OPERATOR MANUAL

Laser Transmitter

MODEL 3510A
3510B
3515A
3515B

Making Light *Work* For You

ORTEL™
CORPORATION

ORIEL CORPORATION

SERIES 351X OPERATING MANUAL
FIBEROPTIC TRANSMITTERS

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Service

Do not attempt to modify or service any part of the system other than in accordance with procedures outlined in this Operator's 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 Ortel for evaluation in accordance with Ortel'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 Ortel Corporation's Customer Service Dept.), service required and/or a description of the problem encountered.

Warranty and Repair Policy

The Ortel Corporation Quality Plan includes product test and inspection operations to verify the quality and reliability of our products.

Ortel uses every reasonable precaution to ensure that every device meets published electrical, optical, and mechanical specifications prior to shipment. Customers are asked to advise their incoming inspection, assembly, and test personnel as to the precautions required in handling and testing ESD sensitive opto-electronic components.

These products are covered by the following warranties:

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

2. Specific Product Warranty Instructions
   All Ortel products are manufactured to high quality standards and are warranted against defects in workmanship, materials and construction, and to no further extent. Any claim for repair or replacement of a device found to be defective on incoming inspection by a customer must be made within 30 days of receipt of the shipment, or within 30 days of discovery of a defect within the warranty period.

   This warranty is the only warranty made by Ortel 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 Ortel. Ortel sales agents or representatives are not authorized to make commitments on warranty returns.

   In the event that it is necessary to return any product against the above warranty, the following procedure shall be followed:

   a. Return authorization shall be received from the Ortel Sales Department prior to returning any device. Advise the Ortel Sales Department of the model, serial number, and the discrepancy. The device shall then be forwarded to Ortel,

transportation prepaid. Devices returned freight collect or without authorization may not be accepted.

b. Prior to repair, Ortel Sales will advise the customer of Ortel test results and will advise the customer of any charges for repair (usually for customer caused problems or out-of-warranty conditions).

If returned devices meet full specifications and do not require repair, or if non-warranty repairs are not authorized by the customer, the device may be subject to a standard evaluation charge. Customer approval for the repair and any associated costs will be the authority to begin the repair at Ortel. Customer approval is also necessary for any removal of certain parts, such as connectors, which may be necessary for Ortel testing or repair.

c. Repaired products are warranted for the balance of the original warranty period, or at least 90 days from date of shipment.

3. Limitations of Liabilities

Ortel'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.

EXCEPT AS EXPRESSLY PROVIDED HEREIN, ORTEL MAKES NO WARRANTY OF ANY KIND, EXPRESSED OR IMPLIED, WITH RESPECT TO ANY GOODS, PARTS AND SERVICES PROVIDED IN CONNECTION WITH THIS AGREEMENT INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. ORTEL SHALL NOT BE LIABLE FOR ANY OTHER DAMAGE INCLUDING, BUT NOT LIMITED TO, INDIRECT, SPECIAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF OR IN CONNECTION WITH FURNISHING OF GOODS, PARTS AND SERVICE HEREUNDER, OR THE PERFORMANCE, USE OF, OR INABILITY TO USE THE GOODS, PARTS AND SERVICE.

Ortel 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.

Ortel 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.

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

DANGER

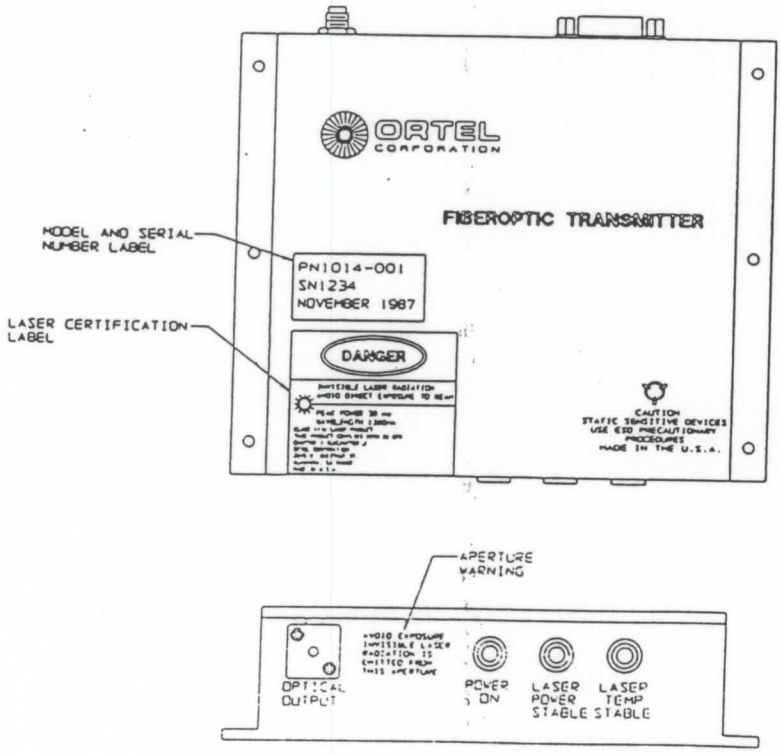
Ortel Laser Transmitte

This fiberoptic laser transmitter 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 module certification label is located on the top label of the transmitter enclosure and it acnlso shows the required DANGER warning logotype (as shown below).

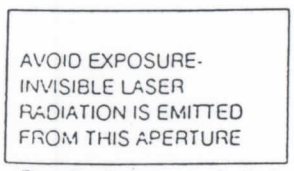
The Ortel laser products are used in optical fiber communications systems for radio frequency and microwave frequency analog fiberoptic links.In normal operation, these systems are fully enclosed and fully shielded by the hermetically sealed laser metal package. Laser bias current is limited by the internal control circuitry. The transmitters are coupled to glass fiber and have 1300 nm optical output wavelength with typically .5 to 7 mW output. The optical radiation is confined to the fiber core. Under these conditions, there is no accessible laser emission and hence no hazard to safety or health. Variations in the different models reflect bandwidth, optical output, noise, and distortion of the laser.

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, however, **to take precautions which include not looking directly into the fiber connector or the fiber which is connected to the fiber connector before it is connected to the fiberoptic receiver. The light emitted from the fiberoptic connector or any fiber connected to the connector is invisible and may be harmful to the human eye. Use either an infrared viewer or fluorescent screen for optical output verification. All handling precautions as outlined by the FDA and ANSI Z136.2 and other authorities of Class IIIb lasers must be observed.**

Do not attempt to modify or to service the laser transmitter. Return it to the Ortel Corporation for service and repair. Contact the Ortel Corporation Customer Service Department for a return authorization if service is necessary.



Detail of Laser Certification Label



Detail of Aperture Label

ORTEL CORPORATION

SERIES 351X OPERATING MANUAL
FIBEROPTIC TRANSMITTERS

1.0 GENERAL INFORMATION

CAUTION Before operating this product, carefully read all the information in Section 3 of this manual.

1.1 DESCRIPTION

This manual describes the following fiberoptic transmitter model numbers:

3510A	.01 - 3 GHz
3510B	.01 - 6 GHz
3515A	1 - 10 GHz
3515B	1 - 12 GHz

The 351X series fiberoptic transmitters are intended for the transmission of RF and microwave analog signals over singlemode optical fiber at 1300 nm wavelength. They contain InGaAsP high speed semiconductor lasers in a patented high speed package, which features a coaxial input and an integral thermoelectric cooler (TE cooler).

The transmitter contains electronic circuits to stabilize the laser temperature and optical output power over a wide environmental range. Also, status monitoring and alarm circuits are included for use in systems that require self diagnosis and failure analysis.

The signal input is via a coaxial SMA connector in a 50 ohm input circuit. The optical output is via a singlemode fiber with suitable optical connectors.

1.2 SPECIFICATIONS

For detailed specifications of an individual product described in this manual, consult the Product Specification Table (PST) included with your manual. If the PST is missing, you can obtain a duplicate from the Ortel Sales Department, (818) 281-3636.

Specifications apply over the entire specified operating range of the product and are guaranteed for 1 year after the date of purchase.

1.3 IDENTIFICATION AND MODEL NUMBERS

Each Ortel product is assigned a unique model number and serial number, which appears on the label of the transmitter. Model numbers for this series have the form

351NX

where N is a 1 digit numeric designation, and X is a letter designation.

1.3.1 OPTIONS

Many of these products have standard performance options, which are designated by numeric suffixes to the model number, separated by a hyphen. Thus,

3510B-001

describes a 6 GHz bandwidth transmitter, with a dc couped RF input (Option 001). The complete performance of a standard product (with any standard options) is described on the Product Specification Table.

Changes to the PST can be accommodated by requesting non-standard options to meet specific performance requirements. Such options are designated by an alpha-numeric suffix,

-XNN

where X is alpha, and N is numeric. Such custom options must be agreed upon in advance with the Ortel Sales Department.

1.4 SERVICE

Do not attempt to modify or service any part of the transmitter. If the transmitter does not meet its warranted specifications, or if a problem is encountered that requires service, it must be returned to Ortel for evaluation, in accordance with Ortel's warranty policy.

When returning the transmitter for service, include the following information: owner, model number, serial number, return authorization number (obtained from Ortel Corporation Customer Service), service required and/or a description of the problem encountered.

1.5 ADDITIONAL MANUALS

Additional copies of this manual are available through the Ortel Sales Department. Specify the model number and serial number series from the title page.

2.0 SAFETY CONSIDERATIONS

Semiconductor laser transmitters are high performance electronic devices that provide highly reliable performance when operated in conformance with their intended design.

For best results when using this product, general safety precautions must be observed during handling and operation. Failure to comply with these general safety precautions and with the specific precautions described elsewhere in this manual violates the safety standards of the design, manufacture and intended use of this product. Ortel Corporation assumes no liability for the customer's failure to comply with these precautions.

2.1 SAFETY SYMBOLS

ESD Sensitive Device	Observe electrostatic precautionary procedures.
CAUTION	Indicates a hazard. It is to call attention to a procedure or practice which, if ignored, could lead to damage to the photo-diode module or other equipment. Do not continue beyond the CAUTION sign until the described conditions are fully understood and met.
DANGER	Indicates a hazard. It is to call attention to a procedure or practice which, if ignored, could lead to personal injury. Do not continue beyond the DANGER sign until the described conditions are fully understood and met.

2.2 ESD SENSITIVE

Semiconductor lasers are static sensitive devices, and products containing them should be treated accordingly. Static electricity can be conducted to the laser chip from the center pin of the RF input SMA connector, and through the DC connector pins. When unpacking and handling the transmitter, prior to installing it, use ESD precautionary procedures, such as grounded wrist straps and grounded work mats.

After the transmitter is installed in an operational circuit, these pins are protected from casual contact and ESD sensitivity is greatly reduced.

2.3 POWER SUPPLY

A power supply is required to provide power to the laser and to the temperature control circuits. Operating the transmitter outside of its recommended power supply values may cause damage to the product. It is recommended that the supply voltages be turned on simultaneously after the connections have been made to the 9-pin connector. For best results, avoid connecting the 9-pin connector to the transmitter housing while the power supply is on. (See Section 4.3 for connection instructions before applying power.)

CAUTION Damage can occur to the laser if the transmitter is operated with one or more supply voltage set outside its recommended range.

2.4 INPUT RF POWER

The laser diode can be overdriven and damaged by the application of excessive RF power. Refer to the specific Product Specification Table for information about the maximum permissible RF power to the transmitter. Do not apply RF power with the transmitter turned off.

2.5 GROUNDING

All power supplies should be connected to an earth ground.

2.6 STORAGE

Observe ESD precautions while storing the transmitter (i.e., anti-static containers) and store away from corrosive materials. Storage temperature: -55 to 85 C.

3.0 THEORY OF OPERATION

The Model 351X series fiberoptic transmitter uses an Ortel high speed laser module to generate an intensity modulated optical signal at 1300 nm wavelength. For more complete information on the operating principles of analog fiberoptic links, consult Ortel's RF/Microwave Fiberoptic Link Design Guide.

3.1 EXTERNAL DISPLAYS AND CONTROLS

The fiberoptic transmitter needs no external controls or adjustments. The laser current is preset at the factory to provide optimum performance according to the specifications published in the data sheet and the Product Specification Table.

3.1.1 LED DISPLAYS

There are three external visual LED displays that provide information about the operating state of the transmitter. These LED's are normally on. If any of the LED's is off after applying dc power to the transmitter and waiting for a few seconds, recheck all power connections. If the condition persists, consult with Ortel's Customer Service department.

POWER ON: This LED is normally ON, and indicates that +15 V is present at Pin #1 of the dc 9-pin connector.

LASER POWER STABLE: This LED is normally ON, and indicates that the laser optical power, as measured by the internal monitor photodiode, is above 90% of the factory preset value.

LASER TEMP STABLE: This LED is normally ON, and indicates that the laser substrate temperature (as determined by the thermistor resistance) is within ±2 C of the factory setpoint. The transmitter may require several seconds of operation before the LED goes on.

3.1.2 STATUS MONITORS

Two monitor voltages are available on the dc connector. They are designed to provide information about the operating condition of internal optical power circuits for routine operational maintenance.

PIN 6: Photodiode Current. 10 V/mA, ±2% (1.0 Mohm load). Provides a buffered voltage proportional to the monitor photodiode current. Measuring and recording this voltage provides a record of the laser output power over time, as measured by the photodiode.

PIN 8: Laser DC Current. 1 V/100 mA, ±2% (1.0 Mohm load). Provides a buffered voltage proportional to the laser dc current. Measuring and recording this voltage provides a record of the laser current over time.

3.1.3 ALARM FUNCTIONS

In addition to the LED visual displays of transmitter operational status, there are two alarm circuits in the transmitter which can be used to drive remote indicators. They are designed to provide a positive interrupt capability if the laser transmitter drifts out of factory set operating conditions, but before the laser fails completely. This provides the capability of replacing or servicing the unit before the link operation is interrupted.

The alarms are designed to interface with user supplied circuits. Alarms are open collector outputs capable of sinking 20 mA when ON and withstanding 15 Vdc when OFF. Normal operation of the alarm circuit is the OFF state. A suggested use of the alarm circuit would be a series connection of an external LED, or a relay, from the system 15 V supply through a 1 Kohm resistor. Assuming negligible voltage drop through the LED or relay, this would provide a 15 mA activation current when the alarm is active.

The alarm functions and pin assignments are as follows.

PIN 7: Low Optical Power. This alarm is ON (sinks current) if the laser monitor photodiode current drops from its factory set value by more than 10%. The alarm is not activated if the photocurrent is HIGHER than the setpoint.

PIN 9: Laser Temperature. This alarm is ON (sinks current) if the laser substrate temperature is more than 2 C higher than the factory setpoint. The alarm is not activated if the temperature is LOWER than the setpoing.

3.2 INTERNAL CONTROL CIRCUITS

The laser module contained in this transmitter contains two sensing elements to provide feedback on the operating conditions of the laser. They are, a monitor photodiode, which provides a current proportional to the output power of the laser chip, and a thermistor, which provides information about the temperature of the laser substrate. The entire substrate is mounted on a Peltier Cooler (thermoelectric cooler) which can heat or cool the laser substrate as necessary to maintain a constant operating temperature for the laser chip.

The 351X transmitter contains two feedback control circuits which use these sensing elements to maintain stable operation.

3.2.1 OPTICAL POWER STABILIZATION

The optical power control circuit senses the current generated by the monitor photodiode and compares the resulting voltage against a reference voltage, which is preset at the factory. A feedback circuit drives a highly stabilized current source, which provides the dc current for the laser operation. This mode of operation is known as "constant power". As the laser ages, the control circuit will maintain the optical output power, as sensed by the internal photodiode, constant by

adjusting the laser current to compensate for changes in chip operating temperature, threshold current, and quantum efficiency. The power control circuit will not compensate for changes in the laser/fiber coupling efficiency.

In addition to the dc current supply circuit, there are two additional circuits in the optical power control circuit. A "slow start" circuit operates when the transmitter is switched on. This circuit increases the laser current over 3 seconds from zero to its operating value. This eliminates transients and which could damage the laser. A current limiter, preset at the factory, establishes a maximum value for the laser current. Thus, a failure of the monitor photodiode will not result in uncontrolled laser current values, which would destroy the laser.

3.2.2 TEMPERATURE STABILIZATION

The temperature control circuit senses the thermistor resistance in the laser module and compares it against a variable reference, which is preset at the factory. The error voltage drives an integrator, which supplies current to the T/E cooler (Peltier Cooler). The current source is bipolar, so heating and cooling functions are provided to the T/E Cooler.

As with the power control circuit, a current limiter prevents the T/E cooler and laser from damage due to excessive heating or cooling functions should the thermistor fail.

4.0 INSTALLATION

The information in this section can be used to make initial performance tests on the laser transmitter. It is not intended as a complete performance verification procedure.

4.1 UNPACKING AND VISUAL INSPECTION

The product described herein was inspected before shipment and found to be free of mechanical and electrical defects. Observe ESD precautions while handling the transmitter. Unpack and examine the product for any damage due to shipping. Keep all packing materials until you are satisfied that the product works according to specifications. Verify that the pins and connectors are free from obvious shipping or handling damage. If damage is discovered, file a claim with the carrier immediately. Notify the Ortel Sales Department as soon as possible.

4.2 OPERATING CONDITIONS

This product is designed and tested to withstand harsh environmental operating and storage conditions. The basic design and manufacturing processes have been subjected to rigorous product qualification tests of temperature cycling, mechanical shock, and vibration. Every product is warranted to operate within specification over the temperature range from -40 to 70 C, and to withstand storage temperatures from -55 to 85 C without degradation.

4.3 CONNECTION INSTRUCTIONS

To operate the transmitter at room temperature in a laboratory setting, it can be placed on a convenient flat surface without any particular concern for a good heatsink. In a field operating environment, to obtain reliable operation over the full temperature range, fasten the transmitter to a solid metallic surface with a good heat sink using screws through the mounting holes provided. Make the fiberoptic connections before applying power to the transmitter.

4.3.1 ELECTRICAL CONNECTION

Observe the following procedures while making electrical connection to the transmitter.

4.3.1.1 DC CONNECTION:

Connect the transmitter to the required dc voltages using a standard 9-pin DSUB connector. The transmitter contains internal regulator and transient suppression circuits. Most high quality power supplies will provide excellent results. For best results, make the dc connection to the transmitter before switching on the supply.

CAUTION: Do not solder wires directly to the pins of the dc connector.

When turning the transmitter on, there is a "slow start" circuit that introduces a 2-3 second delay in the turn on. When the LED's are all lit, the transmitter is ready to use.

4.3.1.2 RF CONNECTION:

CAUTION: Apply RF power only after DC power has been applied.

Connect the RF signal source to the SMA input connector. Absolute maximum signal level shall not exceed 100 mW.

CAUTION: Do not apply excessive torque to the SMA connector. The use of standard wrenches can lead to a damaged connector. Use 7-9 inch pounds of torque. The use of a torque wrench is strongly recommended.

The input impedance of the transmitter is 50 ohms. Use signal sources with the same characteristic impedance. Consult the Product Specification Table for the maximum input signal level. Do not exceed this level to avoid damaging the laser diode.

4.3.2 OPTICAL CONNECTION

The transmitter is designed to operate with singlemode optical fiber at a nominal wavelength of 1310 nm. Transmitters are available with bulkhead optical connectors, pigtail fibers with connectors, and pigtail fibers without connectors.

When splicing two bare fibers, the fiber tip must be cleaved well and the tip must be clean. If not properly cleaved or cleaned, optical power may be scattered and the insertion loss may be high. For temporary splices, the use of index matching fluid is recommended to reduce reflections.

Optical reflections will result in degraded transmitter performance. Consult the Product Specification Table for the recommended optical reflection level for a specific product. For best results, use Ortel recommended connectors.

Optical connectors will exhibit repeatable performance when certain precautions are observed. The connector end surfaces must be kept free of dirt and dust. Before mating, clean with a cotton swab and alcohol, and low dry with a lint free aerosol air spray. Many high quality connectors use keying polarity, and it is important to observe such mating requirements.

Some connectors can be improved by the use of index matching fluid. Consult with the connector manufacturer or Ortel for recommendations regarding specific connectors. Tighten the connectors finger tight. Do not use a wrench, as it will cause excessive optical loss and can damage the connector end faces.

4.4 INITIAL TURN ON PROCEDURE

For initial operation of the transmitter, the use of a simple test circuit as shown in Figure 4.1 is recommended. A fiberoptic receiver of sufficient bandwidth is required to convert the optical

signal to electrical form. Because of their superior operating characteristics for analog signals, the use of Ortel receivers is recommended. Choose a bandwidth that matches the frequency range of the transmitter.

The recommended test equipment for an initial evaluation is as follows:

DESCRIPTION	RANGE	PRESET TO
Signal Generator	.01-10 GHz -10 to 10 dBm	1 GHz 0 dBm
Power Supply — 3 way		+15 V, ±5 V
Power Supply — single		+15 V
Spectrum Analyzer	.01-10 GHz	1 GHz
Optical Power Meter		1300 nm 0 - 5 mW
Amplifier (optional) 30 dB gain	1 GHz	
Fiberoptic Receiver	Same as transmitter	
Digital Voltmeter	0-10 V	

Since the link insertion loss is approximately 40 dB, an amplifier improves the measurement by raising the signal level to the spectrum analyzer. An amplifier is usually required to to measure the output noise floor of the link. The amplifier is usually not required to make basic operating measurements of the link, since most spectrum analyzers will easily display signal levels of -40 dBm, which is the expected output power from a link with 0 dBm input level.

4.4.1 DC OPERATION

Using grounded, shielded cable for power supply connections, verify that the cables are correctly wired and that power supplies are properly adjusted before applying power. Switch on the power supplies simultaneously to the transmitter and receiver. Verify that the LED's are lit. If one or more of the LED's are not lit, double check the power supply connections. If the trouble persists, contact Ortel Customer Service for advice.

When the transmitter is operated at room temperature, it will draw only limited current (approximately 50 mA) from the ±5 V supply, since the thermo-electric cooler will be drawing minimal current.

If an Ortel receiver is in use, Pin 6 of the receiver dc connector provides a simple indication of the optical power reaching the receiver. The proportionality factor is 1V/mA of receiver photocurrent. Typically, 1 mW of optical power will result in 0.7-0.8 mA of photocurrent, resulting in a measured voltage of 700 - 800 mV.

If an Ortel receiver is not in use, use an optical power meter to verify that the optical output power of the transmitter meets specifications.

4.4.2 RF OPERATION

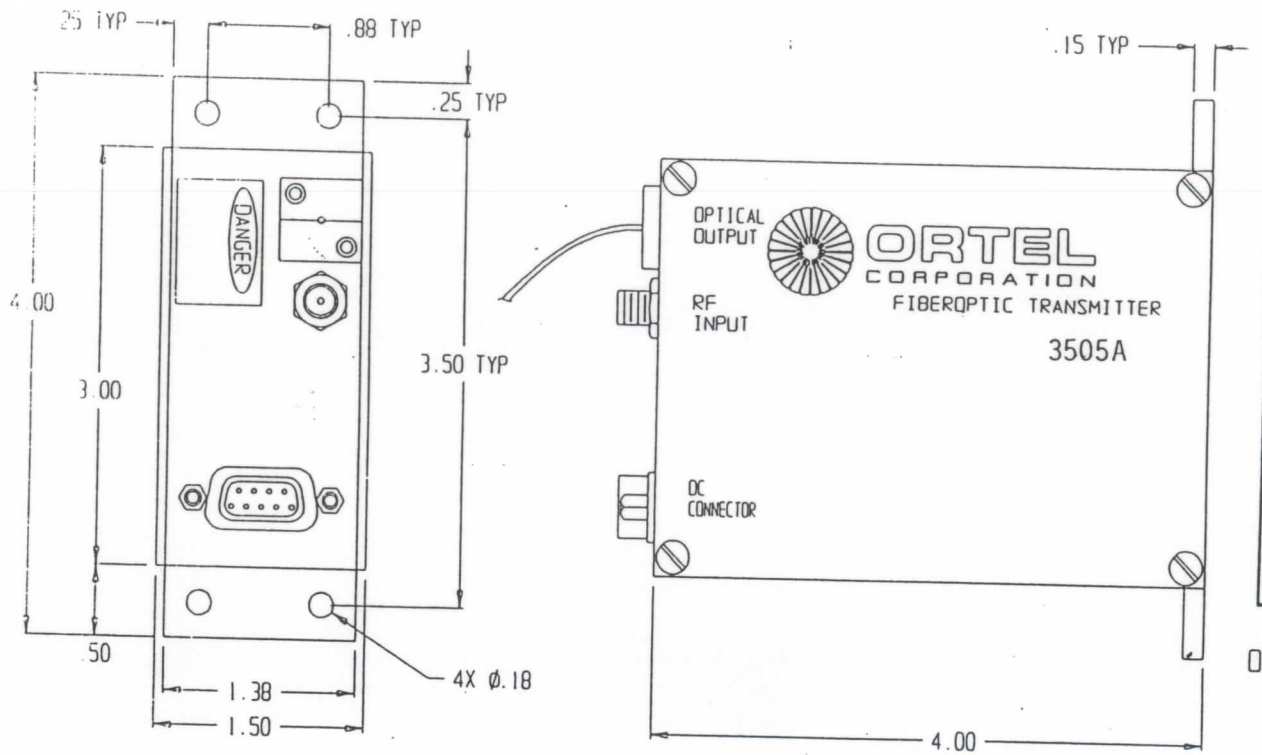
Preset the signal generator to 1 GHz at 0 dBm, or to some convenient frequency within the operating range of the transmitter. It is advisable to calibrate the signal generator and spectrum analyzer by making a direct connection to set a zero dB reference measurement level.

Apply the signal to the transmitter and measure the output of the receiver on the spectrum analyzer. Verify that the output signal is clean with no amplitude jitter or spurious signals.

Measure the power level of the receiver output. The gain of the fiber optic link will depend on the receiver characteristics, as well as the optical loss of the test cable. For short cables (<100 meters) and good quality connectors, and with an Ortel receiver, the link insertion loss should be approximately 38 dB. Variations of $\pm$3 dB in this value can occur and should not be considered unusual.

Adjust the input power up and down by 3-4 dB and verify that the receiver output tracks the input power linearly. If the spectrum analyzer has sufficient bandwidth, measure the amplitude of the second harmonic as a function of input signal power. The second harmonic power should vary as 2:1 relative to the input power, indicating normal linear operation of the transmitter.

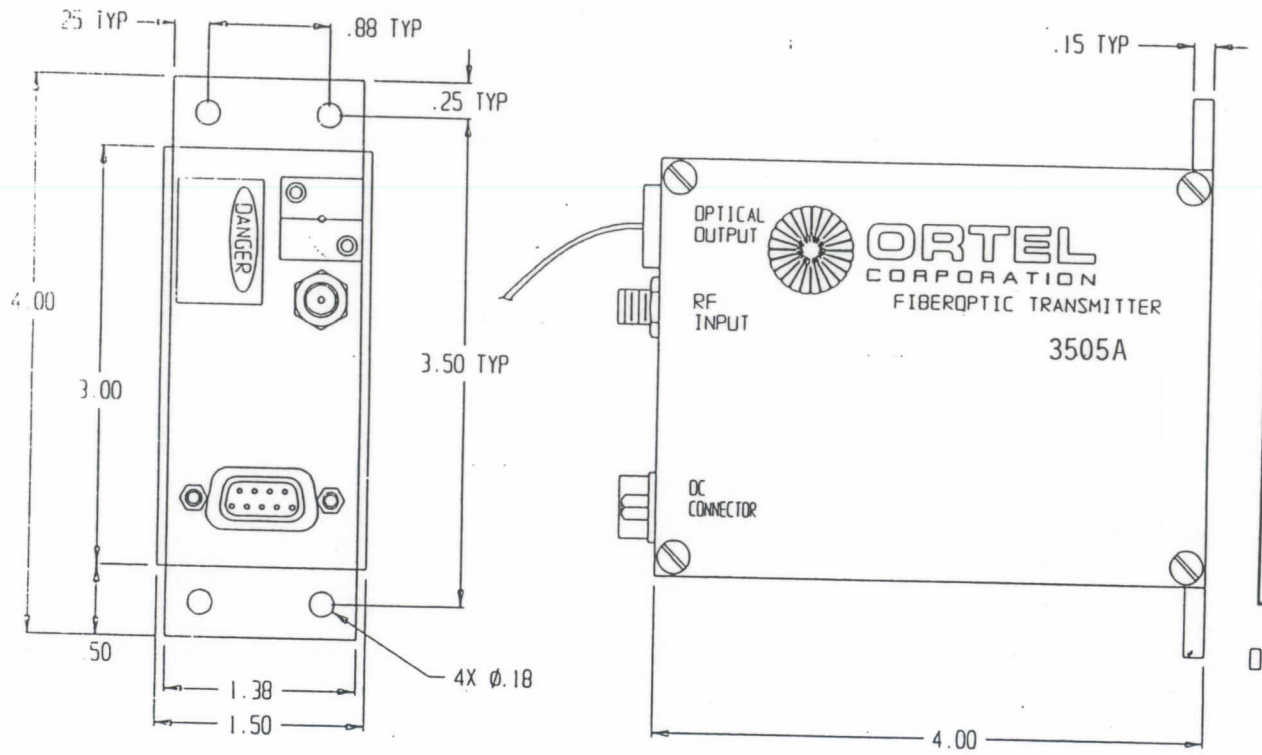
PIN INFORMATION



1	N/C
2	+5 Vdc (+10%, −5%)
3	N/C
4	Power Gnd. - Power Return
5	Reference Gnd. - Use when measuring monitor points.
6	PDI monitor - 1 V/mA. Internal photodiode monitors lase power and indicates photo-current.
7	Laser Temperature Monitor - 5°C/V, 0V = 10°C
8	Laser Current Monitor - 1 V/100 mA. Laser Bias.
9	TEI Monitor - Thermoelectric cooler current. 1 V/A. Centered at 2.0 volts. Positive voltage Indicates cooling.

OUTLINE DRAWING AND PINOUTS

PIN INFORMATION



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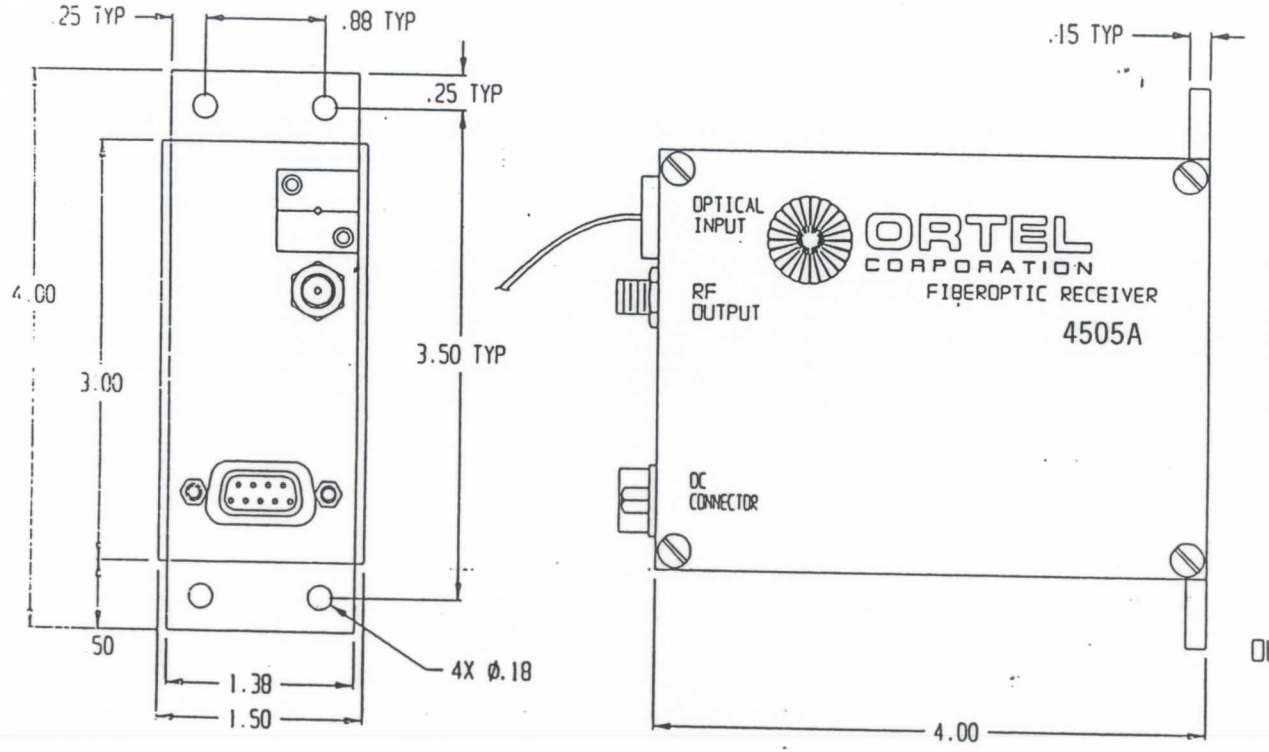
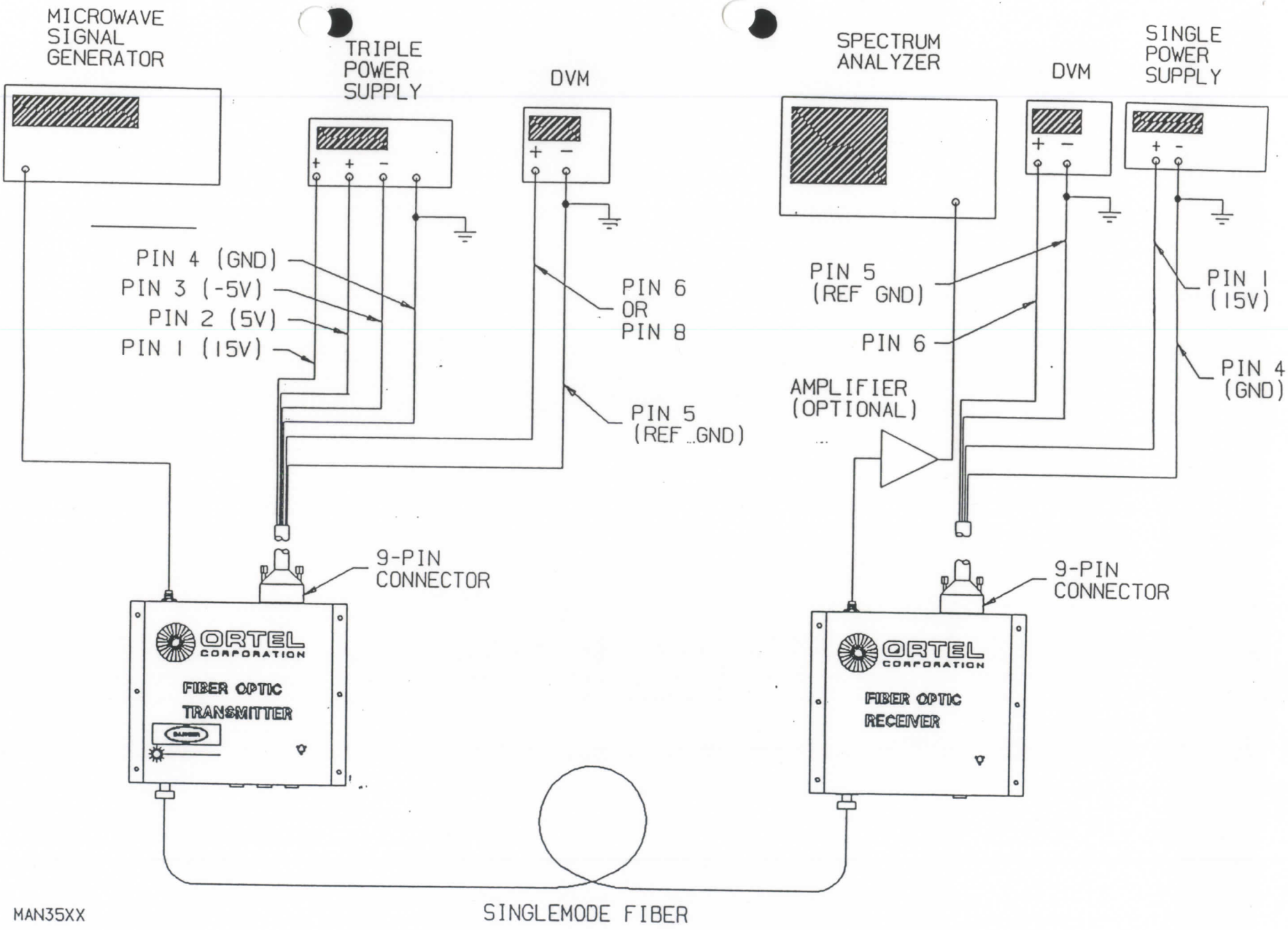


9 PIN CONNECTOR

PIN NO.	FUNCTIONS
1	+15 Vdc
2	AUXILIARY GROUND
3	NC
4	POWER GROUND
5	REF. GROUND
6	OPTICAL POWER MONITOR
7	LOW OPTICAL POWER ALARM*
8	NC
9	NC

*OPEN COLLECTOR OUTPUTS

OUTLINE DRAWING AND PINOUTS


MICROWAVE SIGNAL GENERATOR
TRIPLE POWER SUPPLY
DVM
SPECTRUM ANALYZER
DVM
SINGLE POWER SUPPLY
PIN 4 (GND)
PIN 3 (-5V)
PIN 2 (5V)
PIN 1 (15V)
PIN 6 OR PIN 8
PIN 5 (REF GND)
PIN 5 (REF GND)
PIN 6
PIN 1 (15V)
PIN 4 (GND)
AMPLIFIER (OPTIONAL)
9-PIN CONNECTOR
9-PIN CONNECTOR
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FIBER OPTIC TRANSMITTER
ORTEL CORPORATION
FIBER OPTIC RECEIVER
SINGLEMODE FIBER
MAN35XX