warning contained in the User's Manual is in direct violation of the standards of design, manufacture and intended use of the instrument. The WT&T Inc. assumes no liability for the customer's failure to comply with these safety requirements.

### 1.2 Safety Messages

The following messages may appear in the User's Manual. Please observe all safety instructions that are associated with this message.

<b>WARNING</b>	<b>The procedure can result in serious injury or loss of life if not carried out in proper compliance with all safety instructions. Ensure that all conditions necessary for safe handling and operation are met before proceeding</b>
<b>CAUTION</b>	<b>The procedure can result in serious damage to or destruction of the instrument if not carried out in compliance with all instructions for proper use. Ensure that all conditions necessary for safe handling and operation are met before proceeding</b>
	<b>Refer to the User's Manual for instructions on handling and operating the instrument safely.</b>



Please contact WT&T Inc. ([www.wttechnology.com](http://www.wttechnology.com)) or your local representative with any questions related to any subjects described within this note.

In no case will WT&T Inc. be liable to the buyer, or to any third parties, for any consequential or indirect damage, which is caused by product failure, malfunction, or any other problem.

### 1.3 WARNINGS and CAUTIONS

#### **WARNING**

In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

Use LED module only with provided external 12V DC power supply.

**Testing report, WT&T reference number: LE-4-x**

LED module must be unpacked at ESD protected work station
Do not operate equipment, which may generate high frequency surge energy near LED source.
Do not disassemble the instrument. The LED source contains no user serviceable parts.
Avoid soaking the module with water or any other liquids and operating instrument in high humidity environment. Doing so may cause fire, electrical shock or malfunction.
Do not insert or drop any metal or any flammable material into the power supply or optical head modules through any aperture. Doing so may cause fire, electrical shock or malfunction.
Do not remove any screws and panels of LE-4-x. Some parts generate high voltage. Removing screws and panels may cause electrical shock.
If abnormal sounds or extra high temperatures are observed disconnect the power cord and contact WT&T Inc. or your local representative. Continuing to operate under these conditions may cause fire or electrical shock.
If water or any other liquid is spilled into LED module, turn off the power switch, disconnect power cords and contact WT&T Inc or your local representative. Continuing to operate under these conditions may cause fire or electrical shock.
If smoke or strange smells are observed turn off the power switches, disconnect power cords and contact WT&T Inc or your local representative. Continuing to operate under these conditions may cause fire or electrical shock.
If module is dropped and damaged, turn off the power switch, disconnect power cords and contact WT&T Inc or your local representative. Continuing to operate under these conditions may cause fire or electrical shock



**CAUTION**

Do not place LED module on unstable or inclined surface. There is a possibility that instrument will fall and cause injury.
Disconnect all cords when moving devices. Failure to do so may damage the cords, which may cause fire or electrical shock.

## Testing report, WT&T reference number: LE-4-x

Do not place the cords around any heating instrument. Doing so may damage the cords, which may cause fire or electrical shock.
Do not connect or disconnect cords with wet hands. Doing so may cause fire or electrical shock.
Do not pull electrical cords to disconnect. Doing so may damage the cords, which may cause fire or electrical shock. Hold the plug portion and disconnect the cords.
Do not put heavy items on the cords. Doing so may damage the cords, which may cause fire or electrical shock.
Ensure that the cords are disconnected when storing LED module. Ensure that optical connector on LED module is closed with cap when not in use or when storing.
Store LED's module in a cool dry place
<b>Use only original FC-PC optical adapter/connector to extend the length of LE-4-x pigtail fiber.</b> <i>Perform optical connections when device is powered off.</i> Try to avoid unnecessary disconnections if possible. Keep optical connectors protected with provided caps when the LED modules are not in use.

### 1.4 POWER REQUIREMENTS

The LED module power supply requires 110 (AC), 50-60 Hz stabilized power, Please, check voltage rating on the module power supply before connecting to the MAINS.

## 2. GENERAL INFORMATION

LE-4-x is a compact single channel LED module, designed for laboratory applications demanding low-power broadband sources (Optical spectroscopy, localized illumination, etc.). Light emitting diodes, operating at different central wavelength can be installed in the unit on request. Model LE-4-830 is fitted with ~ 830 nm LED.

Light from customized LED module is delivered through multi-mode (62.5/126 micrometer) optical fiber output pigtail terminated with FC/APC connector and can be collimated or focused at different distances using an optional compact fiber collimators (Model-014, or Model -011).

LE-4-x LED source does not require an external temperature controller. LED driver unit is fitted with an air cooling system and has internal fuse and short circuit protection at each channel. Please contact WT&T for broad range of optional accessories for LE-4x modules

## Testing report, WT&T reference number: LE-4-x

The monolithic construction of LED source and good driving current stabilization provides good short- and long-term *stability* and low sensitivity to *vibrations* of LED source, significantly improving signal-to-noise ratio for optical sensing and spectroscopy measurement systems.

The design has fewer components providing high stability of the LED sources.

### Specifications LE-4-x

Description	Min	Typical	Max	Unit
Maximum drive current: channel	-	65	110	mA
Power consumption	5	10	15	VA
Output		FC/PC		
Number of outputs		1		
Operating temperature	15	25	35	°C
Storage temperature	0	25	65	°C
Humidity (non-condensing)			85	%R.H
Voltage, AC	105	110	230	v
Current stability	±0.01	±0.1	±0.15	mA

### 3.2 Components

Part	Part Number	Quantity
LED module with air-cooling	LE-4-x	1
FC/PC connectorized patch-cords	LE-4x-01	0
Getting started Notes	LE-4x-02	1
<b>Optional components</b>		
Cable 1 (power cord)	LE-4x-O-C1	1

**Testing report, WT&T reference number: LE-4-x**

Connection cable 2	LE-4x-O-C2	0
FC/PC connectorized collimator (adjustable focus)	Model -014	0
Multi-mode fiber pigtailed collimator, FC/PC connectorized	Model-011	0
Measurement fiber U-bench mechanical adapter with magnet holder	Model-U2	0
Mechanical post with sliding arm	Model-P1	0
Small mounting mechanical platform (30x30 cm)	Model-P2S	0
Medium mounting mechanical platform (45x45 cm)	Model-P2M	0
Large mounting mechanical platform (120x65 mm)	Model-P2L	0

**3.3 Recommended consumables**

It is recommended to keep the following items with LED module:

- IPA and lint-free tissue
- FC/PC connector's cleaner

**External description and connection to external circuits**

**4.1 Single channel LED module LE-4-x**



Front-view

Back-view

Side-view

**LED source** is shipped to end-users assembled as shown in the pictures above. Device consists of the LE\_4-x module with FC/PC fiber receptacle. All control electronics,



## Testing report, WT&T reference number: LE-4-x

medium-power LED assembly, air cooling system are integrated in the unit. Front and back panels of the LED module are made using electrically-insulating material. The operation of the LED source is controlled using 2 position switch and power regulation knob at the front panel. Electrical connection between the LED source and an external power supply (AC 110V) is performed using a power cord and socket at the back panel of the module.

LED module (LE-4-x) controls are:

- Enable/disable/set power of LED source (“MAX/OFF/REG”)
- Regulate source output power (“POWER”)
- Connect device to power supply (“DC 12V”)
- Switch on/off module (“I/O” switch on the back panel)
- Output fiber (“OUTPUT”)

### LE-1GS source front panel

source enable/disable/regulate. LED “ON” indicator Fiber output (FC/PC receptacle)



Source power control knob

### LE-1X back panel



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## Testing report, WT&T reference number: LE-4-x

**Power ON switch**    **Power supply plug**    **Air cooling**

### 4.2 Optional modules/components

**FC/FC connectorized patch-cord** is used for connection of LED module channels to experimental setup.

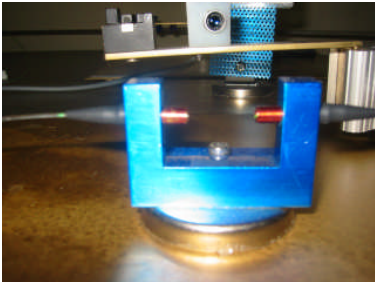
**FC/APC connectorized patch-cord** used for extension of the laser module pigtail length, for optical connections between the LED source module and other optional modules

**FC/PC/APC adapter** used for connection between FC/PC or FC/APC connectorized optical cables.

**Optical fiber collimator (model 014)** provides collimation or focusing of light emitted from the end of FC/PC connectorized patch-cord/pigtail. Fiber collimator can be directly connected to FC/PC connector at the end of the patch-cord.

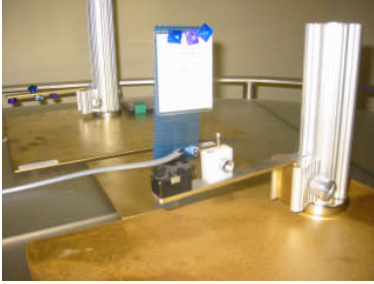
**Optical fiber collimator (model 011) or pigtailed collimator (Model 015)**, FC/APC connectorized. When plugged into LED channel, provides collimation or focusing of light emitted from the end of optical fiber.

**Measurement fiber U-bench** mechanical adapter with magnet holder provides way to perform transmission spectra measurements of different samples positioned between two fiber-collimation pigtails.



**Set of mechanical platforms and holders (magnetic)** is a cost effective solution for setting up basic optical measurement working place. Includes mechanical base (platforms) of different size, long traveling distance stages, holders

## Testing report, WT&T reference number: LE-4-x



### 4 Inspection/connections

#### 5.1 Initial Inspection and electrical cords connections

1. Please inspect the shipping container for any indications of excessive shock to the contents.
2. **Package must be unpacked at ESD protected workstation.**
3. Inspect the contents of shipping container to ensure that shipment is complete
4. Visually inspect delivered parts of LE-4-x and all accompanying components and cables for structural damage.

Please inform WT&T Inc immediately and, if necessary, the carrier, of any damage to shipped components, defective or missing parts, or if the LE-1IR does not pass initial visual inspection.

<b>WARNING</b>	<b>To avoid electrical shock, do not initialize or operate LE-4-x if there is any sign of damage to any of the components.</b>
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#### 5.2 Assembly of the LE-1IR and source operation:

**WARNING:** Please unpack delivered device on ESD protected workstation. Use all necessary ESD protection measures, when working with device.

- After unpacking, place components of the source on the flat surface and make sure that ventilation FAN and ventilation holes are not obstructed.
- . Remove protection plastic cups Clean FC/APC connector, using fiber cleaner. Avoid bending and twisting of the fiber pigtail. Keep output fiber fixed (using clear weak adhesive tape).
- Connect LE-4-x to an external 12V DC power supply and to wall plug 110V AC socket using provided power cord. Switch “ON” power switch at the back panel of the source

## Testing report, WT&T reference number: LE-4-x

- Air-cooling fan on the back of the module will start to operate.
- Put front panel switch to “MAX” (maximum power) or “REG” (regulated power) position. LED will start to operate. Allow LED source temperature to stabilize for up to ~1-5 minutes. When front panel switch is in “REG” position, use power control knob to set the output power. Maximum power corresponds to most clockwise turn of power regulation knob.
- To perform initial test of the LED module:
  - connect output receptacle using connectorized fiber patch-cord to power meter or OSA and perform measurements.
- LED source is in operation

### 5.3 To switch source off, please:

- Put front panel switch into “OFF” position.
- Wait 10-25 seconds. Allow LED diode chip and cooling system to cool down
- Put power switch at the back panel in “OFF” (“0”) position
- **Disconnect mains cable from the wall plug.**

### 5.4 Troubles shooting

#### In case if LED source emit low power or don't operate:

- Check electrical connections between LED source, and wall plug socket.
- Clean the fiber FC/PC connectors.
- Check if “source control switch” is in “MAX” or “REG” positions and if power control knob turned clockwise.
- For all other problems contact your local sales representative or WT&T Inc directly.

<b>WARNING</b>	<b>To avoid electrical shock, do not attempt open module. Contact WT&amp;T Inc. in case of problem</b>
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## 5 Tips on how to keep source stability and output power high

In general, power emitted by LED diodes is reducing with increase of ambient temperature. Do not operate LED source if ambient temperature is outside device operating range. Here some other tips

## Testing report, WT&T reference number: LE-4-x

1. Use only FC/PC connectors to extend the length of an output source pigtail. Clean connectors before every connection.
2. Try to reduce number of optical connections. Clean optical connectors, using special cleaning tools before each connection. Keep optical extension patch-cord plugged into LED pigtail output all the time, if possible. Use dust cover to protect optical connector when LED source and patch-cord are not in use.
3. Don't bend the optical fiber. Even large diameter bends might affect output power significantly. Keep fiber pigtail straight and adjust its position in space to achieve maximum output power.
4. Never touch connectors.
5. Fix position of the fiber in your setup using "invisible tape", when maximum power achieved.
6. Make sure that the air-flow ventilation on the module is not obstructed.

## 6 Maintenance Instructions

### 7.1 Fiber patch-cords.

It is recommended to periodically test the quality of FC/PC connectorized patch cords, using back-reflection meter. The level of back-reflected signal must be in the range of –15 dB or better.

Also a simple way to check the quality of connectors is to observe far optical field emitted from the pigtail/patch-cord connectors, using screen. Optical field distribution must have smooth Gaussian profile. Distortion of the field profile and reduced optical power indicates contamination (or damage) of the optical connector

### 7.2 Cleaning the fiber patch-cords (FC/PC)

To clean the optical patch-cords connectors, please use IPA and fiber connector cleaner. Do NOT use acetone or any other solvents. Please visit [www.wttechnology.com](http://www.wttechnology.com) for more details.

### 7.3 Storage

To maintain optimum operating reliability, do not store the LE-1IR module in locations where the temperature falls below 0°C or rises above +60°C. Avoid storing module in environmental conditions that can result in internal condensation. Ensure that these temperature and humidity requirements are also met whenever the LE-1IR is shipped.

### 7.4 LIMITED WARRANTY

## **Testing report, WT&T reference number: LE-4-x**

WT&T Inc warrants that the products it manufactures and sells will be free from defects and materials and workmanship **for a period of thirty days** from the date of shipment. If any such product proves defective during the applicable warranty period, WT&T, at its option, either will repair the defective product without charge for parts and labor or will provide a replacement in exchange for the defective product. In order to obtain service under this warranty, the customer must notify WT&T INC of the defect before the expiration of the warranty period and make suitable arrangements for the performance of service. In all cases the customer will be responsible for packaging and shipping the defective product back to the service center specified by WT&T, with shipping charges prepaid. WT&T shall pay for the return of the product to the customer if the shipment is Canada, otherwise the customer shall be responsible for all shipping charges, insurance, duties and taxes, if the product is returned to any other location.

This warranty shall not apply to any defect, failure or damage caused by improper use of, or failure to observe, proper operating procedures per the product specification or operator's manual, or improper or inadequate maintenance and care. WT&T shall not be obligated to furnish service under this warranty 1) to repair damage resulting from attempts by personnel other than WT&T's representatives to repair or service the product; 2) to repair damage resulting from improper use or connection to incompatible equipment; 3) to repair damage resulting from operation outside of the operating or environmental specifications of the product.

**WT&T'S LIABILITY FOR THE MERCHANTABILITY AND USE OF THIS PRODUCT IS EXPRESSLY LIMITED TO ITS WARRANTY SET OUT ABOVE. THIS DISCLAIMER AND LIMITED WARRANTY IS EXPRESSLY IN LIEU OF ANY AND ALL REPRESENTATIONS AND WARRANTIES EXPRESSED OR IMPLIED, INCLUDING BUT NOT LIMITED TO, ANY IMPLIED WARRANTY OR MERCHANTABILITY OR OF FITNESS FOR PARTICULAR PURPOSE, WHETHER ARISING FROM STATUTE, COMMON LAW, CUSTOM OR OTHERWISE. THE REMEDY SET FORTH IN THIS DISCLAIMER AND LIMITED WARRANTY SHALL BE THE EXCLUSIVE REMEDIES AVAILABLE TO ANY PERSON. WT&T Inc. SHALL NOT BE LIABLE FOR ANY SPECIAL, DIRECT, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES RESULTING FROM THE USE OF THIS PRODUCT, NOR ANY OTHER LOSSES OR INJURIES, WHETHER A CLAIM FOR SUCH DAMAGES, LOSSES OR INJURIES IS BASED UPON WARRANTY, CONTRACT, NEGLIGENCE, OR OTHERWISE. BY ACCEPTING DELIVERY OF THIS PRODUCT, THE PURCHASER EXPRESSLY WAIVES ALL OTHER SUCH POSSIBLE WARRANTIES, LIABILITIES AND REMEDIES.**

**WT&T INC AND PURCHASER EXPRESSLY AGREE THAT THE SALE HEREUNDER IS FOR RESEARCH USE ONLY AND NOT FOR CONSUMER USES AS DEFINED BY THE MAGNUSON-MOSS WARRANTY ACT OR SIMILAR STATE CONSUMER WARRANTY STATUTE.**

Please contact WT&T to purchase extended warranty.

### **7.5 Return shipments to the WT&T Inc.**

Please contact WT&T Inc. to obtain return authorization prior to shipping any modules to WT&T Inc. The owner's name, and address, the model number and serial number of device, return authorization number, and an itemized statement of defects must be included with the device returned for repair.

**Testing report, WT&T reference number: LE-4-x**

Pack the item in original transportation container and suitable protective box to prevent damage to the delicate instrument. Seal the shipping container securely and clearly mark FRAGILE on its surface.

**Contact information: WT&T Inc.**

**Production/Shipping/Warranty**

**WT&T Inc.**

**CANADA**

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