MOORE INDUSTRIES

April 2016
170-701-00 F

Current to Pressure Transmitter

IPT

Current to Pressure Transmitter

IPT

Table of Contents

Introduction

This manual contains calibration and installation information for the Moore Industries' Current-to-Pressure Transmitter (IPT). Along with a description of the IPT, this manual contains information regarding instrument air, filtration, applications and recommendations. Related tables and illustrations are provided for reference purposes.

This manual contains notes and cautions that must be observed to prevent equipment damage or minor inconveniences during calibration or installation of the IPT. The following definitions describe these captions:

A ***NOTE*** shall contain technical or literary information of a helpful nature. This information is intended to aid the reader's understanding of the subject being discussed and/or minimize inconveniences while performing technical tasks.

A ***CAUTION*** shall contain technical information of a serious nature that if ignored may cause equipment damage.

Description

The IPT is a compact 2-wire current-to-pressure transmitter that converts a standard process current signal to a pneumatic output. In its compact aluminum housing, the IPT snaps onto standard mounting rails or optionally onto a header (RIR or SIR). Because of the extremely low dynamic mass of the transducer element, the unit can be mounted in any position and it is also very insensitive to shock and vibration.

Individual IPTs consist of two parts: the transmitter section and an interlocking pneumatic mounting block, which snaps onto a rail. Units that are ordered without a mounting block will clip onto an RIR or SIR (rack or surface mounted header), which supplies air to each unit using only one pneumatic supply pipe. Both mounting blocks and supply headers contain self-sealing valves. Therefore, the IPT can be removed and replaced without disturbing the pneumatic connections or causing accidental venting of the supply or output air.

Operation can be montiored or calibration performed by using the electrical input and optional pneumatic output test jacks. A red LED display, which indicates the presence of an electrical input signal, is also provided.

Table 1 contains the IPT equipment specifications, including inputs, outputs, power requirements, and performance characteristics.

Model Number. The IPT model number describes the equipment type, functional characteristics, operating parameters, any options ordered, and housing. If all other documentation is missing, this number is used to identify equipment characteristics. The model number for the IPT is located on a label on the side of the unit.

Serial Number. Moore Industries maintains a complete history on every unit it sells and services. This information is keyed to the serial number. When service information is required on the IPT, it is necessary to provide the factory with this number. The serial number is located near the model number.

Table 1. *IPT Equipment Specifications*

Characteristic	Specification
Input	**Current:** 4-20mA or 10-50mA
Output	**Pressure:** 0.2-1 BAR, 1-0.2 BAR, 3-15 psig, 3-27 psig, 15-3 psig, 20-100 kPa, or 100-20 kPa **Zero:** Adjusts zero to ±3% of span **Span:** For 20mA input, adjusts 3-15 psig output to 15 psig ±1%
Performance	**Accuracy:** Less than 0.5% of span including the combined effects of linearity, hysteresis and repeatability -- defined as independent linearity per SAMA standard PMC 20.1 - 1973. (For 3-27 psig or 10-50 mA, error not to exceed 1% of span). **Step Response:** 0.3 seconds into 100 ml (6 cu. in.) at 90% of span **Supply Pressure Effect:** Maximum 0.3% / 1.4 psig (0.3% / 0.1 Bar) **Mounting Position Effect:** Negligible, unit can be mounted in any position but should be calibrated in final orientation **Shock and Vibration Effect:** Less than 0.5% for acceleration up to 10 g's and frequency up to 80 Hz **RFI Effect:** Negligible **Air Capacity:** 1.6 SCFM, minimum **Air Supply:** Instrument air only, filtered and regulated, 20 psig nominal, 30 psig without damage. For 3-27 psig output, 35 psig nominal, 40 psig without damage. **Air Consumption:** Dead ended 0.1 SCFM (0.18 kg/hr)
Front Panel	**LED:** Red light emitting diode indicates presence of electrical input signal **Zero and Span:** Multiturn potentiometers **+T, -T:** Electrical test jacks for calibration; accepts 2mm (0.080 in) dia. x 12.7mm (0.50 in) long phone tip plugs (handles should be less than 8mm or 0.32 in. in diameter
Operating Range: **Temperature Effect:**	–40°C to +85°C (–40°F to +185°F). Less than 0.055%/°F (0.1%/°C)
Weight	20 oz. (0.57 grams)

Note: See Installation Section for physical dimensions.

Instrument Air and Filtration Information

NOTE

For optimum performance, the selection and use of a good quality air filtration system is essential. Most users find that it is much less expensive and troublesome to design a system that includes good air filtration than deal with downtime and repairs later.

To assure the maximum service life of an IPT, two things are important: a clean, dry air supply and a closed-loop application. Good air quality involves removing solids, oil and water from the air after compression. The cleaner the air, the longer the time before servicing is needed.

Oversizing elements avoids performance abberations and reduces maintenance time. Redundancy should be used where possible to avoid shutdown during maintenance.

Solids: Random solid dirt, such as pipe scale and rust, is rarely a problem in compressed air instrument systems. A good filter removes these solids. However, if there is a desiccant dryer in the line, a high-efficiency sub-micron filter is recommended to remove the highly abrasive sub-micron particles produced by the dryer. A high-efficiency filter is desirable in any system, and is often a feature of coalescing-type filters.

Liquid Oil: Liquid oil is the most common problem in compressed air instrument systems. A coalescing filter removes sub-micron liquid droplets from the air, and is usually supplied with an automatic drain.

A coalescing filter works by trapping oil and water droplets in a bed of microfibers. The droplets run together at fiber cross-over points, form large liquid drops, and are forced by air flow to a drain. A filter system consisting of a general purpose first-stage filter (about 5 micron) and a high-efficiency coalescing final filter is recommended to obtain contaminant-free air.

The exact location of the first-stage filter is not important; it can be located just ahead of each final filter, or a single first-stage filter can be located on a main line to protect a number of final filters on branch lines. Each final filter (coalescing) should be located just ahead of each pressure regulator. In a new plant installation, an oilless compressor may be used to eliminate this problem.

Water: The amount of water in an air system depends on temperature, pressure and the relative humidity of the air. Therefore, this amount varies widely with geographical location and weather.

Sufficient water must be removed to lower the dew point of the air to a temperature below ambient. The dew point (at line pressure) is expressed as the temperature at which any moisture in the system begins to condense.

Water may be removed using a number of techniques, including coalescing filters, refrigeration dryers and desiccant dryers. In addition, a variety of combinations and modular systems may be used for special circumstances.

Care must be taken in the selection and location of the filter, because cooling downstream of the filter can cause more condensation of water. A coalescing filter should be installed immediately upstream of the pressure regulator. This type of filter removes most of the water before the air enters the regulator. Air leaving the regulator continues to dry due to the expansion of the air.

For systems subjected to freezing temperatures, the portion of the system that runs outdoors should have a dryer installed. The dryer reduces the dew point below the lowest expected outdoor temperature. A desiccant dryer is used with a coalescing filter upstream to keep the desiccant dryer from being damaged by oil or being overloaded with excessive condensed water. Another high-efficiency coalescing filter is recommended downstream of the dryer, to remove the desiccant fines.

ISA Specifications: The Instrument Society of America standard ISA-S73, 1975 (ANSI MC11.1-1975) covers the air quality requirements for instrument grade air for use in pneumatic installations.

The dew point in outdoor installations must be at least 7.8°C (18°F) below the minimum local ambient temperature. For indoor installations, the dew point must be at least 7.8°C (18°F) below the minimum interior temperature or 2°C (35°F), whichever is greater. Although the ISA standard calls for a 35°F dew point, this is often unnecessary indoors, and may be unsatisfactory outdoors under freezing conditions.

Filters that exceed the ISA specification provide very inexpensive protection. Although the ISA specification calls for particle size not to exceed 3 microns and oil content not to exceed 1ppm, most filter manufacturers supply a line of coalescing filters that remove particles down to sub-micron sizes (often 0.01 micron) while also removing oil to below ISA 1ppm specification (often to 0.01ppm).

Table 2. *Recommended Filters for the IPT Air Supply*

Max. No. of IPTs	MII Part No.	Port Size Female NPT	Max. Flow @ 100 PSIG
5 MICRON GENERAL PURPOSE PRE-FILTERS*			
2	800-802-42**	1/4	18
7	800-803-42	3/8	50
17	800-804-42	1/2	50
30	800-805-42	1/2	150
0.01 MICRON COALESCING FINAL FILTERS*			
2	800-806-42**	1/4	4
7	800-807-42	3/8	15
17	800-808-42	1/2	35
30	800-809-42	1/2	60
62	800-810-42	1	125

* All filters are based on maximum (full) air flow from the IPT.
** These filters do not have sight glasses on the bowls.

Application Information

The IPT*must be* installed in a closed loop to operate properly. In a closed loop, it is possible to measure the controlled variable, to determine if a deviation from the desired value exists, and to automatically provide feedback for actuator loading pressure.

The IPT cannot operate in an open loop. An open loop has inherent limitations that are not consistent with precise control, such as: long term drift of the loop dynamics, load fluctuations that require constant adjustments of the actuator loading pressure, and quality variations because of inconsistencies between operating personnel. A controlled variable cannot be directly measured in an open loop; this prevents compensating adjustments to the system input. If an IPT is installed in an open loop, it appears to drift due to the lack of corrective feedback.

Recommendations

Any approach to providing good instrument air quality should evaluate the worst case air flow and ambient temperature of the location. This is required to determine sizing of the air system elements. A knowledge of yearly humidity cycles is also important for this evaluation.

CAUTION

Before placing IPTs in service, all pneumatic lines and mounting blocks or headers (SIRs or RIRs) should be "blown down" to purge contamination and condensation deposited during piping and installation. Also blow down lines to loads, since all output air vents back through the IPT, and there are never filters installed to trap these contaminants (normally only present at start-up). It is recommend this be done for at least an hour, longer if there is evidence of water or oil coming through.

The IPT requires periodic maintenance. The frequency of the service depends on the environment in which the unit operates and the quality of the instrument air supplied. Service in the field is limited to visual inspection and cleaning of the input nozzle filter screen on the IPT and servicing of the compressed instrument air filtration system. The unit may be returned to the factory for complete disassembly, cleaning, and servicing on a periodic basis.

The use of coalescing filters with retention of 0.01 micron particles and droplets is recommended; they remove all undesirable traces of oil and water droplets. Proper placement with respect to the regulator(s) may eliminate the need for dryers, except when coalescing filters are exposed to freezing (keeping in mind that the dew point of the purified air must be kept below worst case ambient).

Figures 1 and 2 illustrate typical non-redundant systems with multiple branch lines. They both work in any environment above freezing and differ only in the placement of the general purpose first-stage filter. Gages, valves, and differential pressure indicators (for filter service monitoring) are not shown. It is recommended that filters with integral service life indicators or differential pressure indicators be used to help ensure proper servicing, as well as redundancy to avoid shutdown during servicing.

Figures 1 and 2 differ in the method used to remove water. The use of a desiccant type dryer (figure 2) requires upstream filtration to prevent oil contamination of the dessicant, as well as downstream filtration, to prevent desiccant fines from introducing new contamination.

The service life of an IPT is directly proportional to the cleanliness and dryness of its air supply. The small additional cost of providing high-qulaity air ensures a longer, more trouble-free service life for the unit.

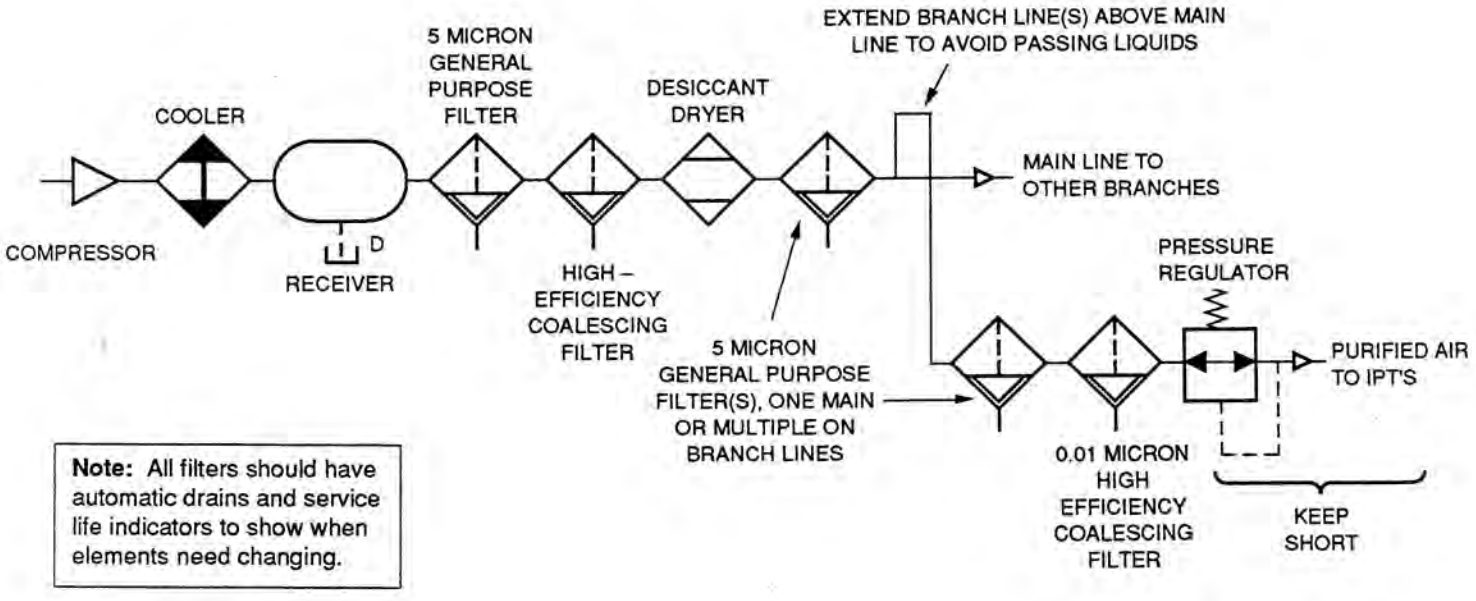


Figure 1. *Non-Redundant System with Desiccant Dryer*

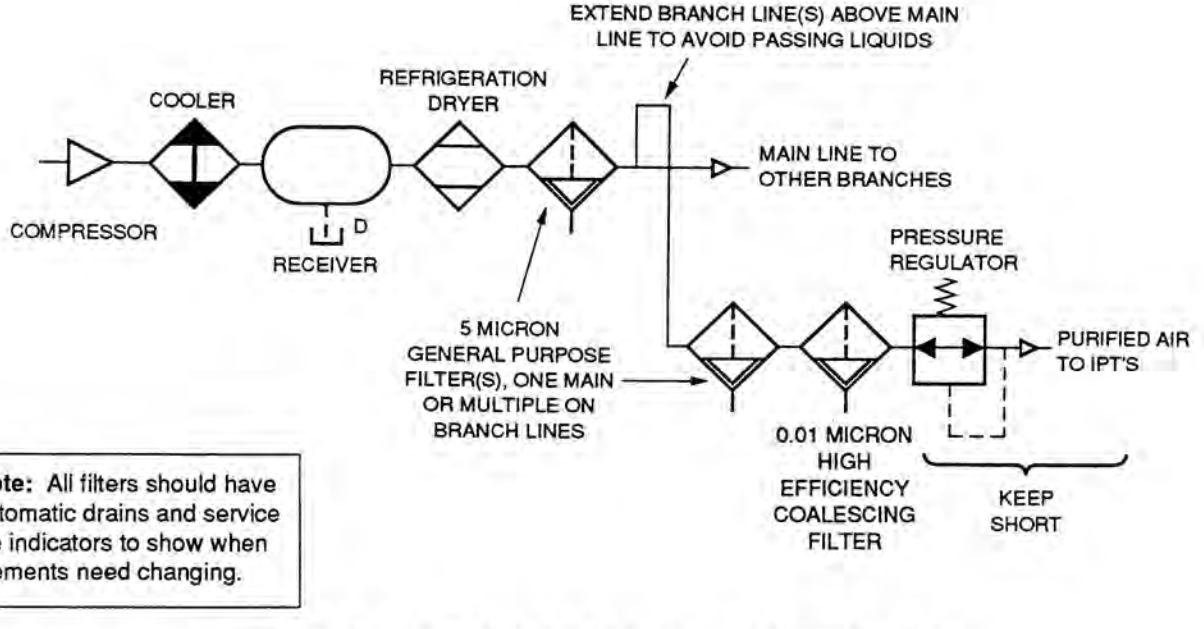


Figure 2. *Non-Redundant System with Refrigeration Dryer*

Calibration

This section provides information necessary to adjust and calibrate the IPT. Each unit is calibrated and checked at the factory prior to shipment. Before installation, every IPT should be checked by the user for proper operation. Generally, these checks, which are specified under Calibration Procedures, require little or no adjustment.

Adjustments

The IPT has Zero and Span adjustments located on the front panel of the unit. They are represented symbolically on the front panel by the following markings:

represents Zero

represents Span

The type of potentiometer used with these adjustments usually require 22 turns of the shaft to move the wiper from one end of its range to the other. It is equipped with a slip clutch at each end to prevent damage if the adjustment is turned beyond the wiper stop. Usually a slight change can be felt when the clutch is at the end of a range (i.e., it is slipping). However, if this change is not felt, either end can be reached by turning the shaft 22 turns in the desired direction. Turning these potentiometers clockwise causes the related output to increase in quantity or become more positive; while turning them counterclockwise causes the related output to decrease in quantity or become more negative.

The Span potentiometer provides an adjustment range of ±1 percent of full scale.

The Zero adjustment consists of a conical-tipped machine screw that displaces a torque arm on the flapper pivot. This controls the gap between the flapper and the nozzle to establish the zero-air bleed rate. The adjustment screw provides a control range of ±3 percent of full scale.

Calibration Equipment

Table 3 lists the equipment required to calibrate the IPT. This equipment is not supplied with the unit and must be provided by the user.

Table 3. *Calibration Equipment*

Equipment	Characteristics	Purpose
Adjustable current source	0-50mA output	Simulate input signal
Dc milliammeter	Accurate to ±0.05%	Measure input signal
Instrument air supply	Filtered	Air supply
Air pressure gauge	Accurate to ±2%	Measure air supply pressure
Air pressure gauge	Accurate to ±0.1%	Measure output pressure
Phone tip probes (2)	Must have 2,03mm (.080 in.) diameter tips, .5 inch long	Easy access to input signal (optional)
Pneumatic test coupler MII P/N 163-202-00	For IPTs with optional test jacks	Easy monitoring of output pressure (optional)
Pneumatic load	Volume of 7.5 cubic inches (approx. 120 milliliters)	Provide standard load for test purposes (per IEC specification #770)

Calibration Setup

Figure 3 is an illustration of a typical calibration setup, including optional equipment. To check or calibrate the IPT, connect the unit as shown in this illustration. Refer to Calibration Procedures.

Calibration Procedure

There are two options shown in figure 3 for monitoring the output of the IPT. The input current may be measured by placing a milliammeter in series with the input terminals as indicated by M1 or connected across the electrical test jacks (+T and -T) as indicated by M2.

CAUTION

When measuring the input current using the electrical test jacks, the milliammeter used must have an internal impedance of less than 10ý. Even with 10ý internal impedance, the readings can have a variation of as much as ±.02% of full scale.

1. For zero adjustment, connect an adjustable current source to the electrical input terminal block. Set the current input signal to zero percent (e.g., 4mA for a 3-15 psig unit, 20mA for a 15-3 psig unit or 10mA for 3-15 psig unit with 10-50mA input).

   NOTE

   Observe that the red LED indicator on the front panel is illuminated at 4mA input current and glows somewhat brighter with increasing current.

2. Using an air pressure gauge to measure the input air supply pressure, connect a filtered air supply to the pneumatic supply port located on the bottom or rear of the unit.

3. If the unit is supplied with the optional front-access pneumatic-output test jack, insert the pneumatic coupler into the receptacle. This avoids having to disturb any operating connections or fittings.

CAUTION

Coupler must be kept lubricated to prevent damage to O-rings in test jacks. Teflon lubricant is recommended. If grease is used, keep out of air passage.

If the unit is not supplied with the output test jacks, use an air pressure gauge to measure the output air supply pressure (e.g., read 3 psig for a 3-15 psig unit or 15 psig for a 15-3 psig unit).

CAUTION

To avoid damaging their housings, use a screwdriver with a head no wider than 0.1 inch (2.54mm) to adjust the Zero-adjustment screw and Span potentiometer.

CAUTION

The Zero-adjustment screw must not be backed out to the point where the slotted head presses against the underside of the front panel. It can put an excessive stress on the transducer frame and may disengage the screw from the flapper tension arm. If this happens, the IPT must be returned to the factory for realignment.

4. Any deviation in the output pressure can be corrected by using the Zero-adjustment screw in a range of ±3 percent.

5. For the Span adjustment, increase the input signal to 100 percent (20mA or 50mA).

6. Any deviation in the output pressure (e.g., 15 psig for a 3-15 psig unit or 3 psig for a 15-3 psig unit), can be corrected by the Span potentiometer over the range of ±1 percent.

7. Repeat steps 1 through 6 (as applicable) until no further adjustments are required.

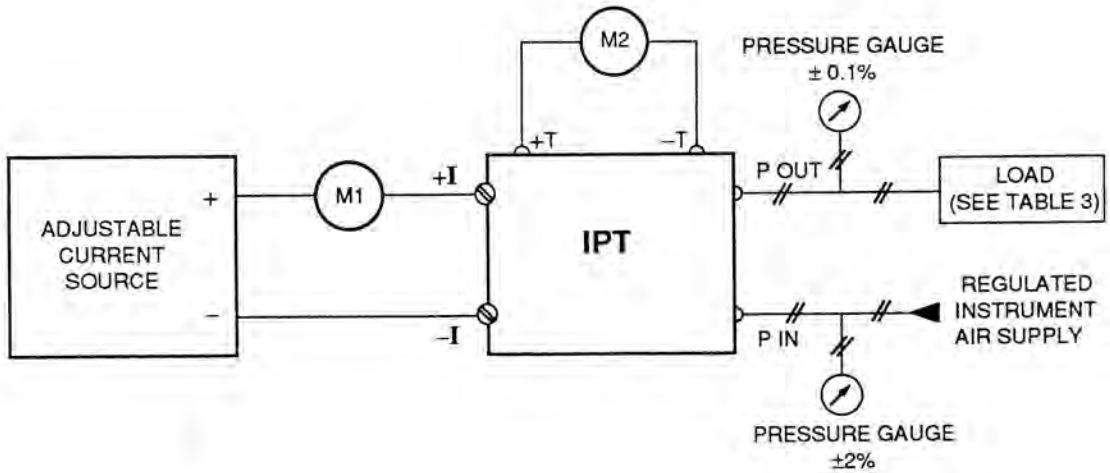


Figure 3. *Calibration Setup*

Installation

Installation of the IPT is divided into three phases: mounting, electrical connections, and pneumatic connections. In most cases, it is easier to mount the IPT before completing the electrical and pneumatic connections.

Mounting

Individual IPTs consist of two parts: the transmitter and the mounting block. Units without a mounting block snap onto a header. IPTs with a mounting block are rail mounted. When mounting the IPT, ensure that the unit is mounted in an area free of dust, moisture, and corrosive elements. Figure 4 shows the mounting dimensions for both mounting styles.

CAUTION

It is recommended that mounting blocks and headers be purged of any debris prior to mounting the IPT. Insert a small diameter, blunt tip probe into the fitting and unseat the ball-check valves for a few minutes with the filtered instrument air supply in operation.

Rack- or surface-mounted IPTs should be ordered with a Moore Industries' rack-mounted header (RIR) or a surface-mounted header (SIR). This eliminates the need for an interlocking mounting block and rail. 5, 10 or 15 units can be snapped onto one header, allowing multiple units to receive supply air from one supply pipe. To mount an IPT onto a header, push the unit into place until the retaining lever snaps up flush beneath the handle. To remove an IPT, press down on the retaining lever and lift the unit out by the handle.

NOTE

Check valves in the headers prevent the loss of supply or output air during mounting or removal of IPTs.

Rail-mounted IPTs must use a pneumatic mounting block. Pneumatic mounting blocks are 1.39 inches wide. Using a 0.17 inch wide gage between blocks provides a uniform spacing in a minimum rail length.

Electrical Connections

There are two terminals on the IPT for connecting input current. The connections can be front access or rear access.

Both the front and rear access electrical terminals are compression screw sockets that accept 22 to 14 AWG hookup wire. To complete these connections, use a slotted screwdriver with a head approximately 0.125 inch (3mm) in width to secure the wire leads to the IPT. The screws tighten down, which provides electrical contact between the wire and the terminal. Loosen each screw prior to inserting the wire being terminated. Strip and then tin the end of each wire with 60/40 solder. Then, while holding the uninsulated end of the wire in place, tighten the screw of the corresponding terminal.

The Removable Terminal Block (RTB) option adds a 2-piece wire connector to the IPT. This alows the input wiring to be unplugged without the use of tools, while maintaining polarity. The plug has screw-clamp connections and accepts 22 to 14 AWG wire. The wire should be stripped 0.5 inch (12.7mm).

Pneumatic Connections

Supply air must be clean, dry instrument air. It is recommended that all particles larger than 1 micron be removed. Use of 1/4 inch tubing allows sufficient air for one unit. When using RIR or SIR headers, up to 30 IPTs may be run from a 3/4 inch NPT pipe without degrading performance, provided the air supply pressure is sufficient. Output tubing should be 1/4 inch, though larger tubing may be desirable for exceptionally long runs. Purge the output tubing and the controlled device before connecting to the IPT or RIR/SIR.

CAUTION

Output air cycles back through the IPT. Contamination in the output line or controlled device may easily enter and damage the IPT.

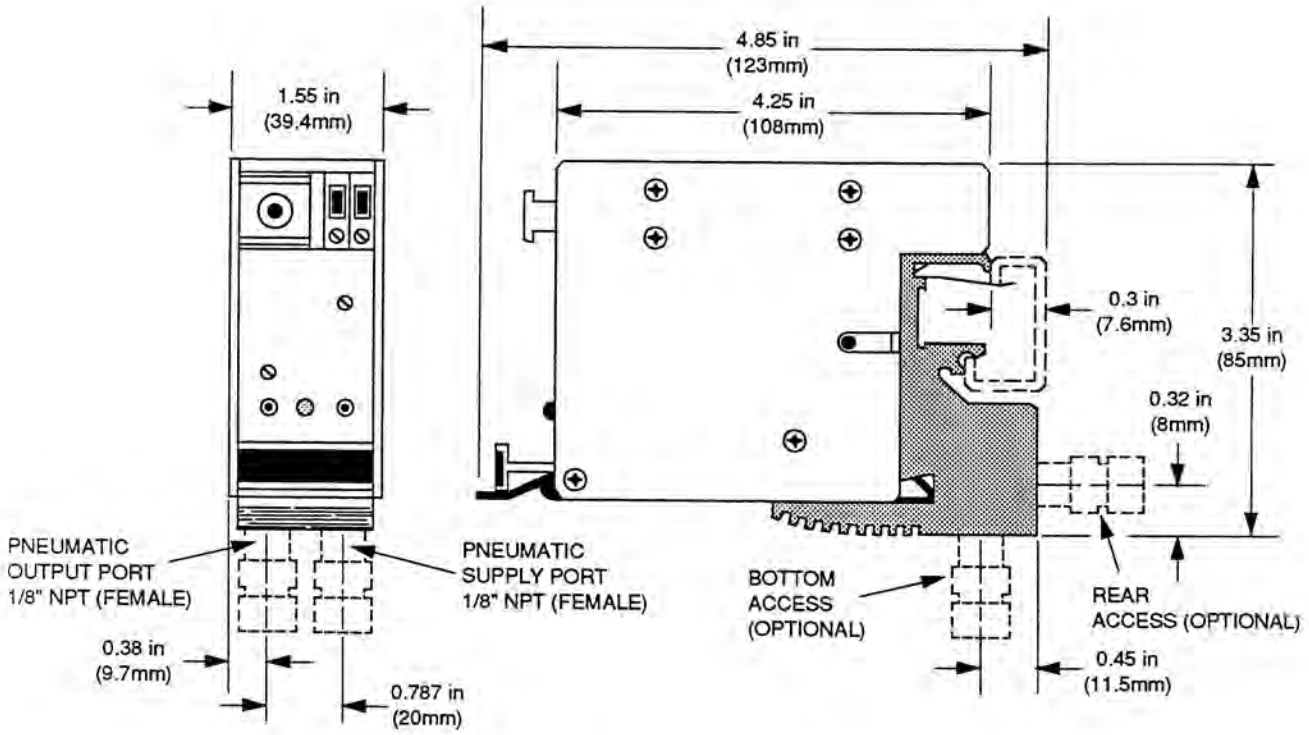


Figure 4. *Mounting Dimensions*

Operation

Once adjusted and installed, the IPT operates unattended, except for occasional cleaning of the air supply filters. The only controls on the outside of the unit are SPAN and ZERO, which after initial adjustment need no further attention.

If a malfunction is isolated to the IPT, refer to the Troubleshooting section for recommendations. A unit may become warm during operation, especially where the ambient temperature is elevated. This is normal and should not be a cause for alarm unless a malfunction is also observed.

Theory of Operation

The principle of operation of the IPT is to modulate shunt-bleed air flow from a throttled source to control output air pressure. The shunt-bleed air-flow rate is controlled by a movable flapper arm imposing variable blocking on a fixed nozzle. See figure 5.

As the flapper arm moves closer to the nozzle, the air flow out of the nozzle is restricted, thereby reducing the flow through the throttling section and increasing the nozzle inlet pressure. The pneumatic amplifier senses nozzle inlet pressure and therefore raises the

output pressure, which also feeds the throttle input. Notice that the throttling section input and output are both raised at the same time, maintaining a nearly constant pressure drop across this section. This linearizes the transfer characteristic, while providing system gain for the control function.

When the flapper moves away from the nozzle, flow increases, causing a reduction in nozzle entry pressure and consequently a lowering of output pressure.

Current control of output pressure is achieved by placing a small permanent magnet at one end of the flapper and locating it within the gap of an electromagnet, which has its coil energized by the 4-20mA process control current. The flapper is supported near its center by a taut band torsion ribbon, which provides a frictionless pivot with centering torque.

Zero adjustment is provided by a conical tipped screw, which applies a displacement bias to the torsion ribbon.

Span adjustment is achieved by a variable resistance shunt load across the electromagnetic coil.

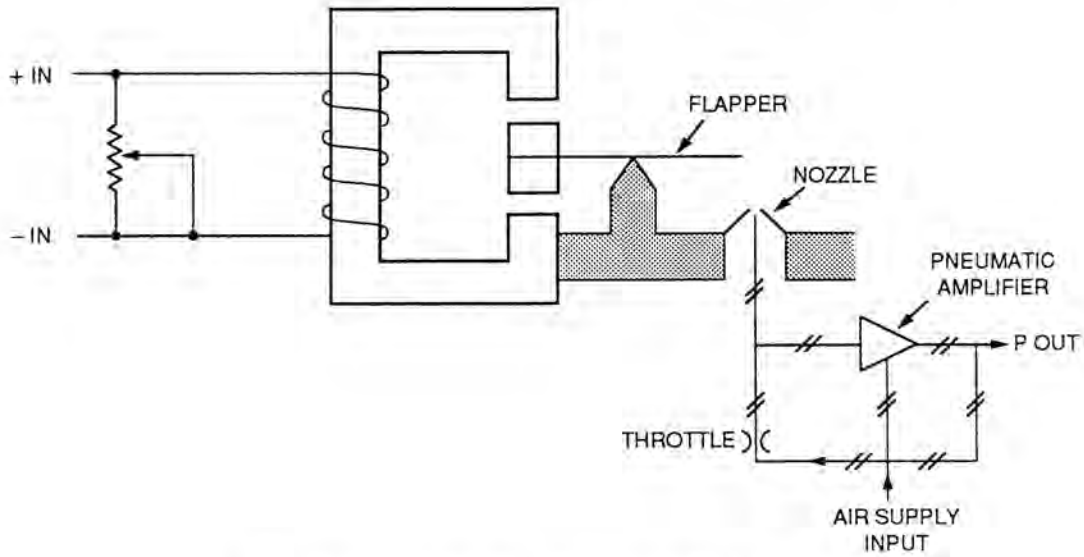


Figure 5. *IPT Simplified Functional Diagram*

IPT

Maintenance

Because instrument air continuously flows through IPT passageways, the air lines must be kept clean. Depending on the purity of the air supply, the filter and two internal orifices of the IPT assembly must be cleaned at regular intervals to maintain specified performance. The two orifices should be cleaned at least once a year. Initial random checks can help establish a satisfactory maintenance interval geared to the user's air supply purity.

The supply air filter screen should be removed and flushed with trichloroethance (TCE) and then air dried before replacement.

1. Remove the IPT from the mounting block by pressing down on the locking lever and pulling straight out to disengage the pneumatic fittings.
2. To remove the supply air filter screen, first slide the nozzle retainer clip to the right and then pull the nozzle out of the main body.
3. Remove the filter screen and flush with TCE and air dry before reinstalling.
4. Slide the nozzle back into the main body.

To clean its orifices, the IPT assembly must be removed from the extruded aluminum case. To remove the assembly, proceed as follows:

1. Remove the 6 screws securing the right side cover and remove the cover.
2. Remove the bottom 4 screws securing the left side cover and remove the cover. Turn the unit over. The test point connector and the test point jack are now free.
3. Without pulling the wires loose on the printed circuit board attached to the front panel, slide out the front panel.
4. Remove the screw on the bottom of the front panel to free the printed circuit board.
5. Insert a blade screwdriver between the rear panel and the IPT. Separate the rear panel from the IPT.
6. Squeeze and slide back the clamp from the tubing barb and pull the tubing from the tubing barb (only on units with optional test jacks).

To access the orifices in the IPT, remove the bottom mounting screw and the two screws at the rear of the unit. The orifices are located in the subassembly. See figure 6.

CAUTION

Use care not to damage the rubber gaskets between the subassemblies.

Clean the orifices with a 0.004 - 0.005 inch diameter steel wire. Push the wire through the hole. Refer to figure 7 for orifice locations.

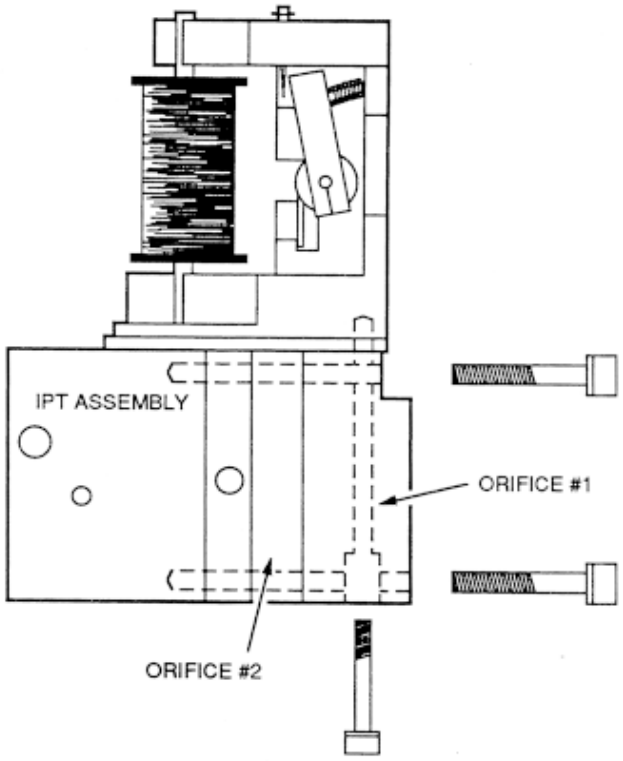


Figure 6. *Screw Locations for Orifice Access*

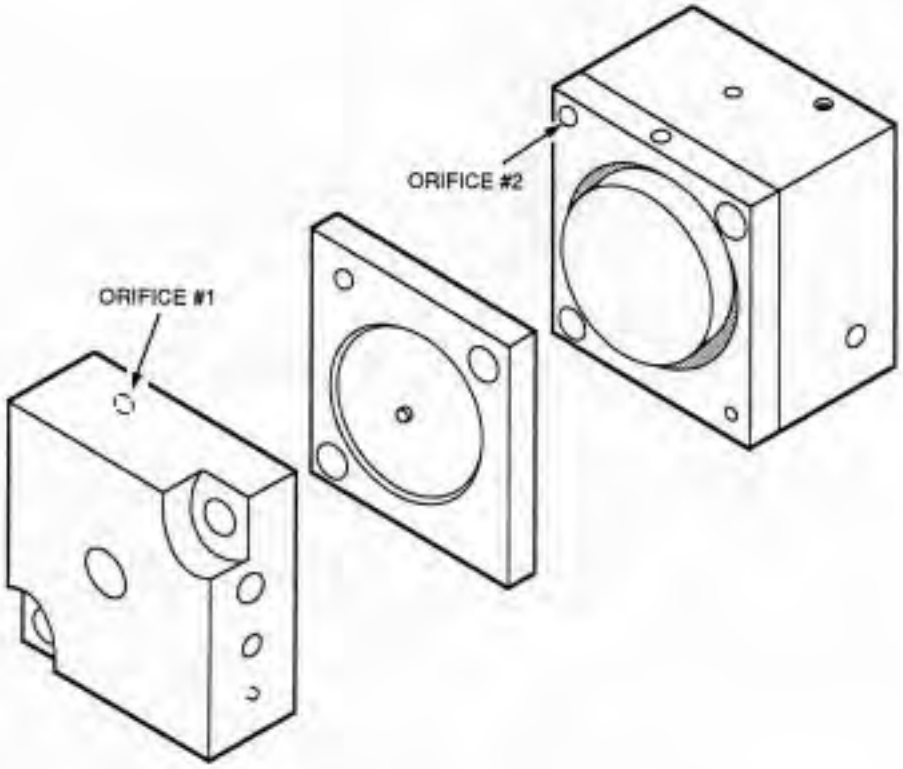


Figure 7. *Orifice Locations*

Troubleshooting

Many components of the IPT have been thermally aged, tested, and selected using a computer-aided design program. This usually makes field repair unnecessary. It is therefore recommended that any unit found to be performing below specifications be returned to the factory in accordance with the instructions found on the back cover of this manual.

If a problem is suspected with the IPT, review the following steps:

1. Make sure that all connections are clean and tight.

2. Verify that bench instruments used to take measurements have the proper range and accuracy and are currently certified.

3. Check that the bleed-air port (located in a slot on the left side panel) is not restricted.

4. Using a test jumper, connect one end to the metal case and the other end to an "IN" terminal while observing the output pressure. The output pressure should not change.

5. If a change in the relationship between the input and the output occurs, try to correct it by readjusting the Zero and Span controls.

6. If the response time lengthens or if the span drops, this may indicate a blockage due to air supply contamination. Clean the orifices and the supply air filter as described in the Maintenance section.

Drawings

The current revision of the IPT schematic is shown in figure 8.

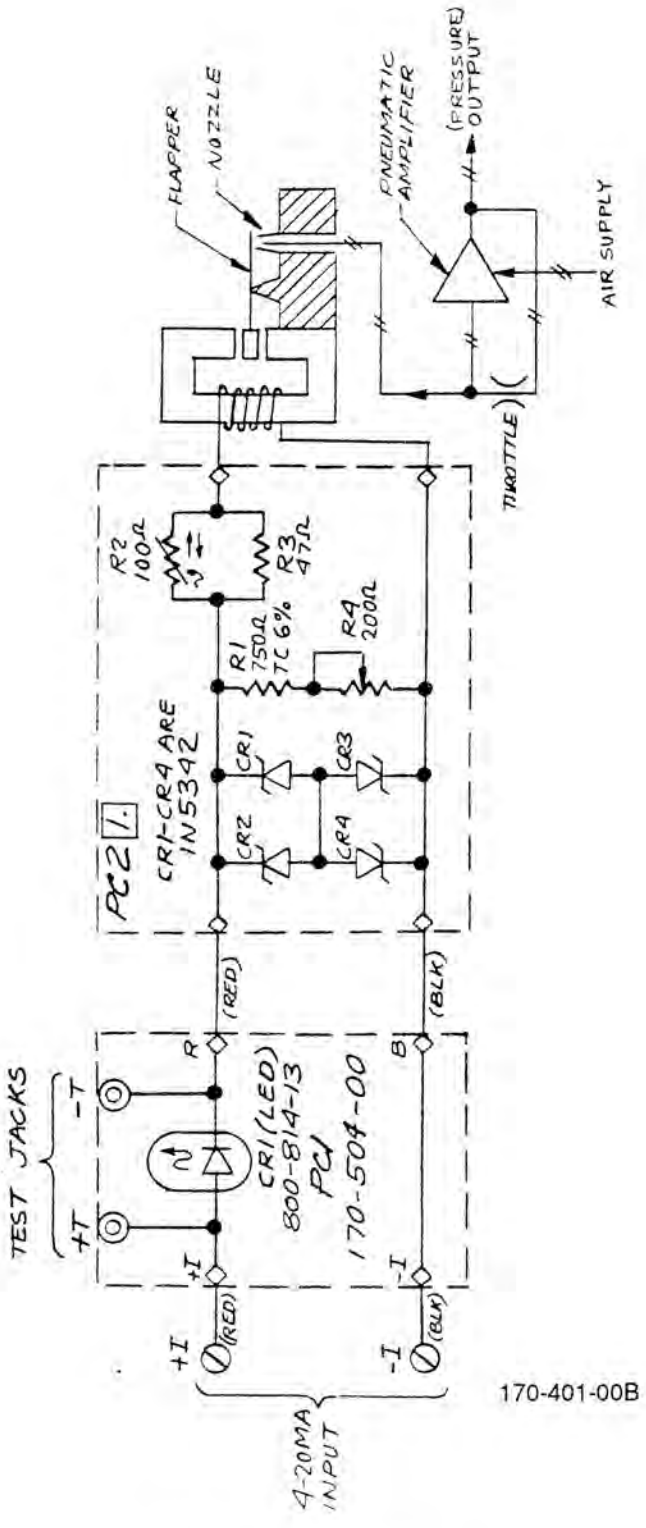


Figure 8. *IPT Schematic*

P/N 170-730-01 A

IPT Supplement

This supplement contains information about the IPT with the -EPS option. If your unit does not have this option, please disregard this supplement.

The specifications and ordering information for the IPT with the -EPS option are shown below.

Specifications

Performance	**Accuracy:** ±0.1% of span between 0° C and +80° C (+32° F to +176° F) ambient temperature including the combined effects of linearity, hysteresis, and repeatability–defined as independent linearity per SAMA standard PMC 20.1-1973 (±0.15% of span between 0° C to –40° C) **Step Response:** <0.2 sec. into 100ml. (6 cu. in.) for 10-90% and 90-10% of span (See Figure 1) **Frequency Response:** 5Hz at –3dB into 100 ml (6 cu. in) **Supply Pressure Effect:** Negligible from 20-40 psig **Mounting Position Effect:** Negligible; unit can be mounted in any position, **Shock and Vibration Effect:** 0.25%/per G min. over 5 to 15 Hz **RFI Effect:** Less than ±0.025% of span at 50V/m	**Performance (Continued)**	**Air Capacity:** See Figure 2 **Air Supply:** Instrument air only, filtered and regulated, 20-40 psig. Must be 5 psig (0.34 Bar) greater than maximum output psig **Air Consumption:** 0.15 scfm, max. (0.3 kg/hr) **Drift:** Not to exceed stated accuracy for 6 months	**Connections**	**Input Connections**: Removable front mounted terminal blocks, 22-14 AWG. **Output Connections:** 1/8 in. NPT female, bottom or rear location on units with optional pneumatic mounting block **Supply Connection:** 1/8 in. NPT female, bottom or rear location on units with optional pneumatic mounting block **Current Test Jacks:** Input current test jack (labeled +T, –T) for calibration; accepts 2mm (0.080 in.) dia. x 12.7mm (0.50 in.) long phone tip plugs (handles should be less than 12mm (0.50 in.) in diameter) **Pneumatic Test Jacks:** Monitors output pressure during calibration (For pneumatic test coupler, order p/n 163-202-00)
		Ambient Conditions	**Ambient Temperature Range:** –40° C to +80° C (–40° F to +176° F) **Ambient Temperature Effect:** ±0.05% typical between 0° C and +80° C (+32° F to +176° F), 0.1% max; ±0.1% typical, between –40° C to 0° C (–40° F to +32° F), 0.15% maximum		
		Front Panel Adjustments	**Output Zero:** Adjusts zero to ±10% of span **Output Span:** Adjusts span to ±10% of span	**Indicators**	**LED:** Red light emitting diode indicates presence of electrical input signal
				Weight	19 ounces (538.7 grams)

Figure 1. *IPT Step Response*

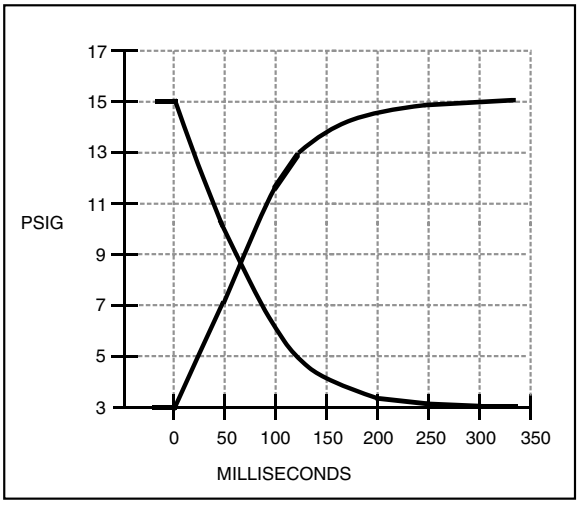
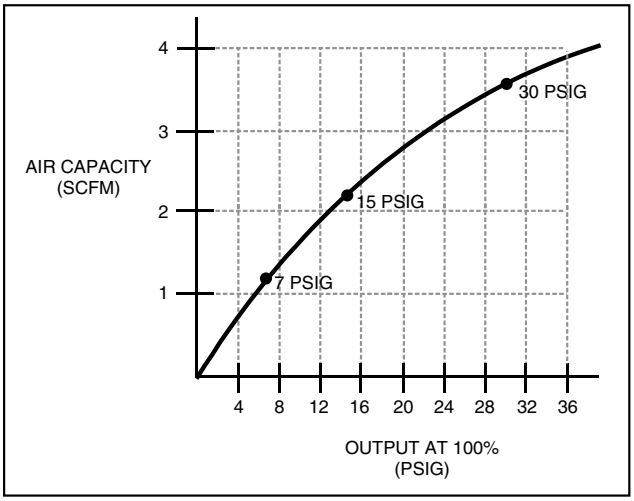


Figure 2. *IPT Air Capacity*



IPT Supplement

Ordering Information

Unit	Input	Output	Supply Pressure	Access Designations	Options	Housing
IPT	**4-20MA** into 375Ω (250Ω for units without LED) **4-12MA** **12-20MA** Custom ranges also available	**0-20PSIG** **3-15PSIG** **3-16.6PSIG** **3-18PSIG** **1-17PSIG** **6-30PSIG** **3-27PSIG** **.2-1BAR** **20-100KPA** **.2-1KGCM2** **.02-.10MPA** Reverse Output **20-0PSIG** **15-3PSIG** **16.6-3PSIG** **18-3PSIG** **17-1PSIG** **30-6PSIG** **27-3PSIG** **1-.2BAR** **100-20KPA** **1-.2KGCM2** **.10-.02MPA** Custom ranges also available	**20-40PSI** **1.4-2.8BAR** **1.4-2.8KG** **140-280KPA** **.14-.28MPA**	See Table S-1	**-EPS** Extended Performance Specifications	**DIN** DIN-style aluminum housing mounts on 32mm G-type (EN50035) and 35mm Top Hat (EN50022) rails using a pneumatic mounting block or multi-unit air supply header (RIR) or (SIR) **WTI** Water-tight enclosure per NEMA 3R definition. (requires -FA7, -FA8, -FA9, or -FA10 access designation) ***P** (suffix) indicates unit comes equipped with a base plate and U-bolts for mounting on a 2-inch pipe (e.g. **WTIP**)

When ordering, specify: Unit / Input / Output / Supply Pressure / -Access Designation -Option [Housing]
Model number example: IPT / 4-20MA / 3-15PSIG / 20-40PSI / -FA1 -EPS [DIN]

Table S-1. *Access Designations*

Current Input Location	Pneumatic Output and Supply Location*	Pneumatic Test Jack Location	LED and Current Test Jacks	Access Designations
Front	Bottom	None	Yes	-FA1
Front	Rear	None	Yes	-FA2
Front	Bottom	Front	Yes	-FA3
Front	Rear	Front	Yes	-FA4
Front	Bottom	None	None	-FA5
Front	Rear	None	None	-FA6
Front	None	None	Yes	-FA7
Front	None	Front	Yes	-FA8
Front	None	None	None	-FA9
Front	None	Front	None	-FA10
Front	Bottom	Front	None	-FA11
Front	Rear	Front	None	-FA12

*Applicable only on units with mounting blocks

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.

MOORE INDUSTRIES™

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