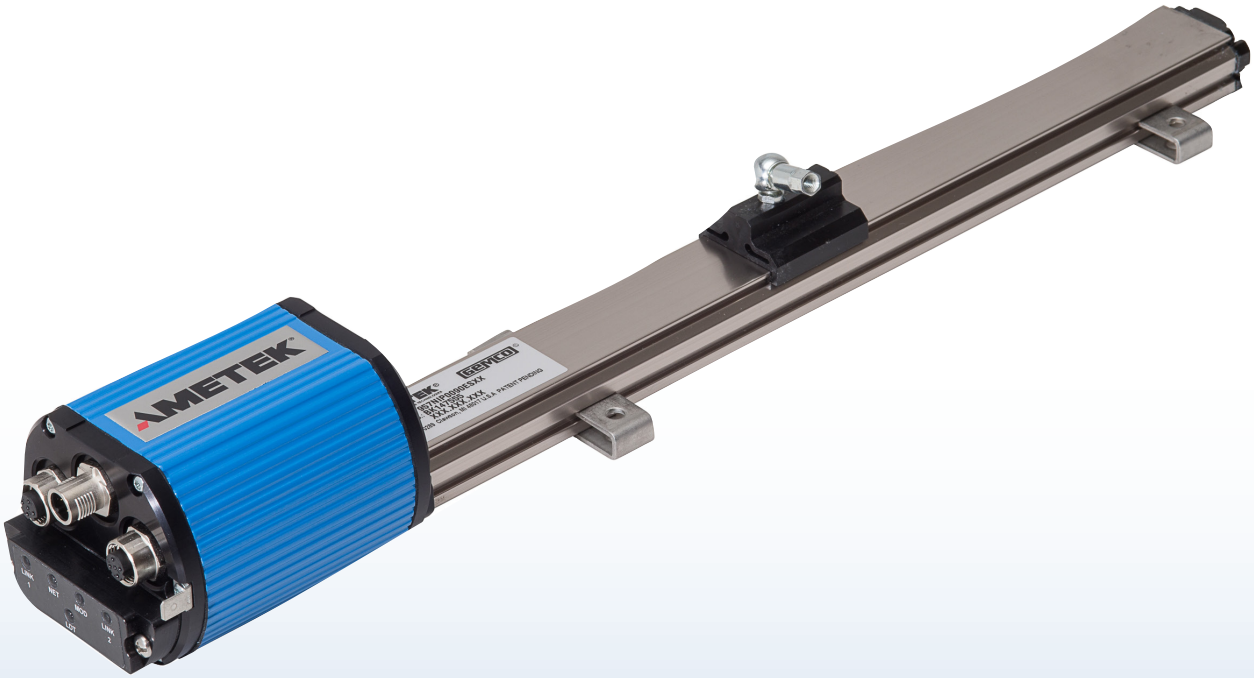
GEMCO®

EtherNet/IP™

957N ReadyLink™ Network LDT with RapidRecall™

Mechanical Installation & Wiring Manual

EtherNet/IP™
conformance tested



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FACTORY AUTOMATION

Contents

The ReadyLink™ Network LDT manual will be divided into two separate manuals. The first one being the mechanical Installation manual and the second manual will be our Network configuration manual.

These instructions are designed to address the technical aspects of mounting and wiring our Ethernet/IP™ Network LDT into the host network. Please read the entire chapter before working with the Network LDT. These instructions are written for trained personnel who are responsible for mounting and commissioning Ethernet based sensors into the host network.

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

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 maintain¬ing 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.

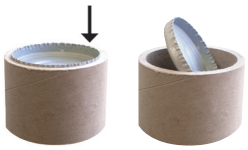
Ametek reserves the right to revise and redistribute the entire contents or selected pages of this manual. All rights to the contents of this manual are reserved by Ametek.

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.



NOTE: The part number on the LDT is a record of the characteristics that make up your specific unit. For translation of the part number, see Appendix B.

Chapter 1: 957N ReadyLink™ Network LDT Overview

AMETEK Factory Automation markets, engineers, and manufactures sensors and controls for demanding and harsh industrial environments. Products include GEMCO® linear and rotary sensors. Our sensors are absolute and never require homing or calibrating in the event of a power loss and are built in the USA to meet global application needs.

The ReadyLink™ Network LDT with RapidRecall™ is our newest linear displacement transducer (LDT) being developed with an EtherNet/IP™ network interface. The Network LDT provides maximum flexibility for installation and ease of use in demanding, high-performance, networked industrial applications. EtherNet/IP™ is an Industrial Ethernet implementation of the Common Industrial Protocol (CIP), managed by the Open DeviceNet™ Vendor Association (ODVA). EtherNet/IP™ was introduced in 2001 and today is the most developed, proven and complete industrial Ethernet network solution available for manufacturing automation. EtherNet/IP™ systems require only a single point network connection for both configuration and control, thus simplifying installation and wiring.

Our linear displacement transducer line utilizes advanced, proven Magnetostrictive technology to provide highly precise and absolute non-contact position feedback down to 1 micron resolution. We package these sensors to survive in the most demanding and hostile environments. The position of the magnet on the sensing element is precisely determined by a time of flight method. The LDT converts this position value where it is transmitted to the host controller via the ethernet network.

The ReadyLink™ Network LDT is available in two different package styles; the 953N is our Rod Style package that is suitable for installation into hydraulic cylinders, and our 957N Brik™ Low Profile Style package that incorporates the same electronics but is housed in an aluminum style extrusion.

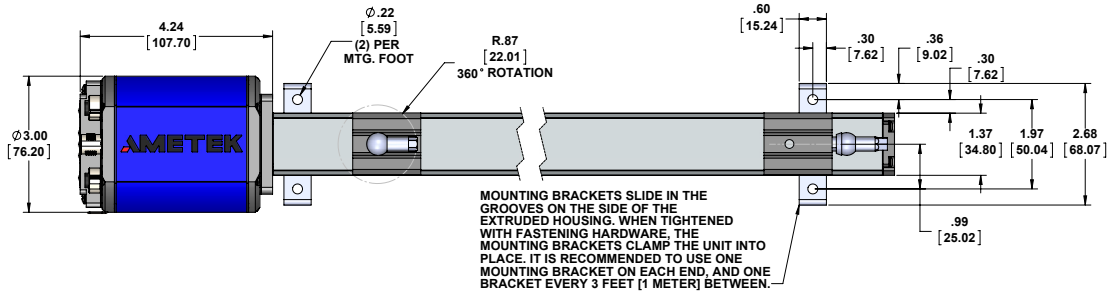
The AMETEK ReadyLink™ Network LDT is a smart device; it has a RapidRecall™ Configuration Module to help aid in the configuration of the LDT. This module can also be used to help configure the static IP address of the LDT. The module has three rotary DIP switches that allow the user to configure how the IP address is assigned as well as other functions. The RapidRecall™ Module can also store all user configurations. Once the LDT has been configured, these settings can be uploaded to the module. Refer to our Network Configuration manual for further information on this feature.

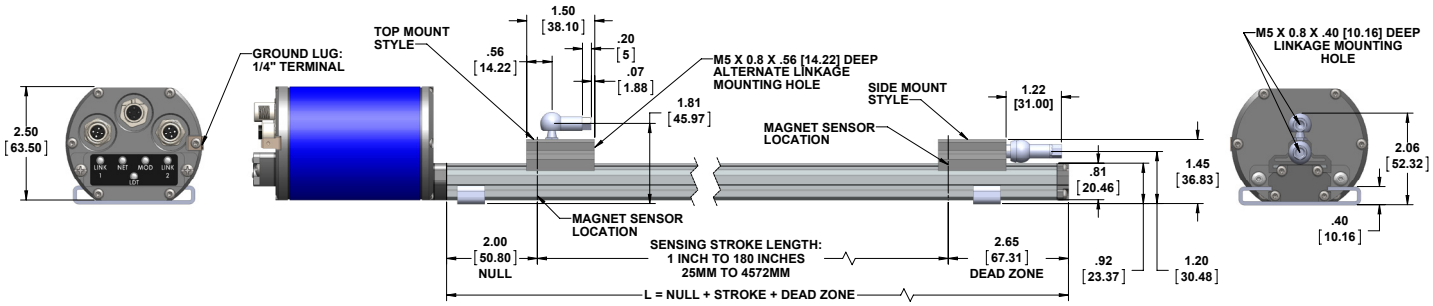
The Network LDT has three connectors. The incoming power is a 4-pin M12-A style connector. The Network communication will be two 4-pin M12-D coded connectors. The LDT supports Star, Line and Device Level Ring (DLR) topology. Our Network LDT supports DHCP (Dynamic Host Control Protocol) or the systems entire IP address can be assigned via a PC or the last 3 octets can be set manually via rotary DIP switches.

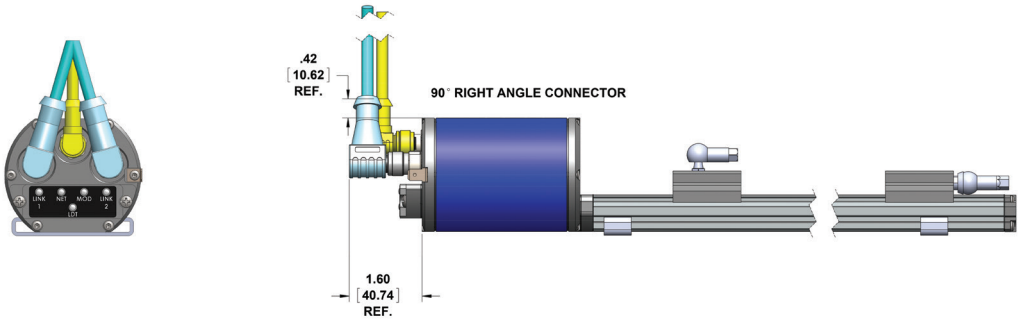
There are five diagnostic LEDs located on the cover next to the connectors that will indicate the health of the LDT and its network communication status.

The ReadyLink™ Network LDT is totally configurable and can be set for your exact needs. Parameters such as counting direction, position and velocity format, resolution, and zero position are all programmable.

Chapter 2: 957N Rod Style Dimensions







Chapter 3: Installing the LDT

Units can be ordered in span lengths up to 180 inches long in .1 inch increments. The slide magnet is designed to move effortlessly along the transducer in guide tracks, or the floating magnet assembly can be positioned up to 1/4" above the unit, and truly be non-contact. A variety of hardware is available for attaching the slide magnet to the moving portion of the process.

The 957N 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

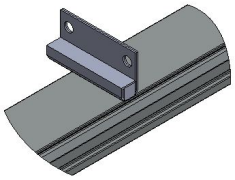
The transducer can be mounted vertically or horizontally using the SD0522000 mounting brackets. The mounting brackets slide in the grooves on the lower part of the extrusion and clamp down when tightened. It is recommended to use one mounting bracket on each end and every three feet between.

Ferro-magnetic material, which is material readily magnetized, should be placed no closer than .25" from the sensing surface of the LDT.

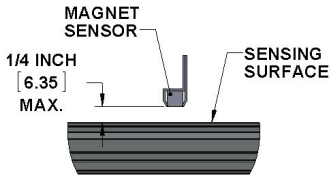
Magnet Assembly

Magnets are always ordered as a separate line item, your choices are our Slide Magnets or the Floating 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. The slide magnet is made of a self-lubricated high wear polymer Delrin™, the slide magnet is designed to move effortlessly along the transducer in guide tracks. A standard female swivel mounting arm is provided with the slide magnet assembly. For extensions and other options contact the factory.

Floating Magnet Detail

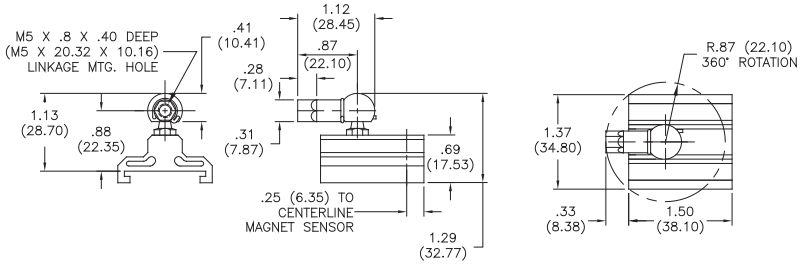


FLOATING MAGNET
ISOMETRIC VIEW

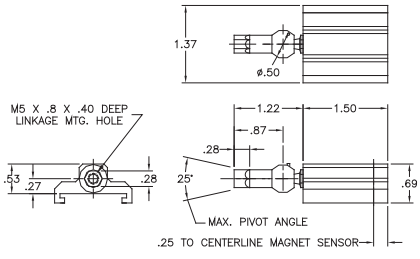


FLOATING MAGNET DETAIL

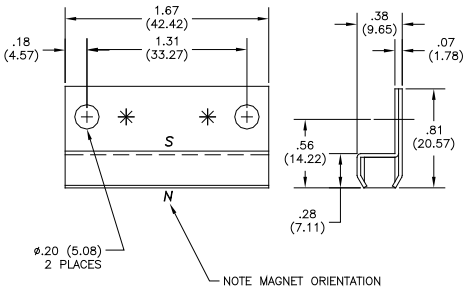
Slide Magnet Assembly- Top Mounted Swivel
P/N: SD0521800



Slide Magnet Assembly - End Mounted Swivel
P/N: SD0521801



Large Floating Magnet Assembly
P/N: SD0551500



Chapter 4: Wiring

The Ethernet Network LDT has three connectors. The incoming power is a 4-pin M12-A style connector. The Network communication will be two 4-pin M12-D coded connectors. The LDT supports Star, Line and Device Level Ring (DLR) topology and supports DHCP (Dynamic Host Control Protocol)

Note: Any unused connectors should be covered using our 04-521619 connector end cap.

MALE 4 PIN (M12-A) INPUT VOLTAGE

FEMALE 4 PIN (M12-D) BUS LINKS 1 AND 2

INPUT VOLTAGE		
PIN NUMBER	WIRE COLOR	SUPPLY VOLTAGE
1	BROWN	+24 VDC
2	WHITE	NO CONNECTION
3	BLUE	DC GROUND (FOR SUPPLY)
4	BLACK	NO CONNECTION

BUS CONNECTIONS LINK 1 AND 2		
PIN NUMBER	WIRE COLOR	FUNCTION
1	WHITE/ORANGE	Tx+
2	WHITE/GREEN	Rx+
3	ORANGE	Tx-
4	GREEN	Rx-

4.1 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 Network Connections

Power Supply/Ground Connections

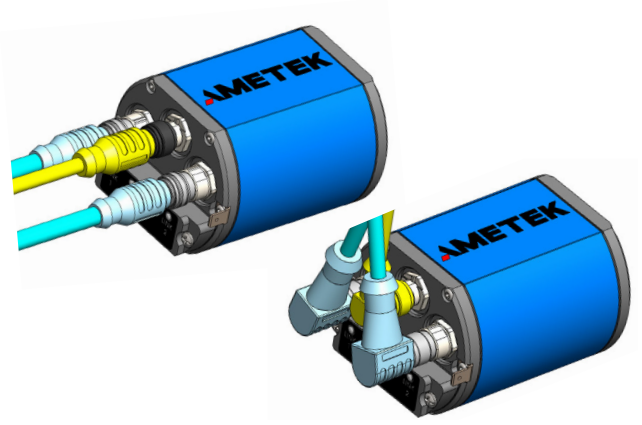
The 957N incoming power cable is a 4-Pin, M12-A, Euro Style cordset. It has 4 conductors of 22ga, with a shield; these cables are available in either Straight or Right Angle versions. To reduce electrical noise, the shield must be properly used. When grounding the LDT, a single earth ground should be connected to the power supply common. The LDT power supply common should be connected to the power supply common (-) terminal. On our Straight version cable the shield is tied to the cables coupling nut, and should not be connected to the controllers ground (See figure 4-2 Grounding Connections). However, if you are using one of our 949-044LXX Right Angle version cables, the cables shield is not tied to the cables coupling nut, in this case it is recommended to tie the shield to the power supply common. *Any unused wires should be insulated and tied back.*

On corsets where the shield is tied to the coupling nut, the LDT's shield should NOT be tied to the earth ground at the power supply (See section 4.2 Grounding Connections).

In order for the Network LDT to operate properly, the LDT's external power supply must provide a voltage between +7 to +30 VDC. Each LDT will draw approximately 2.3 watts of power. The power supply must be rated at 275mA 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.) It is preferable that the cable between the LDT and the power supply 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 pass straight thru this enclosure and not tied to ground.

Network Connections

The Network communication will be two 4-pin M12-D coded connectors. Our Network LDT supports Star, Line & DLR topology. These connections will require M12-D cables; these are available in either Straight or Right Angle versions, as well as M12-D on one end and RJ45 on the other. All cables have 4 conductors of 24ga, with an aluminum/polyester/aluminum foil with an overall braid of tinned copper shield. These cables meet the Requirements of TIA/EIA568-C, Category 5e Cable for 10 and 100 Base-T Ethernet. Always observe proper grounding techniques such as single point grounding and isolating high voltage (i.e. 120/240 VAC) from low voltage cables, whenever possible.



WARNING: Do not route the ReadyLink™ Network LDT cables near high voltage sources.

Network Cable lengths

Per ODVA specifications, it is recommended that the maximum total cable run length be 100 meters or less. Typical cable lengths are 1 and 5 meters, cables greater than 10 meters are available; however, proper care must be taken during installation. It is recommended that one uninterrupted piece of cable is always used. 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.

4.2 Grounding Connections

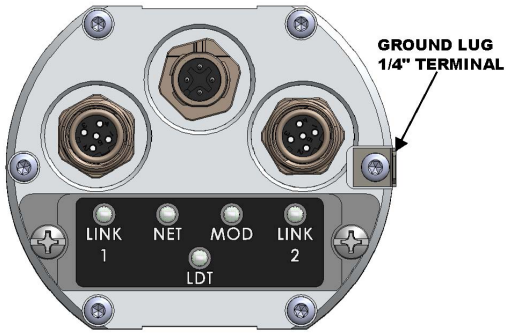
There is a ¼" terminal ground lug provided on the LDT's head / cover assembly to help ensure a good ground. This lug should be tied to the chassis of the machine. This ground is internally isolated from the ground provided by the Power Supply shields ground.

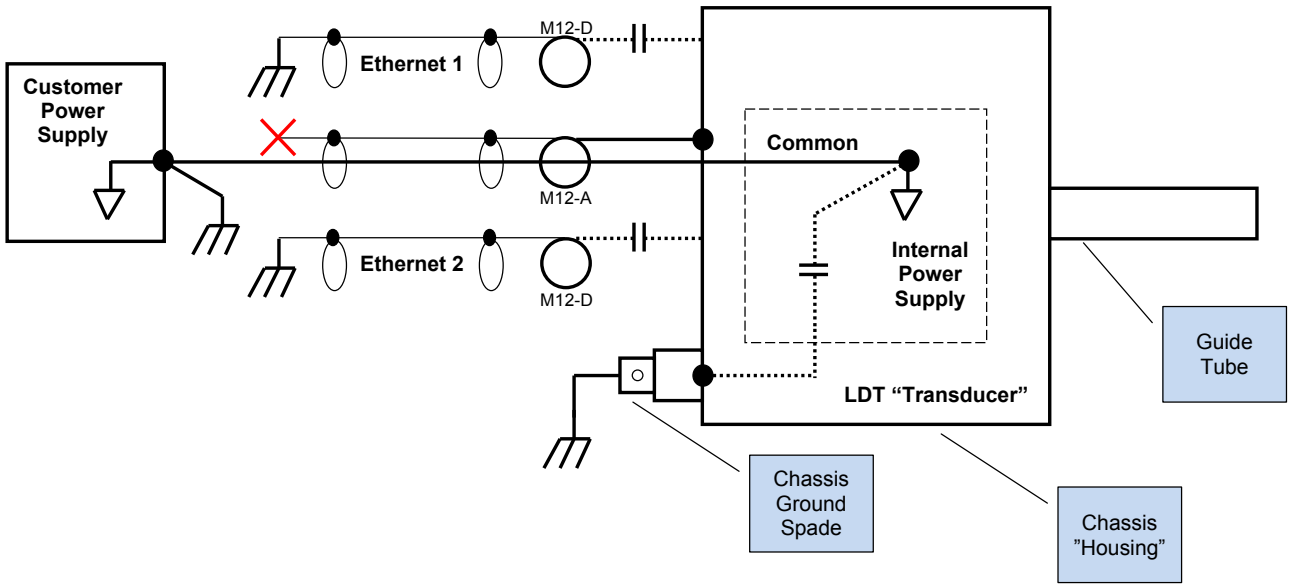
Always observe proper grounding techniques such as single point grounding and isolating high voltage (i.e. 120/240 VAC) from low voltage (7-30 VDC cables). Whenever possible, the cables should be run in conduit by themselves.

Startup

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

Turning on power - Note that the system may execute uncontrolled movement when power is first applied, when the Network LDT is part of a closed loop system whose parameters have not yet been configured





Power Supply cable shield IS connected to connector coupling nut

Chapter 5: Features

Position Update

The position of the magnet along the active measuring range is precisely determined by a time of flight method. The Network LDT converts this position value where it is transmitted to the host controller via the Network. All displacement outputs are absolute and do not lose their position after loss of power.

Position update frequencies are available up to 1,000 measurements per second (Length dependent).

Counting Direction and Resolution

The Network LDT can be configured increasing, decreasing, position, or velocity counts, along with the desired resolution. These parameters can all be configured during the LDT Network configuration. Measure Direction Forward will increase counts as the magnet moves from the head of the LDT to the tip. The default zero position will be closest to the head of the LDT, but can be user configured at time of set up to be located anywhere along the active stroke range (Area between Null & Dead Bands). The resolution of the positional output is selectable and can be set for English (Imperial) or metric units.

Network LDT Default Settings	
Position Measurement	Increasing from Head to Tip
Position Format	Inches
Position Measuring Increment	0.0001"
Preset	Zero position will be located closest to head. At 2" Null point, LDT will default to 2.0000"
Velocity	Increasing from Head to Tip
Velocity Format	Inches / Second
Velocity Resolution	0.01"/sec

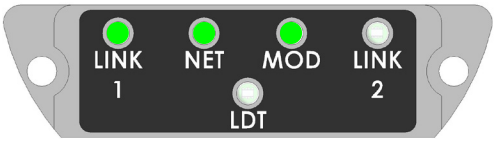
Automatic Gain Control

The Network LDT has an auto-tuning capability and will automatically compensate for the floating magnet assemblies or adverse application conditions. The Automatic Gain Control (AGC) feature automatically searches and finds the magnet on power up compensates for the distance that the magnet is mounted from the extrusion. If power is applied without a magnet on the LDTs extrusion and within the active sensing range, the LED will turn RED indicating no magnet signal is detected. To correct this, turn the power off and place magnet within the active stroke area, then re-apply power to the LDT.

Diagnostics

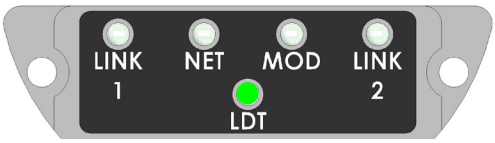
To help aid in troubleshooting, the Network LDT is equipped with four network LEDs and a bi-color LDT status LED. These LEDs are labeled Link1, Net, Mod, Link 2, and LDT. The four top row LEDs will be used to display diagnostics and network status, the bottom row LDT LED is used to display the status of the Linear Transducer. If there is ever a loss of magnet, the LDT LED will turn red and the unit will transmit a position of zero or last valid position (user defined), as well as send a fault message to the Network that the unit has lost its signal. A green LDT LED indicates that the magnet is within the sensing range and the LDT is working properly.

Network LED Functionality



Network LED Number	Indicator	Status
LINK 1	Green Flashing	The module senses a link on connection 1. The LINK 1 LED flashes each time a packet is received or transmitted.
	Green Off	The module does not sense a link.
LINK 2	Green Flashing	The module senses a link on connection 2. The LINK 1 LED flashes each time a packet is received or transmitted.
	Green Off	The module does not sense a link.
NET-Network Status	Off	The module has no power or no IP address is assigned.
	Green On	The module has at least one established Ethernet IP connection.
	Green Flashing	There are no Ethernet/IP connections established to the module.
	Red Flashing	One or more of the connections in which this module is the target has timed out. This state is only left if all times out connections are re-established or if the module is reset.
	Red On	The module has detected that its IP address is already in use.
	Green/Red Flashing	The module is performing a power on self-test.
MOD-Module Status Indicator	Off	No power is applied to the module.
	Green On	The module is operating correctly.
	Green Flashing	Standby. The module has not been configured.
	Red Flashing	A minor recoverable fault has been detected.
	Red On	A major internal error has been detected.
	Green/Red Flashing	The module is performing a power on self-test.

LDT LED Status Indicator



LED Status	Summary	Description
Steady Off	No power	No power to LDT or internal power supply has failed. Verify that incoming M12-A power cable is connected and supplying a voltage between 7 to 30vdc.
Solid Green	Power is applied and magnet signal is detected	LDT is working and detecting a good magnet signal. Note: Network communications are not necessary to get a solid Green LDT.
Solid Red	No magnet signal detected	Magnet is not detected. Verify that magnet was on guide tube when power was applied. Remove power, verify magnet is on the guide tube, re-apply power.
Flashing Red	Major fault	Consult factory or network troubleshooting guide.
Slow Flashing Red/Green - 1 Sec Red/ .25 Sec Green	Max ACG Gain Set	AGC gain has been set to its maximum value, verify that magnet was on the guide tube when power was applied. Remove power, verify magnet is on the guide tube, re-apply power.
Flashing Green	Minor fault	Consult factory or network troubleshooting guide.

NOTE: If there is ever a loss of magnet, the LDT LED will turn red and the unit will transmit a fault message to the Network that the unit has lost its signal.

Appendix A: Troubleshooting

Troubleshooting describes common problems that may occur when installing the LDT and offers possible solutions to these problems. If, after reading this ap¬pendix, 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 or pushing on the rod. If power was applied to the LDT without the magnet, insert magnet into active region of the LDT and cycle power.

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 957N 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 network LDT on a single power supply, remember that each LDT typically requires 2.3 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, 2.3 watts divided by 24 VDC equals 96mA.

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 30VDC

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.

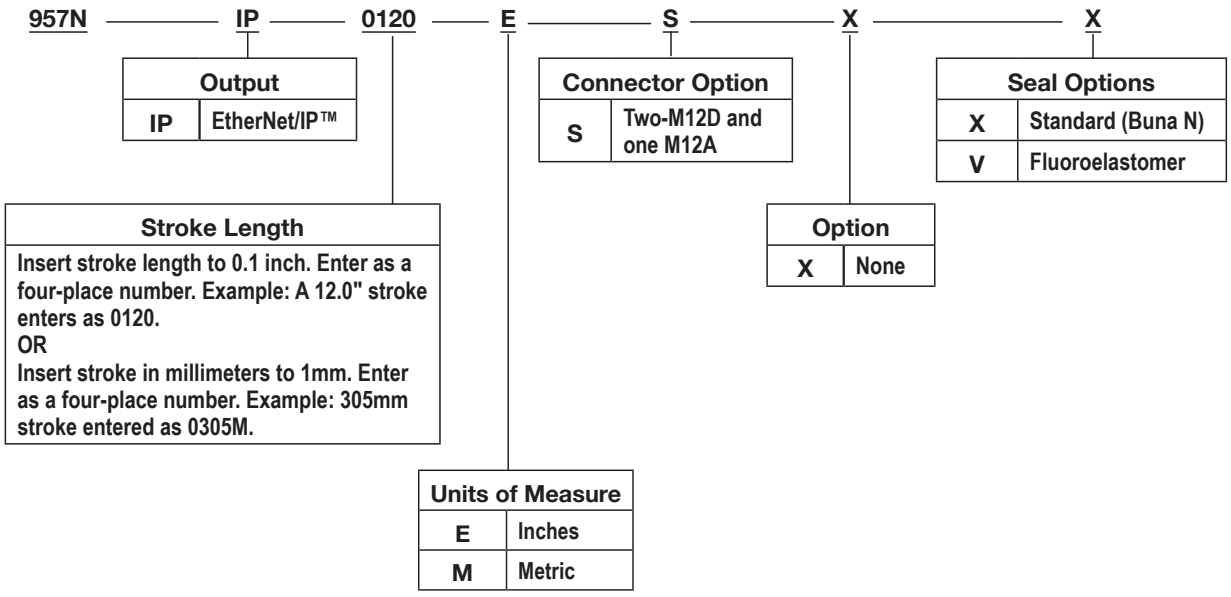
5. Turn the power supply off.
6. Check the continuity of the individual wires of the cable between the power supply and the LDT. Check for continuity from one end of the cable to the other. Also verify that no shorts exist between pins.
7. Reconnect the mating connector to the LDT.
8. Turn power supply 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 2.3 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.

Appendix B: Part Numbering System

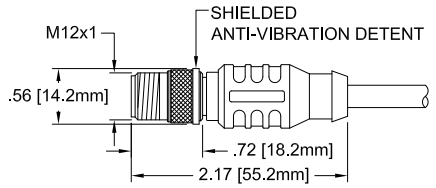
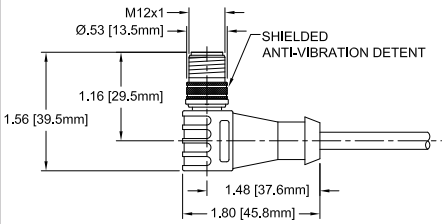
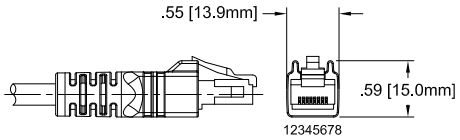
The Ethernet/IP™ LDT is available in either our 953 Rod Style Package or the 957 Profile package. The numbering scheme listed below will break down the numbering system for our 957 Brik Style products. The LDTs are available with strokes from 1" to 180" in .1" increments. The “Unit of Measure” field will allow you to select either inches or millimeters (Note: This is only for the active stroke length of the sensor. The resolution, direction & counting format are all user defined during the Network set-up process).

The “Seal Option” has two choices – X = Standard Buna N or V = Fluoroelastomer. Depending on where these units will be mounted and what chemicals they may be exposed to, will help determine which option is best for your application.



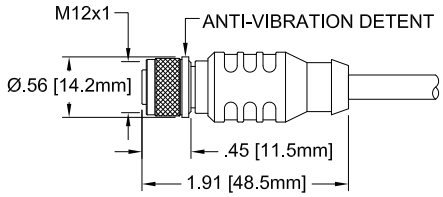
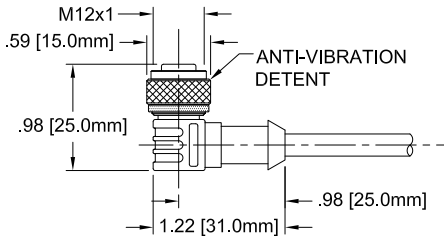
Accessories

Network Cable Assemblies

Straight Connector	Right Angle Connector	RJ45 Connector
		

Description	Part Number
Communications Cable M12-D Straight to M12-D Straight – CAT 5e, Shielded Cable - Available in 1 & 5 Meter lengths	949038L1M = 1 meter 949038L5M = 5 meter
Communications Cable M12-D Straight to M12-D Right Angle – CAT 5e, Shielded Cable - Available in 1 & 5 Meter lengths	949039L1M = 1 meter 949039L5M = 5 meter
Communications Cable M12-D Right Angle to M12-D Right Angle – CAT 5e, Shielded Cable - Available in 1 & 5 Meter lengths	949040L1M = 1 meter 949040L5M = 5 meter
Communications Cable M12-D Straight to RJ45 – CAT 5E, Shielded Cable- 5 Meter	949041L5M
Communications Cable M12-D Right Angle to RJ45 – CAT 5e Shielded Cable - 5 Meter	949042L5M
 Connector End Cap - Unused connectors should be covered by this End Cap	04521619

Power Cable Assemblies

Straight Connector	Right Angle Connector
	

Description	Part Number
Power Cable M12-A Straight to flying leads- Shielded – Available in 5, 10 & 15 Meter lengths	949043L5M = 5 meter 949043L10M = 10 meter 949043L15M = 15 meter
Power Cable M12-A Right Angle to flying leads - Shielded – Available in 5, 10 & 15 Meter lenghts	949044L5M = 5 meter 949044L10M = 10 meter 949044L15M = 15 meter

Consult factory for longer lengths or cables not listed above.

Cable Specifications

Cable Type	Gauge	Jacket	Shield	O.D.	Temp.	Bend Radius
Network Cables - ALL	4/24 AWG Stranded	PVC - Teal	Foil / Braid	7.2mm (.285")	-40° to 80°C	5 x O.D. Fixed Applications 10 x O.D. 1 million cycles 20 x O.D. 10 million cycles
Power Cable - Straight	4/22 AWG Stranded	PVC - Grey	Foil / Drain / Braid	7.3mm (.290")	-40° to 105°C	
Power Cable - Right Angle	4/22 AWG Stranded	PVC - Grey	Foil / Drain	5.2mm (.205")	-40° to 105°C	

Appendix C: Specifications

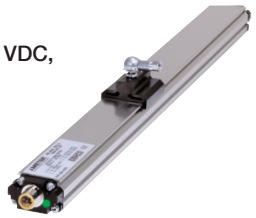
General Specifications	
Connectors	
Power	Male - M12-A Coded
EtherNet (2 Connectors)	Female - M12-D Coded
Displacement	
Profile Style	1" to 180" – thick wall aluminum cover and extrusion (25mm to 4570mm)
Dead Band	2.65"
Null	2.00"
Internal Position Resolution	0.00003" (0.7 micron)
Non-linearity	Less than ± 0.01% of stroke (1) (± 0.003" typical)
Hysteresis	Less than 0.001"
Repeatability	Equal to output resolution
Position Temperature Drift	(6µm + 5ppm · Stroke)/°C
Operating Temperature	-40°F to 185°F (-40°C to 85°C)
Storage Temperature	-40°F to 185°F (-40°C to 85°C)
Electrical Specifications	
Input Voltage	7 to 30 VDC
Power Consumption	2.3W maximum (at 30 VDC), 2.1W typical at 1ms interrogation time and 24V input voltage
Current Draw	275mA maximum (at 7VDC), 87.5mA @ 24VDC typical
Data Format	
Measured Variables	Single magnet displacement and velocity
Position Measurement Reference	Offset to preset value (User Configurable)
Measurement Direction	Forward or reverse (User Configurable)
Position Format (Units):	centimeter, millimeter, micron, inch, 0.01 inch, 0.001 inch, 0.0001 inch (User Configurable)
Position Measuring Increment	1 to 100 (User Configurable)
Velocity Format (Units):	centimeter/sec (User Configurable) inch/sec
Velocity Resolution	1 to 65535 (User Configurable)
Measurement Mode	Asynchronous
Interface Specifications	
Interface Type	EtherNet/IP
Data Transmission Rate	100 Mb/s maximum
Other Specifications	
Enclosure Rating	IP-67 (IEC 60529)
Shock	100G (IEC 60068-2-27)
Vibration	15G (IEC 60068-2-6)
Approvals	CE (EMC) EN 61000-6-2 & EN 61000-6-4 ODVA Compliant

953 VMAX LDT

- Shock resistant to 1000Gs
- Vibration resistant to 30Gs
- Analog outputs, 0-10 VDC, +/-10 VDC, 0-5 VDC, +/-5 VDC, 4-20mA
- Digital output Start/Stop, Control Pulse, and Variable Pulse (PWM)
- SSI (Synchronous Serial Interface) 24, 25, or 26 Bit, Binary or Gray Code, Synchronous or Asynchronous Mode
- Removable cartridge
- IP68 rating
- Stroke length to 300"
- Input power range is 7 to 30 VDC
- Programmable zero and span
- Diagnostic Tri-Color LED

955 BRIK Gen III & 955S Smart BRIK

- Low profile LDT
- Analog output 4-20mA, 0-10 VDC, +/-10 VDC, digital output
- Programmable zero and span
- Stroke length to 180"
- Wide input voltage range
- Optional floating magnet
- Diagnostic LED



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- PROGRAMMABLE LIMIT SWITCHES
- EXTREME DUTY CABLE REEL PRODUCTS
- ROTARY LIMIT SWITCHES
- RESOLVERS
- MILL DUTY ENCLOSURES
- ULTRA HIGH SPEED PLS
- SAFETY PRODUCTS

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