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4-Wire/2-Wire HART[®] Isolators



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HIT/HIX

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4-wire/2-wire HART Isolators

Introduction

The Moore Industries' 2-wire, loop powered HIX HART® Isolator, and its 4-wire, mains powered variant, the HIT, are compact, DIN-rail mounted “loop add-ons”. They both are used to break the common electrical (galvanic) path between a HART transmitter and one or more receiving devices in a process instrumentation loop.

About this Manual

Wherever you see a “**WARNING**”, “**Caution**” or “**Note**” pay particular attention.

WARNING - Hazardous procedure or condition that could injure the operator.

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

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

HIT/HIX Description

The HIT and the HIX:

- **Safeguard I/O cards from surges, spikes and transients.** Add the 500Vrms isolating capability of a HART Isolator to a loop to break the common (galvanic) path that can pass dangerous overloads from DCS to HART transmitter to PLC and vice-versa. This hazard is common—even when a transmitter and DCS are supposedly “isolated” already.
- **“Isolate” areas of an application.** Ease maintenance complications by using the 4-wire HIT to maintain secondary loop integrity while the primary HART master is down for maintenance.
- **Facilitate the “Sharing” of one HART output**—safely—with a secondary control or recording device.
- **Eliminate “Bucking” power supply problems.** Whenever more than one 4-wire device provides power to the loop, each power source (typically grounded with differing potentials) vies for control. This can cause both HART and analog signals to fluctuate, adversely affecting loop reliability and accuracy.

Inputs and Outputs

Input to both the HIX and HIT is HART standard 4-20mA with digital data superimposed. Both isolators “pass” the conditioned HART signal through from transmitter to receiver, and from receiver back to transmitter. This “signal passing” is operationally transparent to devices on either end of the loop.

Note:

The HIX and HIT are not HART-addressable devices. They are “invisible” to the other HART devices on the loop.

Transmitter Excitation

The 4-wire HIT is also capable of providing power to the transmitter it is isolating by virtue of its standard, 24V excitation output.

Power

The HIX is a 2-wire isolator, drawing power from the output leg of the loop (typically, the *secondary* DCS, PLC, or ESS).

The HIT is a 4-wire unit. It can be ordered in configurations that draw power from either external DC or external AC sources.

Moore Industries offers a complete line of instrument power supplies ideal for use with the HIT. Ask your local Interface Solutions Expert for information.

Housing

Both the HIX and HIT are housed in aluminum DIN-style housings. Older versions of the product are housed in high-impact, thermoplastic cases. The compact housing styles can be mounted on either G-type DIN-rail or Top Hat DIN-style rail.

¹HART is a registered trademark of the HART Communication Foundation.

Specifications

<p>Performance Accuracy: ±0.1% of span Stability: ±0.2% of reading per year Isolation: HIX: 500Vrms between Input, Output and Case; HIT: 500Vrms Between Input, Output, Case and Power Tested To: HIX: 1500Vrms between Input, Output and Case for 1 minute; HIT: 1500Vrms between Input, Output, Case and DC Power for 1 minute (2300Vrms from AC Power to Input, Output and Case for 1 minute) Common Mode Rejection: Exceeds 95dB at 60Hz with a limit of 1500Vrms</p>	<p>Performance (continued) Input Impedance: 250 ohms nominal, 100 ohms with -IZ100 option Input Overrange Protection: 250% of full scale Output Current Limiting: 25mA typical; 30mA maximum Broken Wire Input: Output driven ≤3mA for HIX; ≤1mA for HIT TX Power Supply: 24Vdc, ±10% @ 24mA (regulated) Ripple: <10mV for HIX & HIT DC power and <35mV for HIT AC power when measured; Across 250 Ohm Resistor. Burden: 5V, maximum Load Capability: Vs – 12Vdc <hr/> 20mA Response Time (analog output): 100msec maximum to 99% of output</p>	<p>Ambient Conditions Temperature Range: -20°C to +85°C (-4°F to +185°F) Effect: ±0.007% of span/°C typical; ±0.015% of span/°C maximum Humidity: 5-95% non-condensing RF/EMI Protection: Less than +/- 0.1% of span error when tested at 10V/m @ 80-1000Mhz ;20V/m @ 80-1000Mhz for -RF option</p> <p>Adjustments Type: Front panel pots Span: ±10% Zero: ±5% (non-interactive when span is set first)</p> <p>Weight HIT: DC 283g (10 oz), AC 425 g (15 oz) HIX: 198 g (7 oz)</p>
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Specifications and information subject to change without notice.

Ordering Information

Unit	Input	Output	Power	Options	Housing
HIT 4-wire, Line-(Mains) Powered, HART Isolator with Transmitter Excitation	4-20mA 4-20mA into 250 ohms with HART digital data superimposed	4-20mA Isolated, 4-20mA into ≤1000 ohms (with 24Vdc, 117Vac, or 230Vac power); HART digital data superimposed	24DC ±10% 117AC 50/60HZ, ±15% 230AC 50/60HZ, ±15% 2 Watts power consumption	-RF 20V/M RFI/EMI Immunity @ 80- 1000MHz, 1KHz AM -IZ100 reduces the input resistance to 100 ohms -LL keeps the output from going below 3.3mA when the input goes to 0mA	DIN Aluminum DIN-style housing mounts on 32mm G-type (EN50035) and 35mm Top Hat (EN50022) rails FLB Flange bracket with top/bottom mounting holes
HIX 2-wire, Loop-Powered, HART Isolator	4-20mA 4-20mA into 250 ohms with HART digital data superimposed	4-20mA Isolated, 4-20mA into ≤600 ohms (with 24Vdc power); HART digital data superimposed	12-42DC	-IZ100 reduces the input resistance to 100 ohms	DIN Aluminum DIN-style housing mounts on 32mm G-type (EN50035) and 35mm Top Hat (EN50022) rails FLB Flange bracket with top/bottom mounting holes

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

Model number examples: HIX / 4-20MA / 4-20MA / 12-42DC / [DIN] and HIT / 4-20MA / 4-20MA / 117AC / -RF [DIN]

HIT/HIX

4-wire/2-wire HART Isolators

Dimensions

Figure 1. Dimensions for Aluminum DIN-Housed HIX and HIT HART Isolators

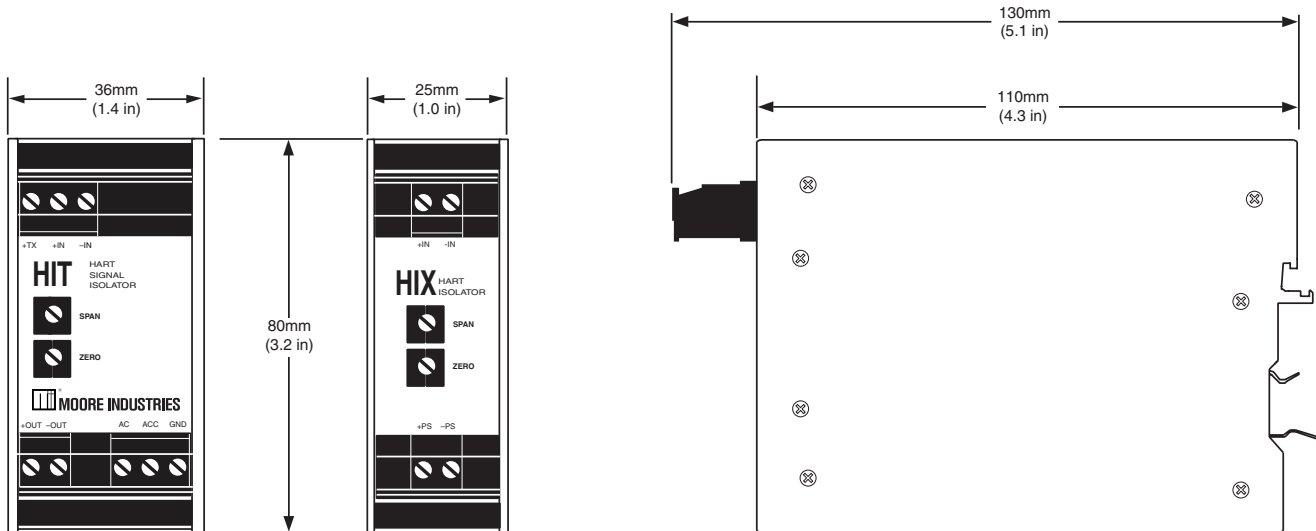
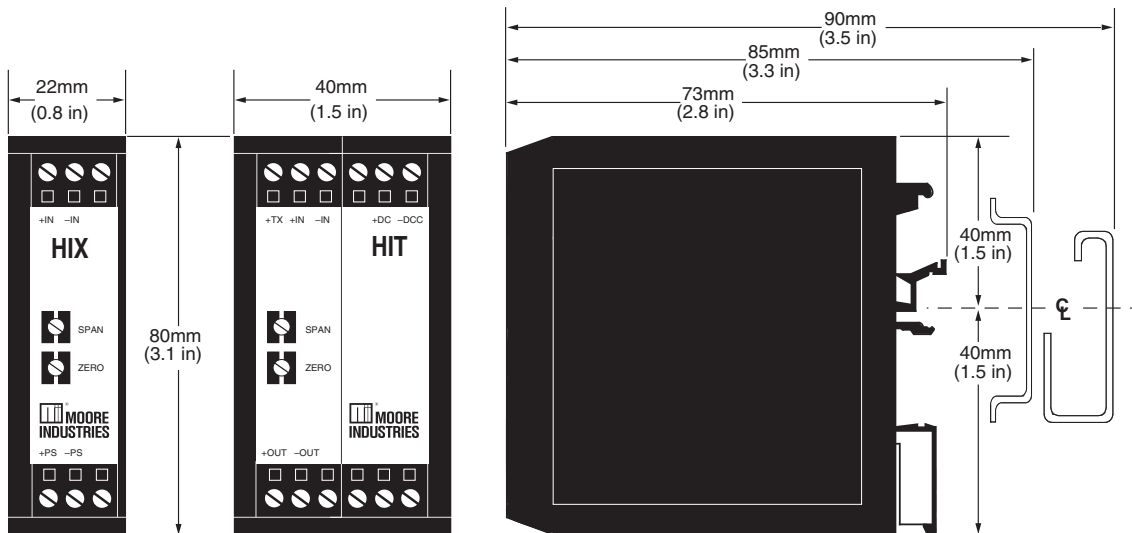


Figure 2. Dimensions of the older legacy HART Isolator Family of Products in ECD Housings



Calibration

To calibrate the HIX or the HIT, set up the equipment listed in Table 1 as shown in Figure 3 and Figure 4, as appropriate.

Table 1. Calibration Equipment for the HIX and HIT

Device	Specifications
Current/Voltage Calibrator	Adjustable, calibrated to an accuracy of $\pm 0.025\%$ (Moore Industries' CLC Current Loop Calibrator or equivalent such as the EDC Model CRC103 or MV105)
HART Communicator	HART Communicator Model 275/375/475 or equivalent. Should be capable of both reading and simulating a valid HART signal (and 4-20mA analog signal)
Power Supply	Calibrated, regulated 24Vdc ($\pm 10\%$) source, nominal, for HIX or dc-powered HIT; calibrated, regulated 117Vac or 230Vac ($\pm 10\%$) source, nominal, for ac-powered HIT
Load Resistor	250ohm with $\pm 0.01\%$ precision; required only if using a Voltmeter to calibrate the analog output from the HIX or HIT (voltage drop across the precision resistor; 4-20mA=1-5V)
Multimeter	Calibrated to an accuracy of $\pm 0.025\%$, minimum; such as Keithley Model 197 or Fluke Model 8840, 8842, or equivalent
Screwdriver	Standard (blade) head; head width 3.1mm (0.125 in), maximum

All referenced product names are the sole property of their respective manufacturers.

Procedure

1. Apply the appropriate power to the unit being calibrated.
2. Set the INPUT (current simulator) to 4mA.
3. Adjust the ZERO potentiometer (pot) on the HIX or HIT front panel until the meter in the setup reads 1V, $\pm 0.02V$.
4. Adjust the INPUT to 20mA.
5. Adjust the SPAN pot on the HIX or HIT front panel until the meter in the setup reads 5V, $\pm 0.02V$.

Note:

HIX and HIT span and zero are non-interactive as long as zero is set first. It is not necessary to repeat steps 3, 4 and 5.

6. Use the HART transmitter simulator to send data or "a command" to the HART receiver simulator in the setup.
7. Use the HART receiver to send data or "a command" to the HART transmitter simulator in the setup.
8. Repeat steps 2 through 5 while using the adjustable current source to change the level of current (staying between 4 and 20mA) in the setup. Note that the HART traffic is unaffected by changes in the 4-20mA flowing through the loop.

HIT/HIX

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Figure 3. Setting up to Calibrate the HIT

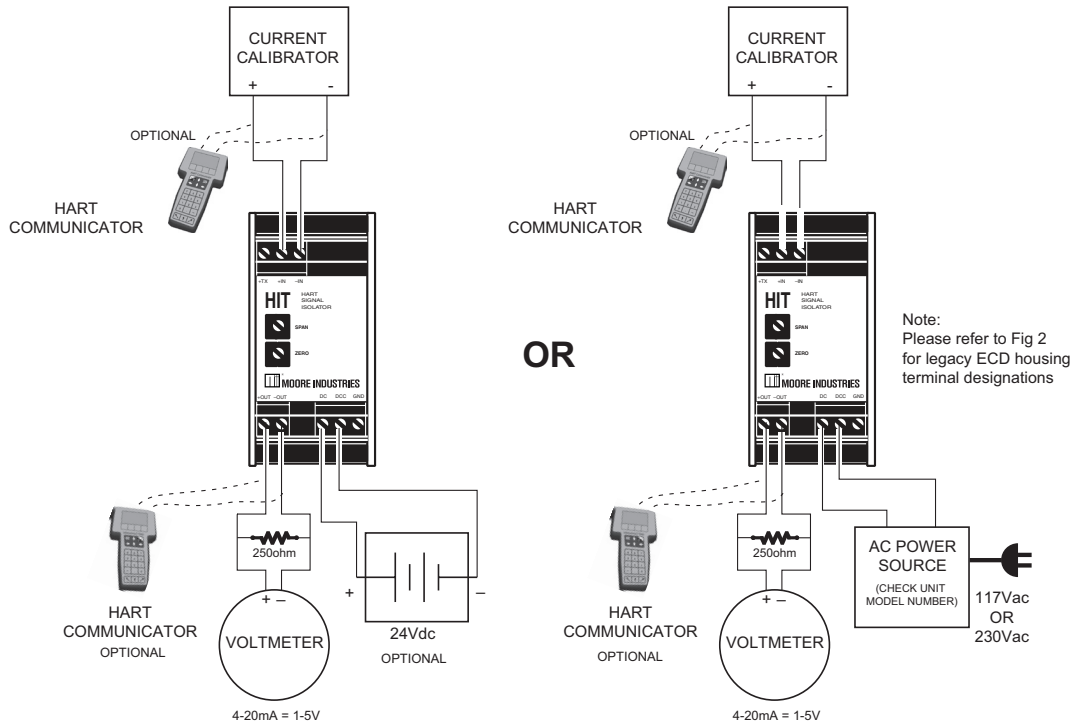
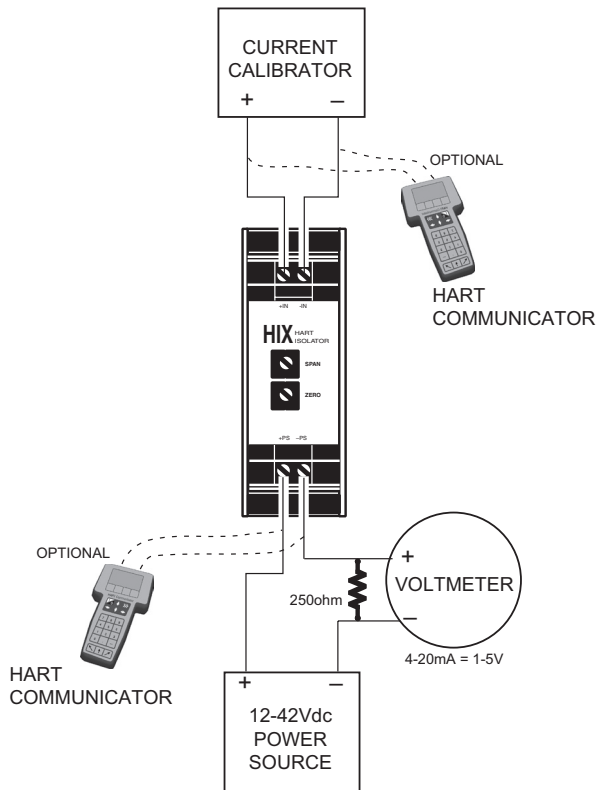


Figure 4. Setting up to Calibrate the HIX



Installation

The HIX and HIT housings accommodate both 32mm, DIN-style G-rail (EN50035) and 35mm Top Hat rail (EN50022). Figure 1 and Figure 2 on Page 3 show the dimensions of the housing for each type of isolator.

Note:

Make sure to calibrate the instruments prior to installation. Also, install all instruments in their intended application and on their rail before making any electrical connections. Allow enough room for pivoting instruments vertically on the rail for removal in applications involving multiple banks of HIXs and/or HITs.

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 (IPT², IPX², etc.) and some can be classified as transmitters (TRX, TRY, etc.) while some are both a receiver and a transmitter (SPA², 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.

Electrical Connections

Caution:

Always remove power from the loop before making any electrical connections.

Area Isolation

Figure 5 shows the connections for using an HIX Isolator to provide area isolation for a secondary HART master or receiver.

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CE Conformity

Installation of any Moore Industries' products that carry the CE marking must adhere to the guidelines in the Recommended Ground Wiring Practices section in order to meet the EN 61326 requirements set forth in the applicable EMC directive.

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

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.

WARNING:

Terminals on this unit may be connected to hazardous voltages. Before making ANY connections to this unit, ALL hazardous voltages must be de-energized.

Installation Category

All terminals are rated CAT II, except for terminals with the -RF option. These terminals are rated CAT I.

Equipment Ratings

The HIT does not generate hazardous voltages, rather, it provides a 4-20mA current input a 4-20mA output. Products connected to the HIT should be designed to receive these inputs.

Supply Wiring

All power connections should be made with 14 or 16 AWG (0.083mm or 0.064mm) wire.

The end of each conductor should be stripped no more than 8mm. 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.

Conductors connected to screw-type connections should have a ring- or spade-lug crimped onto the wire end.

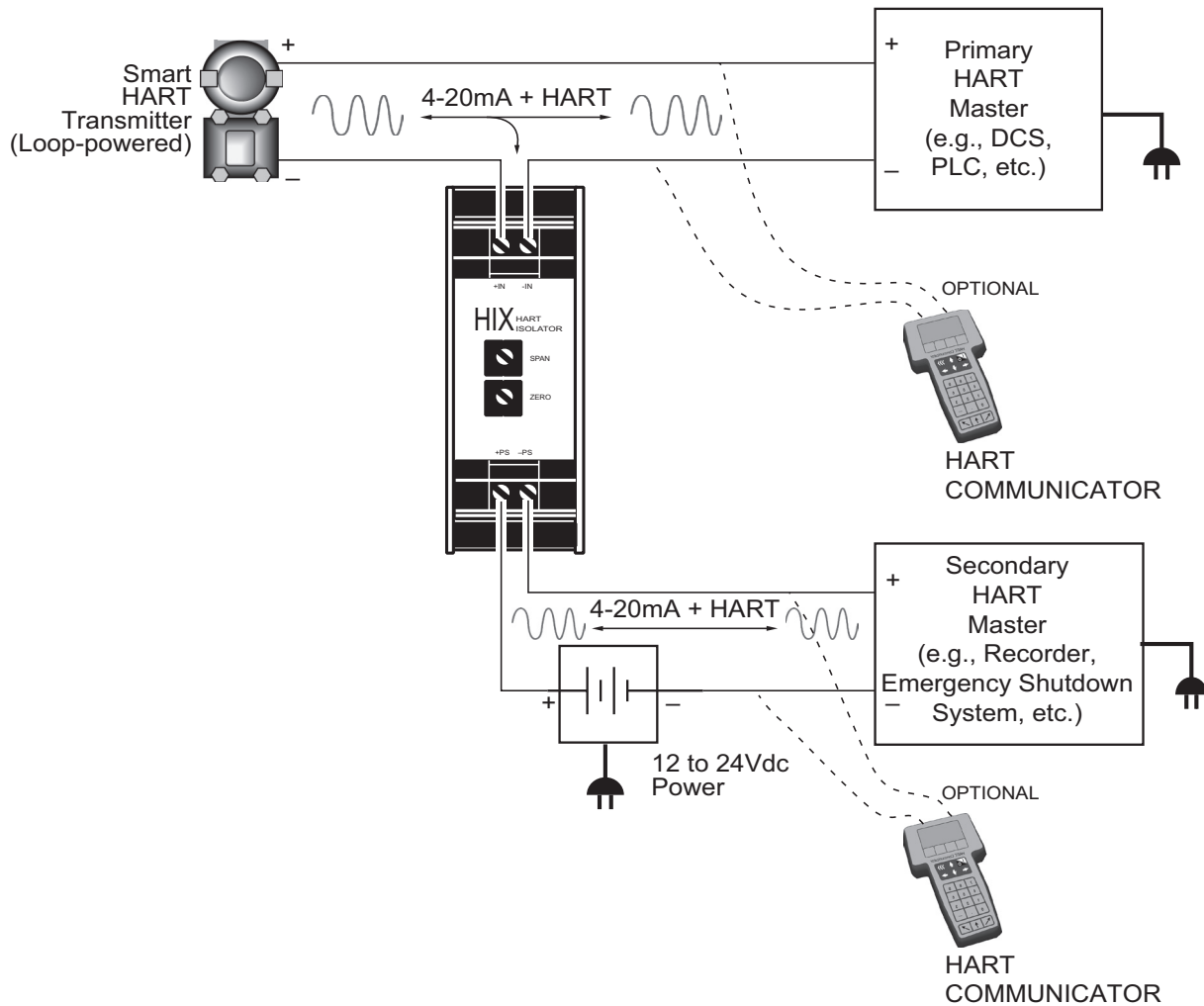
Preventing Power Supply “Bucking”

Figure 5 shows how the HIX can be used to overcome trouble with power supplies competing to provide voltage to the HART transmitter. Often, when a loop consists of several devices drawing power from separate sources, disparate ground potentials between these sources cause a “bucking” phenomenon that can cause current skewing. By adding a HIX (or HIT) to such loops, this problem is eliminated.

Solving 4-Wire Transmitter Problems

Figure 6 shows how to use the 4-Wire HIT to provide the same kind of power supply isolation in applications that call for the use of 4-wire transmitters

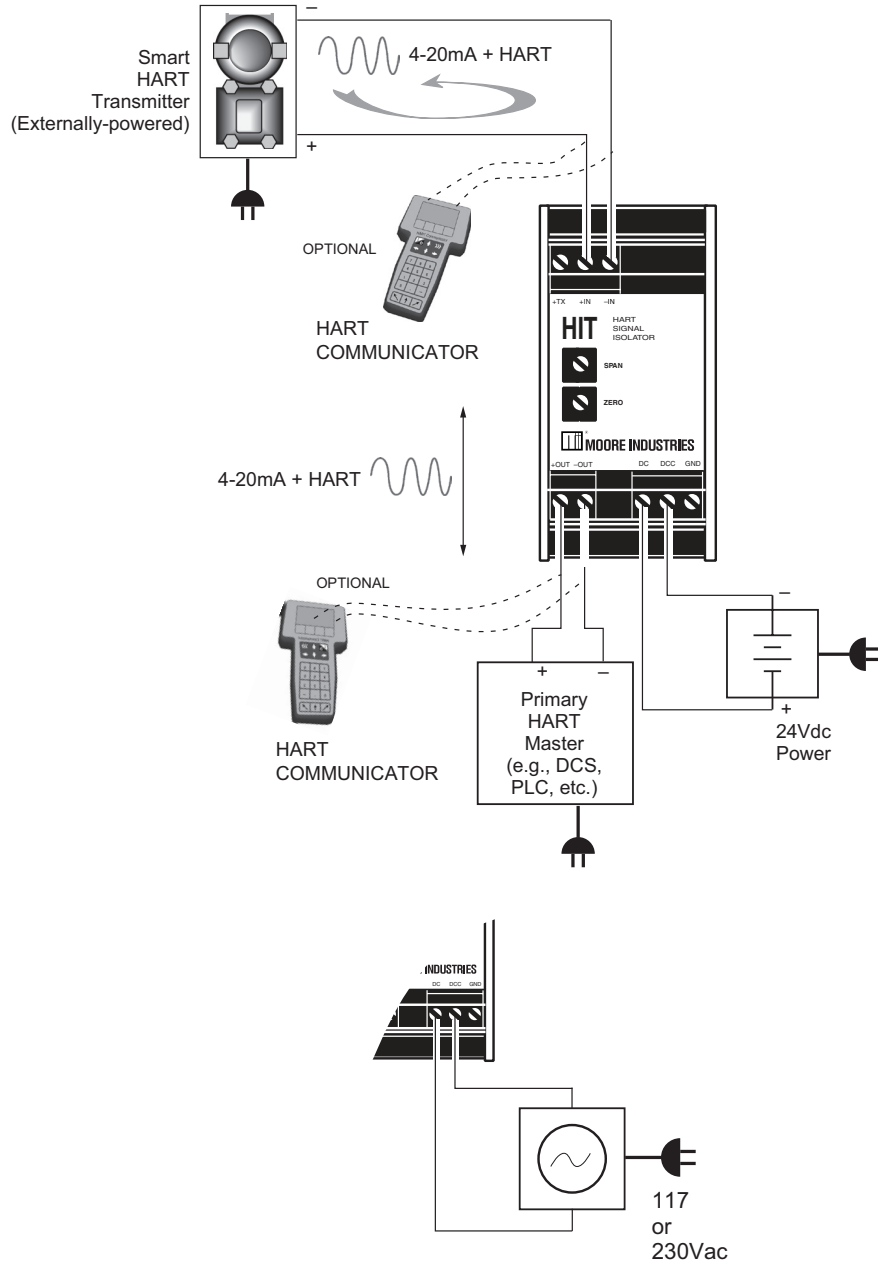
Figure 5. Using the HIX to “Isolate” a Secondary HART Master.



HIT/HIX

4-wire/2-wire HART Isolators

Figure 6. Connecting the HIT in an Application

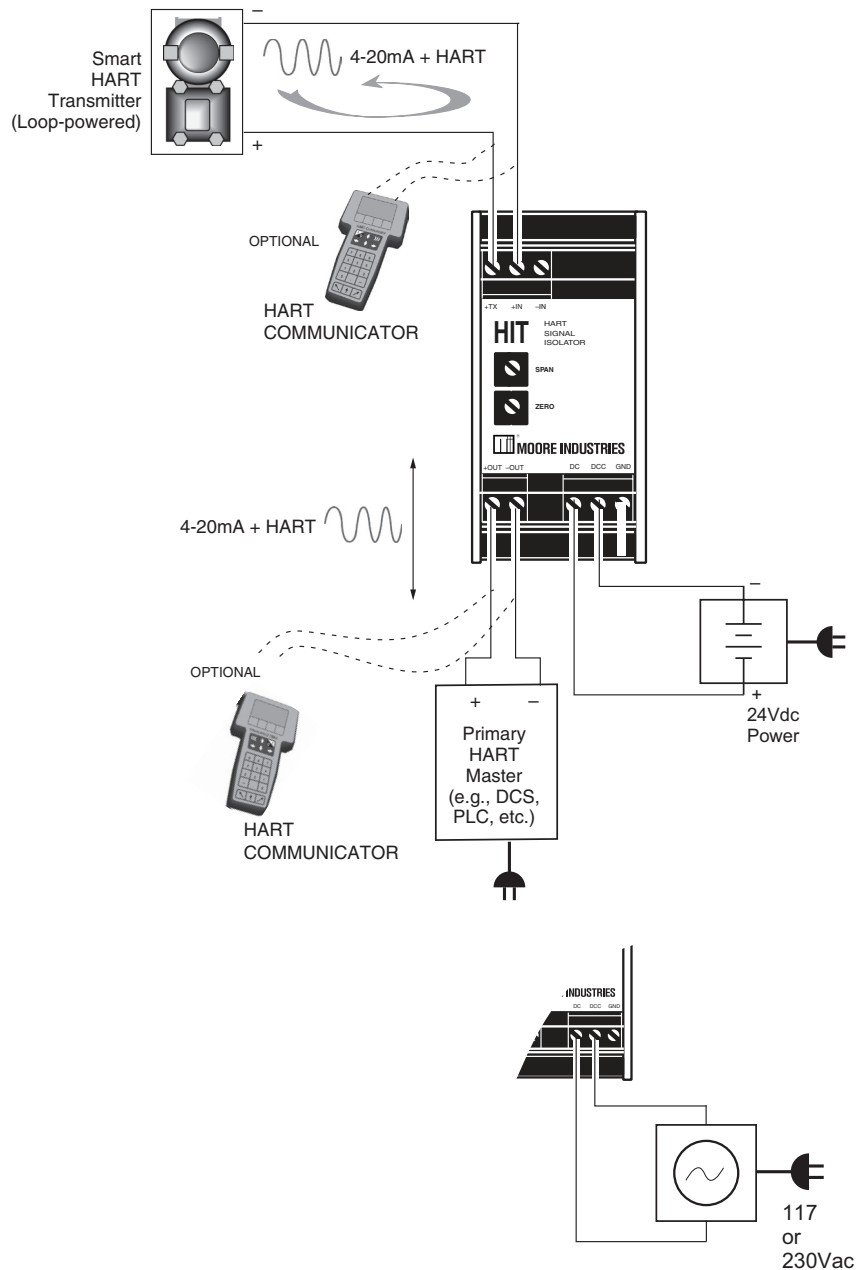


Using -TX to Stop “Bucking”

Another method of preventing competing power supplies from causing loop problems incorporates the HIT's -TX option. Figure 7 shows how to hookup up the 4-wire HIT to power the HART transmitter. This configuration not only solves the bucking power supply problem. It also saves the cost of an additional supply.

When installing any Moore Industries product, always follow all local regulations and standards for grounding, shielding, and safety. The following grounding and wiring practices must be followed for HIX in order for the unit(s) to meet the requirements set forth in EMC standard EN61326.

Figure 7. Using the HIT with TX to combat Power Supply Bucking.



RETURN PROCEDURES

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.

WARRANTY DISCLAIMER

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.



WORLDWIDE • www.miinet.com

United States • info@miinet.com Tel: (818) 894-7111 • FAX: (818) 891-2816	Belgium • info@mooreind.be Tel: 03/448.10.18 • FAX: 03/440.17.97	China • sales@mooreind.sh.cn Tel: 86-21-62491499 • FAX: 86-21-62490635
Australia • sales@mooreind.com.au Tel: (02) 8536-7200 • FAX: (02) 9525-7296	The Netherlands • sales@mooreind.nl Tel: (0)344-617971 • FAX: (0)344-615920	United Kingdom • sales@mooreind.com Tel: 01293 514488 • FAX: 01293 536852