

Optiva Reference Oscillator Link Installation Manual



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EMCORE Corporation offers a broad portfolio of compound semiconductor-based components and systems for the broadband, fiber optic, satellite communication, defense and solar power markets. EMCORE has two primary operating segments: Fiber Optics and Photovoltaics. The company's integrated solutions philosophy embodies state-of-the-art technology, material science expertise, and a shared vision of our customer's goals and objectives to be leaders in fiber optics and photovoltaics.

EMCORE's solutions include: optical components and subsystems for fiber-to-the-premise, cable television, high speed data and telecommunication networks; defense photonics products for commercial and military applications including lasers, modulators, spectrometers, sensors, fiber gyro components and diagnostic instruments; solar cells, solar panels, and fiber optic ground station links for global satellite communications.



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General

- 1 to 20 MHz optimized for reference signals
- 15 dB adjustable gain range provides perfect level match for signal distribution
- Designed for high level signal input
- 50 Ohm BNC signal interface
- Receiver RF power monitoring: Panel LED, SMA, & remote monitoring
- SNMP monitoring and control
- High-dynamic-range, optically-isolated DFB lasers run cooler and require less power
- Fits in Optiva® enclosures which support daisy chain® video, audio and data links
- Hot swap redundant power supplies virtually eliminate downtime
- 16, 4, 2, & 1 slot enclosures available



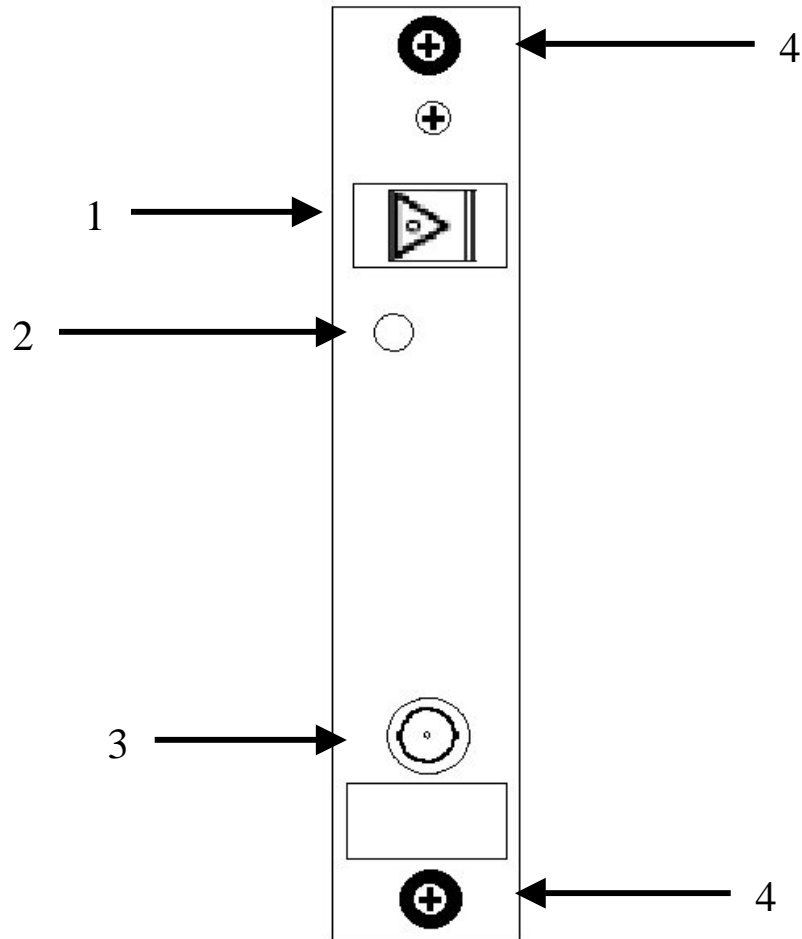
Optiva® Reference oscillator link is a high-performance, cost-effective alternative to coaxial cable. They provide much longer transmission distances than copper cables, which simplify network design, ease installation and even enhance immunity from EMI, RFI and lightning. These transmitters and receivers take the best RF design features of Emcore's extensive families of products and combine them into a compact package compatible with the Optiva™ OT-CC-16 chassis.

The Optiva™ family's wide range of RF, video, audio and data transport products include a unique data bus design that provides a higher level of monitoring and control with a single chassis mix and match flexibility. The final result is a chassis system that can be factory or user custom configured to meet a wide range of fiber transport applications.

All units come as an insert card version. The cards can be inserted into the Optiva 3RU 16-slot, 19" rack-mountable card cage (OT-CC-16), 1RU 4-slot 19" rack (OT-CC-1U-4) or one of the smaller Optiva™ Desktop Card Racks (OT-DTCR Series). The power supply must be the 12 volt version.

Interface and Controls

Transmitter
Figure 01



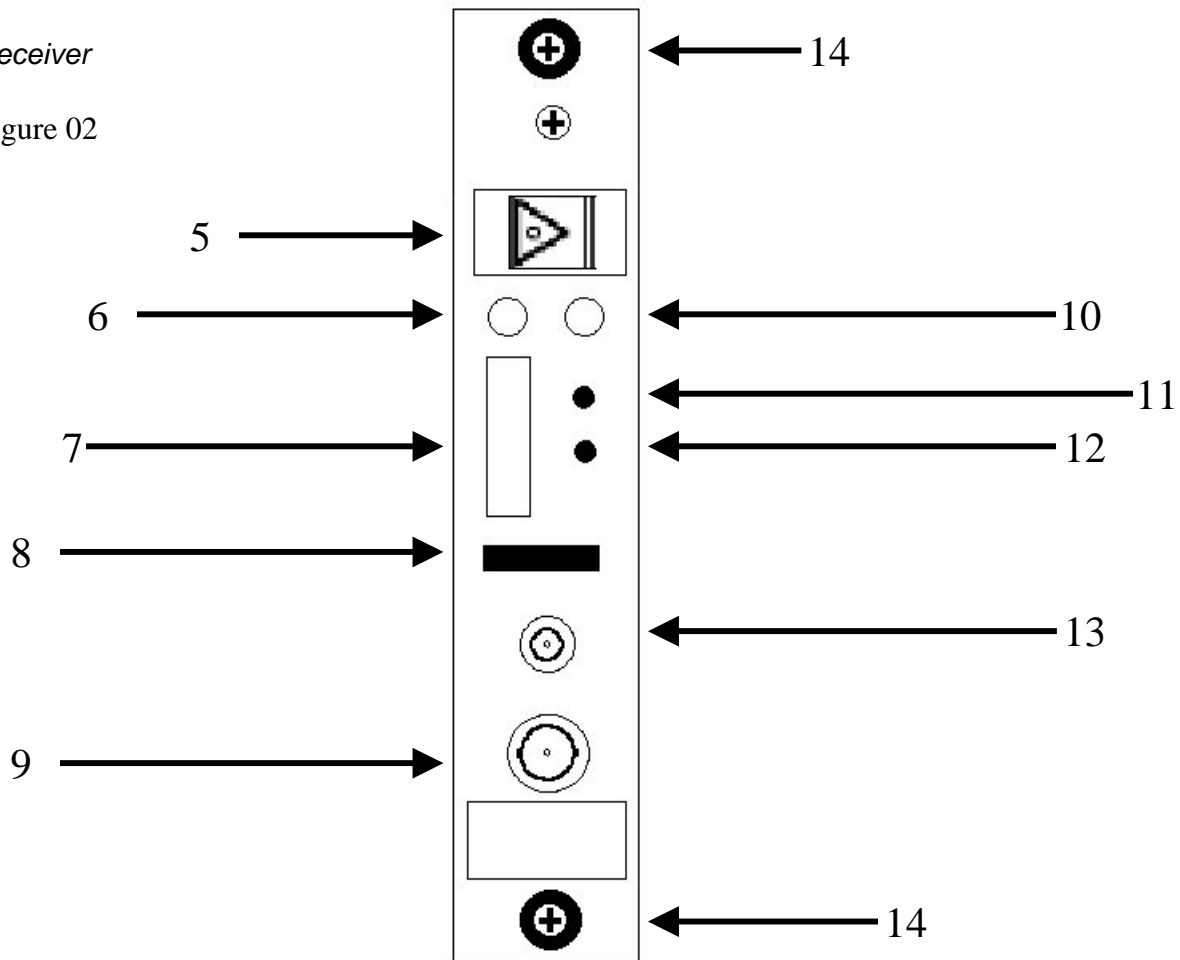
Transmitter

1. **Out** The output of the laser is provided from this SC-APC socket. (see “*Optics Handling*” section)
2. **STATUS** This LED glows green when OK and red when there is a major alarm.
3. **RF IN** The RF input signal is applied to this RF connector.
4. The chassis retention screws will secure the seated module into the chassis.

NOTE: A toothpick or cotton swab end provides a convenient safe way to access the recessed buttons and switches. For a toothpick, break off the end for a flatter surface.

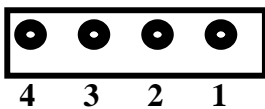
Receiver

Figure 02



Receiver

- 5. **IN** The input optical fiber is inserted into this SC-APC socket. (see “Optics Handling” section)
- 6. **STATUS** This LED illuminated indicates the “ON” status condition of the module.
- 7. **RF dBm** The illuminated LED bar graph indicates the RF output in four levels.
- 8. **STATUS MONITOR** (See below for pin detail.)
- 9. **RF OUT** The RF output signal is available at this RF connector.
- 10. **OPTICAL** The illuminated LED indicates the presence of fiber optic light.
- 11. **H** This button will increase the output RF level in approximately 1dB increments.
- 12. **L** This button will decrease the output RF level in approximately 1dB increments.
- 13. **MONITOR** This connector provides a -25dB representation of the RF output.
- 14. The chassis retention screws will secure the seated module into the chassis.



Status monitor pin details

- 4= ground
- 3= PDI current (This varies from unit to unit 0dbmo = 1.15 to 1.2vdc)
- 2= summary alarm (low state normal, 3.3vdc alarm condition)
- 1= not defined

Installation

Module Installation

- Align the top and bottom card edges in the chassis channel and slide firmly into the back plane.
- Tighten the top and bottom module screws to secure in chassis.

Transmitter Installation

- Connect reference signal to the RF input connector.
- Insert the SC/APC connector in the fiber output connector socket. (see “*Optics Handling*” section)

Receiver Installation

- Insert the SC/APC connector in the fiber input connector socket. (see “*Optics Handling*” section)
- Connect reference signal output to the RF output connector.
- Press and release the **H/L** button to adjust the output RF to the desired level.
- The LED bar graph provides a rough reference of operation.
- Signal level can be monitored through the provided SMA monitor port. (*Approximately –25dB relative to output*)

Operation

Signal Input

Every step has been taken to ensure simple hands free operation. In general, higher RF powers into the laser will provide better signal to noise and phase noise performance, therefore Emcore recommends that the user adjusts the output power of the reference oscillator to as high as possible up to the +15 dBm maximum input specification of the transmitter. The exact low end of acceptable RF input will depend on your particular application, but in general RF inputs as low as 0 dBm can still work well in most applications.

Signal Output

At the receiver end of the link, an internal photodiode and variable gain RF amplifier bring the RF level to the optimal level for your equipment. Because RF inputs and the amount of fiber loss can vary significantly between different systems, we have included a large amount of gain in the receiver. For those systems with low RF inputs and high optical loss, you can set this RF amp to its maximum, however if you drive the transmitter with a high RF input and have little optical loss then you should reduce the RF output to 12 dBm or less to avoid saturating the electrical amp.

LED Indicator Tables & Diagram

TX Status LED (Table 01)

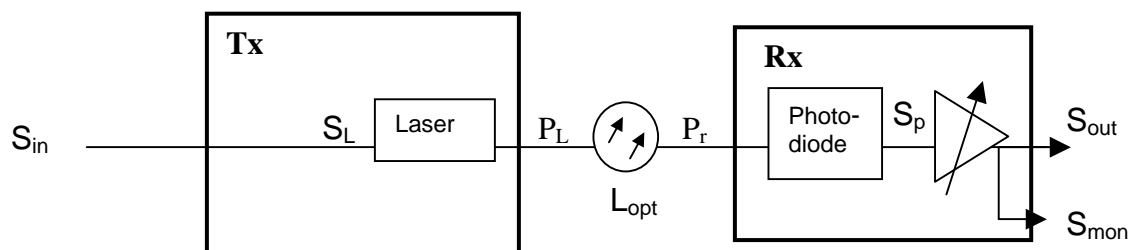
“STATUS” LED, On Transmitter	“STATUS” LED, On Chassis	“ALERT” LED, On Chassis	Notes
Green	Blue	OFF	Status OK
Red	OFF	Red	Summary Alarm

RX Status LED (Table 02)

“OPTICAL” LED, On Receiver	“STATUS” LED, On Receiver	“STATUS” LED, On Chassis	“ALERT” LED, On Chassis	Notes
Green	Green	Blue	OFF	Optimal range
Amber	Green	Blue	OFF	Low, warning
Off	Red	OFF	Red	Low, alarm

The optical status lights are warning indicators that illuminate when the optical input passes the set limits. Illumination of these indicators will not disrupt service of the carried signals.

Optiva Reference Oscillator Link Transmission System



Remote Monitoring

Simple Network Management Protocol (SNMP)

The Optiva System is designed to provide remote status and control monitoring via SNMP monitoring programs. Use of this feature requires the use of a network management system agent card (NMS) that serves as the interface between the data retrieved from the system cards and the management program. Management Interface Bases (MIB's) are available with the purchase of the NMS card (OPV-CTRLR-IC). The MIB defines the detailed variables and protocol for the particular product.

▪ OTS-1RefT (Transmitter)

Monitored Values

Laser Bias	Optical Power Alarm	Firmware #
Optical Power	Model #	Hardware #
Temperature	Serial #	
Summary Alarm	Manufacture date	

Controlled Values

None

▪ OTS-1RefR (Receiver)

Monitored Values

Temperature	Power Supply Alarm	Manufacture date
RF Power Level	Photo Diode Alarm	Firmware #
Photo Diode Current	Model #	Hardware #
Summary Alarm	Serial #	

Controlled Values

RF Gain

Specifications

Parameter		Min	Typical	Max	Units
Link	Frequency Range	1	-	20	MHz
	RF link gain (1dBo optical loss, RX gain at max)	2	12	-	dB
	Fiber Distance	0	-	20	Km
	Optical Loss	0	-	8	dBo
	Air Temperature	-10	-	50	°C
Transmitter	RF input	-	0	15	dBm
	TX Gain (TG) at 10 MHz	-18	-13	-	dB (W/A)
	RF Flatness (1-20 MHz)	-	0.5	2	DB PP
	Input IP3 (0dBm per tone, 10&11 MHz)	30	34	-	dBm
	Carrier to Noise Ratio, (3dBm RF input, 10 MHz)	130	136	-	DB/Hz
	Spur Free Dynamic Range (1dBo loss)	105	>111	-	dB/Hz ^{-2/B}
	RF return loss	-	-15	-10	dB
	Optical Power	5	6	7	dBmo
	DC Power	-	12 110	- 150	V mA
Receiver	RX Gain (RG), at 10 MHz	22	27	-	dB (A/W)
	RX Gain Range (Reduction from max)	15	-	-	dB
	Gain Flatness (max gain) 1-20 MHz	-	1.5	2	dB PP
	RX RF Return Loss	-	-19	-15	dB
	Output IP3 (10&11 MHz)	24	30	-	dBm
	Output P 1dB @ 10 MHz	-	15	-	dBm
	Optical Input	-12	-	10	dBmo
	Optimal	-6	-	10	dBmo
DC Power	-	12 150	- 200	V mA	

1. Link RF Gain dB = TG+RG -2*Fiber Loss dBo (assumes Rin=Rout)

2. dBmo & dBo indicate optical power & loss to minimize confusion with RF dBm and dB

Ordering Information

Model Number *Description*

Product Code	Specifications
→ OTS-1RefT/B5-1306-SA-IC	Transmitter, 1-20 MHz, BNC 50 ohm, 1310 nm, 6dBm (min), SC/APC
OTS-1LT/B5-1303-SA-IC	Transmitter, 50-3000 MHz, BNC 50 ohm, 1310 nm, 3dBm (min), SC/APC
OTS-1LT/B7-1303-SA-IC	Transmitter, 50-2500 MHz, BNC 75 ohm, 1310 nm, 3dBm (min), SC/APC
OTS-1LT/S5-1303-SA-IC	Transmitter, 50-3000 MHz, SMA 50 ohm, 1310 nm, 3dBm (min), SC/APC
→ OTS-1RefR/B5-SA-IC	Receiver, 1-20 MHz, BNC 50 ohm, SC/APC
OTS-1LR/B5-SA-IC	Receiver, 50-3000 MHz, BNC 50 ohm, SC/APC
OTS-1LR/B7-SA-IC	Receiver, 50-3000 MHz, BNC 75 ohm, SC/APC
OTS-1LR/S5-SA-IC	Receiver, 50-3000 MHz, SMA 50 ohm, SC/APC
OPV-CTLR-IC	NMS SNMP Controller Card & MIB for Optiva Family
OTP-1ETR-A2/A2-LC	Optical Tcwr, 1Ch, Ethernet, SM, LC
OT-CC-16-01	Chassis, Rack Mount, 16 Slot, 3RU, Rear Access
PS-200-NA	Power Supply, 12 Vdc, Universal AC Input, (North American Power Cord)
PS-200-EU	Power Supply, 12 Vdc, Universal AC Input, (European, Power Cord)
PS-200-UK	Power Supply, 12 Vdc, Universal AC Input, (United kingdom) Power Cord)
OT-OPF-1	Face plate, Blank, 1 slot
OT-OPF-2	Face plate, Blank, 2 slot
CA-MD25-P	Cable Pigtail Shielded Micro DB-25 pin

Optics Handling & Safety

Working with fiber optic cables and interfaces require a clean dust free environment. The optical power is confined in the optical core only a few microns in diameter. Small particles of dust can block the proper transfer of light through the connectors. It is therefore important to keep connectors as clean as possible, and when in doubt of the cleanliness of a connector, clean it prior to inserting into a transmitter or receiver receptacle.

A number of events can damage fiber optic connectors. Unprotected connector ends can experience damage by impact, airborne dust particles, or excess humidity or moisture. Never touch the fiber end face of the connector.

When cleaning fiber optic connectors use only Industrial grade 99% pure isopropyl alcohol, lens-grade, lint-free tissue, and optionally canned dry air. Alternatively, there are a number of simple, effective products that are specifically designed for cleaning fiber optic connectors.

Never look into an illuminated fiber end.

Disclaimer

Every attempt has been made to make this material complete, accurate and up-to-date. Users are cautioned that EMCORE reserves the right to make changes without notice and shall not be held responsible for any damages, including consequential, caused by reliance on the material presented, including, but not limited to, typographical, arithmetical, or listing errors.

WARNINGS, CAUTIONS, LIABILITY, WARRANTY AND GENERAL NOTES

Safety Considerations

When installing or using this product, observe all safety precautions during handling and operation. Failure to comply with the following general safety precautions and with specific precautions described elsewhere in this manual violates the safety standards of the design, manufacture, and intended use of this product. Emcore assumes no liability for the customer's failure to comply with these precautions.



The fiberoptic laser transmitter used in Emcore's Optiva link contains a class IIIb laser product as defined by the U.S. Department of Health and Human Services, Public Health Service, Food and Drug Administration. This laser product complies with 21 CFR, Chapter I, Subchapter J of the DHEW standards under the Radiation Control for Health and Safety Act of 1968.

The laser operates at nominally 1310 nm with less than 30 mW optical output. The typical optical output for this product is less than 10 mW. The protective laser plug-in module housing prevents a user from being exposed to hazardous optical output levels. Since there is no human access to the laser output during system operation, no special operator precautions are necessary when fiber is connected to the transmitter and receiver. During installation, service, or maintenance, the service technician is warned to not look directly into the end of the fiber connector or the fiber. The light emitted from the fiberoptic connector or any fiber connected to the transmitter is invisible and may be harmful to the human eye. Use either an infrared fluorescent screen or an optical power meter for optical output verification. All handling precautions as outlined by Federal agencies or other authorities of class IIIb lasers must be observed.

Do not attempt to modify or to service the laser diode module. Return it to Emcore for service and repair. Contact the Emcore Customer Service Department for a return authorization and further instructions.

Electrostatic Sensitivity

Observe electrostatic precautionary procedures. Semiconductor laser transmitters and receivers provide highly reliable performance when operated in conformity with their intended design. However, a semiconductor laser may be damaged by an electrostatic charge inadvertently imposed by careless handling.

Static electricity can be conducted to the laser chip from the center pin of the RF input connector, and through the DC connector pins. When unpacking and otherwise handling the transmitter, follow ESD precautionary procedures including use of grounded wrist straps, grounded workbench surfaces, and grounded floor mats.

Exposure to electrostatic charge is greatly reduced after the transmitter or receiver has been installed in an operational circuit.

Service

Do not attempt to modify or service any part of the system other than in accordance with procedures outlined in this Operation Manual. If the system does not meet its warranted specifications, or if a problem is encountered that requires service, return the apparently faulty plug-in or assembly to Emcore for evaluation in accordance with Emcore's warranty policy.

When returning a plug-in or assembly for service, include the following information: Owner, Model Number, Serial Number, Return Authorization Number (obtained in advance from Emcore's Customer Service Dept.), service required and/or description of the problem encountered.

Warranty

Emcore warrants to the original purchaser all standard products sold by Emcore to be free of defects in material and workmanship for one (1) year from date of shipment from Emcore. During the warranty period, Emcore's obligation, at our option, is limited to repair or replacement of any product that Emcore proves to be defective. This warranty does not apply to any product that has been subject to alteration, abuse, improper installation or application, accident, electrical or environmental over-stress, negligence in use, storage, transportation, or handling.

This warranty is the only warranty made by Emcore and is in lieu of all other warranties, expressed or implied, except as to title, and can be amended only by a written instrument signed by an officer of Emcore. Emcore sales agents or representatives are not authorized to make commitments on warranty returns.

Limitations of Liabilities

Emcore's liability on any claim of any kind, including negligence, for any loss or damage arising from, connected with, or resulting from the purchase order, contract, or quotation, or from the performance or breach thereof, or from the design, manufacture, sale, delivery, installation, inspection, operation or use of any equipment covered by or furnished under this contract, shall in no case exceed the purchase price of the device which gives rise to the claim.

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FURNISHING OF GOODS, PARTS AND SERVICE HEREUNDER, OR THE PERFORMANCE, USE OF, OR INABILITY TO USE THE GOODS, PARTS AND SERVICE.

Emcore will not be responsible for loss of output or reduced output of opto-electronic devices if the customer performs chip mounting, ribbon bonding, wire bonding, fiber coupling, fiber connectorization, or similar operations. These processes are critical and may damage the device or may affect the device's output or the fiber output.

Emcore test reports or data indicating mean-time-to-failure, mean-time-between-failure, or other reliability data are design guides and are not intended to imply that individual products or samples of products will achieve the same results. These numbers are to be used as management and engineering tools, and are not necessarily indicative of expected field operation. These numbers assume a mature design, good parts, and no degradation of reliability due to manufacturing procedures and processes.

Emcore is not liable for normal laser output degradation or fiber coupling efficiency degradation over the life of the device.

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