



**4-Wire Isolator, Converter, Repeater,
and Splitter in an Aluminum Housing**

ECT_[DIN]

User's Manual

All product names are registered trademarks of their respective companies.

Customer Support

Moore Industries is recognized as the industry leader in delivering top quality to its customers in products and services. We perform a sequence of stringent quality assurance checks on every unit we ship. If any Moore Industries product fails to perform up to rated specifications, call us for help. Our highly skilled staff of trained technicians and engineers pride themselves on their ability to provide timely, accurate, and practical answers to your process instrumentation questions. Our headquarters and other facilities phone numbers are listed below.

There are several pieces of information that can be gathered before you call the factory that will help our staff get the answers you need in the shortest time possible. For fastest service, gather the complete model and serial number(s) of the problem unit(s) and the job number of the original sale.

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Safety Messages

Please read this manual in its entirety. It should answer most of your questions. For personal and system safety, and for optimum product performance, make sure you thoroughly understand the contents before installing, using, or maintaining this product. Should you still have questions please visit our web site at www.miinet.com or contact any of our sales/support offices nearest you.

Your safety and the safety of others is very important. We have provided many important safety messages in this manual. Please read these messages carefully. These safety messages alert you to potential hazards that could hurt you or others or render damage to units.

All Moore Industries instrumentation should only be used for the purpose and in the manner described in this manual. If you use this product in a manner other than that for which it was intended, unpredictable behavior could ensue with possible hazardous consequences.

Each safety message is associated with a safety alert symbol. These symbols are found in the throughout the manual. The definition of these symbols is described below:

Pay particular attention wherever you see the following symbols:



Note – Information that is helpful for a procedure, condition or operation of the unit.



Caution – Hazardous procedure or condition that could damage or destroy the unit.



Warning – Hazardous procedure or condition that could injure the operator.

Qualified Personnel

The Moore Industries' product/systems described in this manual may be operated only by personnel qualified for the specific task in accordance with the relevant documentation, in particular its warning notices and safety instructions. Qualified personnel are those who, based on their training and experience, are capable of identifying risks and avoiding potential hazards when working with these Moore Industries' products/systems.

Proper use of Moore Industries products

Moore Industries' products may only be used for the applications described in the catalog and in the relevant technical documentation. If products and components from other manufacturers are used, these must be recommended or approved by Moore Industries'. Proper transport, storage, installation, assembly, commissioning, operation and maintenance are required to ensure that the products operate safely and without any problems. The permissible ambient conditions must be complied with. The information in the relevant documentation must be observed.

We have reviewed the contents of this publication to ensure consistency with the hardware and/or software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions. Specifications and information are subject to change without notice.

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Introduction

This is the user's manual for Moore Industries' line of 4-wire, Economy Signal Isolator/Converters, the ECT [DIN]. Available in configurations that accept a variety of inputs, the principal function of the ECT family of products is to provide low cost isolation between instruments at either end of a process loop.

ECTs furnish up to 1500Vrms isolation between transmitting and receiving devices.

The ECT can also function as a low-cost signal converter or splitter. Configurations accommodate a single input and your choice of one or two accurate outputs. Dual inputs and dual outputs are also available. Inputs and outputs are available in a variety of industry standard ranges. Refer to the *Ordering Information* table for more information.

The ECT is a highly cost-effective means of protecting process signals from distortions associated with ground loops, motor noise, and other common types of electrical interference.

Specifications

<p>Performance</p> <p>Accuracy: $\pm 0.1\%$ of span</p> <p>Stability: $\pm 0.2\%$ of reading per year</p> <p>Isolation: WITHOUT -RF OPTION: 1500Vrms between input, output and power; WITH -RF OPTION: 500Vrms between input and output, 1500Vrms power terminals</p> <p>Output Response Time: DC Input, 100msec, maximum to 99% of output; AC Input, 400msec, maximum, from 0-99% of output</p> <p>DC Input Resistance: 50 ohms</p> <p>Ripple: 10mV peak-to-peak maximum measured across 250 ohm resistor</p> <p>Load Effect: Current outputs, 0.01% of span from 0 to maximum load</p> <p>Power Supply Effect:</p>	<p>Performance (continued)</p> <p>Maximum Input Overrange: Current inputs, 250% of full scale; DC Voltage inputs, 150% of full scale</p> <p>Burden: 1V maximum with 4-20mA input; 0.01V maximum with 0-5A input</p> <p>Output Current Limiting: 25mA, typical; 30mA, maximum</p> <p>Ambient Conditions</p> <p>Operating Range: -40°C to $+85^{\circ}\text{C}$ (-40°F to $+185^{\circ}\text{F}$)</p> <p>Storage Range: -40°C to $+85^{\circ}\text{C}$ (-40°F to $+185^{\circ}\text{F}$)</p> <p>Ambient Temperature Effect: $\pm 0.007\%$ of span/$^{\circ}\text{C}$, typical; $\pm 0.015\%$ of span/$^{\circ}\text{C}$, maximum</p> <p>Relative Humidity: 0-95% non-condensing</p>	<p>Ambient Conditions (Continued)</p> <p>RFI/EMI Protection: WITHOUT -RF OPTION: Less than $\pm 0.1\%$ of span error when tested at 10V/m @ 20-1000MHZ WITH -RF OPTION: Less than $\pm 0.1\%$ of span error when tested at 30V/m @ 20-1000MHZ</p> <p>Common Mode Rejection: Exceeds 95 dB @ 60Hz with a limit of 1500Vrms</p> <p>Adjustments</p> <p>Front panel potentiometer</p> <p>Span: $\pm 10\%$</p> <p>Zero: $\pm 5\%$ (non-interactive when span is set first)</p> <p>Weight</p> <p>Single I/O Channel: 384g (13.7oz) maximum</p> <p>Dual I/O Channel: 431g (15.4 oz) maximum</p>
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ECT

4-Wire Isolator, Converter, Repeater,
and Splitter in an Aluminum Housing

Ordering Information

Unit	Input	Output	Power	Option	Housing
ECT 4-Wire (Line/ Mains) Powered Isolator/ Converter	SINGLE INPUT CHANNEL: 4-20mA into 50 ohms 1-5V into 1 Mohm 0-10V into 1 Mohm 0-150AC into 100 kohms 0-5AAC into 0.002 ohms DUAL INPUT CHANNELS: 2X4-20mA into 25 ohms 2x1-5V into 1 Mohm 2X0-10V into 1 Mohm (Other AC ranges also available)	SINGLE OUTPUT CHANNEL: 4-20mA into 1000 ohms 4-20MAB* See bi-directional note below 0-10V into 5 kohms minimum DUAL OUTPUT CHANNELS: 600 ohms 2X1-5V into 5 kohms minimum 2X0-10V into 5 kohms minimum SIGNAL SPLITTER DUAL OUTPUT CHANNELS: 2X4-20mA into 600 ohms (available with 4-20mA input only)	24DC , $\pm 10\%$ 117AC , 50/60Hz, $\pm 10\%$ 230AC , 50/60Hz, $\pm 10\%$ (3 watts maximum for single channel models; 5 watts maximum for dual output channel models) 12DC (9-16Vdc)	-DI Differential input. Performs A-B subtraction of two inputs where input A will always be larger than input B. The 4-20mA output will equal 0-100% difference between A and B inputs.* -EM Externally-mounted input transformer for current input (available with 0-5AAC input only) -EP External power, output stage powered by external source (only available on signal splitter in DIN housing) -RF Enhanced RFI/EMI filtering provides 30V/m@20-1000MHz protection with less than $\pm 0.1\%$ of span error (Not available on Dual Input Channel models) -TX 24V transmitter excitation (16V for 2X4-20mA DUAL INPUT model) for powering a 2-wire transmitter (available on 4-20mA input models only; standard on models with 2X4-20mA output) -VTD Standard Factory Calibration with NIST Test Data Report	DIN Aluminum DIN-style housing mounts on 32mm G-type (EN50035) and 35mm Top Hat (EN50022) rails FLB2 Externally-mounted flange provides a secure mount and ensures resistance to vibration

When ordering, specify: Unit / Input / Output / Power / Options [Housing]

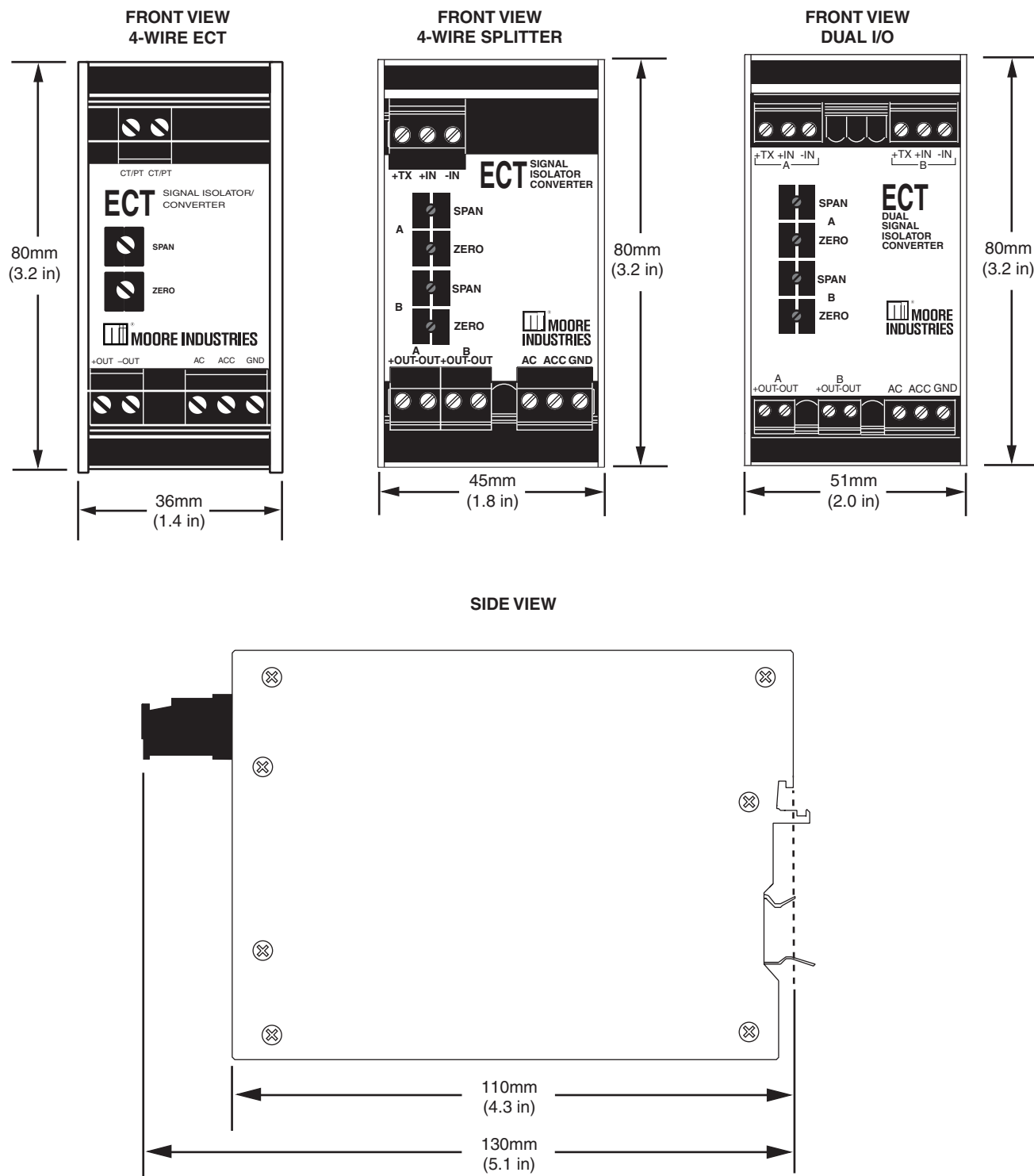
Model number example: ECT / 0-5AAC / 4-20MA / 117AC / -RF [DIN]

Options

The following paragraphs describe the options available with the ECT family of transmitters:

- **EM – Externally Mounted Transformer**, for use with the 0-5Aac input configuration, this option consists of a toroidal transformer that physically separates high-level current input from the receiving device in a process loop. This provides the added convenience of allowing the servicing of receivers without having to interrupt process signals.
- **TX – Transmitter Excitation**, available for use with the 4-20mA input configuration, TX-equipped ECTs provide power for a 2-wire transmitter in the process loop, eliminating the need to provide separate power supplies for the non-isolated transmitters.
- **RF – RFI/EMI Protection**, available for use with our aluminum housings, this option provides you with outstanding protection against RFI and EMI interference. Units with the -RF option are provided with 30V/m@20-1000MHZ protection with less than $\pm 0.1\%$ of span error (requires -EM option for AC current input)

Figure 1. Dimensions of the aluminum-housed ECT and ECT Splitter [DIN]



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4-Wire Isolator, Converter, Repeater,
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Table 1. Terminal Designations for 4-Wire Units

4-Wire (Line/Mains-Powered) Models	Top Terminals (left to right)			Bottom Terminals (left to right)							
	T1	T2	T3	B1	B2	B3	B4	B5	B6	B7	B8
AC Power Single Input/Dual Outputs & -TX	+TX	+IN	-IN	A +OUT	A -OUT	B +OUT	B -OUT		AC	ACC	GND
DC Power Single Input/Dual Outputs & -TX	+TX	+IN	-IN	A +OUT	A -OUT	B +OUT	B -OUT		DC	DCC	GND
	T1	T2	T3	B1	B2	B3	B4	B5	B6		
Power with AC Input or -EM Option		CT/PT	CT/PT	+OUT	-OUT		AC	ACC	GND		
AC Power with -TX Option	+TX	+IN	-IN	+OUT	-OUT		AC	ACC	GND		
Power with DC Input or -EM Option		CT/PT	CT/PT	+OUT	-OUT		DC	DCC	GND		
DC Power with -TX Option	+TX	+IN	-IN	+OUT	-OUT		DC	DCC	GND		

Table 2. Terminal Designations for 4-Wire Dual I/O Units

4-Wire (Line/Mains-Powered) Dual I/O Models	Top Terminals (left to right)									Bottom Terminals (left to right)								
	T1	T2	T3	T4	T5	T6	T7	T8	T9	B1	B2	B3	B4	B5	B6	B7	B8	B9
AC Power & Dual Inputs/Dual Outputs	A +TX	A +IN	A -IN				B +TX	B +IN	B -IN	A +OUT	A -OUT		B +OUT	B -OUT		AC	ACC	GND
DC Power & Dual Inputs/Dual Outputs	A +TX	A +IN	A -IN				B +TX	B +IN	B -IN	A +OUT	A -OUT		B +OUT	B -OUT		DC	DCC	GND

Key	Definition
A	Channel 1 on dual output models
B	Channel 2 on dual output models
AC	AC line power input
ACC	AC line power return (neutral)
CT/PT	Current Transformer/Potential Transformer input
DC	+DC power input
DCC	-DC power input
GND	Ground
IN	Input signal (+ or -)
OUT	Output signal (+ or -)
-TX	Transmitter excitation for powering 2-wire transmitter

Calibration

Prior to shipment, every ECT is subjected to rigorous testing by our team of skilled technicians. Every product Moore Industries manufactures, sells and services is guaranteed to meet the strict quality standards that have become synonymous with our company name.

Before placing your ECT into service, a bench check of basic operation is recommended to ensure that the unit hasn't sustained any damage during transit, and to set zero and span points for your application.

Every unit should be:

- Checked to verify that the appropriate ECT model has been ordered for the intended application.
- Connected in a calibration setup (described later in this section) and checked for desired output.
- Adjusted for desired zero and span.

Table 3. Gathering the equipment for 4-wire ECT calibration

Device	Specifications
Voltage/Current Calibrator	Adjustable, calibrated to an accuracy of $\pm 0.025\%$ (EDC Model CR 103 or MV 105 or equivalent) Rotek Model 811A (or equivalent) recommended for calibrating AC input units.
Power Supply	Calibrated, 24Vdc, $\pm 10\%$, nominal or 117Vac $\pm 10\%$ or 230Vac $\pm 10\%$
Load Resistor	250 ohms ($\pm 0.01\%$) precision
Multimeter	Calibrated to an accuracy of $\pm 0.025\%$, minimum (Keithley Model 197, or Fluke Model 8840 or 8842 or equivalent)
Screwdriver	Standard (Blade-type), head width 3.1mm (0.125 in), maximum

Calibration Setup

Table 3 lists the equipment you will need to bench check the ECT. These materials are not supplied by Moore Industries, but should be available in those environments suited for calibration and maintenance of electronic instruments.

Figures 2 through 5 show the calibration setups for each type of ECT. Moore Industries recommends that the procedures in this section be carried out at a technician's bench or in a similar, lab-type environment. Do not calibrate the ECT in the field or installed in the application.

Calibration Procedure

With the unit incorporated into the setup described in the appropriate Figure (2, 3, 4 or 5):

1. Apply the appropriate power to the ECT.
2. Set the Voltage or Current Calibrator to 100% span (full scale input) for the type of ECT being calibrated. For example, 20mA for a 4-20mA input unit or 5V for a 1-5V input unit.
3. Adjust the Span potentiometer (pot) until the multimeter reads 20mA, plus/minus the stated accuracy specification. If measuring the voltage drop across the precision resistor, adjust the pot until output is 5V, plus/minus the stated accuracy specification.
4. Set the Calibrator to 0% of the rated span for the type of ECT being calibrated. For example, 4mA for a 4-20mA input unit or 1V for a 1-5V input unit.
5. Adjust the Zero pot until the multimeter reads 4mA, plus/minus the stated accuracy specification. If measuring the voltage drop across the precision resistor, adjust the pot until output is 1V, plus/minus the stated accuracy specification.
6. Repeat steps 2 through 5 for each channel until the ECT output or the voltage across the resistor is stable at both 0 and 100% of rated input span.

ECT

4-Wire Isolator, Converter, Repeater,
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Figure 2. Calibrating the 4-wire ECT

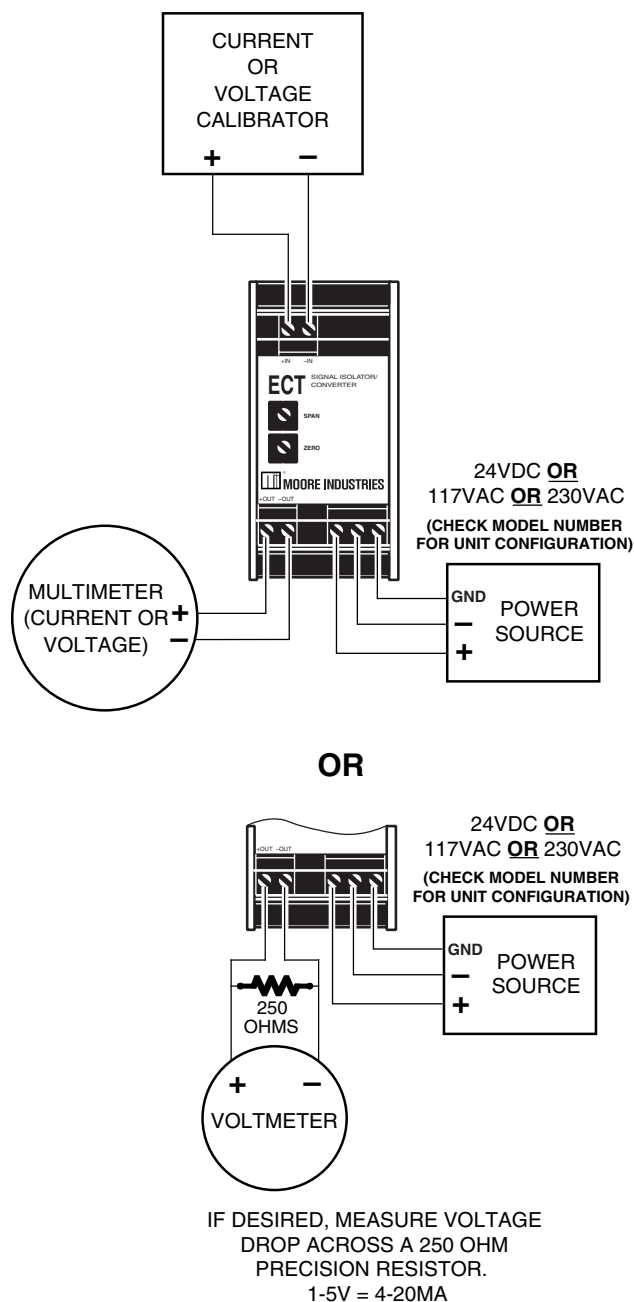


Figure 3. Calibrating the 4-wire ECT equipped with the -EM option

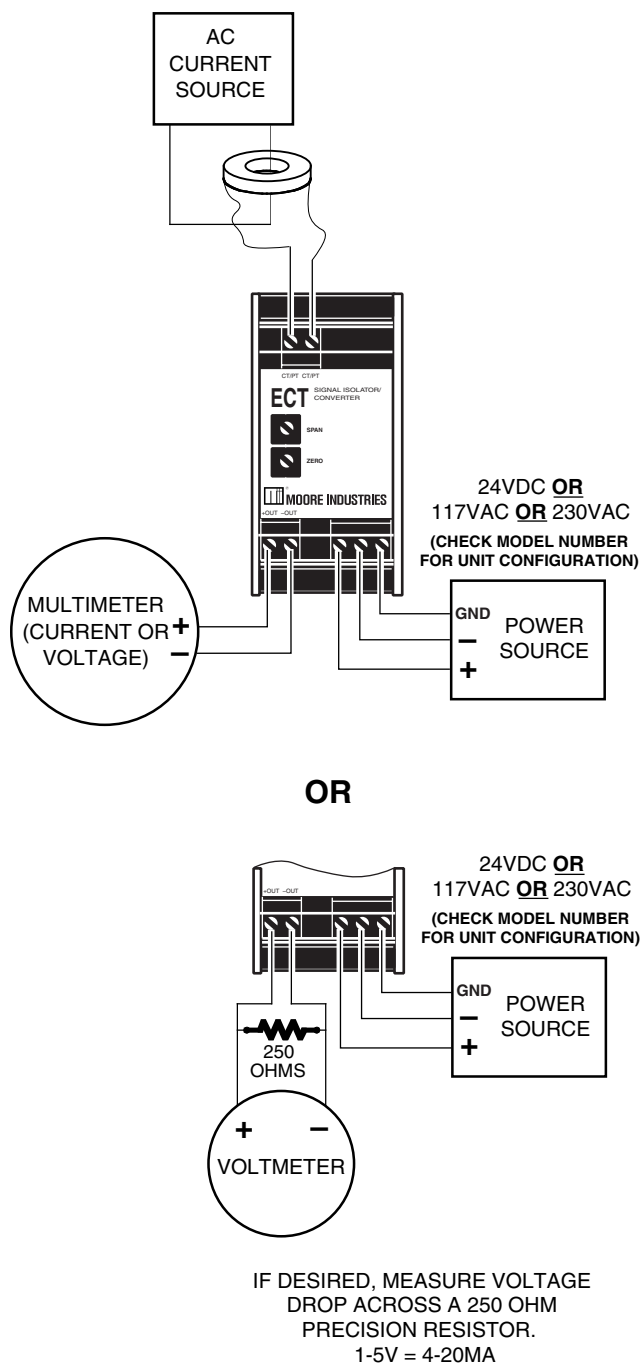


Figure 4. Calibrating the 4-wire ECT Channel Splitter

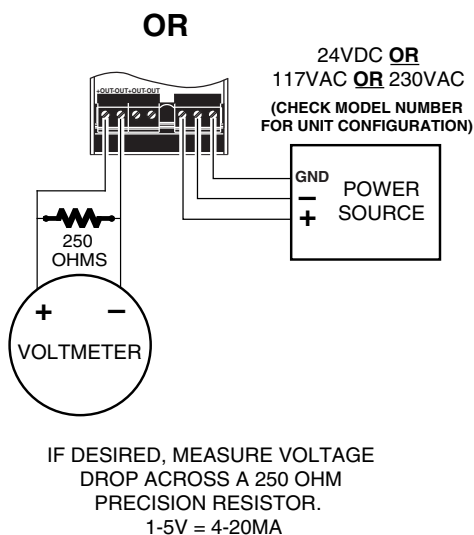
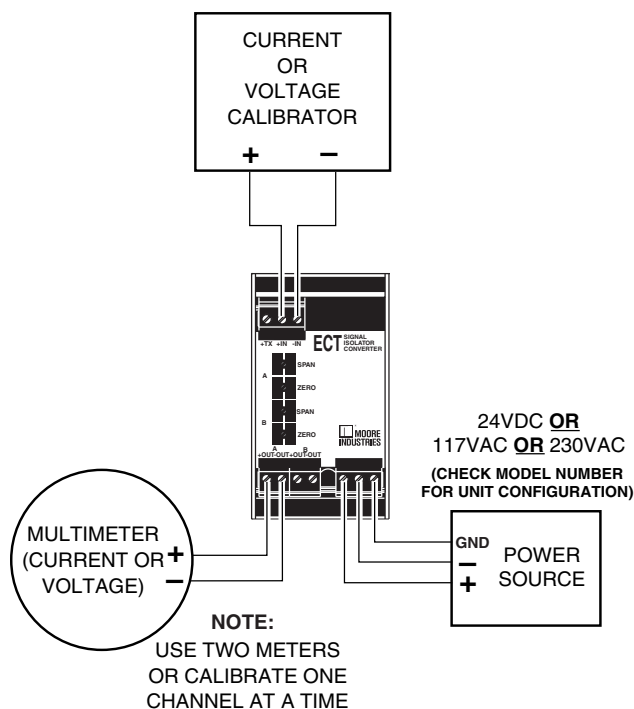
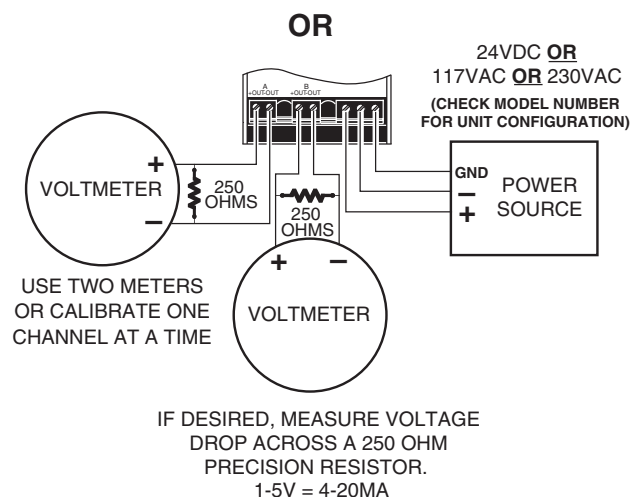
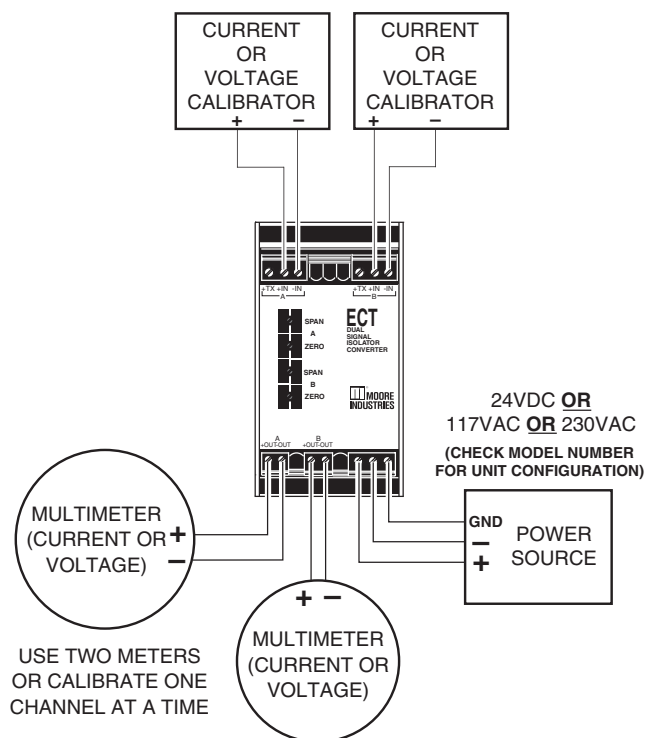


Figure 5. Calibrating the Dual I/O configured ECT



ECT

4-Wire Isolator, Converter, Repeater,
and Splitter in an Aluminum Housing

Installation

Figure 1 shows the physical dimensions of the 4-wire ECT family. To install an ECT, set the appropriate lip on the top edge of the DIN rail and pivot downward until the unit snaps into place.

Electrical Connections

Figures 6 through 11 show typical types of 4-wire ECT installations. Simply hookup the ECT in the directed manner, making sure to notice any pertinent notes.



WARNING: Terminals on this unit may be connected to hazardous voltages. Before making ANY connections to this unit, always remove power from the loop or instrument power terminals.

Installation Category

All terminals are rated CAT I.

Equipment Ratings

The ECT does not generate hazardous voltages, it provides different current or voltage inputs, including 4-20mA, 10-50mA, 1-5V, 0-10V, 0-150AC, 0-250AC, and 0-5AAC range and 4-20mA or 0-10V range outputs. Products connected to the ECT should be designed to receive this type of input.



WARNING: If this unit is used in a manner not specified by Moore Industries, the protection provided by the equipment may be impaired.

Switches and Circuit Breakers

For ECT AC powered units, a switch or circuit breaker must be wired in series with the AC power conductors. The switch or circuit breaker used must be located within three meters of the unit.

The circuit breaker or switch will only remove power to the unit, hazardous voltages may still be connected to other terminals on the unit.

117Vac, 230Vac, and 24Vdc Supply Wiring

All power connections should be made with 12 or 14 AWG (3.3mm² or 2mm²) wire.

The end of each conductor should be stripped no more than 0.25in (7mm). The end of the stripped wire should be tinned with solder, or inserted into a ferrule and crimped before being placed into a terminal block.

Tighten the screws on the terminal block to 5.0 - 7.0 lbf-in (0.56 - 0.79 N·m).

Input/Output Wiring

The Input/Output connections can be made with 12 to 24 AWG (3.3mm² to 0.2mm²) wire.

The end of each conductor should be stripped no more than 0.25in (7mm).

Tighten the screws on the terminal block to 5.0 - 7.0 lbf-in (0.56 - 0.79 N·m).

Protective Earth Conductor

The Protective Earth Conductor shall be of equal or larger size wire than the other two power conductors.

The Protective Earth Conductor shall be the first conductor connected to the unit when the unit is being wired. It shall be the last conductor removed when the unit is being un-wired.

Recommended Ground Wiring Practices

Moore Industries recommends the following ground wiring practices:

- Any Moore Industries product in a metal case or housing should be grounded.
- The protective earth conductor must be connected to a system safety earth ground before making other connections.
- All input signals to, and output signals from, Moore Industries' products should be wired using a shielded, twisted pair wiring technique. Shields should be connected to an earth or safety ground.
- For the best shielding, the shield should be run all the way from the signal source to the receiving device. (see Note below)
- The maximum length of unshielded input and output signal wiring should be 2 inches.



Note: Some of Moore Industries' instruments can be classified as receivers (IPT ², IPX ², etc.) and some can be classified as transmitters (TRX, TRY, etc.) while some are both a receiver and a transmitter (SPA ², HIM, etc). Hence, your shield ground connections should be appropriate for the type of signal line being shielded. The shield should be grounded at the receiver and not at the signal source.

CE Certification-related Guidelines

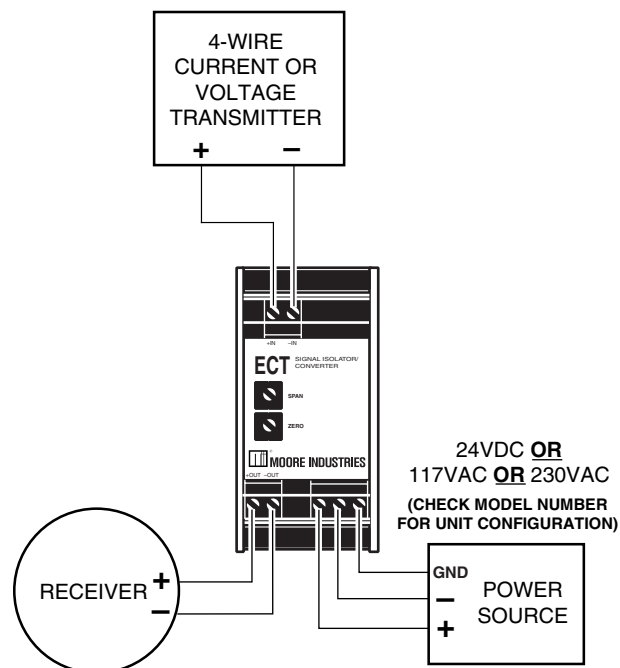
The grounding and wiring practices described above must be followed in order for the unit(s) to meet the requirements set forth in EMC standard EN61326.

The Low Voltage Directive also applies to AC powered and high voltage input versions of the ECT. In order to comply with EN61010-1 (Low Voltage Directive) all guidelines in this section must be followed.

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4-Wire Isolator, Converter, Repeater,
and Splitter in an Aluminum Housing

Figure 6. Installing the 4-wire ECT



OR

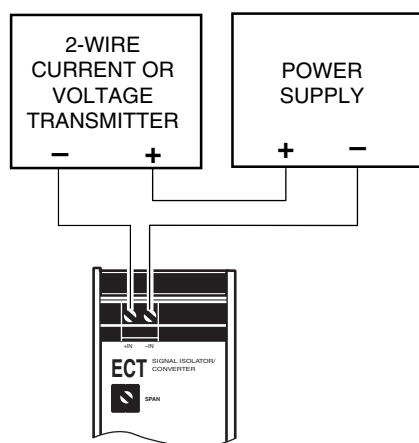
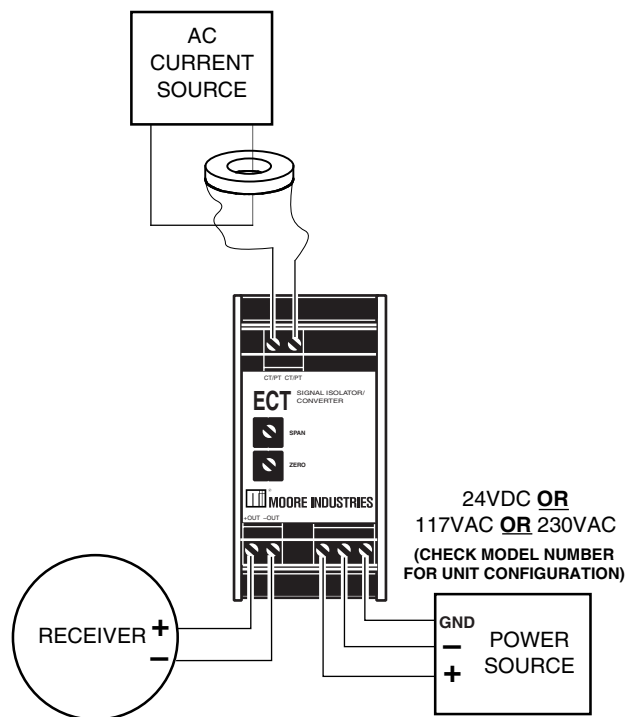


Figure 7. Installing the 4-wire ECT with the -EM option



OR

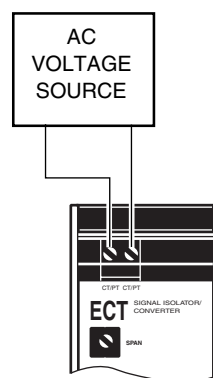


Figure 8. Installing the 4-wire ECT with the -TX option

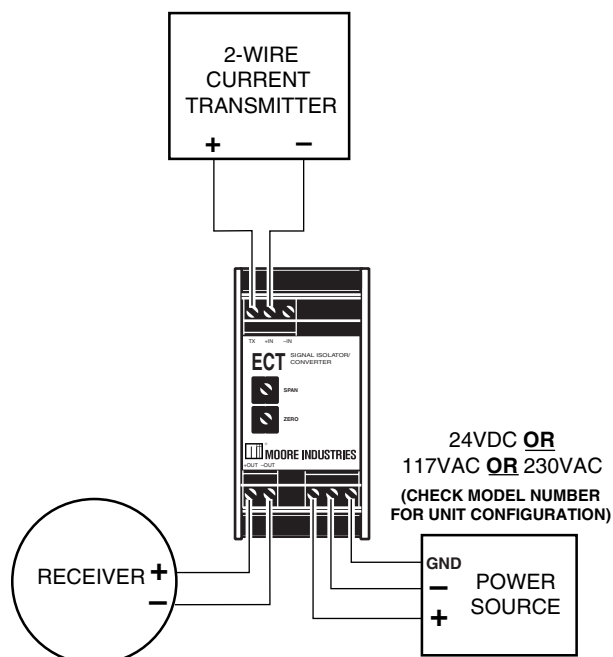
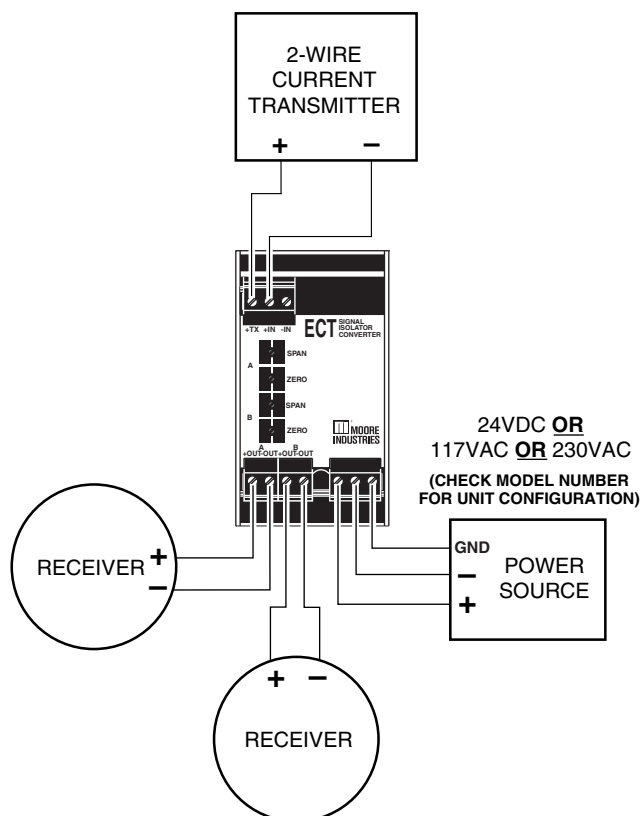


Figure 9. Installing the 4-wire ECT Dual I/O Channel Splitter



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4-Wire Isolator, Converter, Repeater,
and Splitter in an Aluminum Housing

Figure 10. Installing the Dual I/O configured ECT

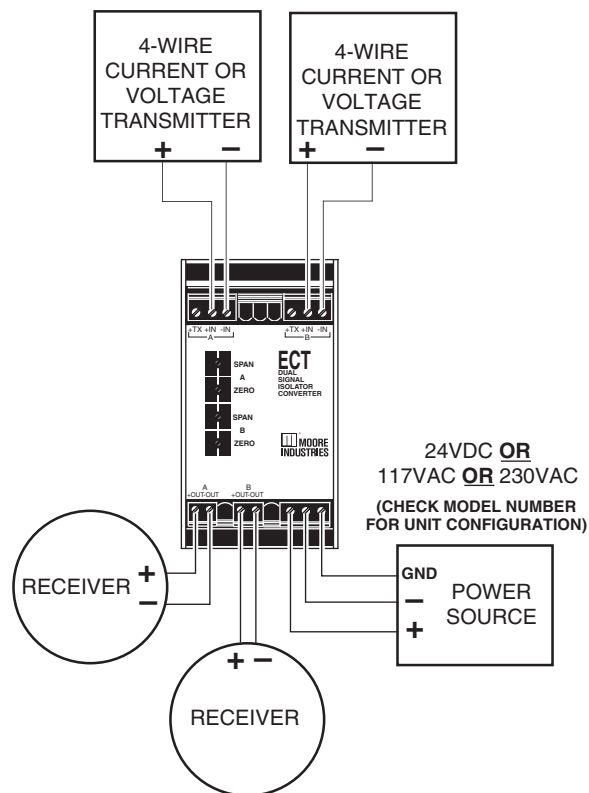
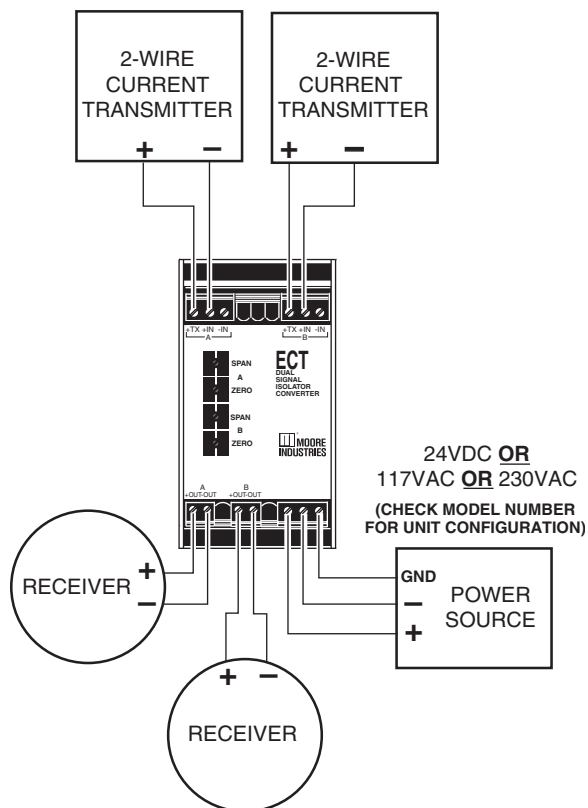
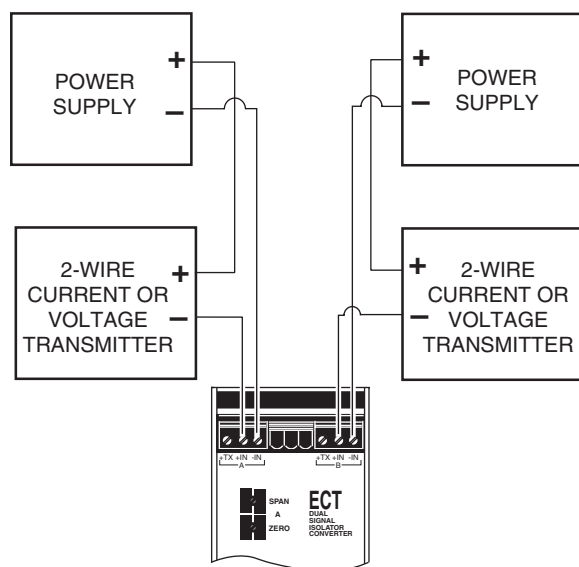


Figure 11. Installing the Dual I/O configured ECT with the -TX option



OR



Installation in Hazardous Locations

This section contains important information regarding installation of the ECT-DIN 2 wire in Hazardous Area locations.



NOTE: The ECT-DIN 2 wire is suitable for Class I Division 2, Groups A-D or General Locations only.



WARNING: Do not disconnect equipment when a flammable or combustible atmosphere is present.



AVERTISSEMENT: Risque d'explosion. Ne pas débrancher tant que le circuit est sous tension, à moins qu'il ne s'agisse d'un emplacement non dangereux.



AVERTISSEMENT: Risque d'explosion. La substitution de composants peut rendre ce matériel inacceptable pour les emplacements de Classe I, Division 2.

Specific Conditions of Use

The following instructions must be adhered to when the ECT-DIN 2 wire is used in hazardous locations and potentially explosive atmospheres.

The ECT-DIN 2 wire shall be installed in compliance with the enclosure, mounting, spacing and segregation requirements of the ultimate application.

cULus Installation
Nonincendive Applications
Class I, Division 2, Groups A-D

The ECT-DIN 2 wire shall be installed into an enclosure that utilizes a tool removable door or cover.

Customer Support

Moore Industries is recognized as the industry leader in delivering top quality to its customers in products and services. We perform a battery of stringent quality assurance checks on every unit we ship. If any Moore Industries product fails to perform up to rated specifications, call us for help. Our highly skilled staff of trained technicians and engineers pride themselves on their ability to provide timely, accurate, and practical answers to your process instrumentation questions.

Factory phone numbers are listed on the back cover of this manual.

If problems involve a particular ECT, there are several pieces of information that can be gathered ***before you call the factory*** that will help our staff get the answers you need ***in the shortest time possible***. For fastest service, gather the complete model and serial number(s) of the problem unit(s) and the job number of the original sale.

Warranty Disclaimer

Moore Industries ("The Company") makes no express, implied or statutory warranties (including any warranty of merchantability or of fitness for a particular purpose) with respect to any goods or services sold by the company. The company disclaims all warranties arising from any course of dealing or trade usage, and any buyer of goods or services from the company acknowledges that there are no warranties implied by custom or usage in the trade of the buyer and of the company, and that any prior dealings of the buyer with the company do not imply that the company warrants the goods or services in any way.

Any buyer of goods or services from the company agrees with the company that the sole and exclusive remedies for breach of any warranty concerning the goods or services shall be for the company, at its option, to repair or replace the goods or services or refund the purchase price. The company shall in no event be liable for any consequential or incidental damages even if the company fails in any attempt to remedy defects in the goods or services, but in such case the buyer shall be entitled to no more than a refund of all monies paid to the company by the buyer for purchase of the goods or services.

Any cause of action for breach of any warranty by the company shall be barred unless the company receives from the buyer a written notice of the alleged defect or breach within ten days from the earliest date on which the buyer could reasonably have discovered the alleged defect or breach, and no action for the breach of any warranty shall be commenced by the buyer any later than twelve months from the earliest date on which the buyer could reasonably have discovered the alleged defect or breach.

Return Policy

For a period of thirty-six (36) months from the date of shipment, and under normal conditions of use and service, Moore Industries ("The Company") will at its option replace, repair or refund the purchase price for any of its manufactured products found, upon return to the Company (transportation charges prepaid and otherwise in accordance with the return procedures established by The Company, to be defective in material or workmanship. This policy extends to the original Buyer only and not to Buyer's customers or the users of Buyer's products, unless Buyer is an engineering contractor in which case the policy shall extend to Buyer's immediate customer only. This policy shall not apply if the product has been subject to alteration, misuse, accident, neglect or improper application, installation, or operation. THE COMPANY SHALL IN NO EVENT BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES.

To return equipment to Moore Industries for repair, follow these four steps:

1. Call Moore Industries and request a Returned Material Authorization (RMA) number.

Warranty Repair –

If you are unsure if your unit is still under warranty, we can use the unit's serial number to verify the warranty status for you over the phone. Be sure to include the RMA number on all documentation.

Non-Warranty Repair –

If your unit is out of warranty, be prepared to give us a Purchase Order number when you call. In most cases, we will be able to quote you the repair costs at that time. The repair price you are quoted will be a "Not To Exceed" price, which means that the actual repair costs may be less than the quote. Be sure to include the RMA number on all documentation.

2. Provide us with the following documentation:
 - a) A note listing the symptoms that indicate the unit needs repair
 - b) Complete shipping information for return of the equipment after repair
 - c) The name and phone number of the person to contact if questions arise at the factory
3. Use sufficient packing material and carefully pack the equipment in a sturdy shipping container.
4. Ship the equipment to the Moore Industries location nearest you.

The returned equipment will be inspected and tested at the factory. A Moore Industries representative will contact the person designated on your documentation if more information is needed. The repaired equipment, or its replacement, will be returned to you in accordance with the shipping instructions furnished in your documentation.



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