Section 13. HART Analog Input Module

13-1. Description

HART (Highway Addressable Remote Transducer) is a digital communication protocol designed for industrial process measurement applications. Field measurement devices (transmitters) interface a process control system via an analog 4-to-20 mA current loop. HART uses a low-level frequency shift-keyed sine wave signal that is superimposed on the standard 4-to-20 mA process measurement current loop. Since the HART sine wave signal is small and its average value is zero, the current loop analog 4-to-20 mA signal is not significantly affected by the presence of the HART signal. Using HART allows a field device to provide more than one measurement, which is a feature not available when using only the 4-to-20 A analog current signal.

"Smart" field devices may be described as field devices in which the analog 4-to-20 mA signal, digital communication, and sometimes power, co-exist on the same pair of wires. The Ovation HART Analog Input (HAI) module is a standard form factor Ovation I/O module, which will permit Ovation to communicate with HART devices.

The HART Analog Input Module is applicable for CE Mark configured systems.

Note

See **Section 3. I/O Modules** for environmental, installation, wiring and fuse information.

13-2. Module Groups

13-2.1. Electronics Module

There is one Electronics Module group for the HART Analog Input Module:

- 5X00058G01 interfaces to eight current loop signals with an input range of 4-20 mA.

13-2.2. Personality Module

There is one Personality Module group for the HART Analog Input Module.

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- 5X00059G01 contains a single printed circuit board assembly with eight fused two-wire loop-powered or non-fused active-source (four-wire isolated current output) transmitter inputs. Eight user servicable fuses (one fuse for each analog input channel) are located on the personality module. Each fuse is used to protect the auxiliary power supply only if the associated analog input channel is connected to a two-wire loop powered current transmitter.

Note

Revision 02 and later personality modules contain a ninth user servicable fuse (1/2 A) for the electronics module +24 VDC auxiliary power input.

Table 13-1. HART Analog Input Subsystem (16 Bit)

Range	Channels	Electronic Module	Personality Module
4-20 mA loop powered (2 wire) or active source (4 wire)	8	5X00058G01	5X00059G01

This configuration is CE Mark Certified.

13-3. Module Block Diagram

The Ovation HART Analog Input Module assembly consists of two modules, an electronics module containing a logic printed circuit board (LHA) and a field printed circuit board (FHI). The simplified block diagram for the FHI field board is shown in Figure 13-1. The electronics module is used in conjunction with a personality module, which contains a single printed circuit board (PHAI).

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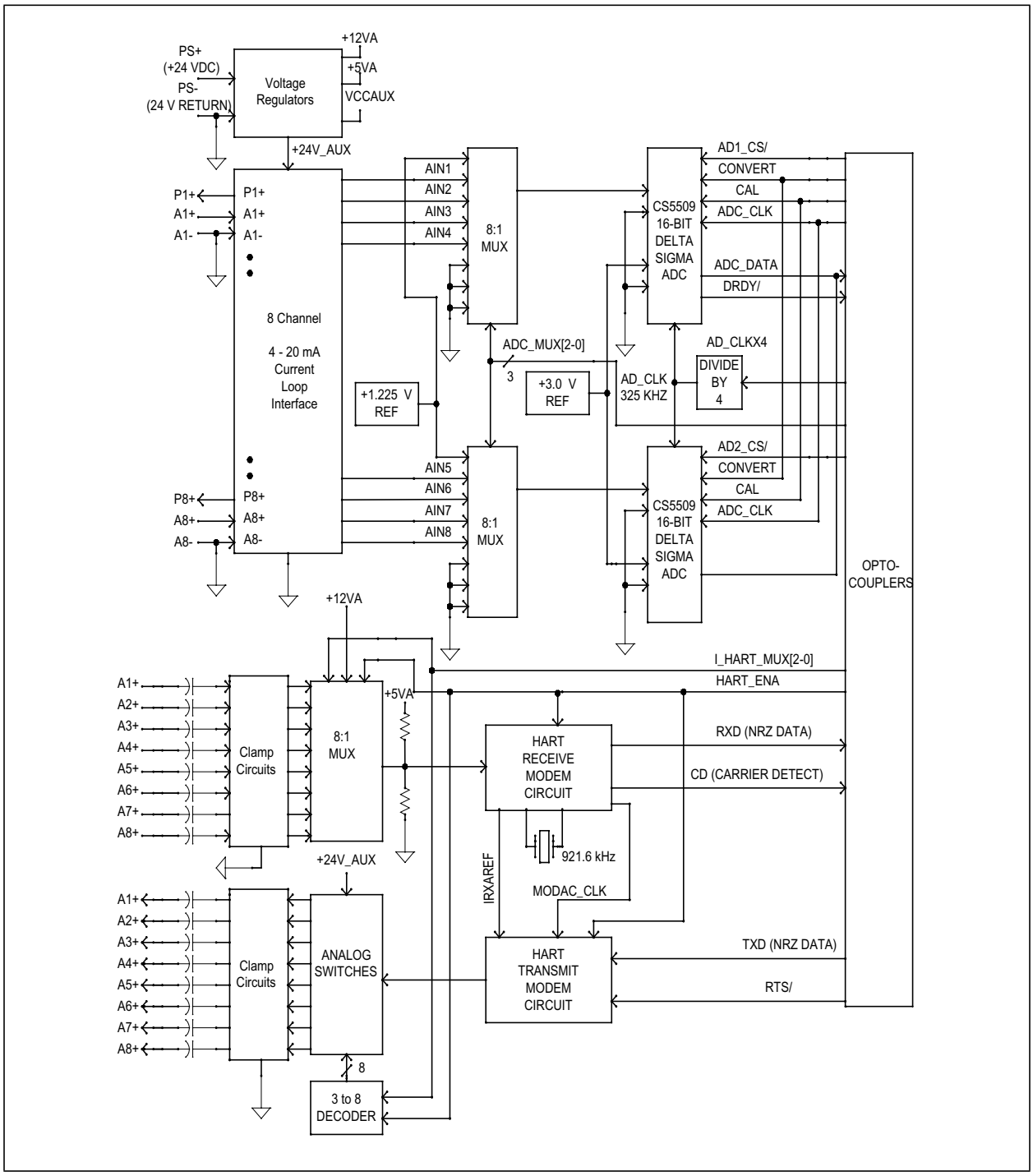


Figure 13-1. HART Analog Input Electronics Module FHI Field Board Block Diagram

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13-4. External Power Supplies

Note

Module power specifications (main and auxiliary) refer to the actual power drawn by the module from the 24 VDC main power supply and from the +24 VDC auxiliary power supply and from the AC or DC mains.

The HART Analog Input Module utilizes the standard +24V Ovation main power supply to provide the power required for the logic circuitry.

The HART Analog Input Module utilizes a +24 auxiliary power supply to provide the power required for the field circuitry. This includes all 4-20 mA loop power, A/D conversion, and the remaining output channel components.

It is recommended that the HART Analog Input module utilize the Ovation cabinet's Auxiliary +24V DC power that is obtained from the standard Ovation DIN Rail power supply auxiliary output.

However, if an external auxiliary power supply is utilized by the HART analog input module, the power supply noise output must meet the following requirements.

Table 13-2. Power Supply Noise Output

Noise	All Rated Loads (500 HZ to 10 kHZ)	2.2 mV RMS Max.

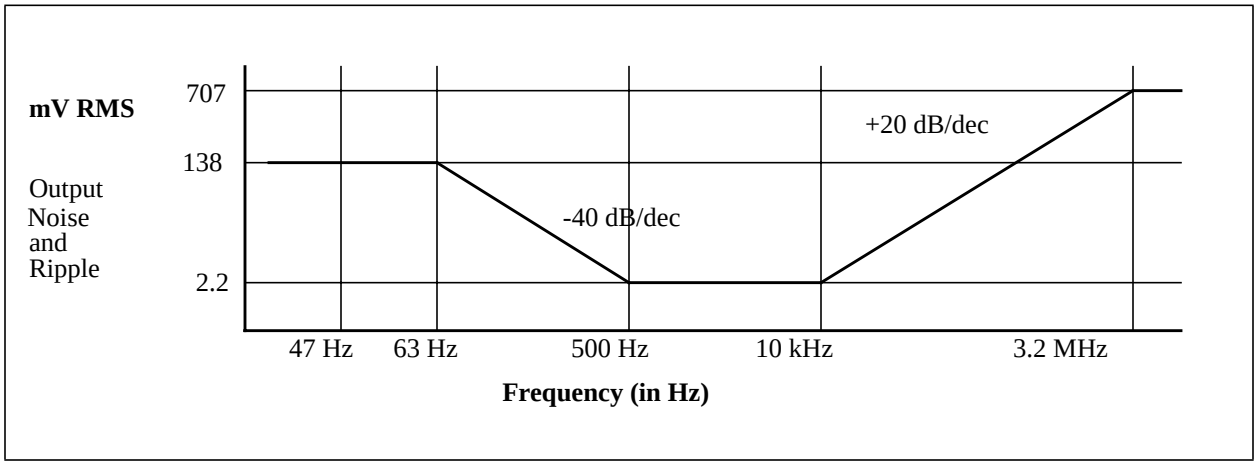


Figure 13-2. Power Supply Output Noise Requirements

If an external supply is utilized to provide auxiliary power, see Appendix D for the steps to be taken before connecting the external power supply to the Ovation I/O base unit terminal block.

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In addition, all modules utilizing the auxiliary power supplies, including the HART modules, **MUST** utilize shielded I/O cables in order to suppress coupled noise and transients into the HART modules. This includes modules on the same branch utilizing the auxiliary power, or modules on other branches utilizing the same auxiliary power. This recommendation applies regardless of the type of power supply chosen by the user.

13-5. Specifications

Electronics Module (5X00058)
Personality Module (5X00059)

Table 13-3. HART Analog Input Module Specifications

Description	Value
Number of channels	8
Input range	4 to 20 mA normal operation 0 to 23 mA with under-range and over-range levels user selected and Controller monitored.
A/D Resolution	16 bits
Reference accuracy (@ 25^{o}C)	+/-0.05% of span @ 99.7% confidence
Accuracy over temperature	+/-0.1% of span over the full operating temperature range
Sampling rate (per ms)	Each channel is sampled every 24 ms.
Dielectric isolation: Channel to channel Channel to logic	 No channel to channel isolation 1000 VAC/VDC for one minute
Operating temperature range	0^{o} to 60^{o}C. (32^{o}F to 140^{o}F)
Humidity (non-condensing)	0% to 95%
Module power	Main: 1.2W typical. 2.5W maximum Aux. power supply voltage = 24 VDC -5%, +6.25% Aux: 4.1W typical. 7.2W maximum
Two-wire transmitter power	13.5V minimum (P_{n+} to A_{n+}) @ 20 mA where n = 1 to 8 (current limited to 32 mA maximum)

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13-6. Hart Analog Input Terminal Block Wiring Information

Each Personality module has a simplified wiring diagram label on its side which appears above the terminal block. This diagram indicates how the wiring from the field is to be connected to the terminal block in the base unit.

The diagrams for the HART Analog Input Personality modules are illustrated in Figure 13-4. The following table lists and defines the abbreviations used in those diagrams.

Abbreviation	Definition
A1 - A8 +	Analog Input terminal connection (connected to the negative terminal of a loop powered two-wire current transmitter or the positive terminal of an active-source current transmitter).
A1 - A8 -	Analog Input negative terminal connection (active-source only).
P1 - P8 +	Loop power output terminals (for loop powered two-wire current transmitters - connect to their positive terminal).
SH1 - SH8	Shield terminal connection.
	Earth ground terminals.
PS+, PS-	External Auxiliary power supply terminals.
RSV	Reserved terminal. No connections are allowed on these terminals.

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