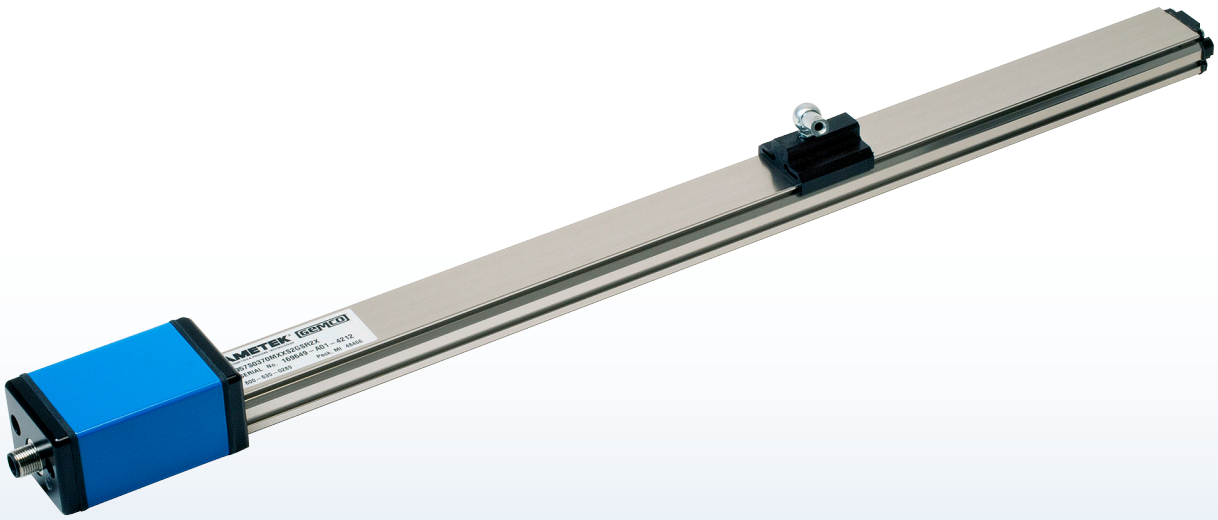
GEMCO®

Series 957SSI Brik™

Linear Displacement Transducer

Installation Manual

957SSI Brik™



ABSOLUTE PROCESS CONTROL
KNOW WHERE YOU ARE... REGARDLESS

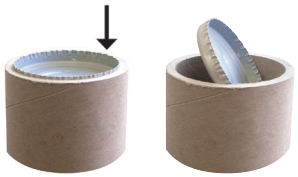
AMETEK®

Contents

NOTE: Ametek has checked the accuracy of this manual at the time it was approved for printing. This manual may not provide all possible ways of installing and maintaining the LDT. Any errors or additional possibilities to the installation and maintenance of the LDT will be added in subsequent editions. Comments for the improvement of this manual are welcome.

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: 957SSI Overview

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

The 957SSI Brik™ provides a Serial Synchronous Interface output signal that is proportional to the position of the magnet assembly along the length of the probe.

This sensor is built to withstand the most severe environmental conditions and is completely absolute. This means that power loss will not cause the unit to lose position information or require re-zeroing. The non-contact design allows this device to be used in highly repetitive applications without mechanical wear.

Features

The 957SSI has auto-tuning capability. This is the ability to sense a magnet other than the standard slide magnet and adjust its signal strength accordingly.

There is an indicator LED that is located at the connector end of the probe and provides visual status information regarding the operation of the probe. Green indicates proper or normal operation. Red indicates the loss of the magnetic signal or a probe failure. When the probe is in the normal mode of operation, the LED will remain illuminated green continuously.

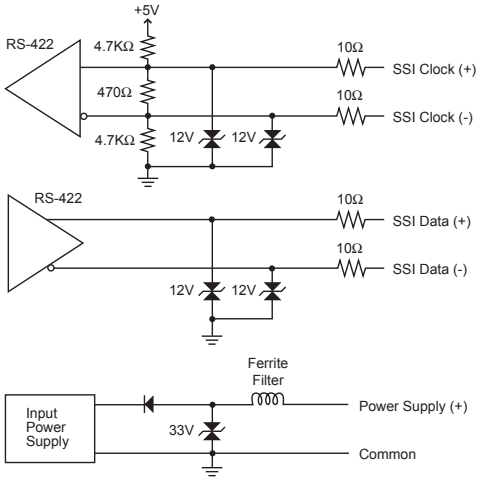
LED Colors*	
Green	Magnet is present and within the active range.
Red	Fault, the LDT has lost its signal from the magnet or the magnet has moved into the Null Zone or Dead Band.
*Refer to diagnostics on page 16 for a complete list of LED colors and functions.	

NOTE: The series number on your LDT is a record of all the specific characteristics that make up your unit. This includes what interface type it has, its output signal and range, the type of connector the unit uses, and stroke length. For a translation of the model number, see Section 3.5 Part Numbering System.

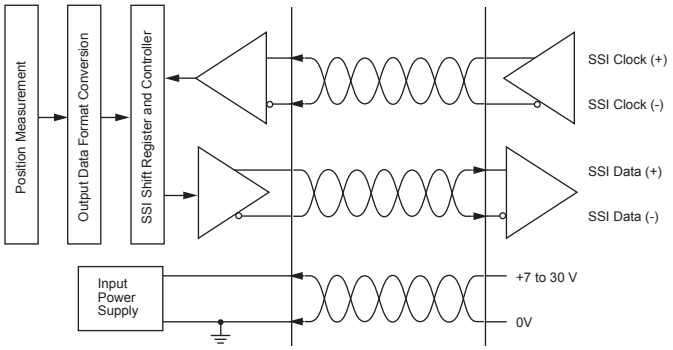
SSI (Serial Synchronous Interface)

The displacement value (position) is encoded into a 24, 25 or 26 Bit format and transmitted at high speeds. Synchronization in a closed loop system is made easy. A clock pulse train from a controller is used to shift out sensor data: one bit of position data is transmitted to the controller for one clock pulse received by the sensor. The absolute position data is continually updated by the sensor and converted by the shift register into serial information.

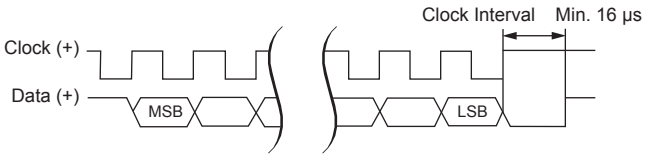
SSI Sensor Input



SSI Logic Diagram

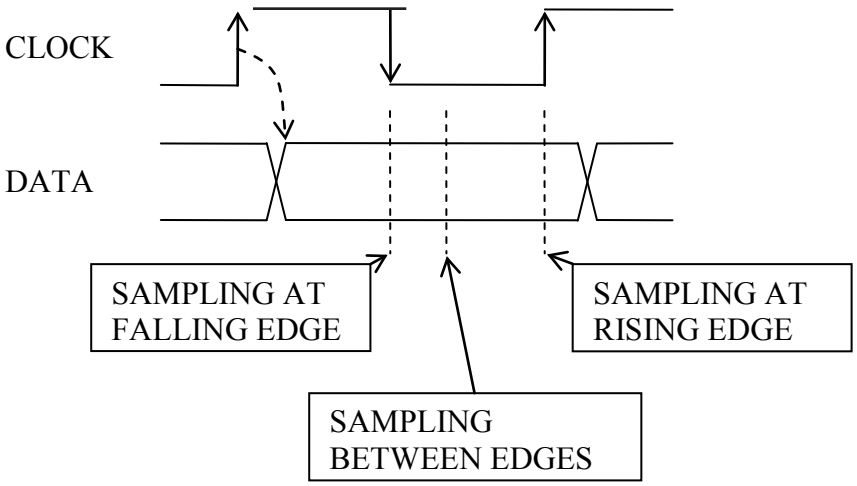


SSI Timing Diagram



Note: Based on Gemco cable P/N 01533149 (Turck P/N RF50610-30M).

New data is placed on the "data" signal 605nS after the rising edge of the "clock" signal. This time, plus the data caused by cable length, must be considered when determining the setup times (frequency) of the controller.



957SSI Brik™ with Magnet Sensor

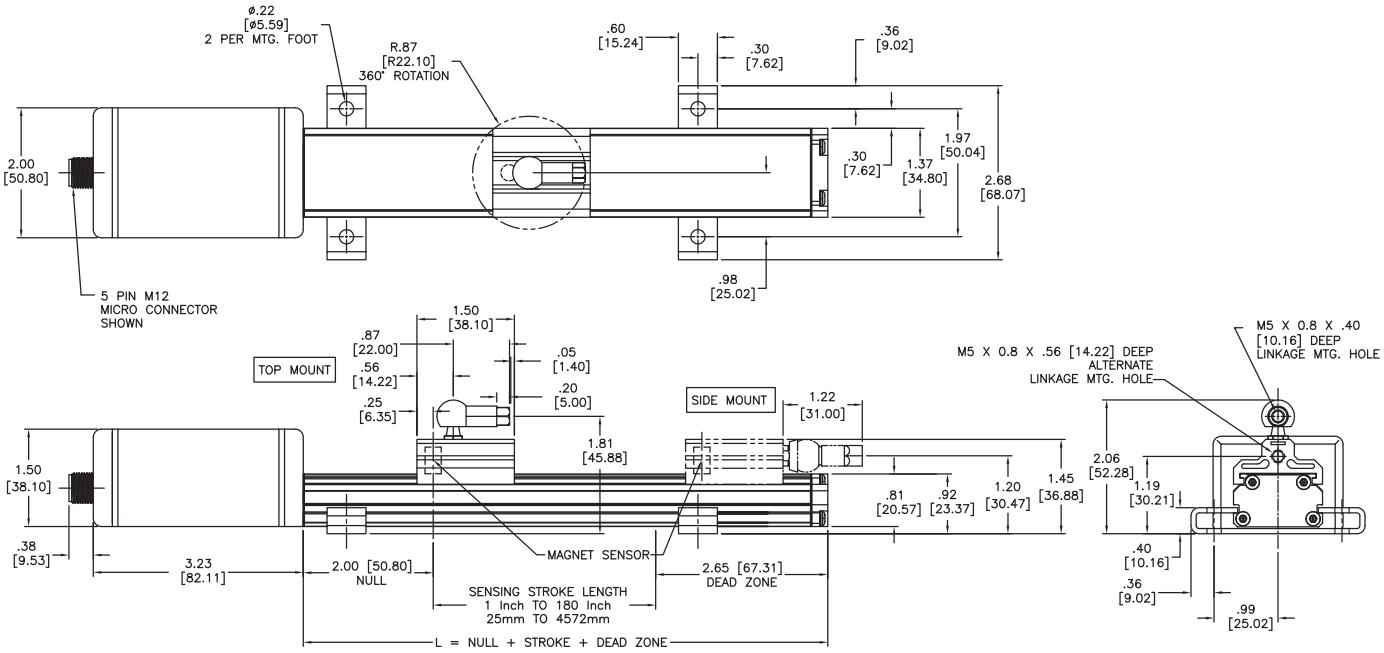


Figure 1-1 957SSI Dimension Drawing for Reference

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.

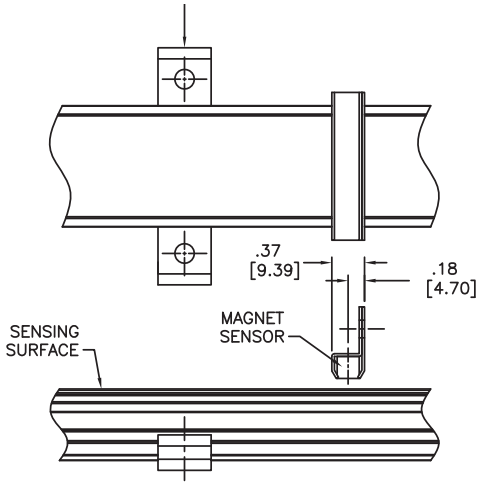


Figure 2-1 Mounting Bracket (SD0522000)

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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 1/4" 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 .25" 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.

2.2 Magnet Position

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

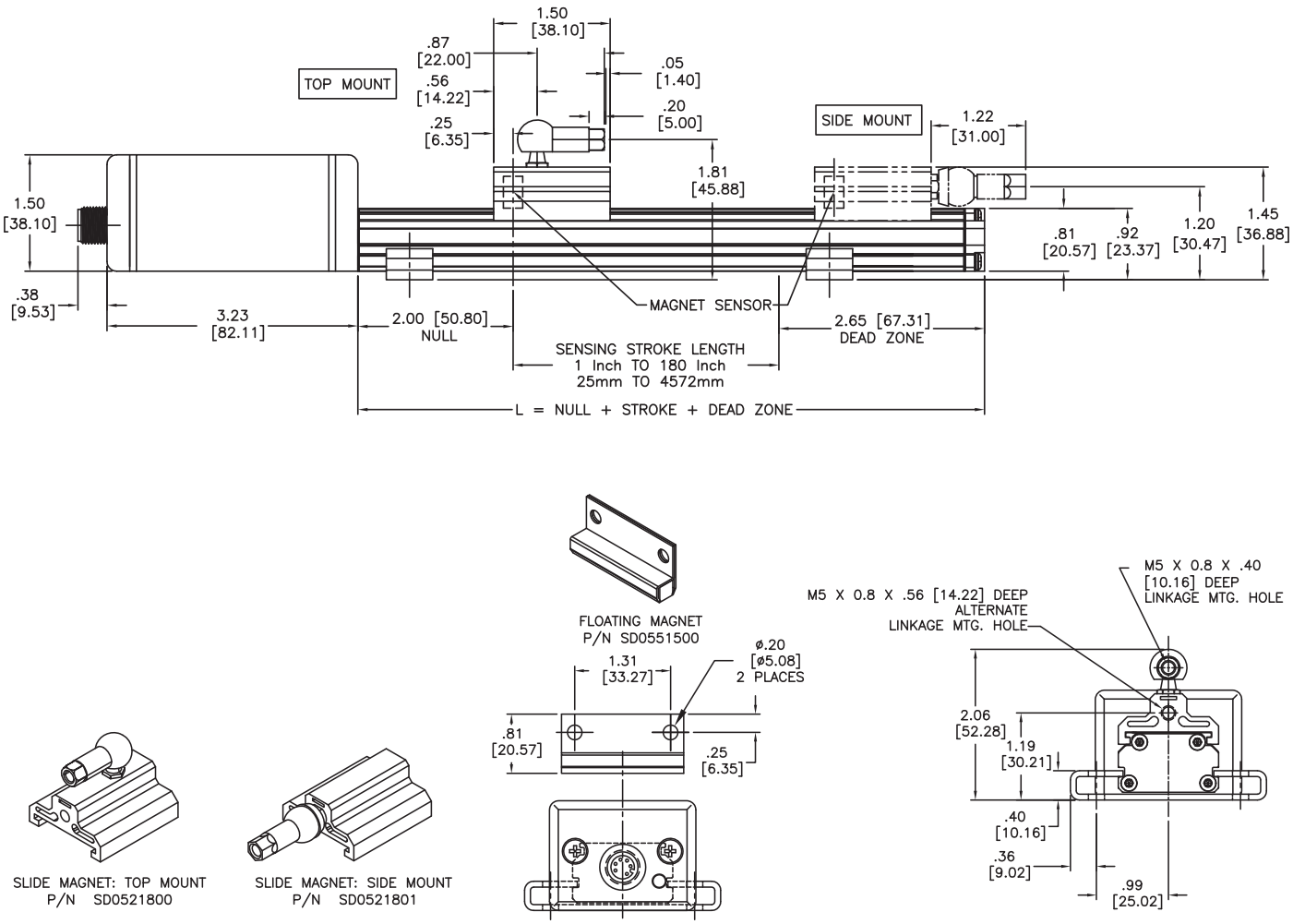

Figure 2-2 Magnet Sensor

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Chapter 3: Wiring

3.1 Wiring Connections

Once the LDT has been installed, wiring connections can be made. There are two groups of connections you will need to make. They are as follows:

- Power Supply Connections (including ground and shield)
- LDT Input/Output Connections

Power Supply/Ground Connections

The 957SSI is available with many different connector/wiring options. Refer to part numbering on unit in question for proper wiring. See Section 3.5 for part numbering and figures 3.3 - 3.8 for wiring details.

The 957SSI standard cable is a 6 Pin, 12mm, cordset. It has 6 conductors of 24ga, with an aluminum/polyester/aluminum foil with drain wire plus an overall braid of tinned copper shield. Cable O.D. is .23 (5.7mm). To reduce electrical noise, the shield must be properly used. Connect the cable's shield to the controller system GND.

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). Whenever possible, this cable should be run in conduit by itself. The power supply common, the cable shield and a good earth ground should be connected together at the location of the power supply common. See figure 3-1 Power Supply Wiring.

WARNING Do not route the Brik™ output cable near high voltage sources.

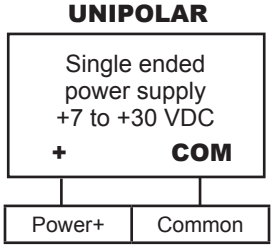


Figure 3-1 Power Supply Wiring

In order for the 957SSI to operate properly, the LDT's external power supply must provide a voltage between +7 to +30 VDC. The power supply must be rated at 150mA minimum. The power supply should provide less than 1% ripple and 10% regulations. (The power supply should be dedicated to the LDT to prevent noise from external loads from affecting the position readings.)

Cable lengths

AMETEK recommends that the maximum cable length be 10 meters. Cables greater than 33 feet are available; however, proper care must be taken during installation.

Any extension to the existing cabling should be mounted in a junction box free of any other cabling, the cable should be a twisted shielded pair with a braided shield. The shield should pass straight thru this enclosure and not tied to ground. When grounding the LDT, a single earth ground should be connected to the power supply common. The LDT power supply common should be connected to the power supply common (-) terminal. The LDT's shield should be tied to the earth ground at the power supply.

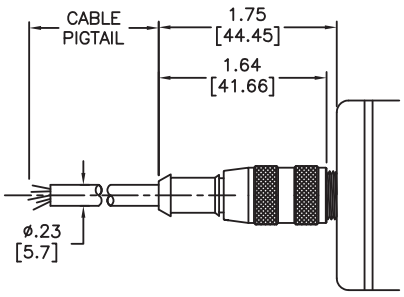
Cable length limitations are based on SSI clock frequencies. Apply good industry practices for long cable runs - keep cable away from high power AC lines and all motor drive cables.

Cable Length		Controller Data Sampling	
		Falling Edge	Rising Edge
6 ft	1.83 m	750 kHz	1500 kHz
30 ft	9.14 m	650 kHz	1300 kHz
100 ft	30.48 m	500 kHz	1000 kHz
150 ft	45.72 m	400 kHz	800 kHz
300 ft	91.44 m	270 kHz	540 kHz
600 ft	182.88 m	160 kHz	320 kHz
1200 ft	365.76 m	90 kHz	180 kHz

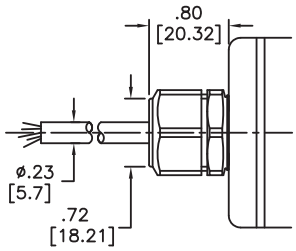
Cable Connectors

The 975SSI is available with various cable connection options. See figure 3-2 for standard options. Should a different connector be required for an application, please contact the factory at 800-635-0289.

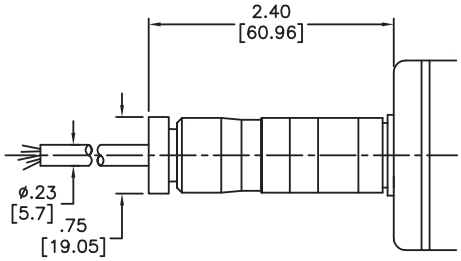
Note: Minimum SSI clock frequency rate is 70 kHz.



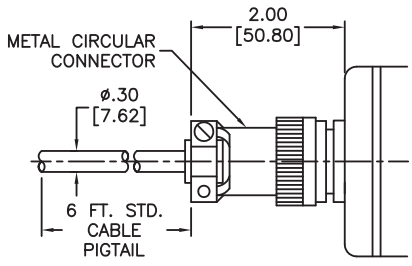
CONNECTOR OPTION S



CONNECTOR OPTIONS C & H



CONNECTOR OPTIONS M & B



CONNECTOR OPTION E

Figure 3-2 Standard Cable Connector Options 957SSI

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Startup

1. Verify connections
The 957SSI is reverse polarity protected; however, components can be damaged from improper connections or over voltage. Before applying power verify connections are correct.

2. Turning on power
Note that the system may execute uncontrolled movement when power is first applied when the 957SSI is part of a closed loop system whose parameters have not yet been configured.

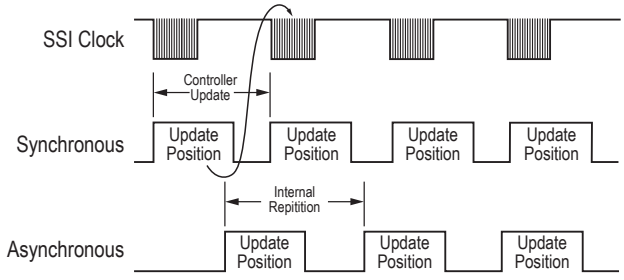
Position Update

The position of the magnet on the extrusion is precisely determined by a time of flight method. The 957SSI converts this position value to a 24, 25, or 26 bit Binary or Gray code data stream where it is transmitted to the host controller via SSI. All displacement outputs are absolute and do not lose their position after loss of power.

Position update frequencies are available up to 6500 measurements per second (Length dependant) in Asynchronous mode, and are controller dependant in the Synchronous mode. However, if the controller interrogates the 957LDT quicker than the LDT can provide data, the 957SSI Brik™ LDT will automatically switch to the Asynchronous mode and supply the host controller with the most up to date positional information.

Synchronous Update Mode

A clock pulse train from the host controller is used to shift out sensor data, one bit of positional data is transmitted to the controller for each clock pulse received by the sensor. The first clock pulse edge from the host controller signals the LDT to make a measurement. The positional data from this measurement will be used during the next controller update cycle.



NOTE: The data in this mode will always be one update cycle old.

Asynchronous Update Mode

The 957SSI Brik™ LDT takes measurements at its preset internal interrogation rate (length dependant) and provides information when requested from the host controller.

NOTE: If the controller or interface module does not specify Synchronous mode, we recommend using the LDT in the Asynchronous mode.

Direction

The 957 can be configured increasing, decreasing, position, or velocity. Option “F” (Measure Direction Forward) will increase counts as the magnet moves from the head of the LDT to the tip. Option “R” will be exactly opposite. The zero position will be located at the end of the blue housing. This is an area where it is physically impossible to detect a magnetic signal. If the 957SSI is in the “Measure Direction Reverse” option, the zero point will be at the far tip of the LDT, again a position that the magnet cannot be detected. If the velocity option is selected, the unit will output velocity and not displacement.

Resolution

The resolution of the positional output is selectable in the part number and can be ordered in English (Imperial) or metric units. Selections 1 thru B are valid options. Refer to section 3.5 Part Numbering for further details.

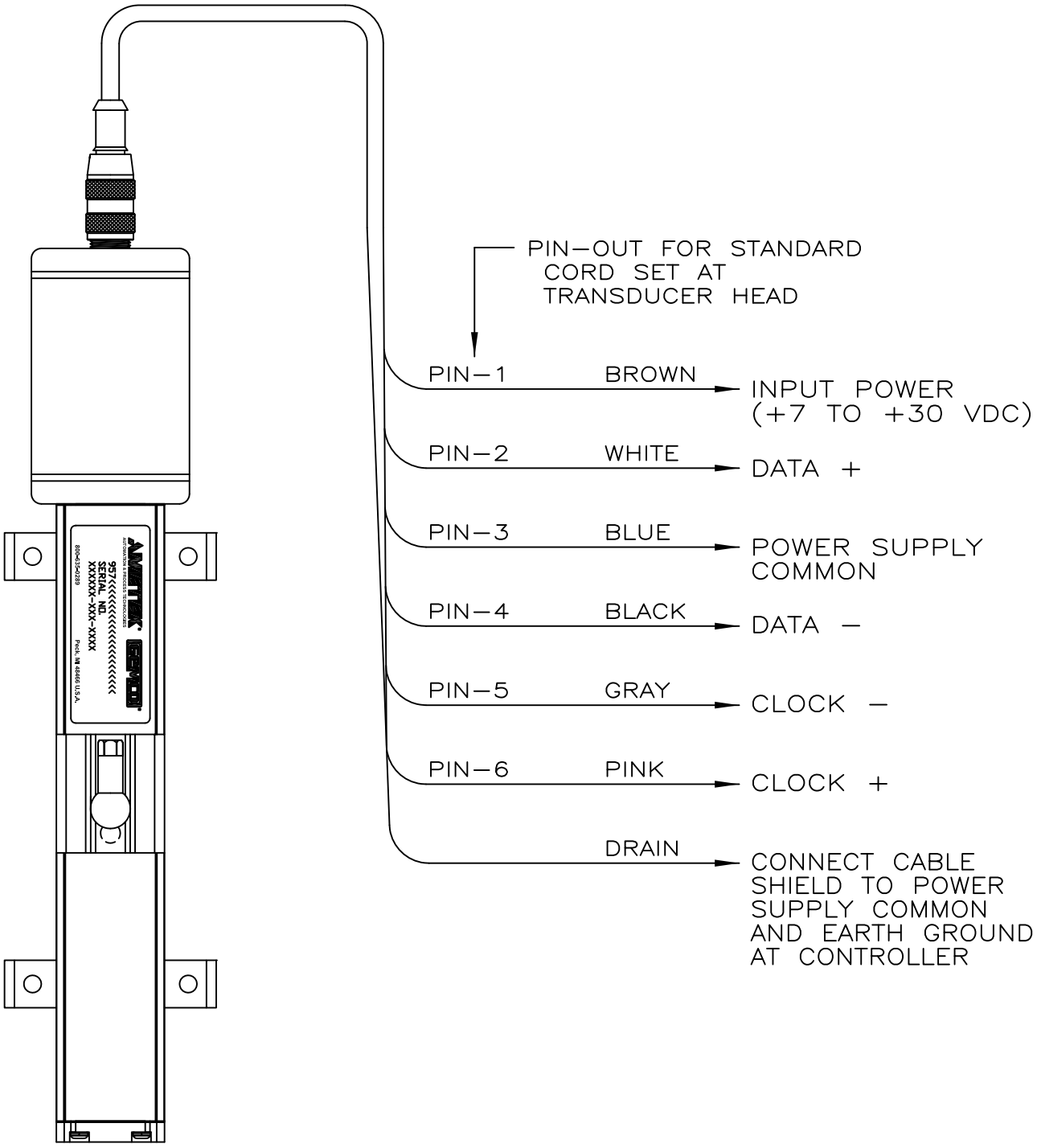


Figure 3-3: Wiring for Connector Option "S", 6 Pin 12 mm

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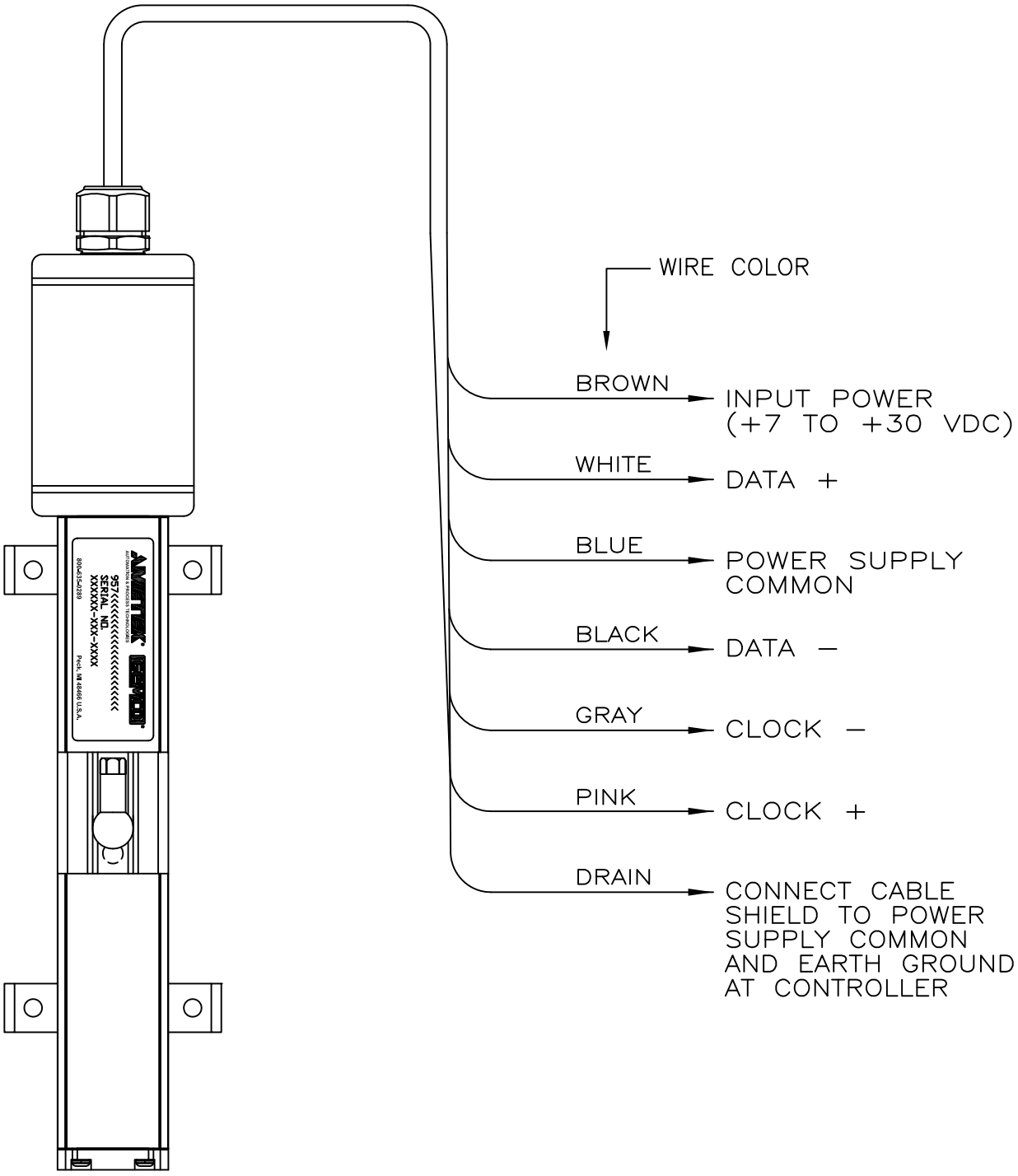

Figure 3-4: Wiring for Connector Option "C", Integral Cable Assembly

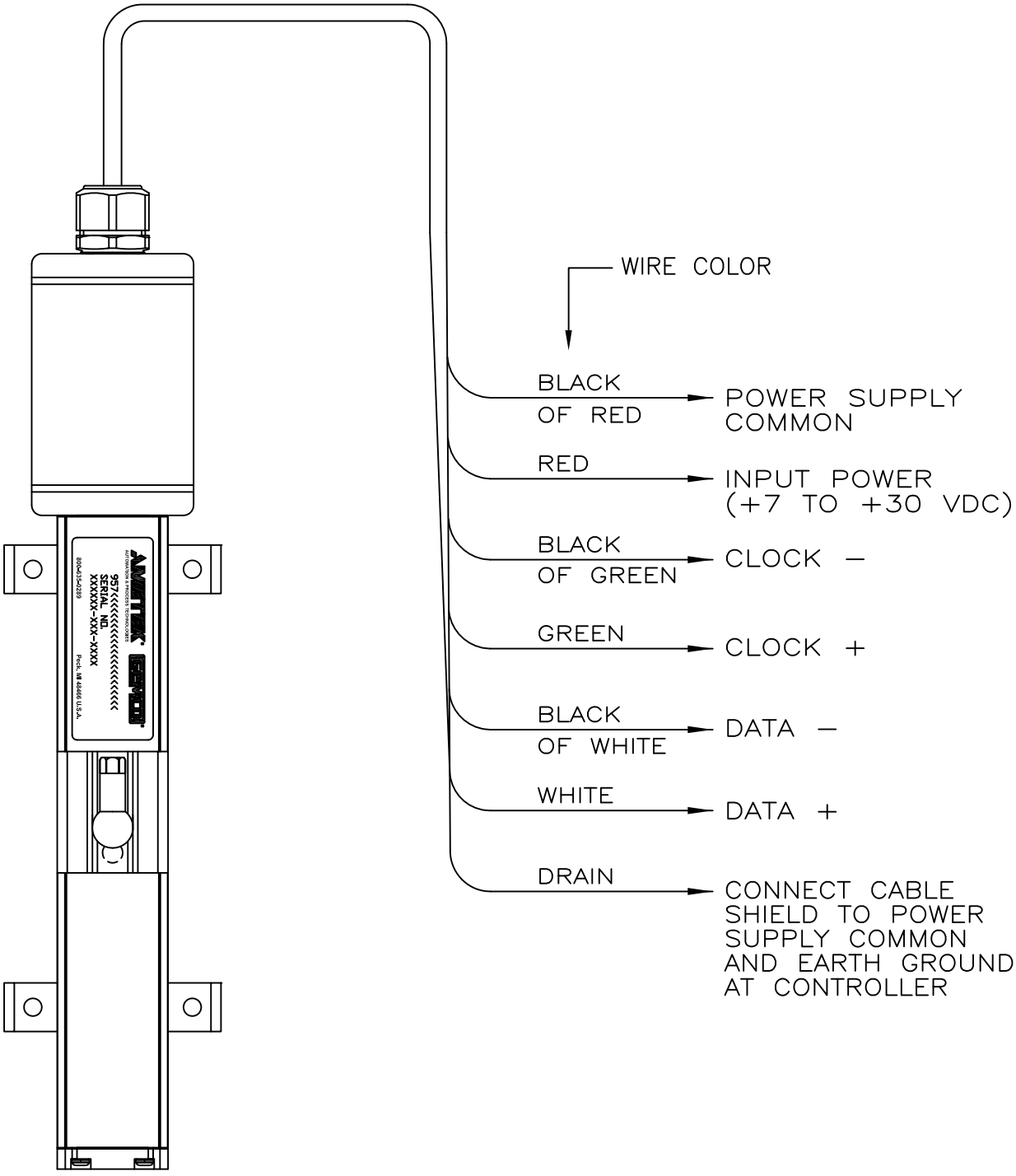

Figure 3.5 Wiring Diagram
Option "H", High Temperature Integral
Cable Assembly

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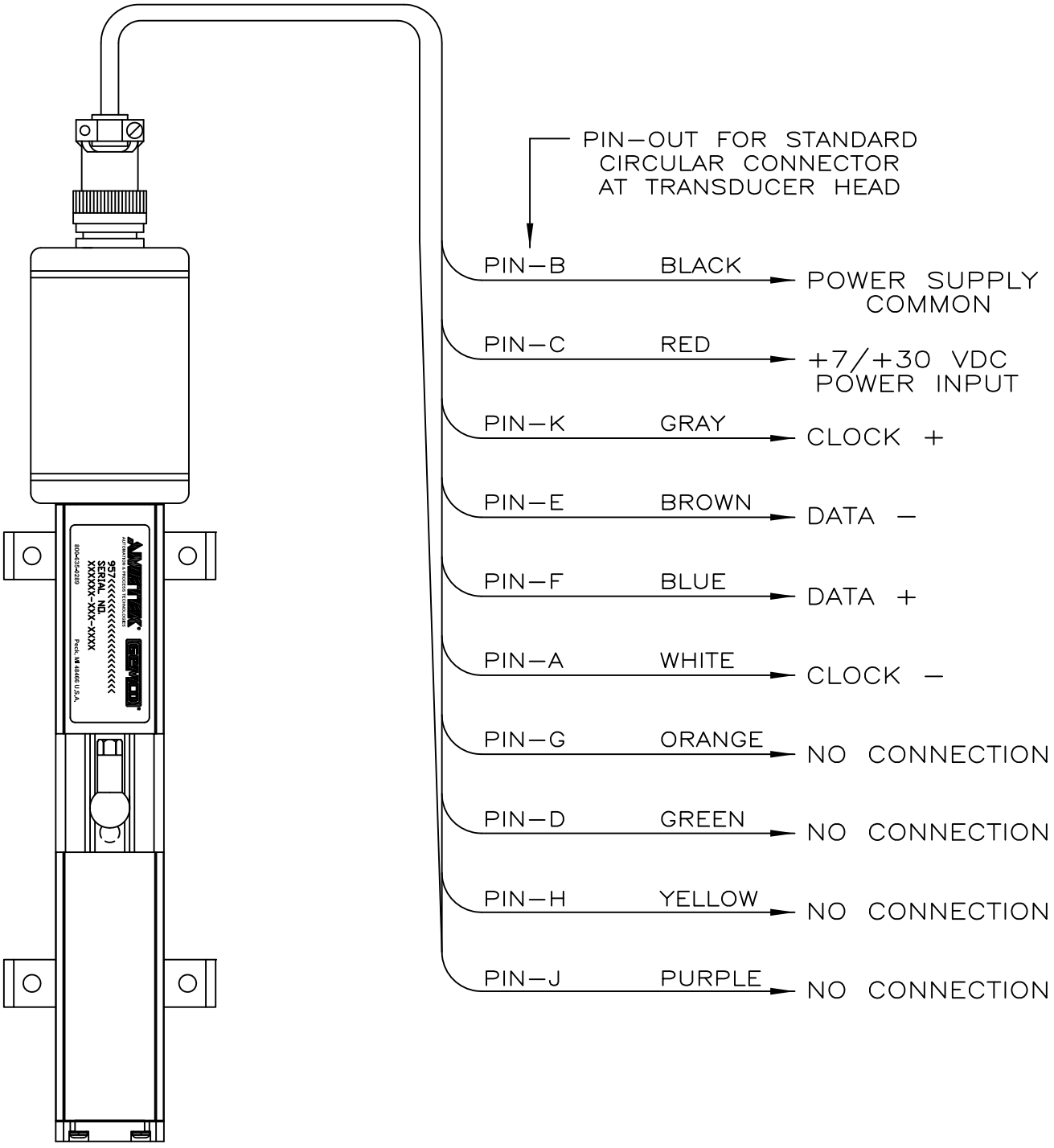
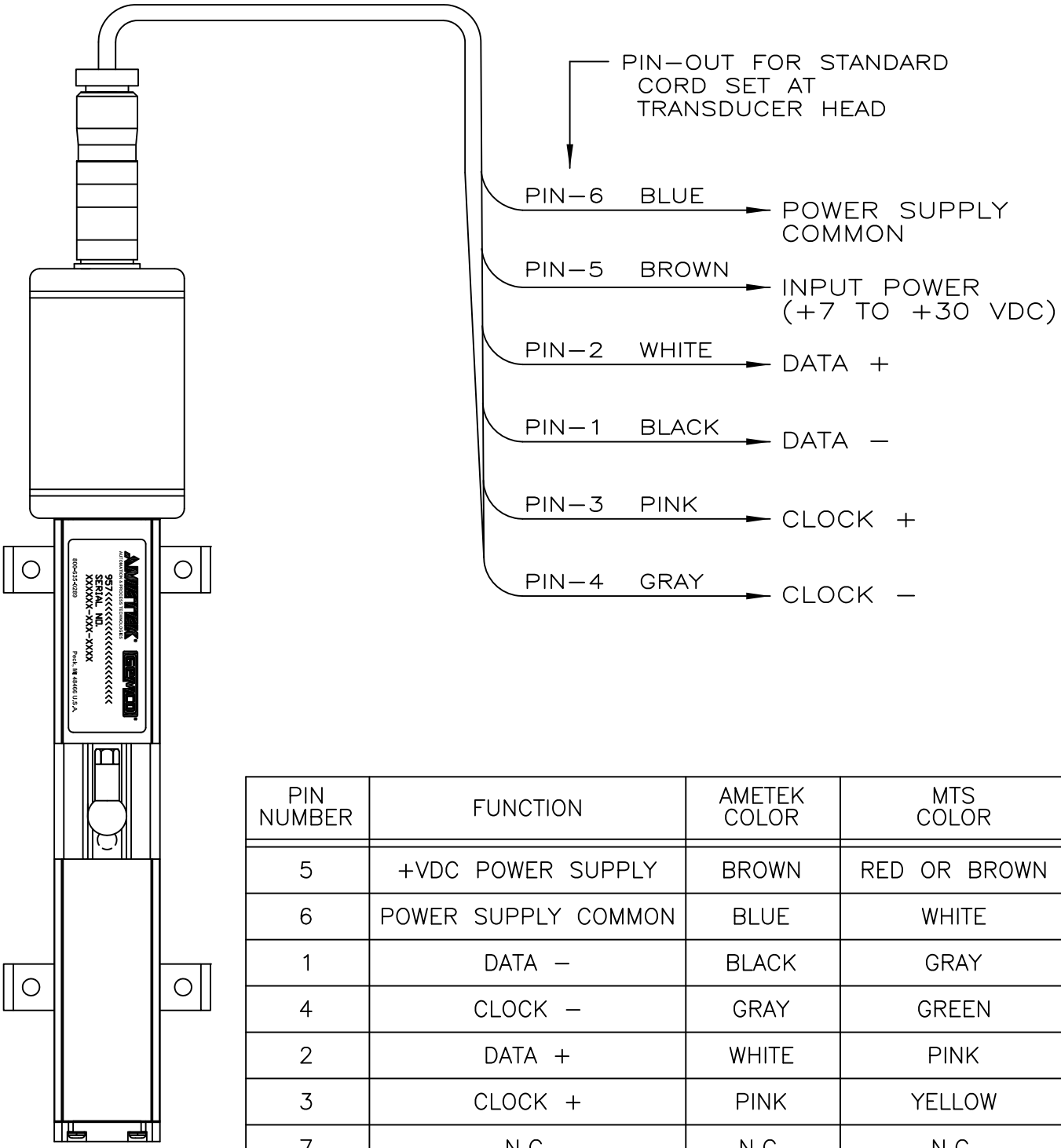


Figure 3-6: Wiring for Connector Option "E", 10 pin MS connector



PIN NUMBER	FUNCTION	AMETEK COLOR	MTS COLOR
5	+VDC POWER SUPPLY	BROWN	RED OR BROWN
6	POWER SUPPLY COMMON	BLUE	WHITE
1	DATA –	BLACK	GRAY
4	CLOCK –	GRAY	GREEN
2	DATA +	WHITE	PINK
3	CLOCK +	PINK	YELLOW
7	N.C.	N.C.	N.C.

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

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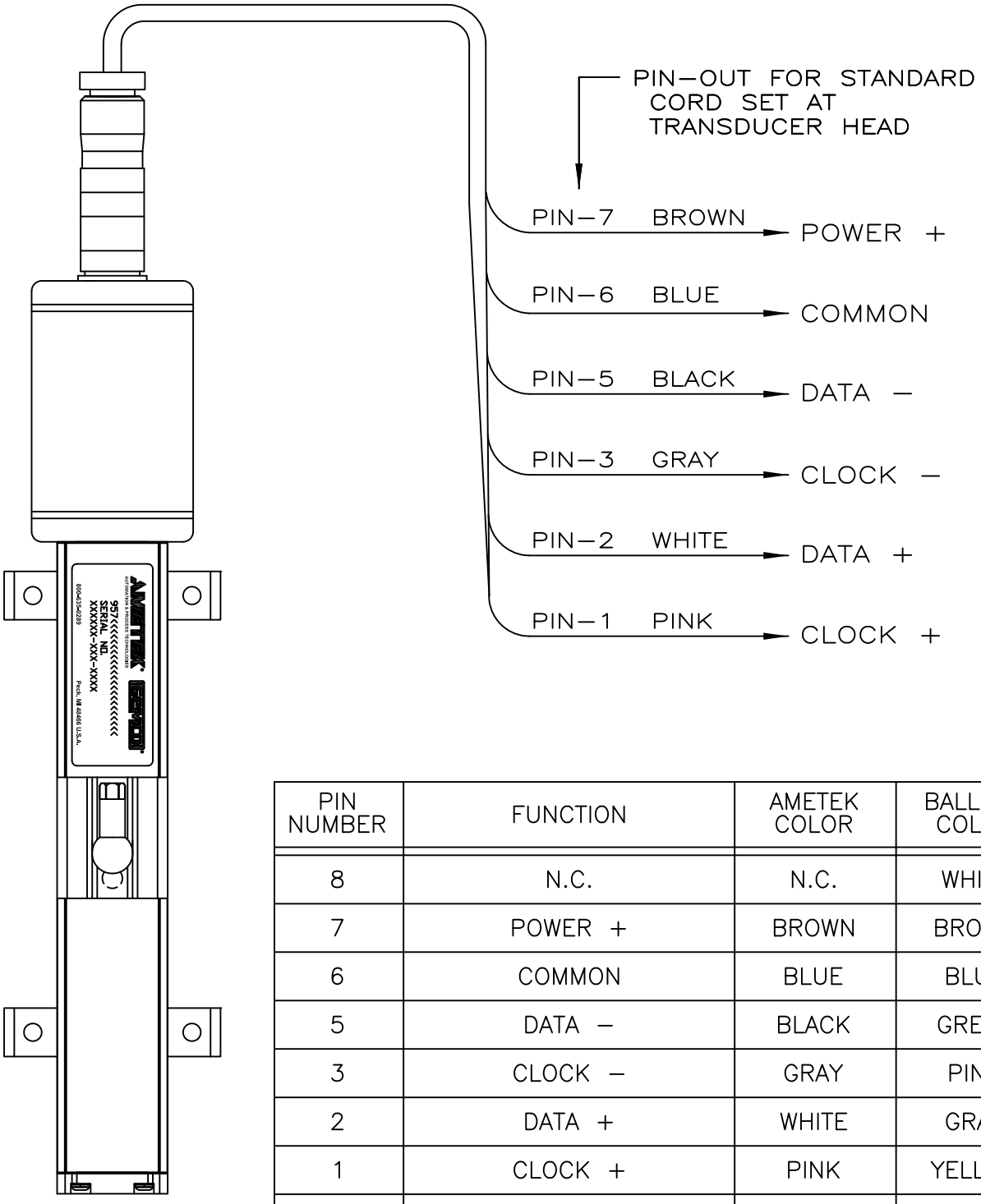

PIN NUMBER	FUNCTION	AMETEK COLOR	BALLUFF COLOR
8	N.C.	N.C.	WHITE
7	POWER +	BROWN	BROWN
6	COMMON	BLUE	BLUE
5	DATA –	BLACK	GREEN
3	CLOCK –	GRAY	PINK
2	DATA +	WHITE	GRAY
1	CLOCK +	PINK	YELLOW
4	N.C.	N.C.	N.C.

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

3.2 Features

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.

Accessories	
P/N	**Description**
949029L6	6 Foot, 6 Pin, Straight, 12mm Cable
949030L6	6 Foot, 6 Pin, Right Angle, 12mm Cable
SD0554600L6	6 foot, 8 Pin, Straight Cable, for Option B
SD0558500L6	6 Foot, 7 Pin, Straight Cable for Option M
SD0521800	Slide Magnet, Top Swivel
SD0521801	Slide Magnet, Top Swivel
SD0551500	Large Floating Magnet
SD0522000	Mounting Foot
Consult factory for complete accessory offerings.	

Diagnostics

The 957SSI is equipped with a tri-color LED next to the connector to help while troubleshooting. The chart below explains the possible LED colors and the faults they represent.

If there is ever a loss of magnet, the LED will turn red and the unit will transmit a position of zero.

957 LED Output Summary	
Output	**957SSI**
Flashing Red	Flash memory corrupt
Flashing Red/Green	EE memory corrupt
Flashing Yellow	Communication/programming mode
Fast Flashing Yellow	Clock input held asserted at power up
Solid Red	No magnet signal detected
Green/Red Blip (1s to 0.12s)	Max Gain but signal detected and within range
Solid Green	Normal probe operation; magnet signal and SSI clock operational
Solid Yellow	No SSI clock pulses detected
Yellow/Red Blip (1s to 0.12s)	SSI clock pulses do not match LDT SSI data length
Green/Yellow Blip (1s to 0.12s)	LDT data not Synchronous with controller (if LDT is programmed for Synchronous mode)

Alarm Bit

The 957SSI can be configured to output a fault bit should there be a problem with the LDT.

3.3 Troubleshooting for 957SSI

Troubleshooting describes common problems that may occur when installing the LDT and offers possible solutions to these problems. If, after reading this appendix, you are unable to resolve a problem, contact our technical support department at 800-635-0289.

General Checks

Make sure that the magnet is located within the LDT's active stroke area. Magnet assemblies should be positioned so that they can move freely over the entire area of the active stroke without binding.

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

Check all LDT wires for continuity and/or shorts. 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.

Power Supply Check

This will help you to determine if your power supply is adequate for the LDT to operate properly, or if the LDT's cable has a short or open.

In order for the 957SSI to operate properly, the external power supply must provide a voltage level between 7 to 30 VDC. A power supply providing voltage above this specified range may damage the LDT. A power supply providing power below this specified range will not be sufficient to power the LDT. When powering more than one Brik™ on a single power supply, remember that each Brik™ typically requires 1.3 watts of power. The amount of current draw will vary based on the input voltage, as well as other operating parameters. To approximate the current draw for a particular LDT, divide the LDT wattage by the input voltage. For example, 1.3 watt divided by 24 VDC equals 55mA.

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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 Section 3.4: Specifications for more information on power consumption.

3.4 Specifications

Specifications					
Connector Interface	6 Pin 12mm Integral cable ass'y, 7 Pin or 8 Pin DIN	Shock	1000 Gs IEC 60068-2-27	Output Type	24, 25 or 26 Bit, Binary or Gray Code (optional parity and error bit), Position Updates
Displacement	1" to 180"	Vibration	30 Gs IEC 60068-2-6	Resolution	English or Metric Units Metric: 1, 5, 10, 20 micron (5 micron standard) English: .00005", .0001", .0005", .001" Consult Factory for Others.
Dead Band	2.65" (67.31 mm) standard	Update Time	Measuring Length 300 750 1000 2000 5000mm Measurements/sec. 4.0 2.4 2.0 1.1 0.5k	Hysteresis	0.008"
Null Zone	2.00" (50.8 mm) standard	Approvals	CE (EMC)	Non-linearity	< 0.01% or +/- 0.005", whichever is greater, (+/- 0.003" Typical)
Enclosure Rating	IP67, IEC 600529	Input Voltage	7 to 30 VDC	Diagnostics	Tri-Color LED beside connector/cable exit, See 'LED Output Summary Table' on page 13
Measured Variables	Single Magnet Displacement, Consult Factory for Velocity or Differential Operation	Current Draw	1.3 watts, (53mA at 24 VDC) typical*	Operating Temperature	-40° to 185° F (-40° to 85° C)
Interface Specifications Input SSI Clock	RS-422, 470 Ohm termination resistance	Storage Temperature	-40° to 221° F (-40° to 105° C)		
Output Data Pulse Resistance	RS-422, 2.0V min. @ 100 Ohm termination	Repeatability	Equal to Output Resolution		
SSI Clock Frequency	Minimum 70 kHz Maximum 150 kHz				
NOTE: Specifications subject to change and are based on a typical 48" stroke. *1.3 watt typical at 1ms interrogation time. Faster interrogation times increase power consumption.					

Cable Specifications

Cable Type	Gauge	Jacket	Temp	Bend Radius
Connector Options "S", "M", "B", "C"	24	PVC	-50° to 105° C	Moving Applications - 2.36" Fixed applications - 1.18"
High Temp Integral Cable "H" option	22	Teflon	-70° to 200° C	Moving Applications - 4.6" Fixed applications - 2.3"
Connector Option "E"	22	Polyurethane	-50° to 105° C	Moving Applications - 2.3" Fixed applications - 1.2"

3.5 Part Numbering System

957 — S — 0120 — E — S — 1 — B — S — F — 1 — X

Brik Extrusion

Output Type	
S	SSI

Units of Measure	
E	Inches
M	Metric

Stroke Length

1" to 180". 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 5mm. Enter as a four-place number. Example: 305mm stroke entered as 0305M.

Connector Option	
S	Standard M12 6 Pin
C_	Integral Cable Assembly. Insert length in feet. Example: C6 = 6 foot cable. *
M	7 Pin DIN, MTS Style D70
B	8 Pin DIN, Balluff S32
H_	High Temp., Integral cable assembly 200° C Teflon Cable. Insert length in feet. Example: H6= 6 foot High Temp Teflon Cable.
E	Environmental 10 Pin MS connector compatible with SD0439700 cable assemblies
	* If stroke is in inches, cable is in feet. If Stroke is in metric, cable is in meters.

Data Length	
1	24 Bits
2	25 Bits
3	26 Bits

Data Format	
B	Binary
G	Gray

Position Update	
S	Synchronous
A	Asynchronous

Direction	
F	Measures Direction Forward
R	Measures Direction Reverse
V	Velocity

Resolution	
1	.005mm
2	.01mm
3	.05mm
4	.1mm
5	.02mm
6	.002mm
7	.001mm
8	.00005"
9	.0001"
A	.0005"
B	.001"

Options	
X	None
A	Alarm Bit 25, Parity 26

NOTE: Contact our Technical Support at 1-800-635-0289 for custom configurations.

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NOTES:

Part Number

Serial Number

Purchase Order Number

Sales Order Number

Comments

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