

**MDS/MMDS Transceiver**  
**TR2126**

INSTALLATION AND OPERATION  
GUIDE FOR SYSTEM OPERATORS

*wcom*  
**WAVECOM**  
ELECTRONICS INC.  
ISO 9002 Registered Company

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TR2126 Manual; MAN1M0301 Rev05(0104)

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and welcome to WaveCom!**



You have chosen an innovative solution from a leading technology design center in the ongoing TV & data delivery revolution.

No doubt you've been thinking that the future of your television delivery system includes new technologies like **Digital TV, Internet Over Cable, Wireless Cable**. By selecting **WaveCom**, you are benefiting from the same design powerhouse that since 1988 has created custom RF and digital products for technology leaders like Nortel Networks, Diva Systems and Cisco Systems.

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- |                            |                           |                            |
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**and more! Designs to fill the market needs of the CATV industry – both foreign and domestic.**

For additional product or corporate information, contact us:

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**WaveCom's Corporate Mandate**

**is to be a leading worldwide designer and manufacturer of state-of-the-art communications equipment and components. Through the remarkable success of our customers and business partners, WaveCom innovations are achieving this goal.**

## **SAFETY PRECAUTIONS**

1. Before installing and operating this equipment, read all Safety, Installation and Operating sections. Retain this manual for future reference.
2. Follow all instructions — Failure to do so may result in damage to the unit or severe personal injury.
3. Servicing should not be attempted by the user. There are no user serviceable parts inside. Refer all servicing to factory qualified personnel.
4. Shock Hazard — An electrical shock hazard exists when the chassis cover is removed as is required to set internal controls. Always disconnect power from the unit before removing the cover.
5. Cleaning — Do not use liquid or aerosol cleaners. Use a damp cloth for cleaning.

**Warning** Do not work on the system or connect or disconnect cables during periods of lightning activity.

**CAUTION:** To comply with FCC RF exposure requirements in section 1.1307, a minimum separation distance of 1.5 meters is required between this antenna and all persons.

## **LES PRÉCAUTIONS DE SÉCURITÉ**

1. Avant d'installer ou d'opérer cet équipement, lisez, toutes les sections de sécurités, d'installations et d'opérations. Gardez ce manuel comme source de référence.
2. Suivez toutes instructions - si non, vous risquez d'endommager la machine ou de vous blesser sérieusement.
3. N'essayez, pas de réparer cet équipement vous même. Référez toutes revisions nécessaire au personnel qualifié de la manufacture.
4. Risque de choc - Il y a un risque de décharge électrique qui existe quand la couverture du châssis est enlevée, comme est nécessaire pour ajuster les contrôles internes. Il faut toujours couper l'électricité avant d'enlever le couvercle pour faire aucun ajustage.
5. Le nettoyage - n'utilisez pas de nettoyeurs aérosols ou liquides. Utilisez un tissu humide pour nettoyer.

**Attention** Ne pas travailler sur le système ni brancher ou débrancher les câbles pendant un orage du foudre.



Important Installation Instructions

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## **1.0 GENERAL INFORMATION**

### **1.1 Functional Overview**

The WaveCom **TR2126** is an MDS/MMDS Transceiver for use in wireless systems. The TR2126 integrates an LNA, downconverter, upconverter, power amplifier, RF and IF diplexers to provide a one-box solution for two-way wireless RF communications. The TR2126 and antenna are situated outdoors and connected to a cable modem indoors by standard RG-59 cable. A single RF connector on the weatherproofed enclosure provides the interface to the transmit/receive antenna for rapid setup. The Transceiver is configured to work with standard cable modem frequency plans and levels, permitting direct connection. The Transceiver also includes an RF mute function to reduce power consumption and broadband noise emissions.

### **1.2 Module Features**

- +30 dBm output for high reverse channel system gain
- Microprocessor controlled gain compensation over temperature
- Low Phase Noise
- Automatic transmit RF mute (transmits only when an IF signal is present)
- Fully weatherized unit, suitable for outdoor mounting

## 1.3 Specifications

### UPCONVERTER SPECIFICATIONS

IF Input Frequency	14.375 to 26.375 MHz
RF Output Frequency	2150 to 2162 MHz
Output (1dB Compression Point)	+30 dBm
Gain	30 ± 2 dB across full temperature range
Gain Flatness	± 0.75 dB full band
In-band Spurious	-60 dBc
Out-of-band Spurious	-60 dBc
Phase Noise	-95 dBc/Hz @ 10 kHz -110 dBc/Hz @ 100 kHz
IF Level for RF Activation	0 dBmV

### DOWNCONVERTER SPECIFICATIONS

RF Input Frequency	2500 to 2686 MHz
IF Output Frequency	222 to 408 MHz
Nominal Gain	32 ± 2 dB
Gain Flatness	± 2 dB full band; ± 0.3 dB/ 6 MHz
Noise Figure	4.5 dB max.
Output 3rd Order Intercept	+24 dBm at nominal gain
Radar Rejection	26 dB (15 dB pre-LNA)
WCS Rejection	70 dB (35 dB pre-LNA)
PCS Rejection	95 dB (50 dB pre-LNA)
Image Rejection	90 dB
Spurious	-70 dBm
Phase Noise	-95 dBc/Hz @ 10 kHz -110 dBc/Hz @ 100 kHz

### GENERAL

Frequency Setting & Stability	± 5 kHz (-40 to +60°C)
Frequency Stability Over Time	<±10 kHz over 10 years
RF Connector	N female, 50 ohms
IF Connector	F female, 75 ohms
Input/Output VSWR	2:1
DC Supply	18 to 24 V, 12 Watts max.
Operating Temperature	-40 to +60°C (-40 to +140°F)
Size	6" x 7" x 1" (15.24 x 17.78 x 2.54 cm)
Mounting	Pole mount

Specifications subject to change without notice.

## 2.0 INSTALLATION

### 2.1 Unpacking the Unit

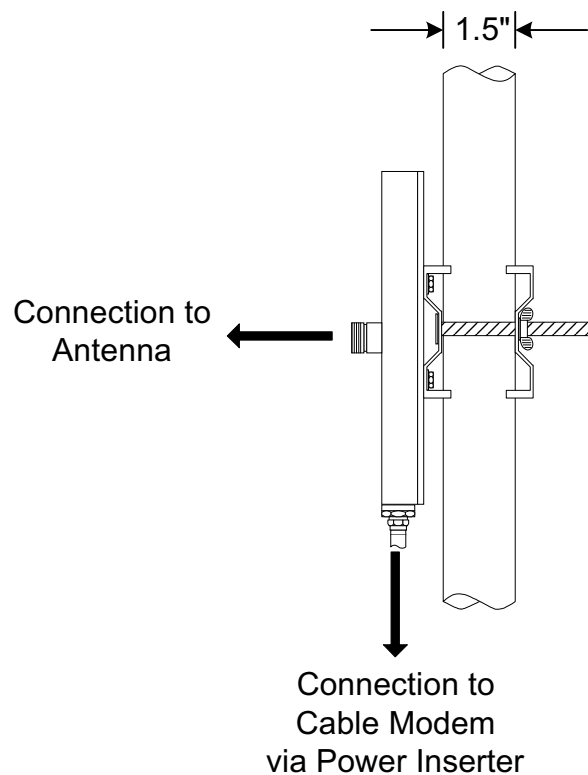
Carefully remove the equipment from its packing material and set it on a solid surface, such as a table or desk. If it appears damaged in any way, notify the carrier, and keep all packing materials for inspection by the carrier's agent.

### 2.2 Mounting the Unit

#### 2.2.1 Mounting the TR2126

The TR2126 was designed for mounting on a pole with a 1.5" diameter. Simply secure the TR2126 unit to a pole as shown in Figure 2.2A with F-Connector on the bottom.

DIAGRAM 2.2A: MOUNTING THE UNIT



#### 2.2.2 Mounting the Antenna

Mount the antenna according to the manufacturer's instructions.

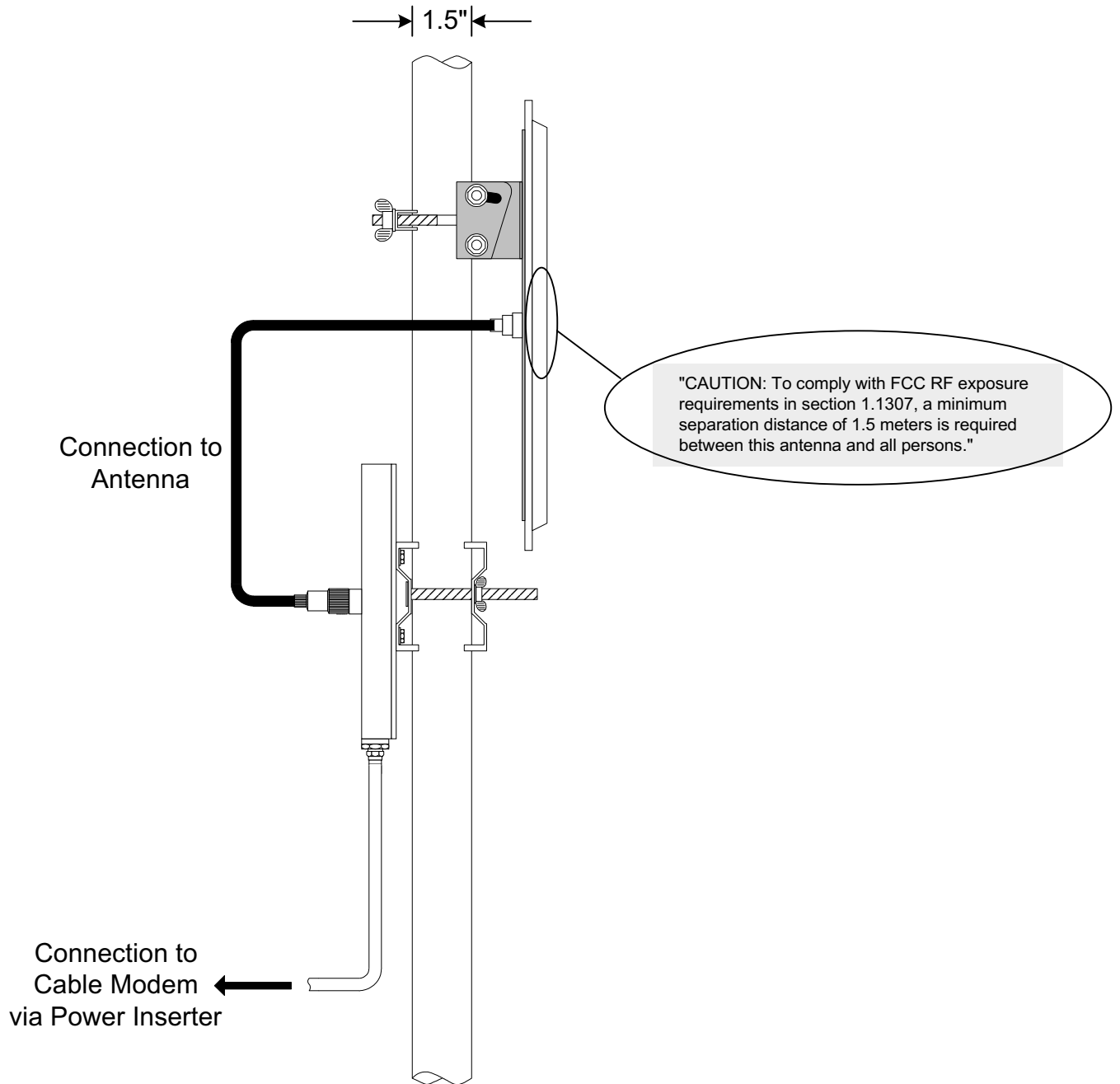
- ☛ The TR2126 is intended for use with flat planar arrays and dipole/parabolic reflectors. Please consult table 2.2B (p. 9) for further information.
- ☛ Included with the TR2126 unit is a self-adhesive label for application on the antenna. To operate the TR2126 in compliance with FCC regulations, you must apply the included label on to the antenna. Peel of the protective backing from the label and affix it to the antenna such that the label is readable from a distance of 3 feet.



TABLE 2.2B: ANTENNA LIST

Transceiver Power		Antenna Type	Antenna Gain
(Watts)	(dBm)		(dBi)
1	30	Flat planar array	12
1	30	Flat planar array	18
1	30	Flat planar array	21
1	30	Dipole/parabolic reflector	24

DIAGRAM 2.2C: APPLYING THE SELF-ADHESIVE LABEL



## 2.3 Connection to the Antenna, Power Inserter and Cable Modem

Connections to the TR2126 are made as shown in Figures 2.3A, 2.3B.

Please note:

- 1) Connect the TR2126 to the Antenna via the front N-Connector.
- 2) Connect the TR2126 to the Cable Modem via the F-Connector. Note that the TR2126 is actually connected to the Power Inserter. The Power Inserter is then connected to the Cable Modem.
- 3) Cover all outdoor connections to the TR2126 using self-amalgamating tape to prevent moisture from penetrating the connections.

DIAGRAM 2.3A: CONNECTION TO THE ANTENNA AND POWER INSERTER

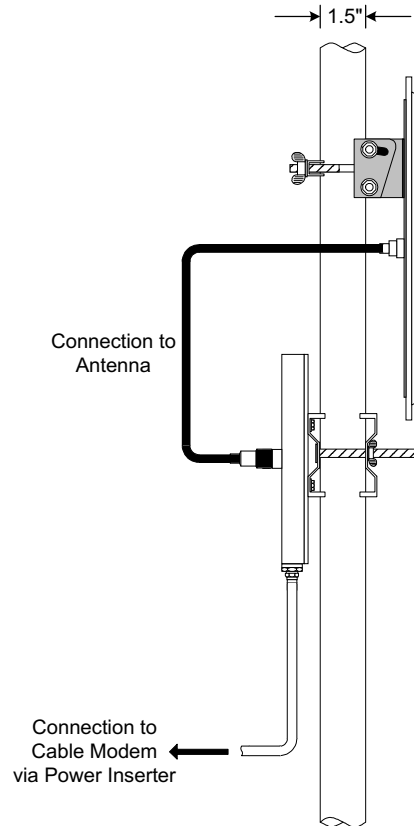
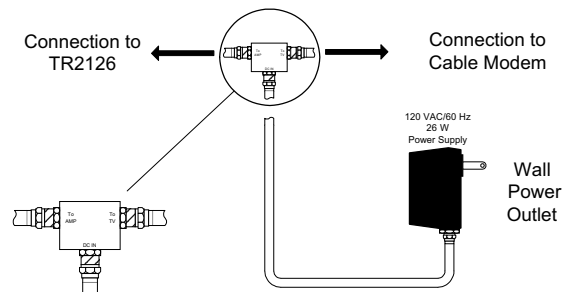


DIAGRAM 2.3B: CONNECTION TO CABLE MODEM VIA POWER INSERTER



## 2.4 Connection to the Power Inserter and Cable Modem

Connections to the TR2126 are made as shown in Figures 2.3A, 2.3B.

Please note:

1) Connect the TR2126 F-Connector to the power inserter, located indoors with the cable modem. The power inserter is then connected to the Cable Modem. The power inserter has three connections:

POWER	Connect to wall adapter with the supplied RG-59 cable with F connectors
TV	Connect to cable modem
Downconverter	Connect to TR2126

If the power inserter is not correctly connected, the TR2126 will not operate, and there is the potential to damage the cable modem.

2) After connection, the F connector **must** be waterproofed with the supplied rubber sealing tape. See Section 2.5 for details.

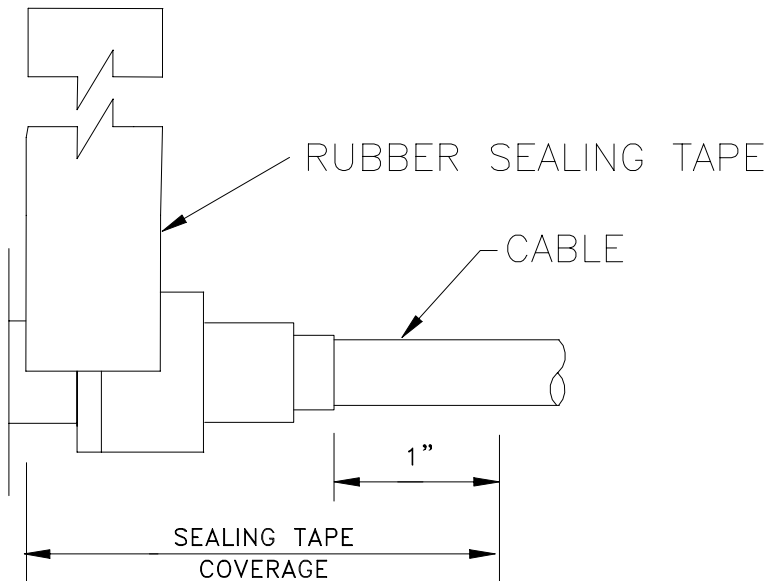
## 2.5 Waterproofing Connections

Many antenna problems are caused by vibration loosening the connectors, which allows moisture to penetrate into the connector. It is highly recommended to seal the connectors using a technique similar to the one described below. This will provide moisture protection and keep the connections tight. WaveCom has provided an 12 inch length of rubber self-amalgamating sealing tape to use on the two connections of the TR2126. The diagrams below show the N connector, but the F connector also should be sealed using the same technique.

### STEP 1

Use a 6" to 7" section of rubber sealing tape. Starting at the TR2126 end, stretch the tape and wrap it around the connector as close as possible to the wall of the TR2126. Overlap the tape by approximately one-half of it's width so that it can form a seal with itself. Extend the wrapping to approximately one inch past the end of the connector.

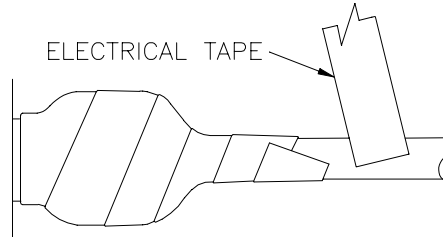
DIAGRAM 2.5A: WATERPROOFING CONNECTION – STEP 1



## STEP 2

Cover the sealing tape with electrical tape (not provided). Start approximately one inch further down the cable, and stretch the tape, overlapping by one-half. Wrap to the TR2126 end and without breaking the tape, wrap back down to the cable end.

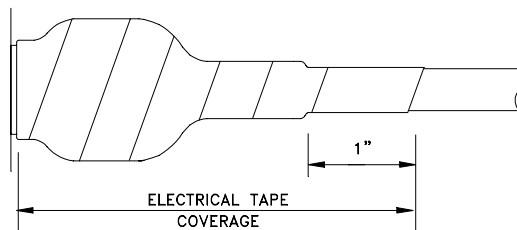
DIAGRAM 2.5B: WATERPROOFING CONNECTION – STEP 2



## STEP 3

When done, the connection should be tightly wrapped with tape, with a good seal to the cable.

DIAGRAM 2.5C: WATERPROOFING CONNECTION – STEP 3



## **3.0 SPECIAL FEATURES**

### **3.1 Gain Compensation Over Temperature**

A voltage controlled attenuator in the TR2126 transmitter is adjusted via the microprocessor in order to

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compensate for changes in temperature. The microprocessor makes the adjustments according to a calibrated table of optimal gain values corresponding to temperatures ranging from -40 to +60 degrees Celsius.

## **4.0 WARRANTY AND SERVICE POLICIES**

### **4.1 Warranty Statement**

WaveCom warrants its products to be free from defects in workmanship or materials for a period of two years. The warranty begins on the date of the original shipment from WaveCom to its customer. No claim may be allowed for expenses incurred in installation or use. No other expressed or implied warranties shall apply to the goods sold. WaveCom is not responsible for delayed shipments, other loss beyond WaveCom's control, or consequential damages of any kind arising in connection with the use of its products. This warranty is a return-to-factory warranty only. During the warranty period WaveCom will at its option, replace, repair or refund the price paid for any item which is returned for service. This warranty does not apply to physically or environmentally abused units.

### **4.2 Service Policies: How to Return an Item for Service**

Before returning any item for service, an R.M.A. (Returned Material Authorization) number must be assigned by WaveCom. A unique R.M.A. number will be assigned for each item being returned. When requesting an R.M.A. number, please be prepared to provide the model, WaveCom serial number, original invoice number, your purchase order number and an adequate fault description. R.M.A. service is available Monday to Friday from 8:30 a.m. to 4:30 p.m. CST (statutory holidays excepted).

To obtain an R.M.A. number you may:                      Call: (306) 955-7075, press '0' for Operator or '2' for Service Dept.  
Or Fax: (306) 384-0086 — Attention: R.M.A. Request

Once an R.M.A. number has been assigned, please refer to it in all correspondence and make certain that all applicable R.M.A. numbers are clearly marked on the outside of each package being returned. You must also ensure that each product is shipped to WaveCom in its original shipping container (or equivalent) via Prepaid carrier, with appropriate insurance and customs documentation (where required). WaveCom will not accept collect shipments, damaged shipments or shipments unaccompanied by an R.M.A. number.

Items will be returned from WaveCom to the customer via prepaid ground carrier. Any alternate means of shipment must be requested by the customer and will be subject to additional charges.

Please ship authorized returning items to:            **Repair Center**  
WaveCom Electronics Inc.  
202 Cardinal Crescent  
Saskatoon, SK Canada S7L 6H8

### **4.3 Repair Charges and Warranty Exemptions**

Items returned beyond the warranty period or items that do not qualify for warranty service are subject to additional out-of-warranty repair charges. Descriptions of these charges and warranty exemptions are below:

- 1) Repair turnaround time is typically 5-10 working days after receipt of the item at WaveCom. A Flat Rate Repair Charge will apply to all out-of-warranty items. Flat Rate Repair Charges are subject to change without notice.
- 2) Any faults due to customer error (ie - incorrect set-up or configuration settings) are subject to the current Test Fee and will be exempt from warranty.
- 3) Items returned with inadequate fault descriptions are subject to the current Test Fee and are exempt from warranty.
- 4) In the event that no fault is found, the item is subject to the current Test Fee and will be exempt from warranty.
- 5) Any product exhibiting external damage (either from shipping, improper handling or use) will be subject to inspection. If said damages are determined to be the cause of failure, the item will be exempt from warranty. All repairs to correct the external damage are subject to Time & Materials Charges (parts and labor at current rates).
- 6) Items with damage caused by unauthorized repairs or by external devices are subject to current out-of-warranty Flat Rate Repair Charges and are exempt from warranty.
- 7) All products returned for Factory Optioning are subject to the applicable current Option Charge plus Test Fee. Factory-optioned products carry the balance of the original warranty or a 90 day warranty, whichever is greater.

All out-of-warranty repairs must be approved by the customer in writing. No repairs will be made until the customer's Purchase Order or Out-Of-Warranty Repair Authorization is received.



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