

Fisher® LC340 Line Conditioner

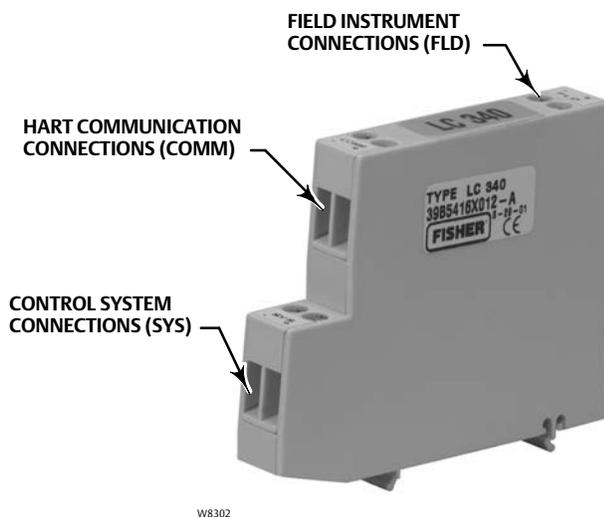
Introduction

Scope of Manual

This instruction manual includes installation and maintenance information for the Fisher LC340 line conditioner (figure 1). This line conditioner is used with FIELDVUE™ instruments in Safety Instrumented Systems (SIS) in de-energize to trip (DETT) applications. Refer to separate manuals for additional information on other FIELDVUE products used with the line conditioner, such as the FIELDVUE DVC6200 SIS digital valve controller.

Do not install, operate, or maintain an LC340 line conditioner without being fully trained and qualified in valve, actuator, and accessory installation, operation, and maintenance. To avoid personal injury or property damage, it is important to carefully read, understand, and follow all of the contents of this manual, including all safety cautions and warnings. If you have any questions about these instructions, contact your Emerson Process Management sales office before proceeding.

Figure 1. Fisher LC340 Line Conditioner



Description

The LC340 line conditioner is used with HART® communicating FIELDVUE instrumentation, such as the DVC6200 SIS digital valve controller. The line conditioner is used when this instrumentation is configured for multi-drop operation and is connected to a 24 volt DC logic solver output. A 24 volt DC low-power solenoid valve may also be powered on the same pair of wires. Although the line conditioner may mount near the logic solver, it is part of the field system just as the field wiring is part of the field system.

The LC340 line conditioner is a passive device that is inserted in-line with both wires of a discrete output loop. The purpose of the line conditioner is to boost the impedance of the logic solver output to facilitate HART communication. The line conditioner receives a 24 volt DC signal from the logic solver, which it passes through a thermal limiter and an inductor. The high AC impedance of the inductor “conditions” the loop to meet the impedance requirements for HART communication. The line conditioner introduces a maximum end-to-end resistance of 30 ohms (2 volt drop at 66 mA) as long as the output load current is less than 100 mA. In an over-current condition, a thermal limiting device raises the end-to-end resistance until the fault is removed.

CAUTION

The LC340 is not rated for use in the process environment. Using the LC340 in the process environment may cause the line conditioner to malfunction, resulting in damage to the product.

The line conditioner is normally installed near the field wiring terminals of the logic solver I/O. HART communication is only possible between the line conditioner and the field instrument and at the line conditioner COMM terminals, but not on the logic solver side of the line conditioner. The line conditioner is not designed or intended for use in the process environment. Neither the line conditioner nor its outputs are approved for hazardous areas. However, a recommended intrinsic safety (IS) barrier can be connected between the FIELDVUE instrument and the line conditioner in intrinsically safe installations. In most cases, if an IS barrier is used, the line conditioner is not needed.

Specifications

Typical specifications for the LC340 line conditioner are shown in table 1.

Table 1. Specifications

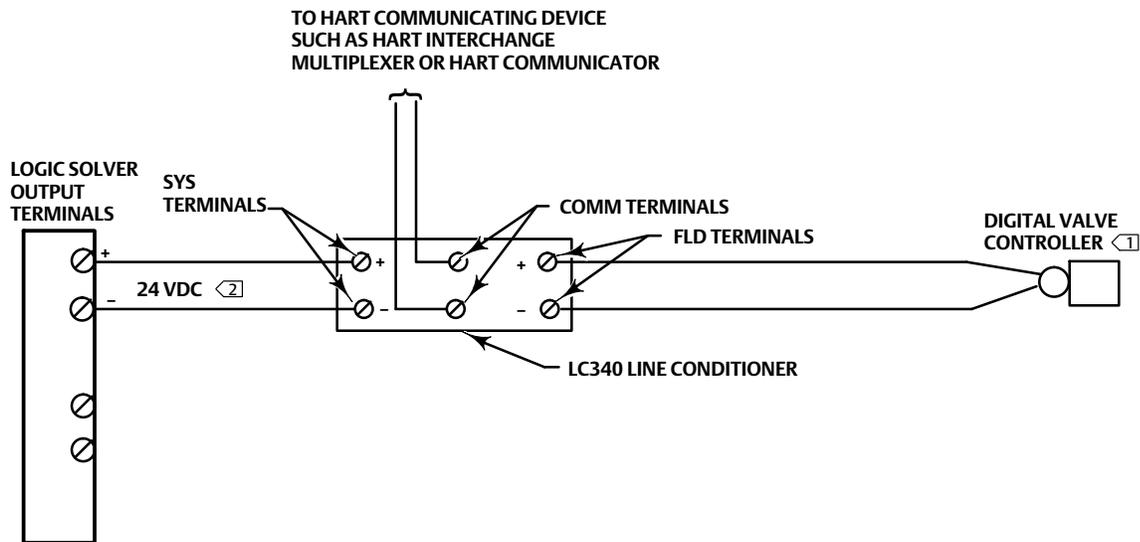
<p>Mounting</p> <p>Mounts on standard 35 mm DIN rail with other filtering components.</p> <p>Connections</p> <p>Three 2-pin Cage-clamp style connectors accept up to 12 AWG wire</p> <p>Power Requirements⁽¹⁾</p> <p>Input Current: equal to load requirements, not to exceed 100 mA Input Voltage: load voltage + (30 ohms x load current); nominally 24 volts DC</p>	<p>Ambient Operating Temperature</p> <p>-40 to 85°C (-40 to 185°F)</p> <p>Ambient Relative Humidity</p> <p>5 to 95%</p> <p>Electrical Classification</p> <p>Per IEC 61326-1</p> <p>Complies with test requirements for I/O Signal/Control ports on equipment intended for use in industrial environments.</p> <p>Dimensions</p> <p>75 mm (3 inches) long by 12.5 mm (0.5 inches) wide by 60 mm (2.4 inches) deep</p>
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1. The line conditioner requires no power to operate; its input requirements are driven entirely by its output load requirements.

Installation

Refer to figure 2 for a typical installation. The LC340 line conditioner mounts on a type 35 DIN rail. Install the line conditioner on the DIN rail. Disconnect the wires from the logic solver output side of the interconnect blocks and connect them to the line conditioner SYS terminals, taking care to maintain correct polarity. Disconnect the wires from the field device side of the interconnect blocks and connect them to the line conditioner FLD terminals, taking care to maintain correct polarity.

Figure 2. Typical Fisher LC340 Line Conditioner Installation



NOTES:

REFER TO THE DVC6200 SIS INSTRUCTION MANUAL (D103557X012), AVAILABLE FROM YOUR EMERSON PROCESS MANAGEMENT SALES OFFICE, FOR POSSIBLE CONFIGURATIONS.

1> DIGITAL VALVE CONTROLLER SET FOR MULTI-DROP OPERATION.

2> LOGIC SOLVER PROVIDES 24 VOLT DC SOURCE FOR DIGITAL VALVE CONTROLLER.

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Shields

If using shielded wiring on both sides of the line conditioner, the shield should connect across the line conditioner. If the line conditioner connects directly to the logic solver output and shielded loop wiring is being used, connect the shield to system ground on the instrument side of the line conditioner.

HART Wiring Connection

The COMM terminals on the line conditioner provide a convenient means to tap into the loop wiring for HART communication. The COMM terminals can be connected to a HART Interchange multiplexer, temporarily connected to a Field Communicator, or left unconnected.

Installation Limitations

The LC340 line conditioner is intended for use in DETT applications only.

The line conditioner introduces a series resistance of 30 ohms maximum into the 24 volts DC output circuit. The user must ensure that the minimum voltage output from the logic solver is sufficient, with the added resistance of the line conditioner in series, to meet the minimum pull-in voltage of the solenoid with the digital valve controller in parallel with the solenoid. This requires the use of a low-power solenoid valve, such as the ASCO 8316 series, or a high-temperature low-power solenoid valve, such as the ASCO X8316 series.

If the ASCO 8316 low-power solenoid valve [rated to 60°C (140°F)] is used, the ASCO specification sheet shows this type rated for 24 volts DC, +10 - 15%, or 20.4 volts DC minimum, with a minimum pull-in current of 42 mA. Since the digital valve controller draws nominally 8 mA in multi-drop mode, the installation must maintain 20.4 volts DC at the solenoid valve when the logic solver output current is 50 mA.

If the ASCO X8316 high-temperature [rated to 80°C (176°F)] low-power solenoid valve is used, this type is also rated for 24 volts DC, +10 - 15%, or 20.4 volts dc minimum, but with a minimum pull-in current of 48 mA. Since the digital valve controller draws nominally 8 mA in multi-drop mode, the installation must maintain 20.4 volts DC at the solenoid valve when the logic solver output current is 56 mA.

Based on this information, table 2 shows the calculated maximum length of stranded wire pair that can be used in the loop. The calculations in this table assume the wire is at 60°C (140°F). The solenoid valve requirements assume the solenoid valve is at its maximum rated temperature. If the actual temperature of the wiring and/or the solenoid valve is lower than assumed, the table values are conservative.

Table 2. Maximum Loop Wire Length for Minimum Logic Solver Outputs

Minimum Logic Solver Output Voltage (volts DC)	Solenoid Valve	Maximum Wire Resistance (Ohms)	Maximum Wire Length							
			22 AWG		20 AWG		18 AWG		16 AWG	
			meters	feet	meters	feet	meters	feet	meters	feet
24.0	ASCO 8316	42.0	330	1071	529	1720	834	2710	1326	4310
23.5		32.0	251	816	403	1311	635	2064	1010	3264
23.0		22.0	173	561	277	901	437	1419	695	2258
22.5		12.0	94	306	151	491	238	774	379	1232
22.0		2.0	16	51	25	82	40	129	63	205
21.5		Solenoid valve pull-in not guaranteed								
24.0	ASCO X8316	34.3	269	875	432	1404	681	2212	1083	3519
23.5		25.4	199	647	320	1039	503	1636	801	2602
23.0		16.4	129	419	207	673	326	1060	519	1686
22.5		7.5	59	191	95	307	149	484	237	770
22.0			Solenoid valve pull-in not guaranteed							
NOTES: 1. Nominal resistance per 1000 feet of stranded wire at 20°C (68°F) (from Belden website): 22 AWG, 17.5 ohms; 20 AWG, 10.9 ohms; 18 AWG, 6.9 ohms; 16 AWG, 4.4 ohms. 2. Calculated resistance per foot at 60°C (140°F) cable temperature: 22 AWG, 19.6 ohms; 20 AWG, 12.2 ohms; 18 AWG, 7.8 ohms; 16 AWG, 4.9 ohms.										

Corrective Maintenance

The line conditioner will work in either polarity, but misconnection could result in the wrong polarity reaching the field devices. If the loop is not operating properly, check the polarity of the voltage at the inputs and outputs of the line conditioner and at the inputs of the field devices.

If the loop power appears to operate properly, but communication with a non-isolated multiplexer or PC modem does not work, it may help to reverse the connections at the COMM terminals. The line conditioner inserts a high impedance only in the “+” side of the loop. Also, misconnection of the logic solver wires to the FLD terminals and the field wiring to the SYS terminals will result in proper loop power, but inoperative HART communications.

If there is inadequate loop voltage, the loop may not support field device operation with a line conditioner installed, refer to the Installation Limitations.

The line conditioner is protected against accidental over-current from sources up to 30 volts DC. If an overcurrent condition occurs, the line conditioner may be inoperative for several seconds thereafter.

Parts

WARNING

Use only genuine Fisher replacement parts. Components that are not supplied by Emerson Process Management should not, under any circumstances, be used in any Fisher instrument. Use of components not supplied by Emerson Process Management may void your warranty, might adversely affect the performance of the instrument, and could cause personal injury and property damage.

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