

5.7-5.8 GHz Integrated Broadband Wireless Transceiver TRI5758

INSTALLATION AND OPERATION GUIDE FOR SYSTEM OPERATORS



Thank-you for purchasing this product and welcome to WaveCom!

You have chosen an innovative broadband wireless 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 such as **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 such as AT&T, Cisco Systems, Cogeco, Comcast, and Cox Communications.

WaveCom designs and manufactures:

✓Agile CATV Modulators	✓256 QAM Upconverters	✓Digital Video Modulators
Frequency Translators	✓Spread Spectrum Devices	✓Off-Air Demodulators
✓Video-On-Demand Products	✓Wireless Cable MMDS	✓Wireless Cable LMDS
✓Frequency Stackers	✓Subscriber Transceivers	✓Satellite Receivers
and more! Designs to fill the mar	ket needs of the CATV industry – b	ooth 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 stateof-the-art communications equipment and components. Through the remarkable success of our customers and business partners, WaveCom innovations are achieving this goal.



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TRI5758 Manual; ML_TRI5758_02 (May 2003); Approval Pending

Specifications subject to change without notice - Printed in Canada

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. The user should not attempt servicing. There are no user serviceable parts inside. Refer all servicing to factory qualified personnel.

4. 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.

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. 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.

INFORMATION TO USER

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) This device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for Class B Digital Device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna
- Increase the separation between the equipment and receiver
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected
- Consult the dealer or an experienced radio/TV technician for help

CAUTION: Any changes or modifications not expressly approved by WaveCom Electronics, Inc. could void the user's authority to operate the equipment.

CAUTION: This device must be professionally installed.

WARNING:

In order to comply with the FCC radiofrequency exposure limits of 1.1310, this equipment must be installed in such a way as to provide a minimum separation distance of 0.5m from the transmitting antenna to persons nearby.

The installer of this radio equipment must ensure that the antenna is located or pointed such that it does not emit RF fields in excess of Health Canada's limits for the general population; consult Safety Code 6, obtainable from Health Canada's Website <u>www.hc-sc.gc.ca/rpb</u>.

INDEX

1.0 GENERAL INFORMATION	7
1.1 Functional Overview	
1.2 Module Features	7
1.3 Specifications	8
2.0 INSTALLATION	9
2.1 Unpacking the Unit	9
2.2 Mounting the Unit	9
2.3 Connection to the Power Inserter and Cable Modem	
2.4 Waterproofing Connections	
3.0 TUNING THE ANTENNA	17
3.1 Signal Strength Tuning via Internal Beeper	
3.2 Reset the Unit to continue Tuning	17
4.0 WARRANTY AND SERVICE POLICIES	
4.1 Warranty Statement	
4.2 Service Policies: How to Return an Item for Service:	
4.3 Repair Charges and Warranty Exemptions	

1.0 GENERAL INFORMATION

1.1 Functional Overview

WaveCom's TRI5758 is an all-weather transceiver designed for subscriber end-use in a fixed broadband wireless system. The TRI5758 combines a low noise downconverter, high power upconverter, directional antenna, and high rejection diplexer to offer a fully integrated RF solution. The TRI5758 transceiver serves to frequency translate and amplify both Upstream and Downstream signals to the appropriate intermediate frequencies for use by an indoor a DOCSIS-compliant or similar cable modem. The TRI5758 is intended to be installed outdoors and connected to the cable modem via low cost 75-ohm coaxial cable such as RG-59, or RG-6. The weatherproof enclosure includes an external F-connector, and internal signal strength indicating beeper, which allows for easy alignment and installation of the unit.

1.2 Module Features

- Meets unlicensed-band maximum allowable transmit power of +28 dBm EIRP
- High Receive Gain of 53 dB allows for optimal Downstream signal recovery for high SNR
- Automatic transmitter RF mute when modem is not transmitting
- Low Noise Figure; < 6 dB typical
- Digital temperature compensation to guarantee specifications over full operating range
- All local oscillators are frequency synthesized and locked to a common internal high stability reference
- Integrated planar antenna
- High reliability, state-of-the-art design using microstrip, MMIC and surface mount technology
- Conservative component derating and 100% burn in help ensure reliable operation
- Fully weatherized unit, suited for outdoor mounting
- Audible installation alignment beeper; to facilitate customer self install

1.3.1 TRI5758 Inband Transceiver Specifications

TRANSMIT SPECIFICATIONS

IF Input Frequency RF Output Frequency

Gain (Integrated) Gain Flatness (Frequency Response)

Gain Stability over Temperature Linear Output Power Spurious (at transmit port) Phase Noise Spectral Inversion Return Loss (IF) IF Level for RF Activation RF Activation/Mute Response Time

DOWNCONVERTER SPECIFICATIONS

RF Input Frequency

IF Output Frequency Gain (Integrated) Gain Flatness (Frequency Response)

Gain Stability over Temperature Noise Figure6.0 dB typical, 7dB max Image Rejection Discrete Spurious (at IF port)

Phase Noise (IF) Spectral Inversion

GENERAL

Integrated Flat Panel Antenna Gain Beamwidth Polarity Cross Polarization Isolation Front/Back Ratio Frequency Setting & Stability Frequency Stability Over Time IF Connector DC Supply Operating Temperature

Size Mounting

Weight

18 to 42 MHz 5727 - 5751 MHz (Option T5727-5751R5775-5799) 5751 - 5775 MHz (Option T5751-5775R5799-5823) 26 dB +/- 2 dB +/- 1 dB full band +/- 0.5 dB over any 6 MHz band +/- 2.0 dB +5 dBm into antenna (16 QAM, QPSK) -40 dBm 9 kHz to 21.4 GHz < -85 dBc/Hz @ 10 KHz typical No spectral inversion 10 dB in Transmit and Receive bands + 5 dBmV <2 microseconds

5775 - 5799 MHz (Option T5727-5751R5775-5799) 5799 - 5823 MHz (Option T5751-5775R5799-5823) 516 -540 MHz 53 dB +/- 2 dB +/- 1.5 dB full band +/- 0.5 dB any 6 MHz band +/- 2.0 dB

90 dB minimum -80 dBm between 510 and 546 MHz -50 dBm from 5 MHz to 510 MHz and from 546 MHz to 860 MHz <-85 dBc/Hz @ 10 kHz typical No spectral inversion

23 dBi 9.0 degrees Vertical or Horizontal 20 dB 30 dB +/- 15 kHz (-30 to +40°C) < +/- 25 kHz over 10 years F female, 75 ohms 18 to 24 VDC, 12W max. -30°C to +40°C (full specifications) -45°C to +45°C (operational) 30.5 x 30.5 x 7.5 cm (12" x 12" x 3") Pole mount 1" to 2.5" dia. pole or wall mount with 90 deg pol, az and el adjustment 2.7kg max.

2.0 INSTALLATION

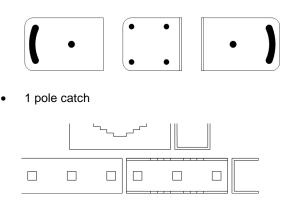
2.1 Unpacking the Unit

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

The following hardware is included in the box for mounting the brackets to the pole:

• 1 L-bracket (taped to one of the foam pieces inside the box)



- 1 V-bolt
- 4 #10-32 flange locknuts for connecting L-bracket to cover
- 2 ¼ 20 flange locknuts for connecting V-bolt and pole catch to the pole

The TRI5758 was designed for mounting on a pole with a diameter of 1.0" to 1.75". Please ensure that the pole used is attached securely to the building or other mounting location.

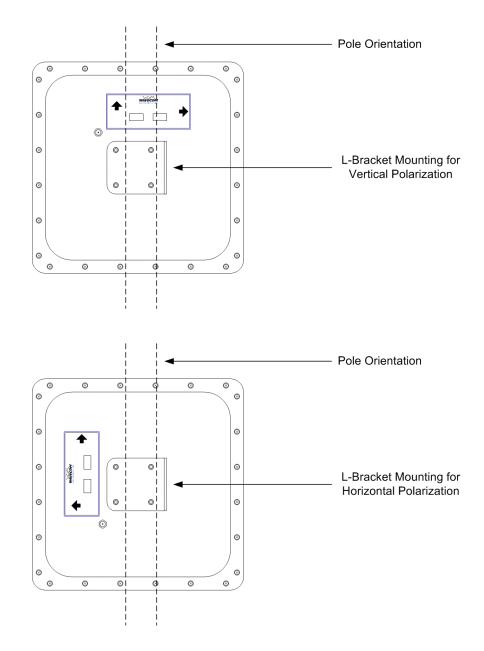
Step 1 – Attach L-Bracket to TRI5758

Before the unit can be attached to the pole, the L-bracket must be attached in the correct orientation according to the polarization required for the particular customer installation. Diagram 2.2A shows the orientation of the bracket relative to the cover for both horizontal and vertical polarization.

The active or desired polarization is the one in which the arrow points up. For example, when the TRI5758 is mounted on the pole, if the arrow pointing up on the back of the TRI5758 says "Horizontal Polarization" then the horizontal polarization is the active polarization. When the TRI5758 is mounted on the pole, if the arrow pointing up on the back of the TRI5758 is mounted on the pole, if the arrow pointing up on the back of the TRI5758 is mounted on the pole, if the arrow pointing up on the back of the TRI5758 is mounted on the pole, if the arrow pointing up on the back of the TRI5758 is mounted on the pole, if the arrow pointing up on the back of the TRI5758 is mounted on the pole, if the arrow pointing up on the back of the TRI5758 says "Vertical Polarization", the vertical polarization is the active polarization

Secure the L-bracket to the cover using the #10-32 locknuts.

DIAGRAM 2.2A: L-BRACKET ORIENTATION



Once the L-bracket is in place, the unit can be mounted to the pole. The pole catch, V-bolt and L-bracket are oriented as shown in Diagrams 2.2B and 2.2C.

DIAGRAM 2.2B: TRI5758 MOUNTED TO POLE

Horizontal Alignment

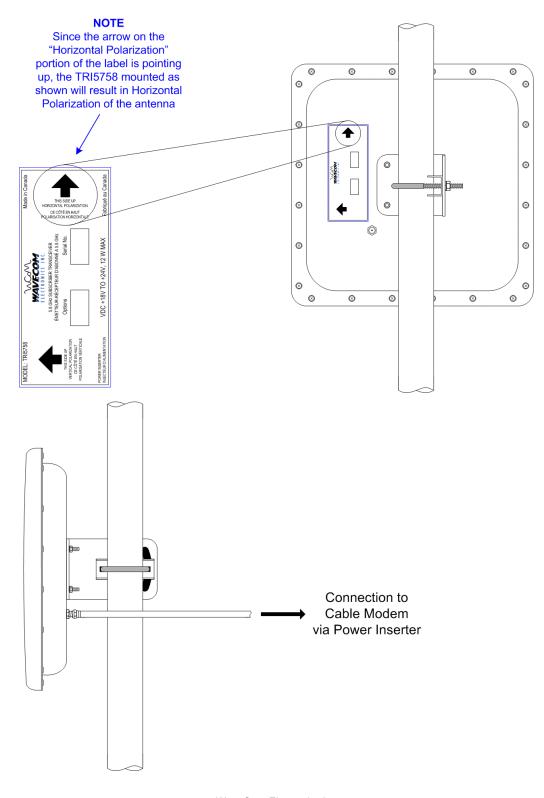
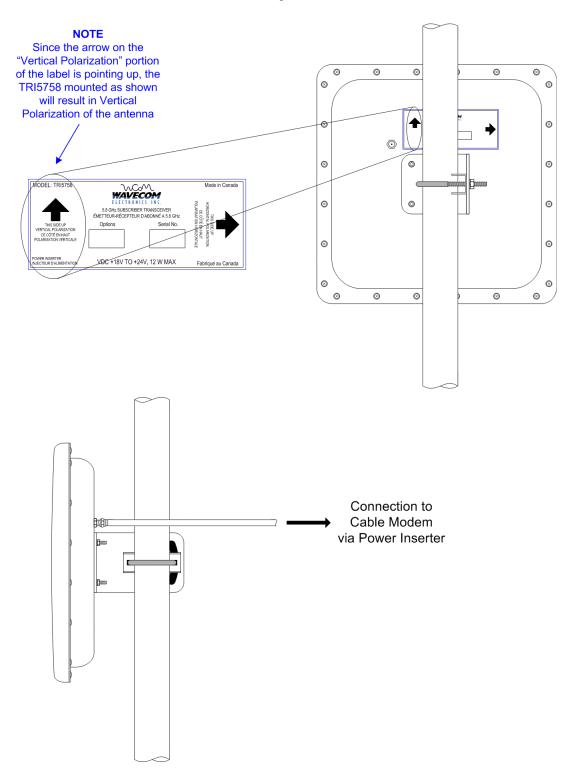


DIAGRAM 2.2C: TRI5758 MOUNTED TO POLE

Vertical Alignment



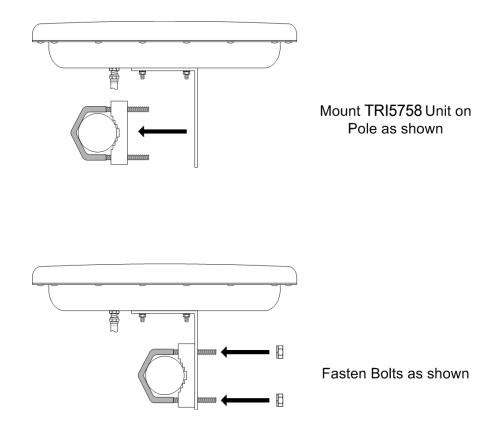
STEP 2 - Position V-bolt and pole catch around pole

To attach the TRI5758 to the pole, first position the pole catch over the threads of the V-bolt and hold against the pole with one hand.



STEP 3 – Position TRI5758 against pole

Using the other hand, bring the TRI5758 up to the pole catch and grab V-bolt, pole catch and L-bracket in a single hand. Ensure that the pole is inside the "L" of the L-bracket and not on the outside of the L. This is necessary to maintain antenna alignment during high winds.



STEP 4 - Tighten TRI5758 against pole

Tighten both ¼" locknuts against the L-bracket so that the unit is held against the pole but can still be rotated and tilted up and down for antenna alignment. The locknut closest to the antenna can be tightened almost all the way while the back one should be approximately finger tight.

2.3 Connection to the Power Inserter and Cable Modem

Connections to the TRI5758 are made as shown in Diagram 2.3A Please note:

 Connect the TRI5758 F-Connector to the power inserter, located indoors with the cable modem. The power inserter is then connected to the Cable Modem, only after the antenna is aligned. The power inserter has three connections:

DC POWERConnect to wall adapter with the supplied RG-59 cable with F connectorsTO MODEMConnect to cable modem (install modem only after the antenna is aligned)TO TRANSCEIVERConnect to TRI5758

WARNING!



If the power inserter is incorrectly connected, the TRI5758 will not operate, and the cable modem could be damaged.

Ensure that the unit is connected in the fashion shown in Diagram 2.3A before plugging in the wall adapter.

2) After connection, the F connector on the TRI5758 **must** be waterproofed with the supplied rubber sealing tape. See section 2.4 for details.

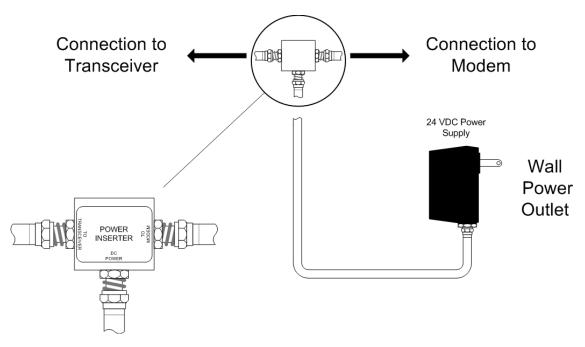


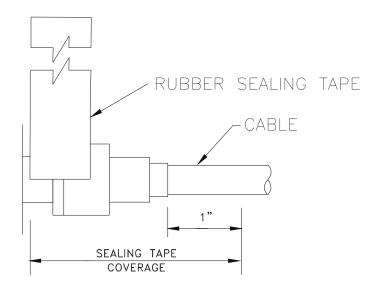
DIAGRAM 2.3A: CONNECTION TO CABLE MODEM VIA POWER INSERTER

2.4 Waterproofing Connections

Many transceiver problems can be attributed to environmental conditions (including vibration), which can loosen cables and permit moisture to penetrate the connectors. It is highly recommended that the connectors be sealed using a technique similar to the one described below. This will provide moisture protection and keep the connections tight. For your convenience, WaveCom has provided a 6" (15 cm) length of rubber self-amalgamating sealing tape to use on the outdoor connection of the TRI5758.

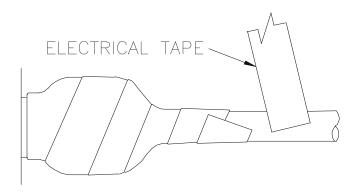
<u>Step 1</u>

Use a 6" section of rubber sealing tape. Starting at the TRI5758 end, stretch the tape and wrap it around the connector as close as possible to the wall of the TRI5758. Overlap the tape by approximately one-half of its width so that it can form a seal with itself. Extend the wrapping to approximately one-inch past the end of the connector.

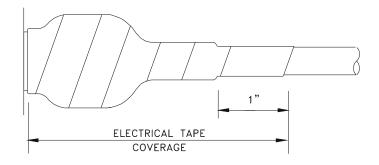


<u>Step 2</u>

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 TRI5758 end and without breaking the tape, wrap back down to the cable end.



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



3.0 TUNING THE ANTENNA

3.1 Signal Strength Tuning via Internal Beeper.

When the unit is first powered up; or power-cycled any time thereafter; an audible signal strength indicator (beeper) will be activated.

Fast beeping indicates a high relative signal strength, whereas slow beeping indicates that the unit requires peaking.

Adjust the unit first panning left and right, then up and down until the rate of beeping is maximized. If the unit is difficult to tilt or turn, loosen the locknuts on the V-bolts slightly.

If the beep rate is very quick this means the antenna alignment is optimal. At this point it is recommended that a portable signal analyzer be used to further fine-tune the antenna alignment. Once antenna alignment is complete, tighten the locknuts to secure the TRI5758 to the pole. If the signal strength is now optimized within acceptable modem receive levels the beeping will stop after approximately 5 minutes or less.

If the beeping rate continues to remain low this may indicate a potential line of sight, distance limitation, and/or a CPE or Base Station RF issue. Try installing the unit in a different location with a better/higher line of sight if possible.

If the beeping quits at any time during tuning, simply power-cycle the unit to reactivate the beeper.

3.2 Reset the Unit to continue Tuning

To reset the timer for alignment, simply unplug the power supply from its AC connection. Wait 5 seconds, then plug the power supply back into its AC connection. The beeper will begin beeping as soon as power is available.

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 units that have been physically or environmentally abused.

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. The serial number of a unit can be found on a barcode label similar to the one pictured below. R.M.A. service is available Monday to Friday from 8:30 a.m. to 4:30 p.m. CST (statutory holidays excepted).



may:

To obtain an R.M.A. number you

Call: (306) 955-7075, press '0' for Operator, or '3' for Service Dept. Fax: (306) 384-0086 — Attention: R.M.A. Request Email: support@WaveCom.ca

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.

For items still under Warranty – Items will be returned from WaveCom Electronics Inc. to its customer via prepaid ground carrier. The customer is responsible for any additional costs incurred, including custom clearance and duties. Any alternate means of shipment must be requested by the customer and will be subject to additional charges.

For items no longer under Warranty – Items will be returned from WaveCom Electronics Inc. to its customer via prepaid ground carrier at the customer's expense. The customer is responsible for any additional costs incurred, including custom clearance and duties. Any alternate means of shipment must be requested by the customer and will be subject to additional charges.

Shipping Instructions will be provided by the repair center when the RMA number is sent to the customer.

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 5-14 business 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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