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TUNICS-OM

MODULAR TUNABLE LASER DIODE SOURCE

USER MANUAL

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SAFETY CONSIDERATIONS

Respect of the following safety precautions is vital to your health and instrument safety.

SYMBOLS AND TERMS:

The following symbols and terms may appear in this manual or on the equipment.

-Terms in this manual:

WARNING	Warning statements identify conditions or practices that could result in injury or loss of life.
CAUTION	Caution statements identify conditions or practices that could result in damage to this product or other property.

-Terms on the product:

DANGER	indicates an injury hazard immediately accessible as you read the marking.
WARNING	indicates an injury hazard not immediately accessible as you read the marking.
CAUTION	indicates a hazard to property, including the product itself.

-Symbols on the product:



CAUTION (Refer to Manual)



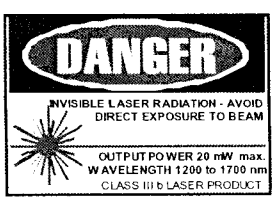
Protective Ground (Earth)



CAUTION, Risk of electric shock



Laser product (This warning label is located on the front panel of each module)



DANGER LABEL
(located on the side of the TUNICS-OM module and on the rear panel)

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LASER SAFETY:

Laser type	External cavity laser diode
Laser output	Single mode optical fiber
Output divergence (half angle @ 1/e_)	0.09 rad

LASER CLASS:

Standard	**Laser Class**
IEC 60825-1	Class 3A
21 CFR Subchapter J	Class IIIb

NOTE: As the TUNICS-OM is a Class IIIb product (21 CFR Subchapter J), it has a Remote Interlock Connector where a remote ON/OFF switch can be connected.
The principle of this function is that if the interlock circuit is open, the output is set to the off state. The output may be turned on again by simply pressing the off/on switch, after corrective action is taken (if needed) (Refer to the Appendix D).

ABSOLUTE MAXIMUM RATINGS:

TUNICS model	**TUNICS-OM 1540**	**TUNICS-OM 1560**
Wavelength range (nm)	1500-1570	1530-1600
Power (standard)	10 mW	10 mW
Power (P6 option)	15 mW	15 mW
Power (P10 option)	20 mW	20 mW

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WARNING: The use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.



WARNING: Under no circumstances look into the end of an optical cable attached to the optical output when the device is operational. The laser radiation is not visible to the human eye, but it can seriously damage your eyesight. Keep the beam cap on after use to avoid laser radiation.



WARNING: Disable the laser output before connecting, or disconnecting, a fiber optic cable on the instrument.

VENTILATION OF THE UNIT:



CAUTION: You must leave enough space under and behind the unit. The apertures (under the unit) and the fan (behind the unit) are used for the inside ventilation. Actually the air enter through these apertures and goes out through the fan.

This product is designed so that the feet should leave enough room under the unit to enable the ventilation. As a result if you want to integrate the unit in a rack you need to keep the feet or leave at least 15mm (0.6 inches) between the two units.

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POWER SOURCE:



WARNING: - TUNICS is intended to operate from a power source that does not apply more than 265 volts RMS between the supply conductors or between either supply conductor and ground.

- TUNICS has a chassis connected to earth via the power supply cable. A protective ground connection by way of the grounding conductor in the power cord is essential for safe operation.

- To avoid the possibility of injury, insert the power cable only into a socket outlet provided with a protective earth contact. Before switching on the instrument, check that the electrical installation fulfills the local safety requirements.

- Use only the power cord and connector specified for your product. This power cord should be in good condition.



WARNING: **DO NOT OPERATE WITHOUT COVERS:** To avoid personal injury, do not operate this product without covers or panels installed.



WARNING: **USE THE PROPER FUSE:** To avoid fire hazard, use only the fuse or correct type, voltage rating and current rating as specified in the Appendix B.



WARNING: **ENVIRONMENTAL CONDITIONS:**

- TUNICS has not been designed for outdoor use.

- To avoid the possibility of injury, do not expose the instrument to rain or excessive moisture.

- Do not operate the instrument in the presence of flammable gases or fumes.

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INTRODUCTION

TUNICS-OM is a compact and modular manually-tunable source for use in multi-wavelength test systems. Up to 8 TUNICS-OM modules can be plugged into a single 19" instrument.

TUNING CHARACTERISTICS:

	TUNICS-OM 1540	TUNICS-OM 1560
Wavelength range		
P = 0 dBm[1]	1500-1570 nm	1520-1600 nm
P = 6 dBm[2]	1520-1570 nm	1540-1590 nm
P = 10 dBm[3]	1530-1570 nm	1540-1580 nm
Tuning repeatability (typical)	±0.01 nm	±0.01 nm
Wavelength setting resolution	0.01 nm	0.01 nm
Tuning speed	10 s (70nm)	10 s (70 nm)
Wavelength stability (long term)[4] [5]	0.1 nm	0.1 nm
Wavelength setting (multi-turn knob)	16 nm/turn	16 nm/turn

LASER OUTPUT CHARACTERISTICS:

Power stability (P = 0 dBm, 1 hour)	±0.01 dB
Side mode suppression ratio	>45 dB
RIN	>145 dB/Hz
Signal to source spontaneous emission ratio[6]	>90 dB

[1] +3 dBm peak output power

[2] P6 option (High output power)

[3] P10 option (High output power)

[4] Measured with 0 dBm output power

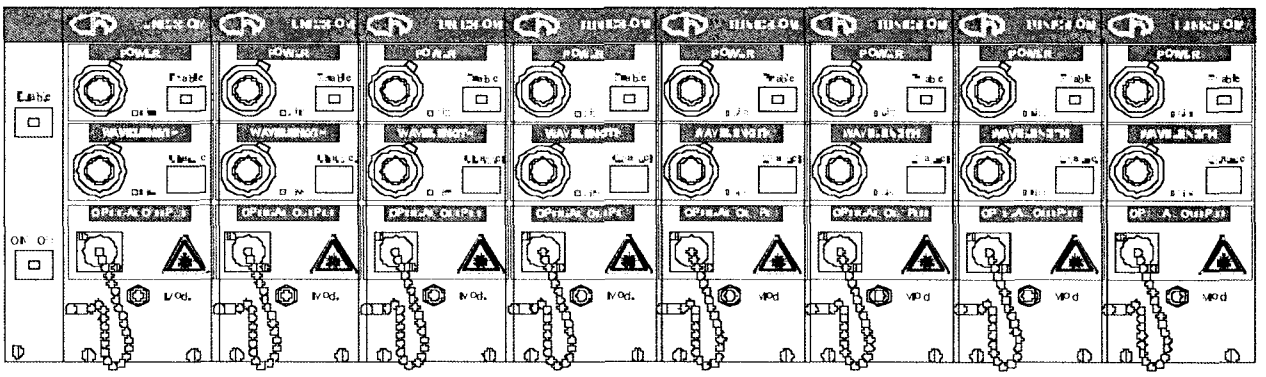
[5] Over 1 hour at constant temperature

[6] ASE-noise-free option (90 dB signal to source spontaneous-emission ratio measured in a 0.1 nm bandwidth at 5 nm from the signal. Not compatible with P10 option)

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I. DESCRIPTION OF THE INSTRUMENT

I.1. Description of the front panel



Front panel of a 8-module TUNICS-OM rack

- On the TUNICS-OM mainframe:

Enable key Key used to enable or disable every modules plugged in the TUNICS mainframe (enlightened when the modules are enabled).

ON/OFF key Enlightened when the mainframe is powered.

- On the TUNICS-OM module:

Enable key Key used to enable or disable the module plugged in the mainframe (enlightened when the module is enabled).

POWER knob The optical power is controlled by a single turn knob. The TUNICS-OM works in an automatic-power control

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mode, meaning that the current is adjusted to deliver the required power.

NOTE: It is possible in the "constant power" mode that the required power cannot be obtained even with the maximum allowed current. In such a case, the current is limited to its maximum value and the optical power is lower than the user-set power value. In this case, the red indicator "***Lim***" is lightened.
Each TUNICS-OM module is calibrated with a calibration curve giving the actual power versus position of the single-turn knob. The calibration curves used are delivered with the TUNICS-OM mainframe.

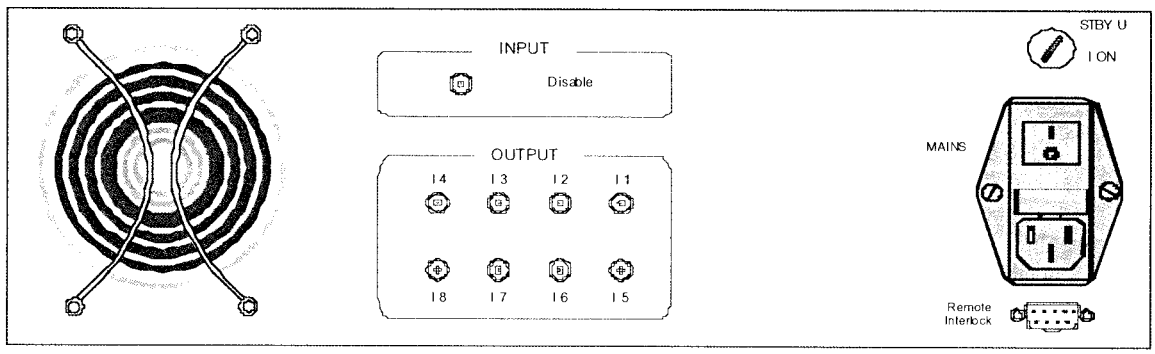
WAVELENGTH knob The wavelength is changed via a multi-turn knob. Although mechanical protections limits the range of the wavelength, it is strongly recommended to control the actual wavelength on a spectrum analyzer when changing the wavelength. Each TUNICS-OM module is calibrated with a calibration curve giving the actual wavelength versus position of the multi-turn knob. The calibration curves used are delivered with the TUNICS-OM mainframe.

Mod. connector Modulation input. The electrical signal input on this connector directly modulates the laser diode chip. Please refer to the III.1 section.

OPTICAL OUTPUT connector The optical output is available on a FC/APC optical output connector. Connections of other type of connectors may damage the output connector, and strongly reduce the performance of the system.

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I.2. Description of the rear panel



Disable — BNC input connector used to disable simultaneously the light output from all modules.

I1 to I8 connectors — Current modulation BNC output connectors.

Mains switch — Used to power ON/OFF the instrument. For the connection of the instrument refer to the II.2 section. To replace the line fuse please refer to the Appendix B.

Power key — The power key is used to switch between the STANDBY and the ON positions.
NOTE: on the STANDBY position the system is still powered.

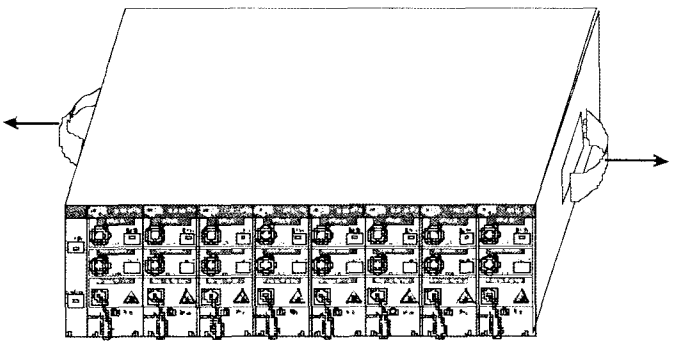
Remote Interlock connector — Sub-D9 connector used to connect a Remote ON/OFF switch (refer to "Safety considerations" chapter).

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II. SETTING UP THE INSTRUMENT

II.1. Instruction to carry the unit

To pull out the unit from its packaging or move it from place, use the **two** lateral retractable handles as shown on the drawing which allow to keep the instrument horizontal during carrying.



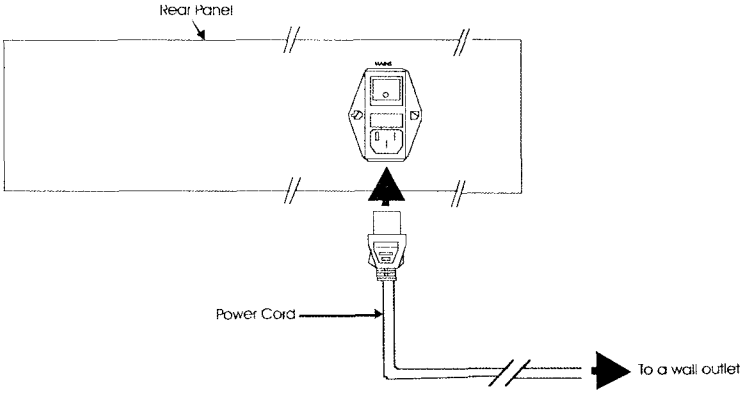
II.2. Connection of the instrument

Plug the modules in the 19" rack, and screw the two front panel screws on each module.

CAUTION: To obtain the optimum performances of the system, it is recommended to place the optical head, or the instrument, on a stable surface isolated from any source of vibrations.

CONNECTION TO ELECTRICAL SUPPLY:

Connect the power supply cable to the rear panel of the controller and then to the proper voltage mains supply point.



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SWITCHING THE INSTRUMENT ON AND OFF:

-To switch ON the instrument, set the main switch at the rear panel controller on the "I" position.

-Press the front panel on/off switch, on the left part of the rack. The green light indicates that the system is ready to operate.

-For safety reasons, the TUNICS-OM rack has a main Enable key to enable or disable all the laser outputs. Each module has also an Enable key to enable or disable the laser output of this particular module.

-Before moving the instrument, or when the instrument is not in use for long periods of the time, the main switch has to be set in the "O" position. In this case, the instrument is no longer powered.

OPTICAL CONNECTION:



CAUTION: The cleanliness of the optical connectors are important to get the optimum performance of the system. Refer to the cleaning instructions in the Appendix B. The standard output connector is FC/APC type connector. Never connect another type or connector on the optical output.

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III. AUXILIARY INPUTS AND OUTPUTS

III.1. Beam modulation

The TUNICS-OM modules have a SMB connector input for high frequency modulation. The bandwidth is greater than 1 GHz, and this modulation input can be used for high frequency analog modulation.



CAUTION: This SMB input is directly connected to the laser diode chip via a 50Ω resistor. It is essential to insure that at any time the diode is forward biased to avoid the destruction of the diode. The maximum current flowing through the diode should also be limited to 80 mA.

The easiest way to insure that the diode is always forward biased, is to set the optical output to 0, with the front panel power control knob, and to modulate with a biased modulation signal. For instance to modulate the diode current from 0 to 80 mA which is the maximum allowed range, the input waveform should range from 0 to 4 Volt.

III.2. Monitor connectors

Tunics OM mainframes are provided with 8 BNC output connectors and one BNC input connector located on the rear panel.

- The output connectors labeled "I1" to "I8" are used to monitor the actual laser diode current of each module. The output voltage is related to the diode current by:

$$V = 4.7 \times I$$

  Where V is the voltage in mV on a given connector, and I is the laser diode current of the corresponding module. The modules are numbered from 1 to 8 from left to right when facing the TUNICS-OM mainframe.

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- The input connector labeled "Disable" may be used to disable simultaneously the light output from all modules. When a TTL "high" level (i.e. +5 V nominal) is applied to the connector, all modules light outputs are disabled. When a "low" level (i.e.: 0 V nominal) is applied to the connector, the common disable function is turned off, and the output of each module is determined by its own enable/disable state (front panel "Enable" key).

- Each time the TUNICS-OM module is switched from "disable" to "enable" (either through the rear panel input or the module front panel enable key), the system settles to the best operating point corresponding to the optical power and wavelength parameters. The output power may fluctuate during a short period of time (a few milliseconds) after enabling the system while the system is performing the best operating point search.

  The operating point of each module may be periodically optimized. This function is enabled through a switch located at the rear of the module. When the switch is in the "single" position, the optimization takes place only when the module is switched from "disable" to "enable" as described above. When the switch is in the "repeat" position, the optimization automatically takes place every 5 mn.

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APPENDIX A: CHARACTERISTICS

CERTIFICATIONS AND COMPLIANCES

Category	Standards or description
EC Declaration of Conformity- EMC	Compliance was demonstrated to the following specification as listed in the Official Journal of the European Union: Directive 89/336/EEC for Electromagnetic Compatibility. EN 50081-1 Emission: EN 55022 Class B Radiated and Conducted Emissions EN 50082-1 Immunity: EN 61000-4-2 Electrostatic Discharge Immunity IEC 801-3 RF Electromagnetic Field Immunity EN 61000-4-4 Electrical fast Transient/ Burst Immunity
EC Declaration of Conformity- Low Voltage	Compliance was demonstrated to the following specification as listed in the Official Journal of the European Union: Low Voltage Directive 73/23/EEC, amended by 93/68/EEC EN 61010-1 : 1993/A2 : 1995 Safety requirements for electrical equipment for measurement control and laboratory use. EN 60825-1/A1 : 1994 Safety of laser Products, Part 1. Equipment classification requirements and user's guide

SAFETY CERTIFICATION COMPLIANCE:

Equipment type	Test and measuring
Safety Class	Class 1 (as defined in IEC 61010-1, annex H)- grounded product
Mains supply voltage	100 - 240 V AC with ± 10% fluctuation max
Installation (Overvoltage) category	**Overvoltage category II** (as defined in IEC 61010-1, Annex J) Local-level mains (wall sockets). Equipment at this level includes appliances, portable tools, and similar products. Equipment is usually cord-connected.
Pollution Degree	**Pollution Degree 2** (as defined in IEC 61010-1). Note: rated for indoor use only. Normally only dry, nonconductive pollution occurs. Occasionally a temporary conductivity that is caused by condensation must be expected. This location is a typical office/home environment. Temporary condensation occurs only when the product is out of service.
Safe operating temperature range	+5 deg. C to +40 deg. C
Maximum relative humidity	80% for temperatures up to 31 deg. C decreasing linearly to 50% relative humidity at 40 deg. C
Altitude (maximum operating)	2000 meters

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POWER SOURCE:

Power supply	100 - 240 V AC ± 10%
Power supply frequency	50 - 60 Hz ± 5%
Max power consumption	120 W

MECHANICAL CHARACTERISTICS:

- TUNICS-OM controller:

Dimensions	**Depth**	370 mm (14.6 in)
	Width	448 mm (17.6 in)
	Height	133 mm (5.2 in)
Weight	5.7 kg (12.6 lb)	

- TUNICS-OM module:

Dimensions	**Depth**	170 mm (6.7 in)
	Width	50 mm (2 in)
	Height	128 mm (5 in)
Weight	1.15 kg (2.5 lb)	

INTERFACES:

Optical connector	FC/APC
Output isolation	35 dB
Return loss	-60dB
Modulation bandwidth	10 KHz to 1 GHz

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APPENDIX B: MAINTENANCE

User maintenance of the Tunics is limited to the following:

- Replacing the line Fuse.
- Cleaning optical connectors for optimum power.
- Checking the performance of optical connections and cables.
- Cleaning the instrument.
- Calibration.

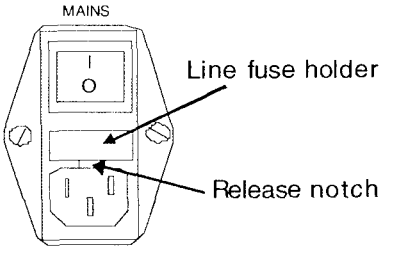
WARNING: DO NOT MAKE ANY SERVICE OR MAINTENANCE ON THE LASER HEAD: Under no circumstance, the user has to make any service or maintenance of any kind on the laser head. The protective cover of the laser head must not be removed by the user. Refer servicing only to authorized personnel from Photonetics.

REPLACING THE LINE FUSE:

Before replacing the Line Fuse be sure you unplug the power cord.

1- Insert a small flat-blade screwdriver into the notch just inside the power cord socket of the line filter. Use the notch to pull the fuse holder straight out to remove the fuse.

2- Replace the fuse (T4Amp L 250V) in the fuse holder and snap the fuse holder back into the lined filter.



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CLEANING AND CARING FOR OPTICAL CONNECTORS AND FIBERS:

- Handle optical fiber with appropriate care and preserve the integrity of optical connectors by keeping them free of contamination.

- Use the following items to clean the optical connectors:
  - clean compressed air
  - fiber-optic cleaning swabs
  - isopropyl alcohol

- Follow these steps to clean the optical connectors:

1- Hold the can of compressed air upright and spray the can into the air to purge any propellant.

2- Spray the clean compressed air on the connectors to remove any loose particles or moisture.

3- Moisten a clean optical swab with isopropyl alcohol then lightly swab the surfaces of the connectors.

4- Spray the clean compressed air on the connectors again to remove any loose particles isopropyl alcohol.

NOTE: Cleaning kits for optical connectors are available from many fiber optic suppliers.



CAUTION: - To optimize the performance of the system and prevent loss of optical power or damage to the optical connectors, keep the connectors clean at all times.

- When cleaning the connectors with a swab, use gentle circular motions. Use only high quality cleaning supplies that are non-abrasive and leave no residue.

- To reduce the need for cleaning, immediately replace protective caps on the optical connectors when not in use.

- Do not over stress or sharply bend optical fiber beyond tolerances specified by the manufacturer.

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APPENDIX C: REPLACEABLE PARTS

For information about replaceable parts, contact your Photonetics sales representative.

STANDARD ACCESSORIES:

Name	Description
Fuse	T4Amp L 250V
Manual, tech.: instruction	TUNICS-OM User manual
PM optical fiber cable	single-mode polarization maintaining cable
Optical fiber cable	single-mode cable
Power Key	Front panel

OPTIONAL POWER CORDS:

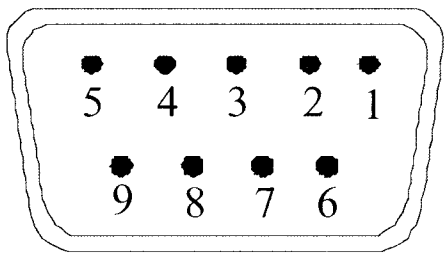
Name		Description
North America	110 V, 60 Hz	CSA STD C22.2 NO21-M1984, ECN 436C approved, 5-15P attachment plug cap moulded onto No18 AWG, type SVT,SJT flexible cord, 2 meter (78.7 inch), 125V/10A AC, US
Universal European	220 V, 50 Hz	DIN 49441/2, CEE7, DIN 0625, VDE approved, IEC attachment plug cap, HO5VV-F3G 0.7 mm_ flexible cord, 2.5 meter (98.4 inch), 250V/10A AC, EUROPEAN
United Kingdom	240 V, 50 Hz	BS4491.EN60.320,BASEC BS6500, ASTA BS 1363A, VDE, SEV, BSI approved, 1.0 mm_ flexible cord, 2 meter (78.7 inch), 250V/10A AC, 25.4 mm fused UK plug (13A fuse)

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APPENDIX D: REMOTE INTERLOCK

- The rear panel contains the Sub-D9 connector used for remote interlock. To use the Remote Interlock function, the user must provide a connector with pins 1 and 2 shortened, the external switch being connected to pins 6 and 7. The switch must be electrically isolated from all other circuits, including earth ground. When nothing is connected to the Remote Interlock connector, the OSICS can be used as usual.

Pin numbers	External connections
1 and 2	short-circuit
6 and 7	External switch



- When the Remote Interlock mode becomes active all the plugged modules are disabled and the ENABLE key is inactive. The modules keeps the disable configuration when the Interlock mode goes back to the inactive mode.

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CONTACTING PHOTONETICS

Service support:

Contact your local Photonetics distributor or sales office.

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For other information:

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An operator will direct your call.

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