

Avoiding HART loop interference when using the Smart Wireless THUM™ Adapter

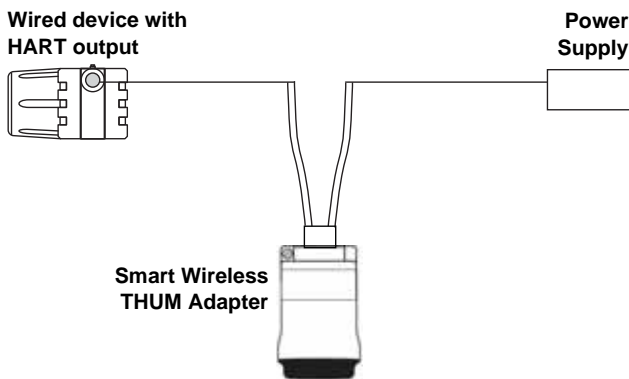
Introduction

This document provides guidance on avoidance of interference on a HART loop that can affect the performance of the Smart Wireless THUM™ Adapter.

The Smart Wireless THUM Adapter employs an innovative energy scavenging design which uses the existing 4-20mA signal of the wired HART sub-device as a power source instead of requiring a separate power supply. Due to the extremely limited power that may be available, the Smart Wireless THUM Adapter is slightly more sensitive to loop interference. Although the Smart Wireless THUM Adapter is designed to ensure reliable data transmission from the wired HART sub-device, interference and excessive noise on the loop may cause the THUM to periodically miss a wireless burst message publication. If this noise and interference is removed, the THUM will automatically recover and continue to provide >99% data reliability.

This white paper will discuss the different potential sources of interference and provides guidance on avoiding interference related problems.

Figure 1. Basic HART loop with THUM adapter



Cabling Considerations

To prevent external interference from being induced on the HART loop, use only high quality shielded, twisted pair cable. The cable size should be a minimum of #24 AWG for runs less than 5,000 ft. and #20 AWG for longer distances.

The theoretical limit for HART communications is 10,000 ft (3,000 m). However, cable capacitance will affect the maximum distance for HART communication. Table 1 below shows the maximum distance for different cable capacitance. The information in the table is based on non-intrinsically safe installations and considers only the capacitive affect of the cable on the HART signal. For more information, see the HART physical layer specifications.

Table 1. Maximum cable length based on cable capacitance

	Cable Capacitance - pf/ft (pf/m)			
	20 (65)	30 (95)	50 (160)	70 (225)
Distance ft. (m)	9,000 (2,769)	6,500 (2,000)	4,200 (1,292)	3,200 (985)

Grounding

Improper grounding can also cause interference on the HART loop so it is important to follow good grounding practices. The signal loop should only be connected to ground at one point, if at all. Cable shields should be grounded at only one point. Generally speaking, the best location for ground connection is near the control system on the power supply.

Smart Wireless THUM

Power Supply

Ripple and noise from a power supply can interfere with HART communications. Ensure that your power supply meets the specifications shown in Table 2 below to avoid interference.

Table 2. Power supply noise requirements for HART conformance

Maximum ripple (47 to 125 Hz)	0.2 V p-p
Maximum noise (500 Hz to 10 kHz)	1.2 mV rms
Maximum series impedance (500 Hz to 10 kHz)	10 Ohm

Certain types of solar power systems are known to interfere with HART communications. Charge controllers that rely on pulse width modulation may not meet the above requirements for supply noise and should be avoided. When choosing a solar power system, make sure that it will not create noise on the HART loop in excess of the limits shown in Table 2.

Other Interference Sources

Other equipment such as loop powered indicators can also cause interference on a HART loop. Care should be taken to ensure that all equipment attached to the HART loop conforms to the noise limits shown in Table 2.

Loop powered remote displays are often used on loops where the HART sub-device is installed in an inaccessible location. Many of these displays were designed for standard 4-20 mA analog loops and may create noise on the loop that has the potential of interfering with HART communications. One example of this is the Rosemount Model 751 LCD indicator which should not be used on a HART loop with a THUM. The analog version of the 751 does not interfere with HART communication and can be used with the THUM.

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**Emerson Process Management
Rosemount Measurement**
8200 Market Boulevard
Chanhassen MN 55317 USA
Tel (USA) 1 800 999 9307
Tel (International) +1 952 906 8888
Fax +1 952 949 7001

Emerson Process Management
Blegistrasse 23
P.O. Box 1046
CH 6341 Baar
Switzerland
Tel +41 (0) 41 768 6111
Fax +41 (0) 41 768 6300

Emerson FZE
P.O. Box 17033
Jebel Ali Free Zone
Dubai UAE
Tel +971 4 811 8100
Fax +971 4 886 5465

**Emerson Process Management Asia Pacific
Pte Ltd**
1 Pandan Crescent
Singapore 128461
Tel +65 6777 8211
Fax +65 6777 0947
Service Support Hotline : +65 6770 8711
Email : Enquiries@AP.EmersonProcess.com



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Summary

The Smart Wireless THUM adapter has been designed to function on loops that conform to HART requirements. Avoid interference issues by ensuring that all wiring and equipment also conform to HART requirements. With proper planning, a well formed HART loop can be created and maintained, ensuring proper THUM adapter performance.

For additional information about the HART protocol and proper installation, refer to the HART Communication Foundation website at <http://www.hartcomm.org/>.