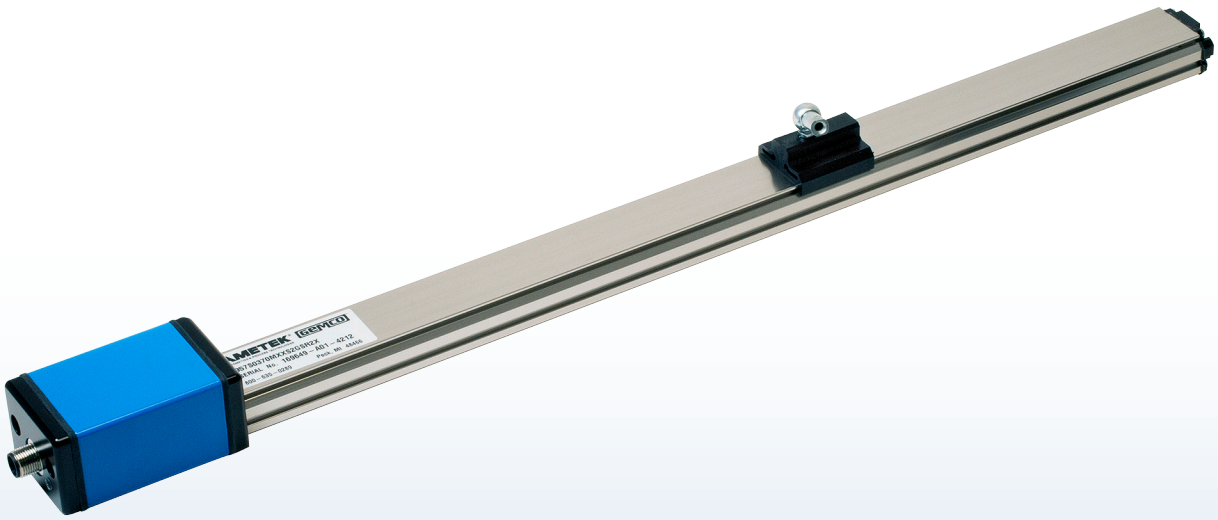
GEMCO®

Series 957A Brik™

Linear Displacement Transducer

Installation Manual

957A-Analog Brik™



ABSOLUTE PROCESS CONTROL
KNOW WHERE YOU ARE... REGARDLESS

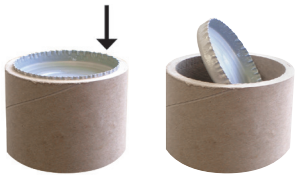
AMETEK®

Contents

Unpacking

Carefully remove the contents of the shipping carton and check each item on the packing slip before destroying the packing materials. Any damage must be reported to the shipping company. If you do not receive all of the parts, contact Ametek at 800-635-0289 (US and Canada) or 248-435-0700 (International).

Most probes are shipped in a Tube. To remove the metal end cap, use a large, flat blade screw driver or a metal rod and tap on the inner edge of the cap until it pivots. Grab the cap and pull it out. Use caution as the edge of the metal cap may be sharp.



If you have an RMA warranty claim, pack the probe in a shipping tube or with stiff reinforcement to prevent the probe from being bent in transit.

Chapter 1: 957A Overview

The 957A Brik™ is a magnetostrictive Linear Displacement Transducer (LDT) for highly accurate continuous machine positioning in a variety of industrial applications.

The 957A Brik™ has a few truly unique features. One feature is the LDT's auto-tuning capability, the ability to sense a magnet other than the standard magnet and adjust its signal strength accordingly. Another feature is that the analog output is programmable over the entire active stroke length. The active stroke area lies between the Null Zone and Dead Band.

There is a diagnostic LED located at the connector end of the probe that remains green while a good magnet signal is present and when the magnet is in the programmed stroke area. The LED turns yellow when the magnet is out of the programmed active range, but still within the active stroke area. The LED turns RED if there is a loss of magnet and the output will go to 0 volts on a voltage unit and 3.8mA on current model units.

The 957A Brik™ LDT with a 4 to 20mA output offers a unique diagnostic capability. The normal 4 to 20mA output indicates the position of the magnet within the programmed span. If the position of the magnet is outside the set span, the output is either 3.9mA or 20.1mA. If the magnet moves into the Null or Dead Zones or there is a loss of magnet the output will be 3.8mA. This feature is only available on units with a current output. On voltage units the voltage output will be 0 volts below the programmed zero point and 10volts above the programmed Span.

All units can easily be changed in the field from a 0-10VDC to a 10-0VDC or a 4-20mA to a 20-4mA.

NOTE: The part number on the LDT is a record of the characteristics that make up your specific unit. For a translation of the part number, see Chapter 6 Part Numbers System.

Chapter 2: Installing the LDT

Units can be ordered in span lengths up to 180 inches long in .1 inch increments. The optional slide magnet is designed to move effortlessly along the transducer in guide tracks, or the standard floating magnet assembly can be positioned up to ¼" above the unit. A variety of hardware is available for attaching the magnet slide to the moving portion of the process.

The 957 Brik™ has a few truly unique features. One feature is the LDT's auto-tuning capability, the ability to sense a magnet other than the standard slide magnet and adjust its signal strength accordingly.

Mounting

The transducer can be mounted vertically or horizontally using the supplied SD0522000 mounting brackets. The mounting brackets slide in the grooves on the lower part of the extrusion and clamp down when tightened. It is recommended to use one mounting bracket on each end and every three feet between.

Ferro-magnetic material, which is material readily magnetized, should be placed no closer than ¼" from the sensing surface of the LDT.

Magnet Assembly

Magnet choices are the Floating Magnet or the Slide Magnet assemblies. When using the Floating Magnet assembly SD0551500, the magnet should be installed within ¼" of the sensing surface. The magnet assembly should also be installed in such a manner that it remains an even distance from the aluminum extrusion throughout the entire stroke. Improperly installed magnets can result in output signal non-linearity, or loss of Magnet signal.

2.1 Dimensions

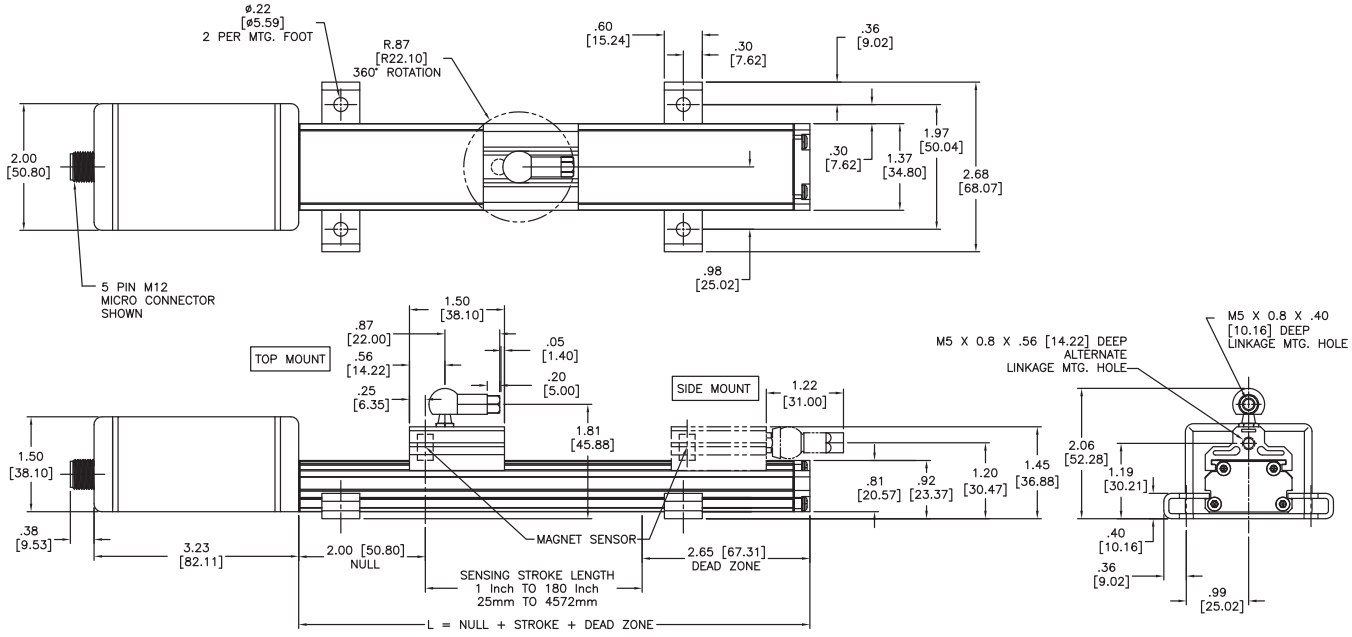
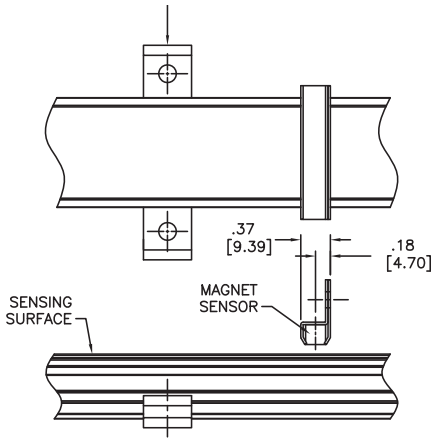


Figure 2-1 957A Dimension Drawing for Reference

2.2 Mounting Bracket



MOUNTING BRACKETS (SD0522000) SLIDE IN THE GROOVES ON THE SIDE OF THE EXTRUDED HOUSING. WHEN TIGHTENED DOWN WITH FASTENING HARDWARE THE MOUNTING BRACKETS CLAMP THE UNIT INTO PLACE. IT IS RECOMMENDED TO USE ONE MOUNTING BRACKET ON EACH END AND EVERY THREE FEET BETWEEN.

Figure 2-2 Mounting Bracket (SD0522000)

2.3 Magnet Position

The sliding magnet is designed to move along the extrusion. The magnet can be slide mounted (Part # SD0521801) top mounted (Part # SD0521800), or floating magnet (Part #SD0551500). Refer to figure 2-2.

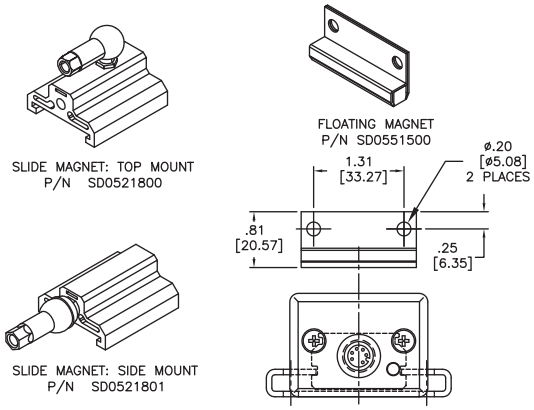


Figure 2-3 Magnet Sensor

When using the Floating Magnet assembly SD0551500, the magnet should be installed within ¼" of the sensing surface. The magnet assembly should also be installed in such a manner that it remains an even distance from the aluminum extrusion throughout the entire stroke. Improperly installed magnets can result in output signal non-linearity, or loss of Magnet signal.

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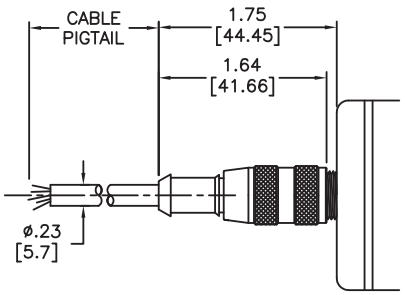
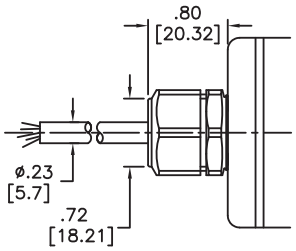
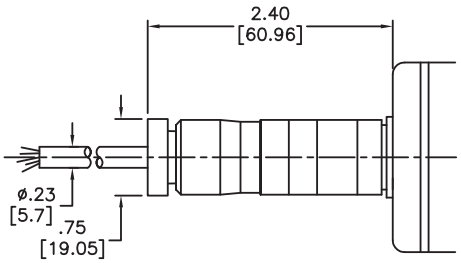
2.4 Connector Options



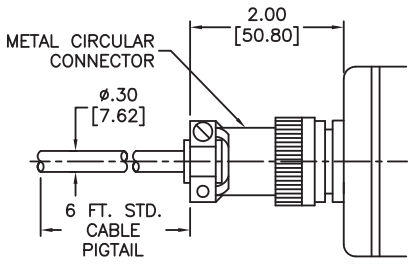
CONNECTOR OPTION S



CONNECTOR OPTIONS C & H



CONNECTOR OPTIONS M & B



CONNECTOR OPTION E

Figure 2-4 Standard Cable Connector Options 957A

Chapter 3: Wiring

3.1 Wiring Connections

Once the LDT has been installed, wiring connections can be made. The 957A has four different connector options. Please refer to the part number label to help identify which wiring diagram is correct. There are two groups of connections that will need to be made. They are as follows:

- Power Supply Connections (including grounding and shielding)
- LDT Input/Output Connections

Power Supply/Ground Connections

The 957A Brik™ is available with many different connector/wiring options. Refer to part numbering on unit in question for proper wiring. See Chapter 6 for part numbering grid and fiqures 3.3 - 3.9 for wiring details.

Connector option S is an industry standard 5 pin 12mm Euro style cordset with a shield. Option B is an 8 pin DIN with a shield, and option M is a 6 pin DIN with a shield. To reduce electrical noise, the shield must be properly used. Connect the cable's shield to the controller system GND. The cable shield is NOT connected at the transducer extrusion. Always observe proper grounding techniques such as single point grounding and isolating high voltage (i.e. 120/240 VAC) from low voltage (7-30 VDC cables).

WARNING: Do not use molded cordsets with LEDs!

It is preferable that the cable between the LDT and the interface device be one continuous run. If you are using a junction box, it is highly recommended that the splice junction box be free of AC and/or DC transient-producing lines. The shield should be carried through the splice and terminated at the interface device end.

NOTE: When grounding the LDT, a single earth ground should be connected to the Power Supply Common (circuit ground). The LDT Power Supply Common should be connected to the Power Supply Common (-) terminal. The LDT power supply (+VDC) should be connected to the power supply positive terminal (+). The LDT cable shield should be tied to earth ground at the power supply. The LDT analog common should not be connected to earth ground and should be used for connection to interface devices only. For assistance, refer to your LDT's wiring drawing in this chapter.

In order for the LDT to operate properly, the external power supply must provide a voltage between 7-30 VDC. The power supply must be rated at one watt minimum. The power supply should provide less than 1% ripple with 10% regulation.

WARNING: Do not route the LDT cable near high voltage sources.

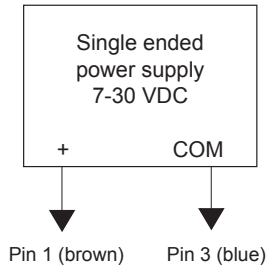


Figure 3-1: Power Supply Wiring

The power supply should be dedicated to the LDT to prevent noise and external loads from affecting it. When powering up more than one LDT on a single power supply, each unit will draw approximately one watt.

V0/V1 (Voltage)

The LDT generates a voltage output based on position. The 957A Brik™ offers 16 Bits of resolution, and is fully programmable over the entire active stroke length. Keep in mind that there is a 2" Null Zone at the connector end of the LDT and a 2.65" Dead Band at the other end of the LDT that the magnet must stay out of at all times. The units come fully programmed from the factory and do not require re-programming unless desired.

The analog output is referenced to the analog common terminal and should not be referenced to any of the other common terminals. For wiring, see Figure 3-2. For programming Zero and Span, See Section 4.2.

C4/C2 (Current)

The LDT generates a current output based on position. The 957A Brik™ offers 16 Bits of resolution, and is fully programmable over the entire active stroke length of the LDT. Keep in mind that there is a 2" Null Zone at the connector end of the LDT and a 2.65" Dead Band at the other end of the LDT that the magnet must stay out of at all times. The units come fully programmed from the factory and do not require re-programming unless desired.

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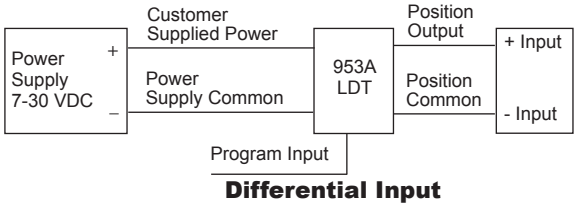
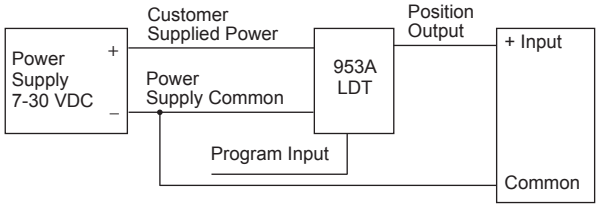
Typical Wiring

Figure 3-2 shows two common methods for wiring the 957A to a customer supplied interface device, such as a PLC or panel meter. The two different methods are commonly referred to as Single Ended Input or Differential Input. Differential Input is the preferred wiring method.

With the Differential Input, the Analog Common wire is connected to the customer supplied input device and the Power Supply Common is wired separately to the customers supplied power source. When wired using the Differential method, the electrical noise and voltage offset errors produced by the currents running through the Power Supply Common are eliminated. The Power Supply Common and Analog Common are internally connected inside of the 957A Brik™ LDT.



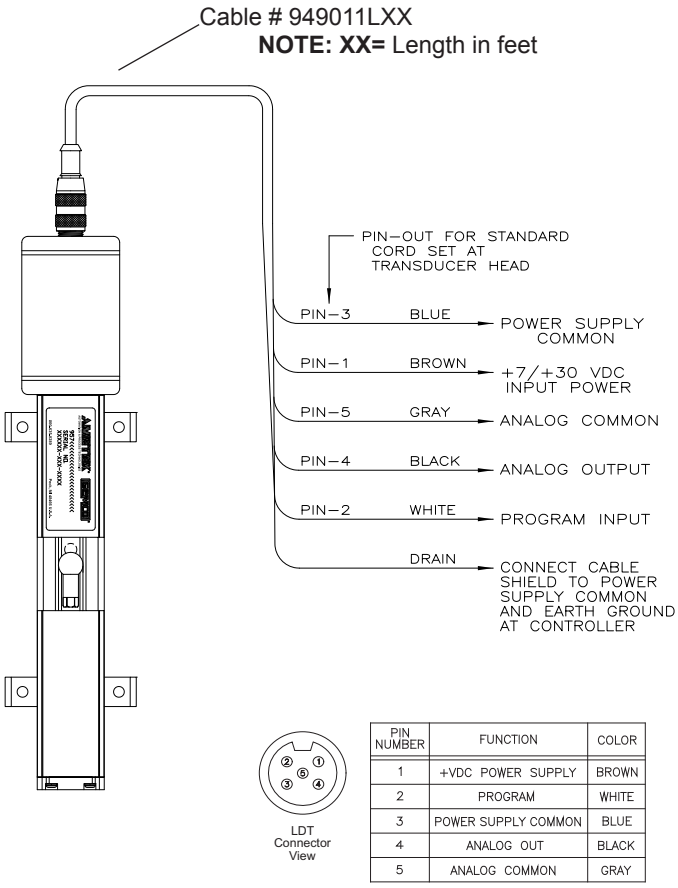
Differential Input



Single Ended Input

Figure 3-2: Current Sourcing

The 957A-C is current sourcing which allows the current to flow from the LDT into the users equipment.



PIN NUMBER	FUNCTION	COLOR
1	+VDC POWER SUPPLY	BROWN
2	PROGRAM	WHITE
3	POWER SUPPLY COMMON	BLUE
4	ANALOG OUT	BLACK
5	ANALOG COMMON	GRAY

Figure 3-3: Wiring for Connector Option "S", 5 Pin Micro

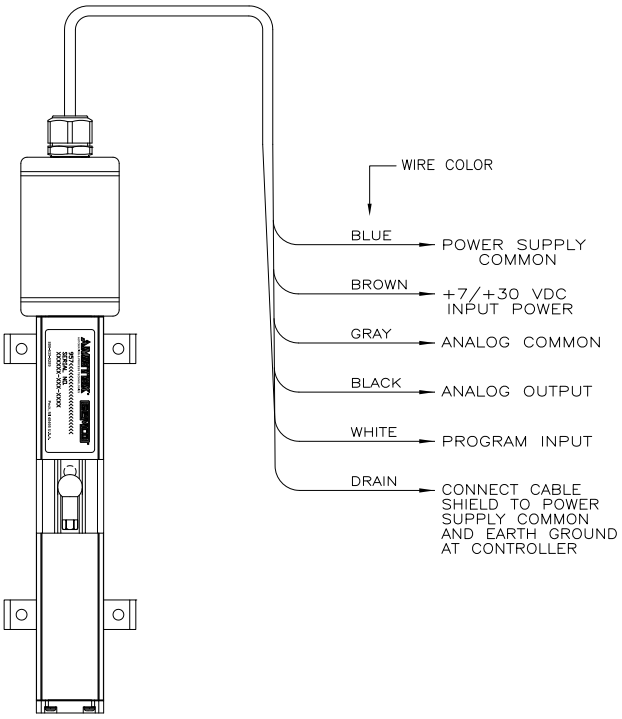


Figure 3-4: Wiring for Connector Option "C", Integral Cable Assembly

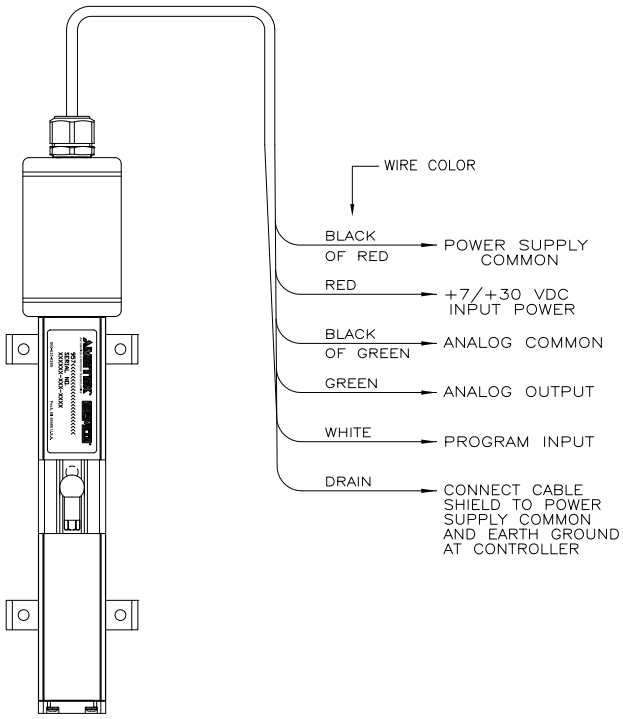


Figure 3-5: Wiring for Connector Option "H", High Temp Integral Assembly

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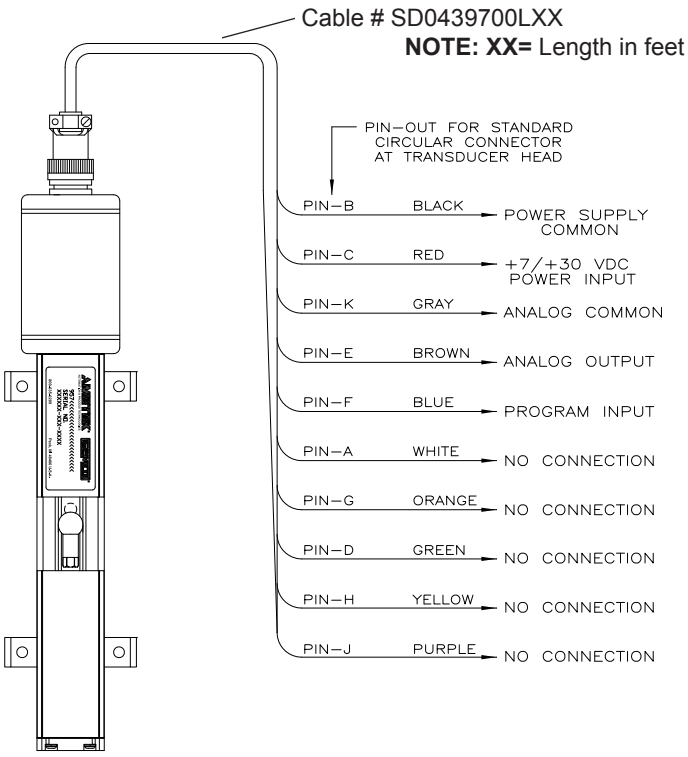
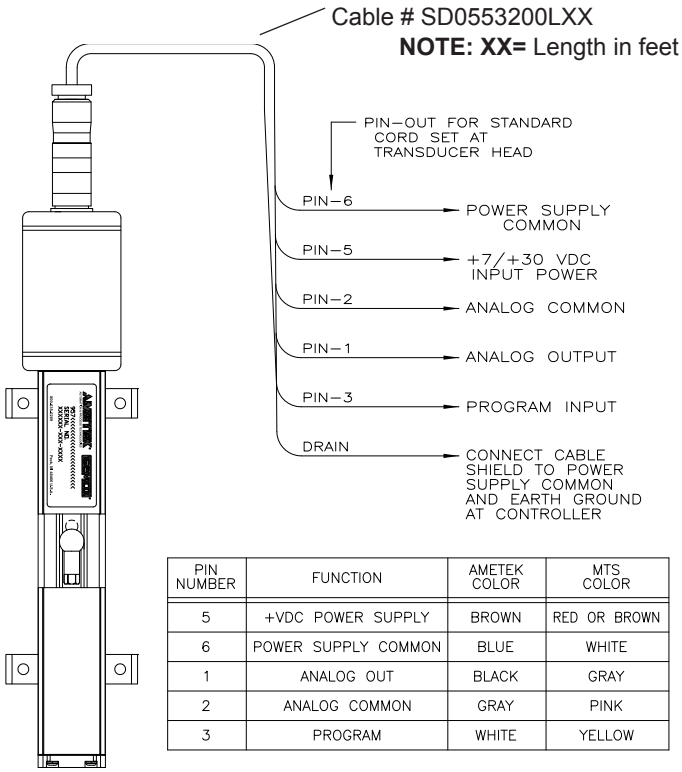
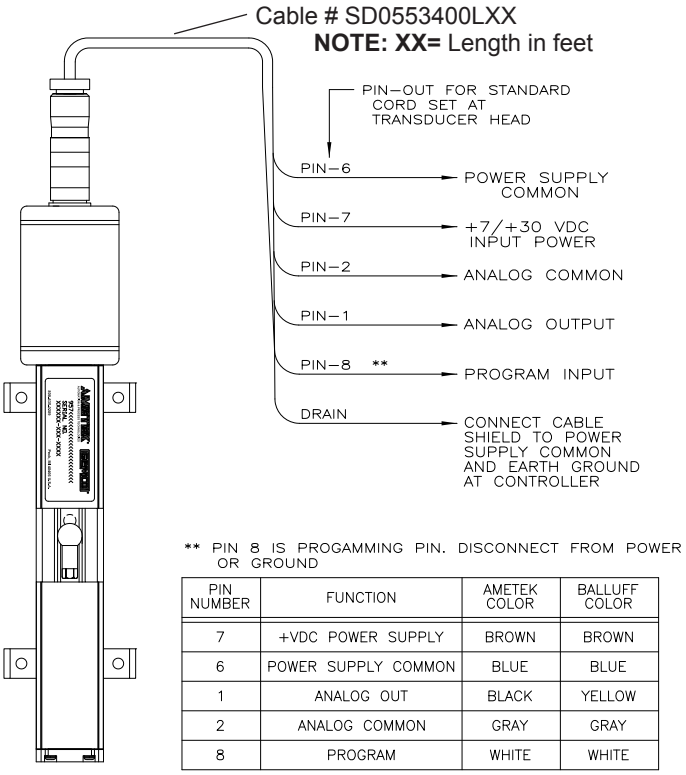


Figure 3-6: Wiring for Connector Option "E", 10 Pin MS Connector



PIN NUMBER	FUNCTION	AMETEK COLOR	MTS COLOR
5	+VDC POWER SUPPLY	BROWN	RED OR BROWN
6	POWER SUPPLY COMMON	BLUE	WHITE
1	ANALOG OUT	BLACK	GRAY
2	ANALOG COMMON	GRAY	PINK
3	PROGRAM	WHITE	YELLOW

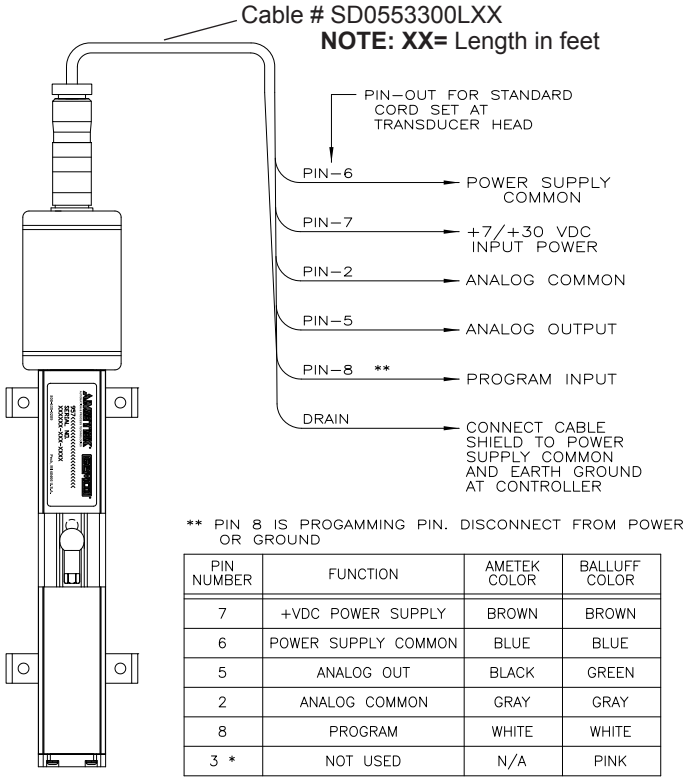
Figure 3-7: Wiring for Connector Option "M", 6 Pin DIN



** PIN 8 IS PROGAMMING PIN. DISCONNECT FROM POWER OR GROUND

PIN NUMBER	FUNCTION	AMETEK COLOR	BALLUFF COLOR
7	+VDC POWER SUPPLY	BROWN	BROWN
6	POWER SUPPLY COMMON	BLUE	BLUE
1	ANALOG OUT	BLACK	YELLOW
2	ANALOG COMMON	GRAY	GRAY
8	PROGRAM	WHITE	WHITE

Figure 3-8: Wiring for Connector Option "B", 8 Pin DIN, Current Output



** PIN 8 IS PROGAMMING PIN. DISCONNECT FROM POWER OR GROUND

PIN NUMBER	FUNCTION	AMETEK COLOR	BALLUFF COLOR
7	+VDC POWER SUPPLY	BROWN	BROWN
6	POWER SUPPLY COMMON	BLUE	BLUE
5	ANALOG OUT	BLACK	GREEN
2	ANALOG COMMON	GRAY	GRAY
8	PROGRAM	WHITE	WHITE
3 *	NOT USED	N/A	PINK

* PIN 3 IS NOT USED ON 957A. FOR FALLING OUTPUT, REPROGRAM LDT & USE PIN 5

Figure 3-9: Wiring for Connector Option "B", 8 Pin DIN, Voltage Output

CAUTION: Pinout is different for voltage vs. current models with connector option "B"

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Chapter 4: Features

4.1 Automatic Gain Control

The Automatic Gain Control feature will automatically search and find the magnet on power up, if power is applied without a magnet on the LDT, the LED will turn RED indicating no magnet signal is detected. Turn power off and place magnet within the active stroke area. Re-apply power.

Diagnostic LED	
LED Color	**Description**
None	No power to LDT
Green	Magnet signal detected and within programmed range.
Yellow	Magnet signal detected, but magnet is outside of programmed range. **NOTE**: Magnet can be programmed in this range if desired.
Red	No magnet signal detected. Make sure magnet is on the extrusion and within the active area. Move magnet back into the range and cycle power.

4.2 Setting Zero & Span Position

The units come fully programmed from the factory and do not require re-programming unless desired. The units are 100% absolute and will not lose programmed parameters on power loss. The Zero and Span points can be programmed in any order and anywhere within the LDT's active sensor area.

NOTE 1: Zero or Span can be adjusted individually without setting the other.

NOTE 2: Zero = 0V on 0-10 VDC units and 4mA on 4-20mA units.

There is a timing sequence that is used to unlock the probe for programming. This is to insure that the Span cannot be accidentally re-programmed by someone in the field.
Before programming the Zero or Span, the program input must be connected to the Power Supply Common for a minimum of 2 seconds and no more than 6 seconds, then released for 1 second. The LTD programming sequence is now unlocked and will remain an unlocked unit until either the Zero or Span is programmed or the 10 second programming sequence times out. During the unlock mode either the Zero or Span can be programmed by momentarily connecting the Program Input to either the Power Supply Common or Power Supply +.

NOTE: The LDT must be unlocked to program the Zero and unlocked again to program the Span. Once either the Zero or Span is programmed the LDT will go back into the locked mode.

To program the Zero or Span, the program input must be connected to the Power Supply Common for 4 seconds, then released for 1 second. Within the next 5 seconds, you can program either the Zero or the Span by momentarily connecting the Program Input to either the Power Supply Common or Power Supply +VDC.

WARNING: During normal operation, electrically insulate the White Program wire to prevent accidental setting of Span.

Manual Setting of Zero & Span

To set the Zero and Span position, follow these steps:

1. Apply power to the LDT.
2. Place magnet assembly where Zero is to be located, but within the active region of the probe.
3. Short the Program Input pin to the Power Supply Common for 4 seconds. Remove the short for 1 second. Within 5 seconds, short the Programming Input pin to the Power Supply Common. This completes the Zero programming process.
4. Place magnet assembly where Span is to be located, but within the active region of the probe.
5. Short the Program Input pin to the Power Supply Common for 4 seconds. Remove the short for 1 second. Within 5 seconds, short the Programming Input pin to the Power Supply +VDC.

   This completes the programming process.

Optional Remote Tester & Programmer

The battery operated remote tester / programmer is available in either a voltage or current model. P/N SD0528810 is designed for voltage units while SD0528811 is for current units. Both units are designed to work with connector option S only. These units are typically used to demonstrate the functionality of the LDT in the field, however, they can be used as a handy troubleshooting / programming device.

1. Attach the 5 pin Euro connector to the 957A.
2. Push the toggle switch to the ON position to power the LDT.
3. Place magnet assembly where Zero is to be located, but within the active region of the probe.
4. Push the black Zero button for 4 seconds, release for 1 second. Within 5 seconds, push the Zero button again. This completes the Zero programming process.
5. Place magnet assembly where Span is to be located, but within the active region of the probe.
6. Push the black Zero button for 4 seconds, release for 1 second. Within 5 seconds, push the Span button.

NOTE: This time the Span button is pushed for the final programming step.

This completes the programming process.

Optional In-Line Programmer

The 955-1409 is a remote programmer that can help simplify the programming process. The programmer is a portable device that can be temporarily or permanently installed in series with the 957A with connector option S.

1. Remove the 5 pin cordset to the LDT.
2. Attach the existing cordset to the 955-1409 programmer.
3. Attach the other end to the LDT.
4. Apply power to the LDT.
5. Place magnet assembly where Zero is to be located, but within the active region of the probe.
6. Push the Zero button for 4 seconds. Release the button for 1 second. Within 5 seconds, push the Zero button again.
7. Place magnet assembly where Span is to be located, but within the active region of the probe.
8. Push the Zero button for 4 seconds. Release the Zero button for 1 second. Within 5 seconds, push the Span button.

This completes the programming process.

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Chapter 5: Troubleshooting

A Tri-color LED is conveniently located next to the conector to help with set-up and diagnostics.

Diagnostic LED	
LED Color	**Description**
None	No power to LDT
Green	Magnet signal detected and within programmed range.
Yellow	Magnet signal detected, but magnet is outside of programmed range. **NOTE**: Magnet can be programmed in this range if desired.
Red	No magnet signal detected. Make sure magnet is on the extrusion and within the active area. Move magnet back into the range and cycle power.

If a problem exists after reading this section, please contact our technical support department.

General Checks

Make sure that the magnet is located within the LDT's active stroke area. Keep in mind that the LDT is programmable over the entire active stroke area. Captive magnet assemblies should be positioned so that they can move freely over the entire area of the active stroke without binding or pushing on the rod end. Non-captive magnet assemblies should be situated so that the magnet is no farther than 0.2" from the rod at any point in the magnet assembly's movement.

NOTE: Ferromagnetic material (material readily magnetized) should be located no closer than 0.25" from the magnet or LDT rod end. This includes mounting brackets, magnet spacers, magnet brackets, and mounting screws. Ferromagnetic material can distort the magnetic field, causing adverse operation or even failure of the LDT.

Check all LDT wires for continuity and/or shorts. It is preferred that the cable between the LDT and the interface device be one continuous run. If you are using a junction box, it is highly recommended that the splice junction box be free of AC and/or DC transient-producing lines. The shield should be carried through the splice and terminated at the interface device end.

Power Supply Checks

If your LDT is not operating properly, the LDT's cable may have an open or short, or the power supply is not supplying sufficient power. To verify this, perform the following steps:

1. Turn the power supply off.
2. Remove the mating connector from the LDT.
3. Turn the power supply on.
4. Using a digital voltmeter, check from the Power Supply Common to the Power Supply + on the mating end of the cable for a level between +7 and +30 VDC.

If reading is between 7 and 30 VDC, turn power supply off and go to step 7. If reading is below 7 VDC, either your power supply is not providing enough power or the LDT's cable possibly has a short/open. Readings of no voltage or minimal voltage (less than 5 volts) may be due to short/open in the cable. If reading is NOT between 7 and 30 VDC, go to step 5. If reading is above 30 VDC, adjust power supply or replace.

5. Turn the power supply off.
6. Check the continuity of the individual wires of the cable between the power supply and the LDT. Check for continuity from one end of the cable to the other. Also verify that no shorts exist between pins.
7. Reconnect the mating connector to the LDT.
8. Turn power supply on.
9. Using a digital voltmeter, check the power supply's "+" and "-" terminals for a voltage between 7 and 30 VDC.

Low voltage readings may indicate a power supply with a wattage (current) rating that is too low. (Each LDT requires approximately 1.3 watts). If the cabling checks out in step 6 and your voltage is below 7 VDC, check your power supply current rating. If voltage is between 7 to 30 VDC and the LDT is still inoperative, contact factory.

*See Chapter 7: Specifications for more information on power consumption.

Chapter 6: Part Numbering

957A — V0 — 0120 — E — S — X

Output	
V0	0 to 10 VDC
V1	10 to 0 VDC
V2	-10 to 10 VDC
V3	10 to -10 VDC
V4	0 to 5 VDC
V5	5 to 0 VDC
V6	-5 to 5 VDC
V7	5 to -5 VDC
C4	4 to 20mA
C2	20 to 4mA

Stroke Length
Insert stroke length to 0.1 inch. Enter as a four-place number. Example: A 12.0" stroke enters as 0120. OR Insert stroke in millimeters to 1mm. Enter as a four-place number. Example: 305mm stroke entered as 0305M.

Units of Measure	
E	Inches
M	Metric

Connector Option	
S	Standard 5 Pin, 12mm Euro
C_	Integral Cable Assembly. Insert length in feet. Example: C6 = 6 foot cable.
M	6 Pin DIN, MTS Style D60
B	8 Pin DIN, Balluff S32
E	Environmental 10 Pin MS Connector compatible w/951 & 952 LDTs w/connector option "E".
H_	High Temp., Integral cable assembly 200° C Teflon Cable. Insert length in feet. Example: H6= 6 foot High Temp Teflon Cable.

Options	
X	None

NOTE 1: Specify magnet and mounting feet as separate line items.

Magnets & Mounting Feet	
Part Number	**Description**
SD0521800	Slide Magnet Assembly, Top Mounted Swivel
SD0521801	Slide Magnet Assembly, Side Mounted Swivel
SD0551500	Large Width Floating Magnet
SD0522000	Mounting Foot - Minimum 2 required per unit

Cable Connections	
Part Number	**Description**
949011L6	5 Pin, 6 Foot, Straight Connector (Option S)
949011L12	5 Pin, 12 Foot, Straight Connector (Option S)
949012L6	5 Pin, 6 Foot, Right Angle Connector (Option S)
949012L12	5 Pin, 12 Foot, Right Angle Connector (Option S)
SD0439700LXX	10 Pin, Straight Connector (Option E)
SD0439701LXX	10 Pin, Right Angle Connector (Option E)
SD0553200LXX	6 Pin, DIN Straight Connector (Option M)
SD0553300LXX	8 Pin, DIN Straight Connector (Option B) -Voltage Output Units
SD0553400LXX	8 Pin, DIN Straight Connector (Option B) - Current Output Units
Note: XX Denotes length in feet. Consult factory for longer lenghts or cables not shown	

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Chapter 7: Specifications

General Specifications	
Connector	5 pin 12mm Euro/Micro standard. Intergrated cable assembly, 6 pin or 8 pin DIN & 10 pin MS optional.
Displacement	1" to 180"
Dead Band	2.65" (67.31 mm) standard
Null Zone	2.00" (50.8 mm) standard
Linearity	Less than +/- 0.01% or +/- 0.005", whichever is greater. (+/- 0.003" typical)
Repeatability	Equal to Resolution
Hysteresis	0.008"
Operating Temperature	-40° to 185° F (-40° to 85° C)
Storage Temperature	-40° to 221° F (-40° to 105° C)
Shock & Vibration Shock Vibration	 1,000Gs (lab tested) IEC 60068-2-27 30Gs (lab tested) IEC 60068-2-6
Zero & Span Adjustability	Factory set at Null Zone & Dead Band locations. Field re-settable at any location within active stroke.
Approvals	CE, 89/336/EEC (EMC)

Electrical Specifications	
Input Voltage	7-30 VDC
Current Draw	One watt, 40mA at 24 VDC typical
Specifications are subject to change and based on a typical 48" stroke length.	

Analog Specifications				
Temperature Drift Position Output	 3.1 ppm/° F/in. of stroke2 3.1 ppm/° F for Voltage output 9.2 ppm/° F for Current output			
Analog Output Loading	Voltage output minimum load resistance: 2K ohms Current output: Guaranteed 5mA minimum for voltage units Maximum load resistance: 500 ohms			
Analog Ripple	<1 mV maximum (position output)			
Update Time	Stroke Length L ≤ 2” 2” < L ≤ 12” 12” < L ≤ 30” 30” < L ≤ 50” 50” < L ≤ 100”	Update Time 0.5 ms 1 ms 2 ms 3 ms 4 ms	Stroke Length 100” < L ≤ 150” 150” < L ≤ 180”	Update Time 5 ms 6 ms
Resolution Internal Output	 0.00006" (1.524 microns) 16-Bit			
Position Output	0-10 VDC, 16 Bits (65,535) resolution		4-20mA, 16 Bits (65,535) resolution	
Output Type Voltage Current	 **V0**- 0 to 10 VDC, **V1**- 10 to 0 VDC, **V2**- -10 to 10 VDC, **V3**- 10 to -10 VDC, **V4**- 0 to 5 VDC, **V5**- 5 to 0 VDC, **V6**- -5 to 5 VDC, **V7**- 5 to -5 VDC, **C4**- 4 to 20mA, **C2**- 20 to 4mA			

Cable Specifications				
Cable Type	**Gauge**	**Jacket**	**Temp**	**Bend Radius**
Connector Options "S", "M", "B", "C"	22	PVC	-50°C to 105°C	Moving Applications – 2.36" Fixed Applications – 1.18"
High Temp Integral Cable "H" Option	22	Teflon	-70°C to 200°C	Moving Applications – 2.36" Fixed Applications – 1.18"
Connector Option "E"	22	Polyurethane	-50°C to 105°C	Moving Applications – 2.36" Fixed Applications – 1.18"

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