Section 19A. Eight Channel RTD Module

19A-1. Description

The Eight (8) channel RTD module is used to convert inputs from Resistance Temperature Detectors (RTDs) to digital data. The digitized data is transmitted to the Controller.

19A-2. Module Groups

19A-2.1. Electronics Modules

There is one Electronics module group for the 8 channel RTD Module:

- 5X00119G01 converts inputs for all ranges and is compatible only with Personality module 5X00121G01 (not applicable for CE Mark certified systems).

19A-2.2. Personality Modules

There is one Personality module groups for the 8 channel RTD Module:

- 5X00121G01 converts inputs for all ranges and is compatible only with Electronics module 5x00119G01 (not applicable for CE Mark certified systems).

Table 19A-1. 8 Channel RTD Module Subsystem

Channels	Electronic Module	Personality Module
8	5X00119G01	5X00121G01

19A-2.3. Module Block Diagram and Field Connection Wiring Diagram

The Ovation 8 Channel RTD module consists of two modules an electronics module contains a logic printed circuit board (LIA) and a printed circuit board (FTD). The electronics module is used in conjunction with a personalty module, which contains a single printed circuit board (PTD). The block diagram for the 8 channel RTD module is shown in Figure 19A-1.

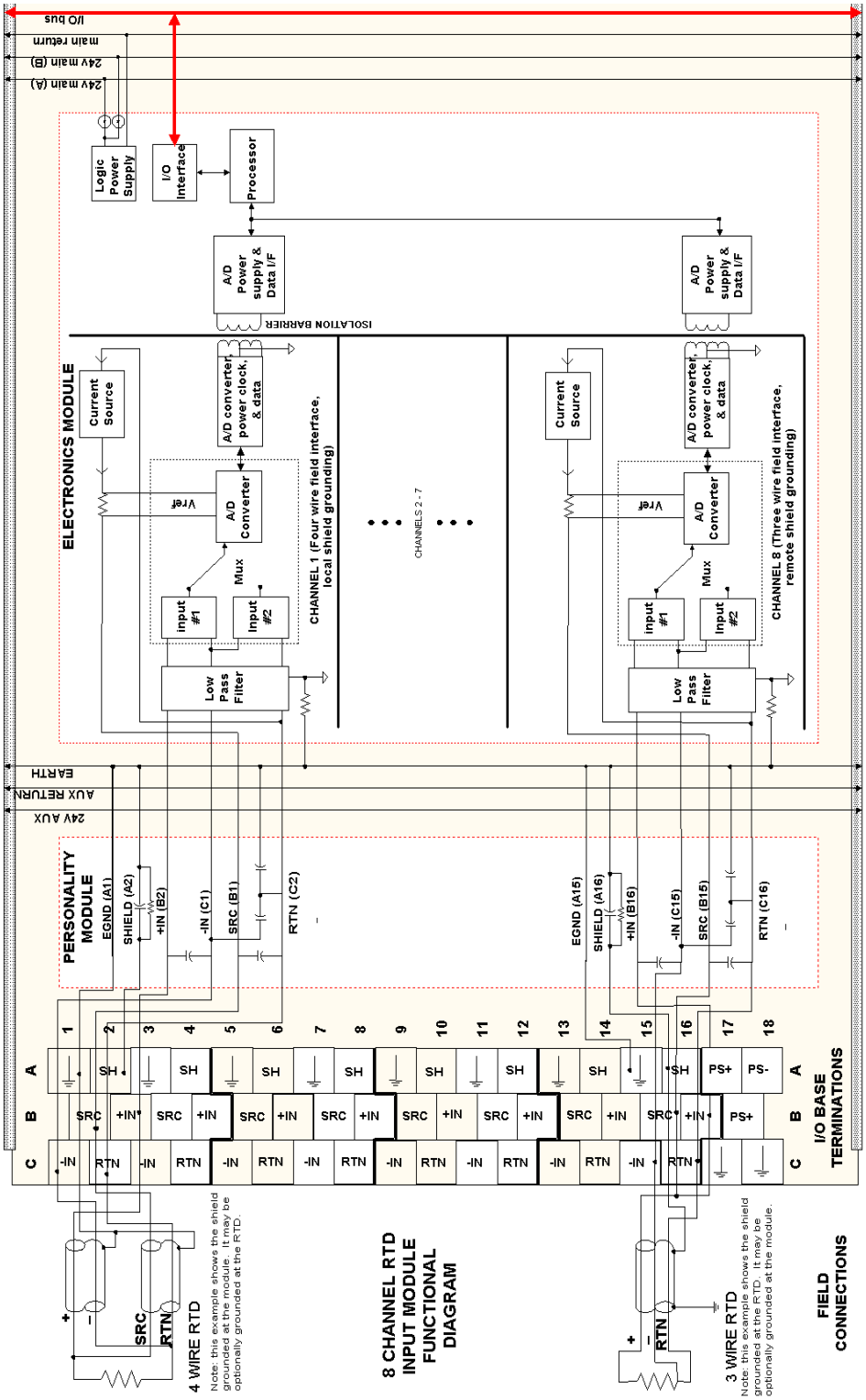

Figure 19A-1. 8 Channel RTD Module Block Diagram and Field Connection Wiring Diagram

19A-3. Specifications

Electronics Module (5X00119)
Personality Module (5X00121)

Table 19A-2. 8 Channel RTD Module Specifications

Description	Value
Number of channels	8
Sampling rate	50 HZ mode: 16.67/sec. normally. In 3 wire mode, lead resistance measurement occurs once every 6.45 sec. during which the rate drops to 3/sec. 60 HZ mode: 20/sec. normally. In 3 wire mode, lead resistance measurement occurs once every 6.45 sec. during which the rate drops to 2/sec. Self Calibration Mode: Occurs on demand only. The rate drops to 1/sec. once during each self calibration cycle.
RTD ranges	Refer to Table 19A-3.
Resolution	12 bits
Guaranteed accuracy (@25°C)	0.10% ± [0.045 (Rcold/Rspan)]% ± [((Rcold + Rspan)/ 4096 OHM)]% ± [0.5 OHM/Rspan]% ±10 μV ± 1/2LSB where: Rcold and Rspan are in Ohms.
Temperature coefficient	10ppm/°C
Dielectric isolation: Channel to channel Channel to logic	 200V AC/DC 1000 V AC/DC
Input impedance	100 M OHM 50 K OHM in power down
Module power	3.6 W typical; 4.2 W maximum
Operating temperature range	0 to 60°C (32°F to 140°F)
Storage temperature range	-40°C to 85°C (-40°F to 185°F)
Humidity (non-condensing)	0 to 95%
Self Calibration	On Demand by Ovation Controller
Common Mode Rejection	120 dB @ DC and nominal power line frequency +/- 1/2%
Normal Mode Rejection	100 dB @ DC and nominal power line frequency +/- 1/2%

Table 19A-3. 8 Channel RTD Ranges

Scale # (HEX)	Wires	Type	Temp °F	Temp °C	Rcold (ohm)	Rhot (ohm)	Excitation current (ma)	Accuracy ± ±counts	Accuracy ± ±% of SPAN
1	3	10 Ohm PL	0 to 1200	–18 to 649	6	106.3	1.0	9	0.22
2	3	10 Ohm CU	0 to 302	–18 to 150	8.5	16.5	1.0	13	0.32
D	3	50 Ohm CU	32 to 284	0 to 140	50	80	1.0	11	0.27
11	3	50 Ohm CU	32 to 230	0 to 110	53	78	1.0	12	0.30
19	3	100 Ohm PL	–4 to 334	–16 to 168	92	163.67	1.0	11	0.27
22	3	100 Ohm PL	32 to 520	0 to 269	100	200	1.0	10	0.25
23	3	100 Ohm PL	32 to 1040	0 to 561	100	301	1.0	10	0.25
25	3	120 Ohm NI	–12 to 464	–11 to 240	109	360	1.0	10	0.25
26	3	120 Ohm NI	32 to 150	0 to 70	120	170	1.0	13	0.32
28	3	120 Ohm NI	32 to 278	0 to 122	120	225	1.0	11	0.27
80	4	100 Ohm PL	32 to 544	0 to 290	100	208	1.0	10	0.25
81	4	100 Ohm PL	356 to 446	180 to 230	168	186	1.0	30	0.74
82	4	200 Ohm PL	32 to 698	0 to 370	200	473	1.0	12	0.30
83	4	200 Ohm PL	514 to 648	268 to 342	402	452	1.0	29	0.71
84	4	100 Ohm PL	32 to 124	0 to 51	100	120	1.0	19	0.47
85	4	100 Ohm PL	32 to 217	0 to 103	100	140	1.0	13	0.32
86	4	100 Ohm PL	32 to 412	0 to 211	100	180	1.0	11	0.27
87	4	100 Ohm PL	32 to 714	0 to 379	100	240	1.0	10	0.25
88	4	120 Ohm PL	511 to 662	266 to 350	200	230	1.0	24	0.59

19A-4. 8 Channel RTD Terminal Block Wiring Information

19A-4.1. Systems Using Personality Module 5X00121G01

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 following table lists and defines the abbreviations used in this diagram.

Table 19A-4. Abbreviations Used in the Diagram

Abbreviation	Definition
+IN, -IN	Positive and negative sense input connection
	Earth ground terminal. Used for landing shields when the shield is to be grounded at the module.
PS+, PS-	Auxiliary power supply terminals.
RTN	Return for current source connection.
SH	Shield connector. used for landing shields when the shield is to be grounded at the RTD.
SRC	Current source connection.

Note:

PS+ and PS- are not used by this module.

19A-5. 8 Channel RTD Module Address Locations

19A-5.1. Configuration and Status Register

Word address 13 (D in Hex) is used for both module configuration and module status. The Module Status Register has both status and diagnostic information. The bit information contained within these words is shown in Table 19A-5.

Table 19A-5. 8 Channel RTD Configuration/Status Register (Address 13 0xD in Hex)

Bit	Data Description - Configuration Register (Write)	Data Description - Status Register (Read)
0	Configure Module	Module Configured (1 = configured; 0 = unconfigured)
1	Force error	Internal or forced error (1 = forced error; 0 = no forced error)
2	50/60 Hz select (0 = 60Hz, 1 = 50Hz)	50/60 Hz System (1 = 50Hz) d(read back)
3	SELF_CAL (Initiates Self Calibration)	Warming bit (set during power up or configuration)
4	0	0
5	0	0
6	0	Module Not Calibrated
7	0	0
8	CH.1 _ 3/4 Wire.	CH.1 _ 3/4 Wire - Configuration (read back)
9	CH.2 _ 3/4 Wire.	CH.2 _ 3/4 Wire - Configuration (read back)
10	CH.3 _ 3/4 Wire.	CH.3 _ 3/4 Wire - Configuration (read back)
11	CH.4 _ 3/4 Wire.	CH.4 _ 3/4 Wire - Configuration (read back)
12	CH.5 _ 3/4 Wire.	CH.5 _ 3/4 Wire - Configuration (read back)
13	CH.6 _ 3/4 Wire.	CH.6 _ 3/4 Wire - Configuration (read back)
14	CH.7 _ 3/4 Wire.	CH.7 _ 3/4 Wire - Configuration (read back)
15	CH.8 _ 3/4 Wire.	CH.8 _ 3/4 Wire - Configuration (read back)

Definitions for the Configuration/Module Status Register bits:

Bit 0: This bit configures the module (write) or indicates the configuration state of the module (read). A “1” indicates that the module is configured. Note that until the module is configured, reading from addresses #0 through #11 (B in Hex) will produce an attention status.

Bit 1: This bit (write “1”) forces the module into the error state, resulting in the error LED being lit. The read of bit “1” indicates that there is an internal module error, or the controller has forced the module into the error state. The state of this bit is always reflected by the module’s Internal Error LED. Whenever this bit is set, an attention status is returned to the controller when address #0 through #11 (B in Hex) are read.

Bit 2: The status of this bit (read) indicates the conversion rate of the module, write to this bit configures the conversion rate of A/D converters as shown below.see Table 19A-6.

Table 19A-6. Conversion Rate

Conversion Rate (1/sec.)	Bit 2
60 (for 60Hz systems)	0
50 (for 50Hz systems)	1

Bit3: Write: This bit is used to initiate self-calibration. Read: This bit indicates that the module is in the “Warming” state. this state exists after power up and terminates after 8.16 seconds. the module will be in the error condition during the warm up period.

Bit4 & 5: These bits are not used and read as “0” under normal operation.

Bit 6: This bit (read) is the result of a checksum test of the EEPROM. A failure of this test can indicate a bad EEPROM, but it typically indicates that the module has not been calibrated. A “0” indicates that there is no error condition. If an error is present, the internal error LED is lit and attention status will be returned for all address offsets 0-11 (0x0 - 0xB). The “1” state of this bit indicates an unrecoverable error condition in the field.

Bit 7: This bits is not used and read as “0” under normal operation.

Bit 8 - 15: These bits are used to configure channels 1 - 8 respectively for 3 or 4 wire operation. A “0” indicates 3 wire and a “1” indicates 4 wire operation, see Table 19A-7 and Table 19A-8).

Word address 12 (0xC) is used to configure the appropriate scales for Channels 1 - 4 (refer to Table 19A-7 and Table 19A-8).

Table 19A-7. Data Format for the Channel Scale Configuration Register(0xC)

Bit	Data Description Configuration (Write)	Data Description Status (Read)
0	Configure Channel #1scale - Bit 0	Channel #1 scale configuration (read back) - Bit 0
1	Configure Channel #1scale - Bit 1	Channel #1 scale configuration (read back) - Bit 1
2	Configure Channel #1scale - Bit 2	Channel #1 scale configuration (read back) - Bit 2
3	Configure Channel #1scale - Bit 3	Channel #1 scale configuration (read back) - Bit 3
4	Configure Channel #2 scale - Bit 0	Channel #2 scale configuration (read back) - Bit 0
5	Configure Channel #2 scale - Bit 1	Channel #2 scale configuration (read back) - Bit 1
6	Configure Channel #2 scale - Bit 2	Channel #2 scale configuration (read back) - Bit 2
7	Configure Channel #2 scale - Bit 3	Channel #2 scale configuration (read back) - Bit 3
8	Configure Channel #3 scale - Bit 0	Channel #3 scale configuration (read back) - Bit 0
9	Configure Channel #3 scale - Bit 1	Channel #3 scale configuration (read back) - Bit 1

Table 19A-7. Data Format for the Channel Scale Configuration Register(0xC)

10	Configure Channel #3 scale - Bit 2	Channel #3 scale configuration (read back) - Bit 2
11	Configure Channel #3 scale - Bit 3	Channel #3 scale configuration (read back) - Bit 3
12	Configure Channel #4 scale - Bit 0	Channel #4 scale configuration (read back) - Bit 0
13	Configure Channel #4 scale - Bit 1	Channel #4 scale configuration (read back) - Bit 1
14	Configure Channel #4 scale - Bit 2	Channel #4 scale configuration (read back) - Bit 2
15	Configure Channel #4 scale - Bit 3	Channel #4 scale configuration (read back) - Bit 3

Caution:

Configuring any or all channel scales while the system is running will cause all channels to return attention status for up to two seconds following the reconfiguration.

Table 19A-8. Data Format for the Channel Scale Configuration Register(0xE)

Bit	Data Description Configuration (Write)	Data Description Status (Read)
0	Configure Channel #5 scale - Bit 0	Channel #5 scale configuration (read back) - Bit 0
1	Configure Channel #5 scale - Bit 1	Channel #5 scale configuration (read back) - Bit 1
2	Configure Channel #5 scale - Bit 2	Channel #5 scale configuration (read back) - Bit 2
3	Configure Channel #5 scale - Bit 3	Channel #5 scale configuration (read back) - Bit 3
4	Configure Channel #6 scale - Bit 0	Channel #6 scale configuration (read back) - Bit 0
5	Configure Channel #6 scale - Bit 1	Channel #6 scale configuration (read back) - Bit 1
6	Configure Channel #6 scale - Bit 2	Channel #6 scale configuration (read back) - Bit 2
7	Configure Channel #6 scale - Bit 3	Channel #6 scale configuration (read back) - Bit 3
8	Configure Channel #7 scale - Bit 0	Channel #7 scale configuration (read back) - Bit 0
9	Configure Channel #7 scale - Bit 1	Channel #7 scale configuration (read back) - Bit 1
10	Configure Channel #7 scale - Bit 2	Channel #7 scale configuration (read back) - Bit 2
11	Configure Channel #7 scale - Bit 3	Channel #7 scale configuration (read back) - Bit 3
12	Configure Channel #8 scale - Bit 0	Channel #8 scale configuration (read back) - Bit 0
13	Configure Channel #8 scale - Bit 1	Channel #8 scale configuration (read back) - Bit 1
14	Configure Channel #8 scale - Bit 2	Channel #8 scale configuration (read back) - Bit 2
15	Configure Channel #8 scale - Bit 3	Channel #8 scale configuration (read back) - Bit 3

Caution:

Configuring any or all channel scales while the system is running will cause all channels to return attention status for up to two seconds following the reconfiguration.

19A-6. Diagnostic LEDs

Table 19A-9. 8 Channel RTD Diagnostic LEDs

LED	Description
P (Green)	Power OK LED. Lit when the +5V power is OK.
C (Green)	Communications OK LED. Lit when the Controller is communicating with the module.
I (Red)	Internal Fault LED. Lit whenever there is any type of error with the module **except** to a loss of power. Possible causes are: ■ - Module initialization is in progress. ■ - I/O Bus time-out has occurred. ■ - Register, static RAM, or FLASH checksum error. ■ - Module reset ■ - Module is uncalibrated. ■ - Forced error has been received from the Controller ■ - Communication between the Field and Logic boards failed
CH1 - CH 8 (Red)	Channel error. Lit whenever there is an error associated with a channel or channels. Possible causes are: ■ - Positive overrange ■ - Negative overrange ■ Communication with the channel has failed