Reference Manual
00809-0400-4728, Rev AA
June 2011

Rosemount 644 Temperature Transmitter with FOUNDATION™ fieldbus

FOUNDATION

ROSEMOUNT®

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Process Management

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Rosemount 644 Temperature Transmitters

Rosemount 644 Hardware Revision	**9**
FOUNDATION™ Fieldbus Device Revision	**2**
Device Descriptor Revision	**1**

NOTICE

Read this manual before working with the product. For personal and system safety, and for optimum product performance, make sure to thoroughly understand the contents before installing, using, or maintaining this product.

The United States has two toll-free assistance numbers and one international number.

Customer Central
1-800-999-9307 (7:00 a.m. to 7:00 p.m. CST)

National Response Center
1-800-654-7768 (24 hours a day)
Equipment service needs

International
1-(952)-906-8888

⚠CAUTION

The products described in this document are NOT designed for nuclear-qualified applications.

Using non-nuclear qualified products in applications that require nuclear-qualified hardware or products may cause inaccurate readings.

For information on Rosemount nuclear-qualified products, contact a Emerson Process Management Sales Representative.

Section 1 Introduction

SAFETY MESSAGES

Instructions and procedures in this section may require special precautions to ensure the safety of the personnel performing the operations. Information that potentially raises safety issues is indicated by a warning symbol (⚠). Please refer to the following safety messages before performing an operation preceded by this symbol.

Warnings

⚠WARNING

Failure to follow these installation guidelines could result in death or serious injury.

- Make sure only qualified personnel perform the installation.

Explosions could result in death or serious injury.

- Do not remove the connection head cover in explosive atmospheres when the circuit is live.
- Before connecting FOUNDATION fieldbus in an explosive atmosphere, make sure the instruments in the loop are installed in accordance with intrinsically safe or non-intrinsic field wiring practices.
- Verify that the operating atmosphere of the transmitter is consistent with the appropriate hazardous locations certifications.
- All connection head covers must be fully engaged to meet explosion-proof requirements.

Process leaks could result in death or serious injury.

- Do not remove the thermowell while in operation.
- Install and tighten thermowells and sensors before applying pressure.

Electrical shock could cause death or serious injury.

- Use extreme caution when making contact with the leads and terminals.

OVERVIEW

Manual

This manual is designed to assist in the installation, operation, and maintenance of Rosemount 644 head mount and 644 rail mount.

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- Transmitter and Manual Overview
- Considerations
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Transmitter

Features of the Rosemount 644 include:

- Accepts inputs from a wide variety of sensors
- Configuration using FOUNDATION fieldbus
- Electronics that are completely encapsulated in epoxy and enclosed in a metal housing, making the transmitter extremely durable and ensuring long-term reliability
- A compact size and two housing options allowing mounting flexibility for the control room or the field

Refer to the following literature for a full range of compatible connection heads, sensors, and thermowells provided by Emerson Process Management.

- Temperature Sensors and Assemblies Product Data Sheet, Volume 1 (document number 00813-0100-2654)
- Temperature Sensors and Assemblies Product Data Sheet, Volume 2 (document number 00813-0200-2654)

CONSIDERATIONS

General

Electrical temperature sensors such as RTDs and thermocouples produce low-level signals proportional to their sensed temperature. The 644 converts the low-level sensor signal to a standard 4–20 mA dc, or digital FOUNDATION fieldbus signal that is relatively insensitive to lead length and electrical noise. This signal is then transmitted to the control room via two wires.

Commissioning

The transmitter can be commissioned before or after installation. It may be useful to commission it on the bench, before installation, to ensure proper operation and to become familiar with its functionality. Make sure the instruments in the loop are installed in accordance with intrinsically safe, FISCO, or non-incendive field wiring practices.

Mechanical

Location

When choosing an installation location and position, take into account the need for access to the transmitter.

Special Mounting

Special mounting hardware is available for mounting a 644 head mount transmitter to a DIN rail or assembling a new 644 head mount to an existing threaded sensor connection head (former option code L1).

Electrical

Proper electrical installation is necessary to prevent errors due to sensor lead resistance and electrical noise. For best results, shielded cable should be used in electrically noisy environments.

Make wiring connections through the cable entry in the side of the connection head. Be sure to provide adequate clearance for cover removal.

Environmental

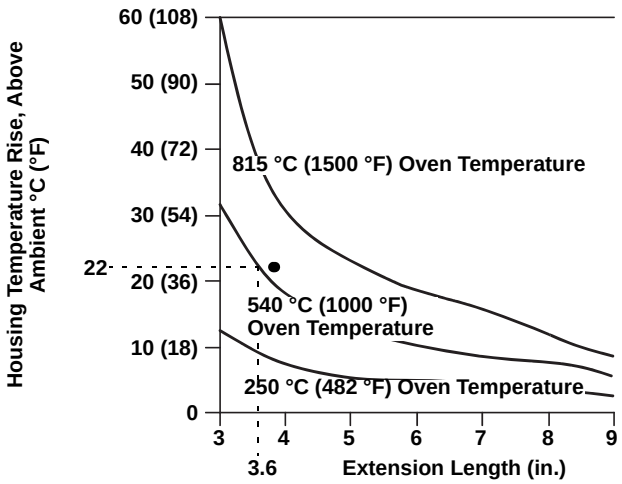
The transmitter electronics module is permanently sealed within the housing, resisting moisture and corrosive damage. Verify that the operating atmosphere of the transmitter is consistent with the appropriate hazardous locations certifications.

Temperature Effects

The transmitter will operate within specifications for ambient temperatures between –40 and 185 °F (–40 and 85 °C). Heat from the process is transferred from the thermowell to the transmitter housing. If the expected process temperature is near or beyond specification limits, consider the use of additional thermowell lagging, and extension nipple, or a remote mounting configuration to isolate the transmitter from the process.

Figure 1-1 provides an example of the relationship between transmitter housing temperature rise and extension length.

Figure 1-1. 644 head mount Transmitter Connection Head Temperature Rise vs. Extension Length



Example

The transmitter specification limit is 85 °C. If the ambient temperature is 55 °C and the process temperature to be measured is 800 °C, the maximum permissible connection head temperature rise is the transmitter specification limit minus the ambient temperature (moves 85 to 55 °C), or 30 °C.

In this case, an extension of 100 mm meets this requirement, but 125 mm provides a margin of 8 °C, thereby reducing any temperature effects in the transmitter.

RETURN OF MATERIALS

To expedite the return process in North America, call the Emerson Process Management National Response Center toll-free at 800-654-7768. This center, available 24 hours a day, will assist you with any needed information or materials.

⚠ The center will ask for the following information:

- Product model
- Serial numbers
- The last process material to which the product was exposed

The center will provide

- A Return Material Authorization (RMA) number
- Instructions and procedures that are necessary to return goods that were exposed to hazardous substances

For other locations, please contact a Emerson Process Management sales representative.

NOTE
If a hazardous substance is identified, a Material Safety Data Sheet (MSDS), required by law to be available to people exposed to specific hazardous substances, must be included with the returned materials.

PRODUCT RECYCLING/DISPOSAL

Recycling of equipment and packaging should be taken into consideration and disposed of in accordance with local and national legislation/regulations.

Section 2 Installation

SAFETY MESSAGES

Instructions and procedures in this section may require special precautions to ensure the safety of the personnel performing the operations. Information that potentially raises safety issues is indicated by a warning symbol (⚠). Please refer to the following safety messages before performing an operation preceded by this symbol.

Warnings

⚠WARNING

Failure to follow these installation guidelines could result in death or serious injury.

- Make sure only qualified personnel perform the installation.

Explosions could result in death or serious injury.

- Do not remove the connection head cover in explosive atmospheres when the circuit is live.
- Before connecting a Field Communicator in an explosive atmosphere, make sure the instruments in the loop are installed in accordance with intrinsically safe or non-incendive field wiring practices.
- Verify that the operating atmosphere of the transmitter is consistent with the appropriate hazardous locations certifications.
- All connection head covers must be fully engaged to meet explosion-proof requirements.

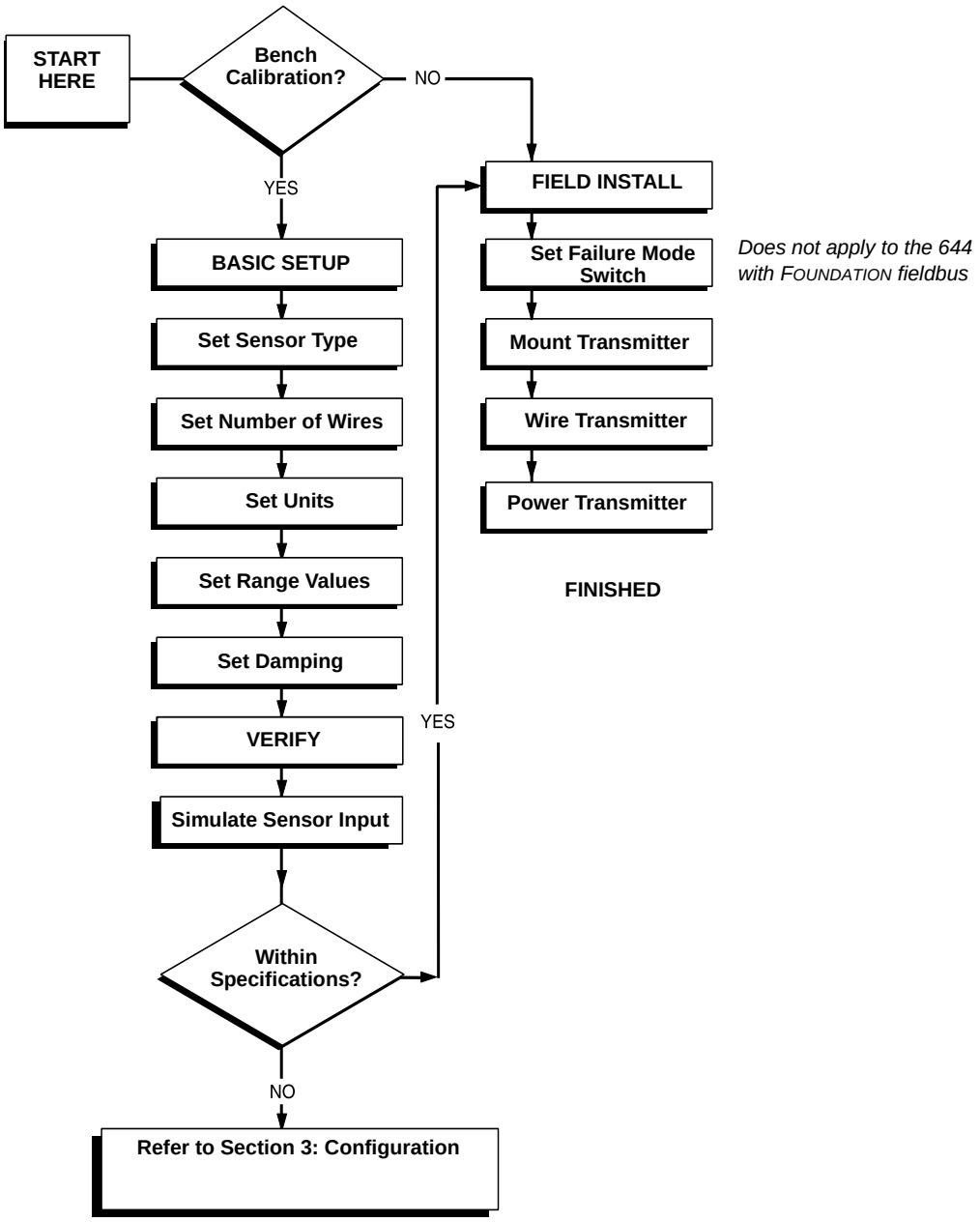
Process leaks could result in death or serious injury.

- Do not remove the thermowell while in operation.
- Install and tighten thermowells and sensors before applying pressure.

Electrical shock could cause death or serious injury.

- Use extreme caution when making contact with the leads and terminals.

Figure 2-1. Installation Flowchart



MOUNTING

Mount the transmitter at a high point in the conduit run to prevent moisture from draining into the transmitter housing.

The 644 head mount installs:

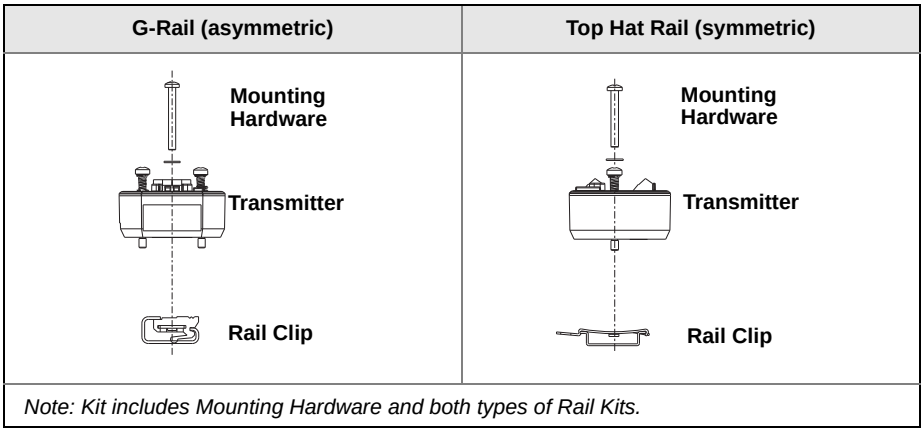
- In a connection head or universal head mounted directly on a sensor assembly
- Apart from a sensor assembly using a universal head
- To a DIN rail using an optional mounting clip.

The 644 rail mount attaches directly to a wall or to a DIN rail.

Mounting a 644H to a DIN Rail

To attach a head mount transmitter to a DIN rail, assemble the appropriate rail mounting kit (part number 00644-5301-0010) to the transmitter as shown in Figure 2-2.

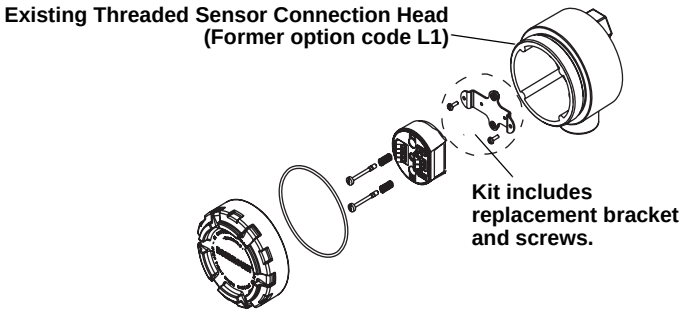
Figure 2-2. Assembling Rail Clip Hardware to a 644H



Retrofitting a 644H for Use in an Existing Threaded Sensor Connection Head

To mount a 644H in an existing threaded sensor connection head (former option code L1), order the 644H retrofit kit (part number 00644-5321-0010). The retrofit kit includes a new mounting bracket and all associated hardware necessary to facilitate the installation of the 644H in the existing head. See Figure 2-3.

Figure 2-3. Assembling 644H for Use in an Existing L1 Connection Head

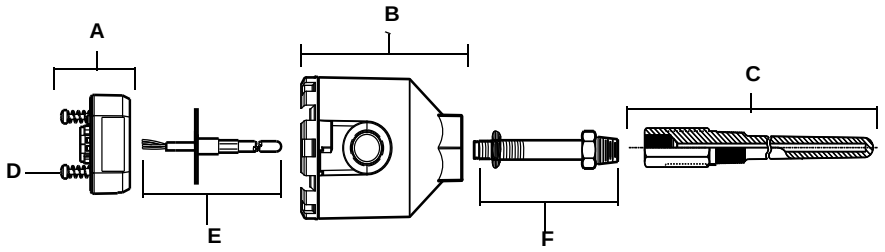


INSTALLATION

Typical European Installation

Head Mount Transmitter with DIN Plate Style Sensor

1. Attach the thermowell to the pipe or process container wall. Install and tighten the thermowell before applying process pressure.
2. Assemble the transmitter to the sensor. Push the transmitter mounting screws through the sensor mounting plate and insert the snap rings (optional) into the transmitter mounting screw groove.
3. Wire the sensor to the transmitter (see Figure 2-7 on page 2-8).
4. Insert the transmitter-sensor assembly into the connection head. Thread the transmitter mounting screw into the connection head mounting holes. Assemble the extension to the connection head. Insert the assembly into the thermowell.
5. Attach a cable gland into the shielded cable.
6. Insert the shielded cable leads into the connection head through the cable entry. Connect and tighten the cable gland.
7. Connect the shielded power cable leads to the transmitter power terminals. Avoid contact with sensor leads and sensor connections.
8. Install and tighten the connection head cover. Enclosure covers must be fully engaged to meet explosion-proof requirements.

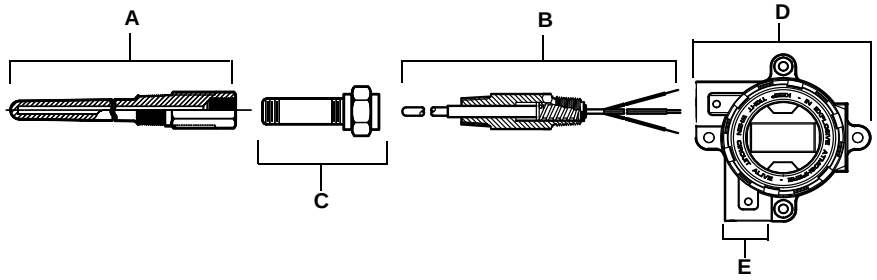


A = 644H Transmitter	D = Transmitter Mounting Screws
B = Connection Head	E = Integral Mount Sensor with Flying Leads
C = Thermowell	F = Extension

Typical North American Installation

Head Mount Transmitter with Threaded Sensor

1. Attach the thermowell to the pipe or process container wall. Install and tighten thermowells before applying process pressure.
2. Attach necessary extension nipples and adapters to the thermowell. Seal the nipple and adapter threads with silicone tape.
3. Screw the sensor into the thermowell. Install drain seals if required for severe environments or to satisfy code requirements.
4. Pull the sensor wiring leads through the universal head and transmitter. Mount the transmitter in the universal head by threading the transmitter mounting screws into the universal head mounting holes.
5. Mount the transmitter-sensor assembly into the thermowell. Seal adapter threads with silicone tape.
6. Install conduit for field wiring to the conduit entry of the universal head. Seal conduit threads with silicone tape.
7. Pull the field wiring leads through the conduit into the universal head. Attach the sensor and power leads to the transmitter. Avoid contact with other terminals.
8. Install and tighten the universal head cover. Enclosure covers must be fully engaged to meet explosion-proof requirements.



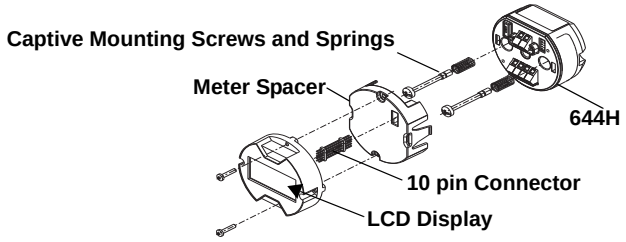
A = Threaded Thermowell
B = Threaded Style Sensor
C = Standard Extension
D = Universal Head
E = Conduit Entry

LCD Display Installation

The LCD display provides local indication of the transmitter output and abbreviated diagnostic messages governing transmitter operation. Transmitters ordered with the LCD display are shipped with the meter installed. After-market installation of the meter can be performed if the transmitter has a meter connector (transmitter revision 5.5.2 or later). After-market installation requires the meter kit (part number 00644-4430-0001), which includes:

- LCD display assembly (includes LCD display, meter spacer, and 2 screws)
- Meter cover with O-ring in place

Figure 2-4. Installing the LCD Display



Use the following procedure to install the meter.

1. If the transmitter is installed in a loop, secure the loop and disconnect the power. If the transmitter is installed in an enclosure, remove the cover from the enclosure.
2. Decide meter orientation (the meter can be rotated in 90° increments). To change meter orientation, remove the screws located above and below the display screen. Lift the meter off the meter spacer. Remove the 8-pin plug and re-insert it in the location that will result in the desired viewing orientation.
3. Reattach the meter to the meter spacer using the screws. If the meter was rotated 90° from its original position, it will be necessary to remove the screws from their original holes and re-insert them in the adjacent screw's holes.
4. Line up the 10-pin connector with the 10-pin socket and push the meter into the transmitter until it snaps into place.
5. Attach the meter cover; tighten at least one-third turn after the O-ring contacts the transmitter housing. The cover must be fully engaged to meet explosion-proof requirements.
6. Use a Field Communicator, AMS software, or a FOUNDATION fieldbus Communication tool to configure the meter to the desired display.

NOTE
Observe the following LCD display temperature limits:
Operating: –4 to 185 °F (–20 to 85 °C)
Storage: –50 to 185 °F (–45 to 85 °C)

WIRING

⚠ All power to the transmitter is supplied over the signal wiring. Use ordinary copper wire of sufficient size to ensure that the voltage across the transmitter power terminals does not drop below 9 Vdc.

⚠ If the sensor is installed in a high-voltage environment and a fault condition or installation error occurs, the sensor leads and transmitter terminals could carry lethal voltages. Use extreme caution when making contact with the leads and terminals.

NOTE
Do not apply high voltage (e.g., ac line voltage) to the transmitter terminals. Abnormally high voltage can damage the unit. (Sensor and transmitter power terminals are rated to 42.4 Vdc. A constant 42.4 volts across the sensor terminals may damage the unit.)

The transmitters will accept inputs from a variety of RTD and thermocouple types. Refer to Figure 2-5 on page 2-7 when making sensor connections. Refer to Figure 2-6 on page 2-8 for FOUNDATION fieldbus installations.

Use the following steps to wire the power and sensor to the transmitter:

1. Remove the terminal block cover (if applicable).
2. Connect the positive power lead to the "**+**" terminal. Connect the negative power lead to the "**–**" terminal (see Figure 2-7).
3. Tighten the terminal screws. When tightening the sensor and power wires, the max torque is 6-in.-lbs (0.7 N-m).
4. Reattach and tighten the cover (if applicable).
5. Apply power (see "Power Supply").

Figure 2-5. Transmitter Power, Communication, and Sensor Terminals

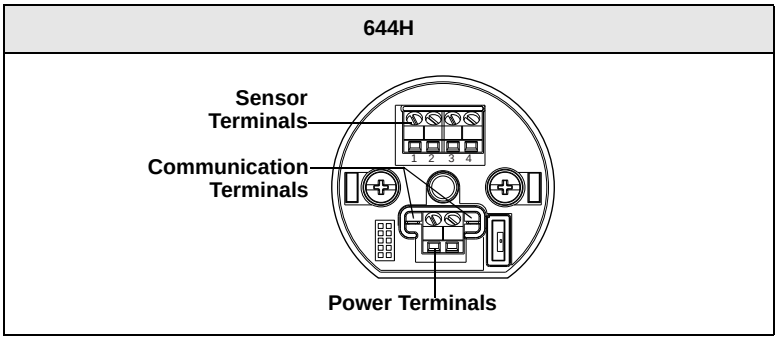
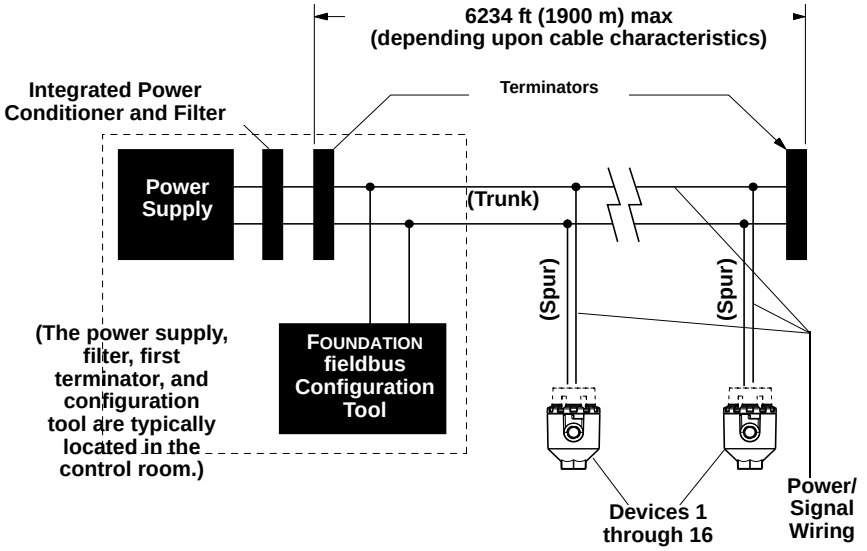


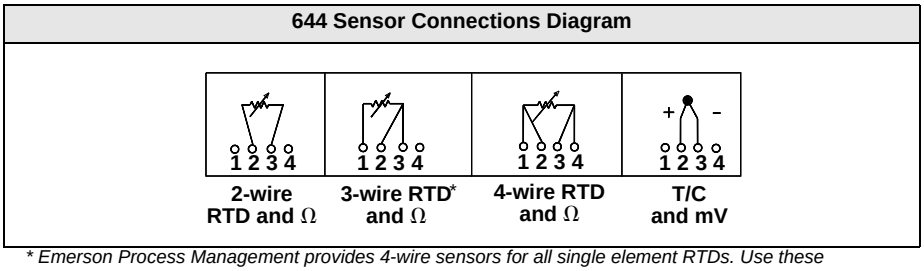
Figure 2-6. Connecting a FOUNDATION fieldbus Host System to a Transmitter Loop



Sensor Connections

⚠ The 644 is compatible with a number of RTD and thermocouple sensor types. Figure 2-7 shows the correct input connections to the sensor terminals on the transmitter. To ensure a proper sensor connection, anchor the sensor lead wires into the appropriate compression terminals and tighten the screws.

Figure 2-7. Sensor Wiring Diagrams



** Emerson Process Management provides 4-wire sensors for all single element RTDs. Use these RTDs in 3-wire configurations by leaving the unneeded leads disconnected and insulated with electrical tape.*

Thermocouple or Millivolt Inputs

The thermocouple can be connected directly to the transmitter. Use appropriate thermocouple extension wire if mounting the transmitter remotely from the sensor. Make millivolt inputs connections with copper wire. Use shielding for long runs of wire.

RTD or Ohm Inputs

The transmitters will accept a variety of RTD configurations, including 2-wire, 3-wire, or 4-wire. If the transmitter is mounted remotely from a 3-wire or 4-wire RTD, it will operate within specifications, without recalibration, for lead wire resistances of up to 60 ohms per lead (equivalent to 6,000 feet of 20 AWG wire). In this case, the leads between the RTD and transmitter should be shielded. If using only two leads, both RTD leads are in series with the sensor element, so significant errors can occur if the lead lengths exceed three feet of 20 AWG wire (approximately 0.05 °C/ft). For longer runs, attach a third or fourth lead as described above.

Sensor Lead Wire Resistance Effect– RTD Input

When using a 4-wire RTD, the effect of lead resistance is eliminated and has no impact on accuracy. However, a 3-wire sensor will not fully cancel lead resistance error because it cannot compensate for imbalances in resistance between the lead wires. Using the same type of wire on all three lead wires will make a 3-wire RTD installation as accurate as possible. A 2-wire sensor will produce the largest error because it directly adds the lead wire resistance to the sensor resistance. For 2- and 3-wire RTDs, an additional lead wire resistance error is induced with ambient temperature variations. The table and the examples shown below help quantify these errors.

Table 2-1. Examples of Approximate Basic Error

Sensor Input	Approximate Basic Error
4-wire RTD	None (independent of lead wire resistance)
3-wire RTD	± 1.0 Ω in reading per ohm of unbalanced lead wire resistance (Unbalanced lead wire resistance = maximum imbalance between any two leads.)
2-wire RTD	1.0 Ω in reading per ohm of lead wire resistance

Examples of Approximate Lead Wire Resistance Effect Calculations

Given:

Total cable length:	150 m
Imbalance of the lead wires at 20 °C:	1.5 Ω
Resistance/length (18 AWG Cu):	0.025 Ω/m °C
Temperature coefficient of Cu (α_{Cu}):	0.039 Ω/Ω °C
Temperature coefficient of Pt(α_{Pt}):	0.00385 Ω/Ω °C
Change in Ambient Temperature (ΔT_{amb}):	25 °C
RTD Resistance at 0 °C (R_o):	100 Ω (for Pt 100 RTD)

- Pt100 4-wire RTD: No lead wire resistance effect.
- Pt100 3-wire RTD:

$$\text{Basic Error} = \frac{\text{Imbalance of Lead Wires}}{(\alpha_{Pt} \times R_o)}$$

$$\text{Error due to amb. temp. variation} = \frac{(\alpha_{Cu}) \times (\Delta T_{amb}) \times (\text{Imbalance of Lead Wires})}{(\alpha_{Pt}) \times (R_o)}$$

Lead wire imbalance seen by the transmitter = 0.5 Ω

$$\text{Basic error} = \frac{0.5\ \Omega}{(0.00385\ \Omega / \Omega\ °C) \times (100\ \Omega)} = 1.3\ °C$$

Error due to amb. temp. var. of ± 25 °C

$$= \frac{(0.0039\ \Omega / \Omega\ °C) \times (25\ °C) \times (0.5\ \Omega)}{(0.00385\ \Omega / \Omega\ °C) \times (100\Omega)} = \pm 0.1266°C$$

- Pt100 2-wire RTD:

$$\text{Basic Error} = \frac{\text{Lead Wire Resistance}}{(\alpha_{Pt} \times R_o)}$$

$$\text{Error due to amb. temp. variation} = \frac{(\alpha_{Cu}) \times (\Delta T_{amb}) \times (\text{Lead Wire Resistance})}{(\alpha_{Pt}) \times (R_o)}$$

Lead wire resistance seen by the transmitter = 150 m × 2 wires × 0.025 Ω/m = 7.5 Ω

$$\text{Basic error} = \frac{7.5\ \Omega}{(0.00385\ \Omega / \Omega\ °C) \times (100\ \Omega)} = 19.5\ °C$$

Error due to amb. temp. var. of ± 25 °C

$$= \frac{(0.0039\ \Omega / \Omega\ °C) \times (25\ °C) \times (7.5\ \Omega)}{(0.00385\ \Omega / \Omega\ °C) \times (100\Omega)} = \pm 1.9\ °C$$

POWER SUPPLY

FOUNDATION fieldbus Installation

Powered over FOUNDATION fieldbus with standard fieldbus power supplies. The transmitter operates between 9.0 and 32.0 Vdc, 11 mA maximum. Transmitter power terminals are rated to 42.4 Vdc.

The power terminals on the 644 with FOUNDATION fieldbus are polarity insensitive.

Ground the Transmitter

The transmitter will operate with the current signal loop either floating or grounded. However, the extra noise in floating systems affects many types of readout devices. If the signal appears noisy or erratic, grounding the current signal loop at a single point may solve the problem. The best place to ground the loop is at the negative terminal of the power supply. Do not ground the current signal loop at more than one point.

The transmitter is electrically isolated to 500 Vdc/ac rms (707 Vdc), so the input circuit may also be grounded at any single point. When using a grounded thermocouple, the grounded junction serves as this point.

Neither side of the loop should be grounded on FOUNDATION fieldbus devices. Only the shield wire should be grounded.

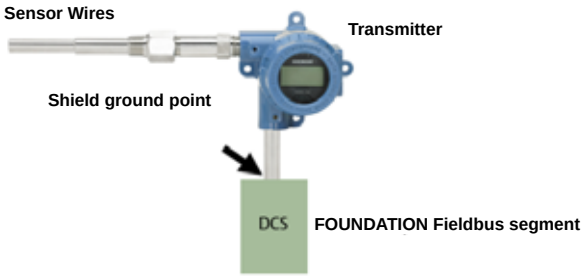
NOTE
Do not ground the signal wire at both ends.

Ungrounded Thermocouple, mV, and RTD/Ohm Inputs

Each process installation has different requirements for grounding. Use the grounding options recommended by the facility for the specific sensor type or begin with grounding Option 1 (the most common).

Option 1:

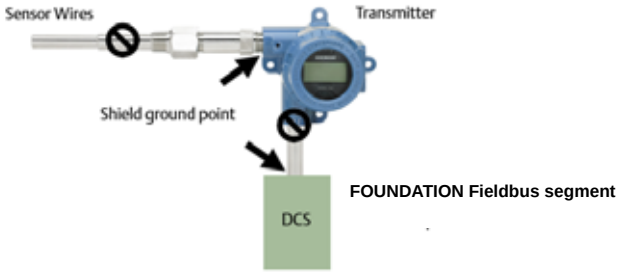
1. Connect signal wiring shield to the sensor wiring shield.
2. Ensure the two shields are tied together and electrically isolated from the transmitter housing.
3. Ground shield at the power supply end only.
4. Ensure that the sensor shield is electrically isolated from the surrounding grounded fixtures.



Connect shields together, electrically isolated from the transmitter

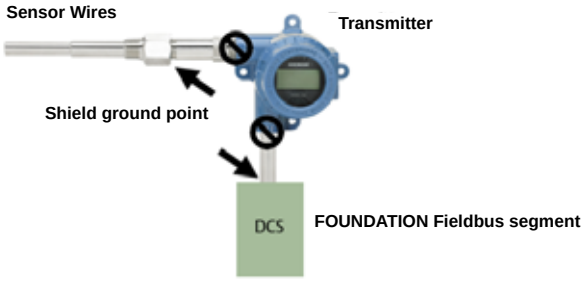
Option 2:

1. Connect sensor wiring shield to the transmitter housing (only if the housing is grounded).
2. Ensure the sensor shield is electrically isolated from surrounding fixtures that may be grounded.
3. Ground signal wiring shield at the power supply end.



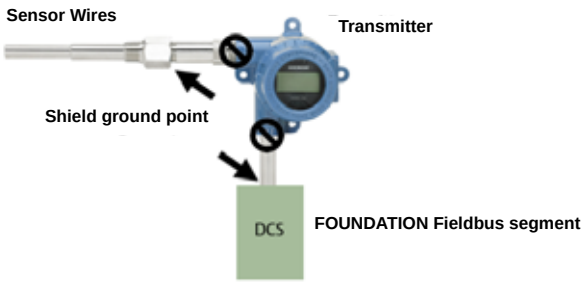
Option 3:

1. Ground sensor wiring shield at the sensor, if possible.
2. Ensure that the sensor wiring and signal wiring shields are electrically isolated from the transmitter housing.
3. Do not connect the signal wiring shield to the sensor wiring shield.
4. Ground signal wiring shield at the power supply end.



Grounded Thermocouple Inputs

1. Ground sensor wiring shield at the sensor.
2. Ensure that the sensor wiring and signal wiring shields are electrically isolated from the transmitter housing.
3. Do not connect the signal wiring shield to the sensor wiring shield.
4. Ground signal wiring shield at the power supply end.



Section 3 Configuration

OVERVIEW

This section provides information on configuring, troubleshooting, operating, and maintaining the Rosemount 644 Temperature transmitter using FOUNDATION fieldbus protocol.

SAFETY MESSAGES

Instructions and procedures in this section may require special precautions to ensure the safety of the personnel performing the operations. Information that potentially raises safety issues is indicated by a warning symbol (⚠). Please refer to the following safety messages before performing an operation preceded by this symbol.

Warnings

⚠WARNING

Failure to follow these installation guidelines could result in death or serious injury.

- Make sure only qualified personnel perform the installation.

Explosions could result in death or serious injury.

- Do not remove the connection head cover in explosive atmospheres when the circuit is live.
- Before powering a FOUNDATION fieldbus segment in an explosive atmosphere, make sure the instruments in the loop are installed in accordance with intrinsically safe or non-incendive field wiring practices.
- Verify that the operating atmosphere of the transmitter is consistent with the appropriate hazardous locations certifications.
- All connection head covers must be fully engaged to meet explosion-proof requirements.

Process leaks could result in death or serious injury.

- Do not remove the thermowell while in operation.
- Install and tighten thermowells and sensors before applying pressure.

Electrical shock could cause death or serious injury.

- Use extreme caution when making contact with the leads and terminals.

GENERAL BLOCK INFORMATION

Device Description

Before configuring the device, ensure the host has the appropriate Device Description file revision for this device. The device descriptor can be found on www.rosemount.com. The initial release of the Rosemount 644 with FOUNDATION fieldbus protocol is device revision 1.

Node Address

The transmitter is shipped at a temporary (248) address. This will enable FOUNDATION fieldbus host systems to automatically recognize the device and move it to a permanent address.

Modes

The Resource, Transducer, and all function blocks in the device have modes of operation. These modes govern the operation of the block. Every block supports both automatic (AUTO) and out of service (OOS) modes. Other modes may also be supported.

⚠ Changing Modes

To change the operating mode, set the MODE_BLK.TARGET to the desired mode. After a short delay, the parameter MODE_BLOCK.ACTUAL should reflect the mode change if the block is operating properly.

Permitted Modes

It is possible to prevent unauthorized changes to the operating mode of a block. To do this, configure MODE_BLOCK.PERMITTED to allow only the desired operating modes. It is recommended to always select OOS as one of the permitted modes.

Types of Modes

For the procedures described in this manual, it will be helpful to understand the following modes:

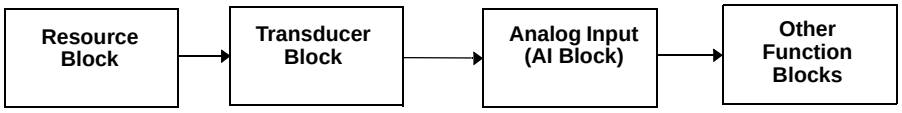
AUTO
The functions performed by the block will execute. If the block has any outputs, these will continue to update. This is typically the normal operating mode.

Out of Service (OOS)
The functions performed by the block will not execute. If the block has any outputs, these will typically not update and the status of any values passed to downstream blocks will be “BAD.” To make some changes to the configuration of the block, change the mode of the block to OOS. When the changes are complete, change the mode back to AUTO.

MAN
In this mode, variables that are passed out of the block can be manually set for testing or override purposes.

Other Types of Modes
Other types of modes are Cas, RCas, ROut, IMan, and LO. Some of these may be supported by different function blocks in the 644. For more information, see the Function Block manual (document number 00809-0100-4783).

NOTE
When an upstream block is set to OOS, this will impact the output status of all downstream blocks. The figure below depicts the hierarchy of blocks:



Link Active Scheduler

The 644 can be designated to act as the backup Link Active Scheduler (LAS) in the event that the designated LAS is disconnected from the segment. As the backup LAS, the 644 will take over the management of communications until the host is restored.

The host system may provide a configuration tool specifically designed to designate a particular device as a backup LAS. Otherwise, this can be configured manually as follows:

⚠
1. Access the Management Information Base (MIB) for the 644. To activate the LAS capability, write 0x02 to the BOOT_OPERAT_FUNCTIONAL_CLASS object (Index 605). To deactivate, write 0x01.
2. Restart the device.

Block Installation

Rosemount devices are pre-configured with function blocks at the factory, the default permanent configuration for the 644 is listed below. The 644 can have up to ten additional instantiated function blocks.

- 2 Analog Input Blocks (tag names AI 1300, AI 1400)
- 1 Proportional/Integral/Derivative Block (tag name PID 1500)

The 644 supports the use of Function Block Instantiation. When a device supports block instantiation, the number of blocks and block types can be defined to match specific application needs.The number of blocks that can be instantiated is only limited by the amount of memory within the device and the block types that are supported by the device. Instantiation does not apply to standard device blocks like the Resource, Sensor Transducer, LCD Transducer, and Advanced Diagnostics Blocks.

By reading the parameter “FREE_SPACE” in the Resource block you can determine how many blocks you can instantiate. Each block that you instantiate takes up 4.5% of the “FREE_SPACE.”

Block instantiation is done by the host control system or configuration tool, but not all hosts are required to implement this functionality. Please refer to your specific host or configuration tool manual for more information.

Capabilities

Virtual Communication Relationship (VCRs)

There are a total of 12 VCRs. One is permanent and 11 are fully configurable by the host system. Sixteen link objects are available.

Network Parameter	Value
Slot Time	8
Maximum Response Delay	2
Maximum Inactivity to Claim LAS Delay	32
Minimum Inter DLPDU Delay	8
Time Sync class	4 (1ms)
Maximum Scheduling Overhead	21
Per CLPDU PhL Overhead	4
Maximum Inter-channel Signal Skew	0
Required Number of Post-transmission-gab-ext Units	0
Required Number of Preamble-extension Units	1

Block Execution times

Analog Input = 45 ms
PID = 60 ms

FOUNDATION FIELDBUS FUNCTION BLOCKS

For reference information on the Resource, Sensor Transducer, AI, LCD Transducer blocks refer to FOUNDATION fieldbus Block Information on page A-1. Reference information on the PID block can be found in the Function Block manual document number 00809-0100-4783.

Resource Block (index number 1000)

The Resource Function Block (RB) contains diagnostic, hardware, and electronics information. There are no linkable inputs or outputs to the Resource Block.

Sensor Transducer Block (index number 1100)

The Sensor Transducer Function Block (STB) temperature measurement data includes sensor and terminal temperature. The STB also includes information about sensor type, engineering units, linearization, reranging, damping, temperature compensation, and diagnostics.

LCD Transducer Block (index number 1200)

The LCD Transducer Block is used to configure the LCD meter.

Analog Input Block (index number 1300 and 1400)

The Analog Input Function Block (AI) processes the measurements from the sensor and makes them available to other function blocks. The output value from the AI block is in engineering units and contains a status indicating the quality of the measurement. The AI block is widely used for scaling functionality.

PID Block (index number 1500)

The PID Function Block combines all of the necessary logic to perform proportional/integral/derivative (PID) control. The block supports mode control, signal scaling and limiting, feed forward control, override tracking, alarm limit detection, and signal status propagation.

The block supports two forms of the PID equation: Standard and Series. You can choose the appropriate equation using the MATHFORM parameter. The Standard ISA PID equation is the default selection.

Resource Block

FEATURES and FEATURES_SEL

The parameters FEATURES and FEATURE_SEL determine optional behavior of the 644.

FEATURES
The FEATURES parameter is read only and defines which features are supported by the 644. Below is a list of the FEATURES the 644 supports.

UNICODE
All configurable string variables in the 644, except tag names, are octet strings. Either ASCII or Unicode may be used. If the configuration device is generating Unicode octet strings, you must set the Unicode option bit.

REPORTS
The 644 supports alert reports. The Reports option bit must be set in the features bit string to use this feature. If it is not set, the host must poll for alerts.

SOFT W LOCK
Inputs to the security and write lock functions include the software write lock bits of the FEATURE_SEL parameter, the WRITE_LOCK parameter, and the DEFINE_WRITE_LOCK parameter.

The WRITE_LOCK parameter prevents modification of parameters within the device except to clear the WRITE_LOCK parameter. During this time, the block will function normally updating inputs and outputs and executing algorithms. When the WRITE_LOCK condition is cleared, a WRITE_ALM alert is generated with a priority that corresponds to the WRITE_PRI parameter.

The FEATURE_SEL parameter enables the user to select the software write lock or no write lock capability. In order to enable the software write lock, the SOFT_W_LOCK bit must be set in the FEATURE_SEL parameter. Once this bit is set, the WRITE_LOCK parameter may be set to “Locked” or “Unlocked.” Once the WRITE_LOCK parameter is set to “Locked” by the software, all user requested writes as determined by the DEFINE_WRITE_LOCK parameter shall be rejected.

The DEFINE_WRITE_LOCK parameter allows the user to configure whether the write lock function will control writing to all blocks, or only to the resource and transducer blocks. Internally updated data such as process variables and diagnostics will not be restricted.
N/A = No blocks are blocked
Physical = Locks resource and transducer block
Everything = Locks every block.

The following table displays all possible configurations of the WRITE_LOCK parameter.

FEATURE_SEL SW_SEL bit	WRITE_LOCK	WRITE_LOCK Read/Write	DEFINE_WRITE_LOCK	Write access to blocks
0 (off)	1 (unlocked)	Read only	NA	All
1 (on)	1 (unlocked)	Read/Write	NA	All
1 (on)	2 (locked)	Read/Write	Physical	Function Blocks only
1 (on)	2 (locked)	Read/Write	Everything	None

FEATURES_SEL
FEATURES_SEL is used to turn on any of the supported features. The default setting of the 644 does not select any of these features. Choose one of the supported features if any.

MAX_NOTIFY

The MAX_NOTIFY parameter value is the maximum number of alert reports that the resource can have sent without getting a confirmation, corresponding to the amount of buffer space available for alert messages. The number can be set lower, to control alert flooding, by adjusting the LIM_NOTIFY parameter value. If LIM_NOTIFY is set to zero, then no alerts are reported.

PlantWeb™ Alerts

The alerts and recommended actions should be used in conjunction with “Operation and Maintenance” on page 3-15.

The Resource Block will act as a coordinator for PlantWeb alerts. There will be three alarm parameters (FAILED_ALARM, MAINT_ALARM, and ADVISE_ALARM) which will contain information regarding some of the device errors which are detected by the transmitter software. There will be a RECOMMENDED_ACTION parameter which will be used to display the recommended action text for the highest priority alarm and a HEALTH_INDEX parameters (0 - 100) indicating the overall health of the transmitter. FAILED_ALARM will have the highest priority followed by MAINT_ALARM and ADVISE_ALARM will be the lowest priority.

FAILED_ALARMS
A failure alarm indicates a failure within a device that will make the device or some part of the device non-operational. This implies that the device is in need of repair and must be fixed immediately. There are five parameters associated with FAILED_ALARMS specifically, they are described below.

FAILED_ENABLED
This parameter contains a list of failures in the device which makes the device non-operational that will cause an alert to be sent. Below is a list of the failures with the highest priority first.

1. Electronics
2. NV Memory
3. HW / SW Incompatible
4. Primary Value
5. Secondary Value

FAILED_MASK
This parameter will mask any of the failed conditions listed in FAILED_ENABLED. A bit on means that the condition is masked out from alarming and will not be reported.

FAILED_PRI
Designates the alerting priority of the FAILED_ALM, see “Alarm Priority” on page 3-13. The default is 0 and the recommended value are between 8 and 15.

FAILED_ACTIVE
This parameter displays which of the alarms is active. Only the alarm with the highest priority will be displayed. This priority is not the same as the FAILED_PRI parameter described above. This priority is hard coded within the device and is not user configurable.

FAILED_ALM
Alarm indicating a failure within a device which makes the device non-operational.

MAINT_ALARMS
A maintenance alarm indicates the device or some part of the device needs maintenance soon. If the condition is ignored, the device will eventually fail. There are five parameters associated with MAINT_ALARMS, they are described below.

MAINT_ENABLED
The MAINT_ENABLED parameter contains a list of conditions indicating the device or some part of the device needs maintenance soon.

Below is a list of the conditions with the highest priority first.

1. Primary Value Degraded
2. Secondary Value Degraded
3. Diagnostic
4. Configuration Error
5. Calibration Error

MAINT_MASK
The MAINT_MASK parameter will mask any of the failed conditions listed in MAINT_ENABLED. A bit on means that the condition is masked out from alarming and will not be reported.

MAINT_PRI
MAINT_PRI designates the alarming priority of the MAINT_ALM, “Process Alarms” on page 3-12. The default is 0 and the recommended values is 3 to 7.

MAINT_ACTIVE
The MAINT_ACTIVE parameter displays which of the alarms is active. Only the condition with the highest priority will be displayed. This priority is not the same as the MAINT_PRI parameter described above. This priority is hard coded within the device and is not user configurable.

MAINT_ALM
An alarm indicating the device needs maintenance soon. If the condition is ignored, the device will eventually fail.

Advisory Alarms

An advisory alarm indicates informative conditions that do not have a direct impact on the device's primary functions. There are five parameters associated with ADVISE_ALARMS. They are described below.

ADVISE_ENABLED

The ADVISE_ENABLED parameter contains a list of informative conditions that do not have a direct impact on the device's primary functions. Below is a list of the advisories with the highest priority first.

1. NV Writes Deferred
2. SPM Process Anomaly detected

ADVISE_MASK

The ADVISE_MASK parameter will mask any of the failed conditions listed in ADVISE_ENABLED. A bit on means the condition is masked out from alarming and will not be reported.

ADVISE_PRI

ADVISE_PRI designates the alarming priority of the ADVISE_ALM, see “Process Alarms” on page 3-12. The default is 0 and the recommended values are 1 or 2.

ADVISE_ACTIVE

The ADVISE_ACTIVE parameter displays which of the advisories is active. Only the advisory with the highest priority will be displayed. This priority is not the same as the ADVISE_PRI parameter described above. This priority is hard coded within the device and is not user configurable.

ADVISE_ALM

ADVISE_ALM is an alarm indicating advisory alarms. These conditions do not have a direct impact on the process or device integrity.

Recommended Actions for PlantWeb Alerts

RECOMMENDED_ACTION

The RECOMMENDED_ACTION parameter displays a text string that will give a recommended course of action to take based on which type and which specific event of the PlantWeb alerts are active.

Table 3-1.
RB.RECOMMENDED_ACTION

	Alarm Type	Failed/Maint/Advise Active Event	Recommended Action Text String
PlantWeb Alerts	None	None	No action required
	Advisory	NV Writes Deferred	Non-volatile writes have been deferred, leave the device powered until the advisory goes away
	Maintenance	Configuration Error	Re-write the Sensor Configuration
		Primary Value Degraded	Confirm the operating range of the applied sensor and/or verify the sensor connection and device environment
		Calibration Error	Retrim the device
		Secondary Value Degraded	Verify the ambient temperature is within operating limits
	Failed	Electronics Failure	Replace the Device
		HW / SW Incompatible	Verify the Hardware Revision is compatible with the Software Revision
		NV Memory Failure	Reset the device then download the Device Configuration
		Primary Value Failure	Verify the instrument process is within the Sensor range and / or confirm sensor configuration and wiring.
		Secondary Value Failure	Verify the ambient temperature is within operating limits

Sensor Transducer Block

NOTE
When the engineering units of the XD_SCALE are selected, the engineering units in the Transducer Block change to the same units. THIS IS THE ONLY WAY TO CHANGE THE ENGINEERING UNITS IN THE SENSOR TRANSDUCER BLOCK.

Damping

⚠ The damping parameter in the Transducer Block may be used to filter measurement noise. By increasing the damping time, the transmitter will have a slower response time, but will decrease the amount of process noise that is translated to the Transducer Block Primary Value. Because both the LCD and AI Block get input from the Transducer Block, adjusting the damping parameter will effect both blocks.

NOTE
The AI Block has it's own filtering parameter called PV_FTIME. For simplicity, it is better to do filtering in the Transducer Block as damping will be applied to primary value on every sensor update. If filtering is done in AI block, damping will be applied to output every macrocycle. The LCD will display value from Transducer block.

Analog Input (AI) Function Block

Configure the AI block

⚠ A minimum of four parameters are required to configure the AI Block. The parameters are described below with example configurations shown at the end of this section.

CHANNEL
Select the channel that corresponds to the desired sensor measurement. The 644 measures both sensor temperature (channel 1) and terminal temperature (channel 2).

L_TYPE
The L_TYPE parameter defines the relationship of the sensor measurement (sensor temperature) to the desired output temperature of the AI Block. The relationship can be direct or indirect.

Direct
Select direct when the desired output will be the same as the sensor measurement (sensor temperature).

Indirect
Select indirect when the desired output is a calculated measurement based on the sensor measurement (e.g. ohm or mV). The relationship between the sensor measurement and the calculated measurement will be linear.

XD_SCALE and OUT_SCALE
The XD_SCALE and OUT_SCALE each include four parameters: 0%, 100%, engineering units, and precision (decimal point). Set these based on the L_TYPE:

L_TYPE is Direct
When the desired output is the measured variable, set the XD_SCALE to represent the operating range of the process. Set OUT_SCALE to match XD_SCALE.

L_TYPE is Indirect
When an inferred measurement is made based on the sensor measurement, set the XD_SCALE to represent the operating range that the sensor will see in the process. Determine the inferred measurement values that correspond to the XD_SCALE 0 and 100% points and set these for the OUT_SCALE.

NOTE
To avoid configuration errors, only select Engineering Units for XD_SCALE and OUT_SCALE that are supported by the device. The supported units are:

Pressure (Channel 1)	Temperature (Channel 2)
°C	°C
°F	°F
K	K
R	R
Ω	Ω
mV	mV

When the engineering units of the XD_SCALE are selected, this causes the engineering units of the PRIMARY_VALUE_RANGE in the Transducer Block to change to the same units. THIS IS THE ONLY WAY TO CHANGE THE ENGINEERING UNITS IN THE SENSOR TRANSDUCER BLOCK, PRIMARY_VALUE_RANGE parameter.

Configuration Examples

4-wire, Pt 100 α = 385
AI1 = Process Temperature
AI2 = Terminal Temperature

Transducer Block

If Host System Supports Methods:

1. Click on Methods
2. Choose Sensor Connections
3. Follow on-screen instruction.

If Host System Doesn't Not Support Methods:

1. Put transducer block into OOS mode.
   a. Go to MODE_BLK.TARGET
   b. Choose OOS (0x80)
2. Go to SENSOR_CONNECTION.
   a. Choose 4-wire (0x4)
3. Go to SENSOR_TYPE.
   a. Choose PT100A385
4. Put the transducer block back into Auto mode.

AI Blocks (Basic Configuration)[(1)]

AI1 as Process Temperature

1. Put the AI Block into OOS mode.
   a. Go to MODE_BLK.TARGET
   b. Choose OOS (0x80)
2. Go to CHANNEL
   a. Choose Sensor 1
3. Go to L_TYPE
   a. Choose Direct
4. Go to XD_Scale
   a. Choose UNITS_INDEX to be °C
5. Go to OUT_SCALE
   a. Choose UNITS_INDEX to be °C
   b. Set the 0 and 100 scale to be the same as the PRIMARY_VALUE_RANGE
6. Put the AI Block back into Auto mode.
7. Follow Host Procedure Download Schedule into Block.

(1) *Configure a* minimum of four parameters to get a value out of the AI Block.

AI2 as Terminal Temperature

1. Put the AI Block into OOS mode.
   a. Go to MODE_BLK.TARGET
   b. Choose OOS (0x80)
2. Go to CHANNEL
   a. Choose Body Temperature
3. Go to L_TYPE
   a. Choose Direct
4. Go to XD_Scale
   a. Choose UNITS_INDEX to be °C
5. Go to OUT_SCALE
   a. Choose UNITS_INDEX to be °C
   b. Set the 0 and 100 scale to be the same as the SECONDARY_VALUE_RANGE
6. Put the AI Block back into Auto mode.
7. Follow Host Procedure Download Schedule into Block.

Filtering

⚠ The filtering feature changes the response time of the device to smooth variations in output readings caused by rapid changes in input. Adjust the filter time constant (in seconds) using the PV_FTIME parameter. Set the filter time constant to zero to disable the filter feature.

Process Alarms

Process Alarm detection is based on the OUT value. Configure the alarm limits of the following standard alarms:

- High (HI_LIM)
- High high (HI_HI_LIM)
- Low (LO_LIM)
- Low low (LO_LO_LIM)

In order to avoid alarm chattering when the variable is oscillating around the alarm limit, an alarm hysteresis in percent of the PV span can be set using the ALARM_HYS parameter. The priority of each alarm is set in the following parameters:

- HI_PRI
- HI_HI_PRI
- LO_PRI
- LO_LO_PRI

Alarm Priority

Alarms are grouped into five levels of priority:

Priority Number	Priority Description
0	The alarm condition is not used.
1	An alarm condition with a priority of 1 is recognized by the system, but is not reported to the operator.
2	An alarm condition with a priority of 2 is reported to the operator.
3-7	Alarm conditions of priority 3 to 7 are advisory alarms of increasing priority.
8-15	Alarm conditions of priority 8 to 15 are critical alarms of increasing priority.

Status Options

Status Options (STATUS_OPTS) supported by the AI block are shown below:

Propagate Fault Forward
If the status from the sensor is Bad, Device failure or Bad, Sensor failure, propagate it to OUT without generating an alarm. The use of these sub-status in OUT is determined by this option. Through this option, the user may determine whether alarming (sending of an alert) will be done by the block or propagated downstream for alarming.

Uncertain if Limited
Set the output status of the Analog Input block to uncertain if the measured or calculated value is limited.

BAD if Limited
Set the output status to Bad if the sensor is violating a high or low limit.

Uncertain if Man Mode
Set the output status of the Analog Input block to uncertain if the actual mode of the block is Man.

NOTE
The instrument must be in Out of Service mode to set the status option.

Advanced Features

The AI Function Block provides added capability through the addition of the following parameters:

ALARM_TYPE
ALARM_TYPE allows one or more of the process alarm conditions detected by the AI function block to be used in setting its OUT_D parameter.

OUT_D
OUT_D is the discrete output of the AI function block based on the detection of process alarm condition(s). This parameter may be linked to other function blocks that require a discrete input based on the detected alarm condition.

LCD Transducer Block

The LCD meter connects directly to the 644 electronics FOUNDATION fieldbus output board. The meter indicates output and abbreviated diagnostic messages.

The first line of five characters displays the sensor being measured.

If the measurement is in error, “Error” appears on the first line. The second line indicates if the device or the sensor is causing the error.

Each parameter configured for display will appear on the LCD for a brief period before the next parameter is displayed. If the status of the parameter goes bad, the LCD will also cycle diagnostics following the displayed variable.

Custom Meter Configuration

Shipped from the factory, Parameter #1 is configured to display the Primary Variable (temperature) from the LCD Transducer Block. Parameters 2 – 4 are not configured. To change the configuration of Parameter #1 or to configure additional parameters 2 – 4, use the configuration parameters below.

The LCD Transducer Block can be configured to sequence four different process variables as long as the parameters are sourced from a function block that is scheduled to execute within the 644 temperature transmitter. If a function block is scheduled in the 644 that links a process variable from another device on the segment, that process variable can be displayed on the LCD.

DISPLAY_PARAM_SEL
The DISPLAY_PARAM_SEL parameter specifies how many process variables will be displayed. Select up to four display parameters.

BLK_TAG_#(1)
Enter the Block Tag of the function block that contains the parameter to be displayed. The default function block tags from the factory are:

TRANSDUCER
AI 1300
AI 1400
PID 1500

BLK_TYPE_#(1)
Enter the Block Type of the function block that contains the parameter to be displayed. This parameter is generally selected via a drop-down menu with a list of possible function block types. (e.g. Transducer, PID, AI, etc.)

PARAM_INDEX_#(1)
The PARAM_INDEX_# parameter is generally selected via a drop-down menu with a list of possible parameter names based upon what is available in the function block type selected. Choose the parameter to be displayed.

CUSTOM_TAG_#(1)
The CUSTOM_TAG_# is an optional user-specified tag identifier that can be configured to be displayed with the parameter in place of the block tag. Enter a tag of up to five characters.

(1) # represents the specified parameter number.

UNITS_TYPE_#[(1)]
The UNITS_TYPE_# parameter is generally selected via a drop-down menu with three options: AUTO, CUSTOM, or NONE. Select AUTO only when the parameter to be displayed is pressure, temperature, or percent. For other parameters, select CUSTOM and be sure to configure the CUSTOM_UNITS_# parameter. Select NONE if the parameter is to be displayed without associated units.

CUSTOM_UNITS_#[(1)]
Specify custom units to be displayed with the parameter. Enter up to six characters. To display Custom Units the UNITS_TYPE_# must be set to CUSTOM.

OPERATION AND MAINTENANCE

Overview

This section contains information on operation and maintenance procedures.

METHODS AND MANUAL OPERATION
Each FOUNDATION fieldbus host or configuration tool has different ways of displaying and performing operations. Some hosts will use Device Descriptions (DD) and DD Methods to complete device configuration and will display data consistently across platforms. The DD can found on www.rosemount.com. There is no requirement that a host or configuration tool support these features.

The information in this section will describe how to use methods in a general fashion. In addition, if your host or configuration tool does not support methods this section will cover manually configuring the parameters involved with each method operation. For more detailed information on the use of methods, see your host or configuration tool manual.

Troubleshooting Guides

Figure 3-1. 644 troubleshooting flowchart

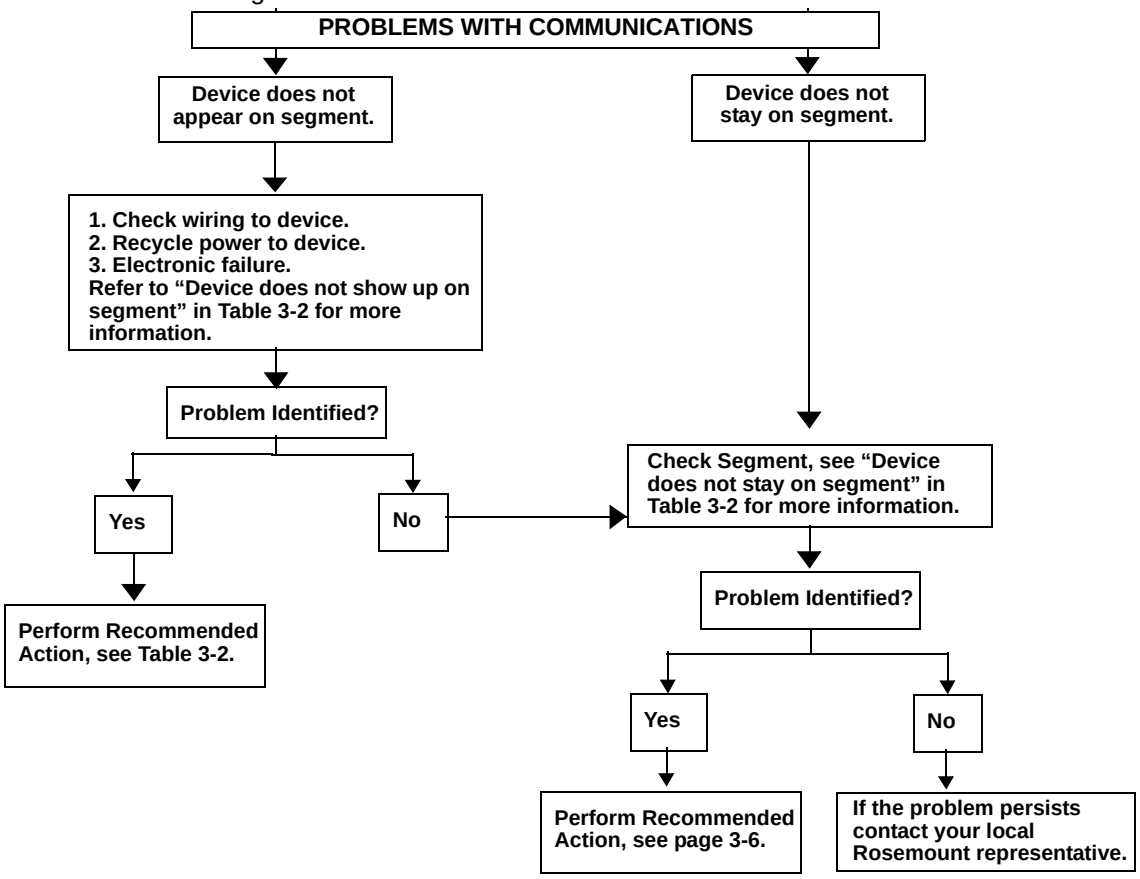
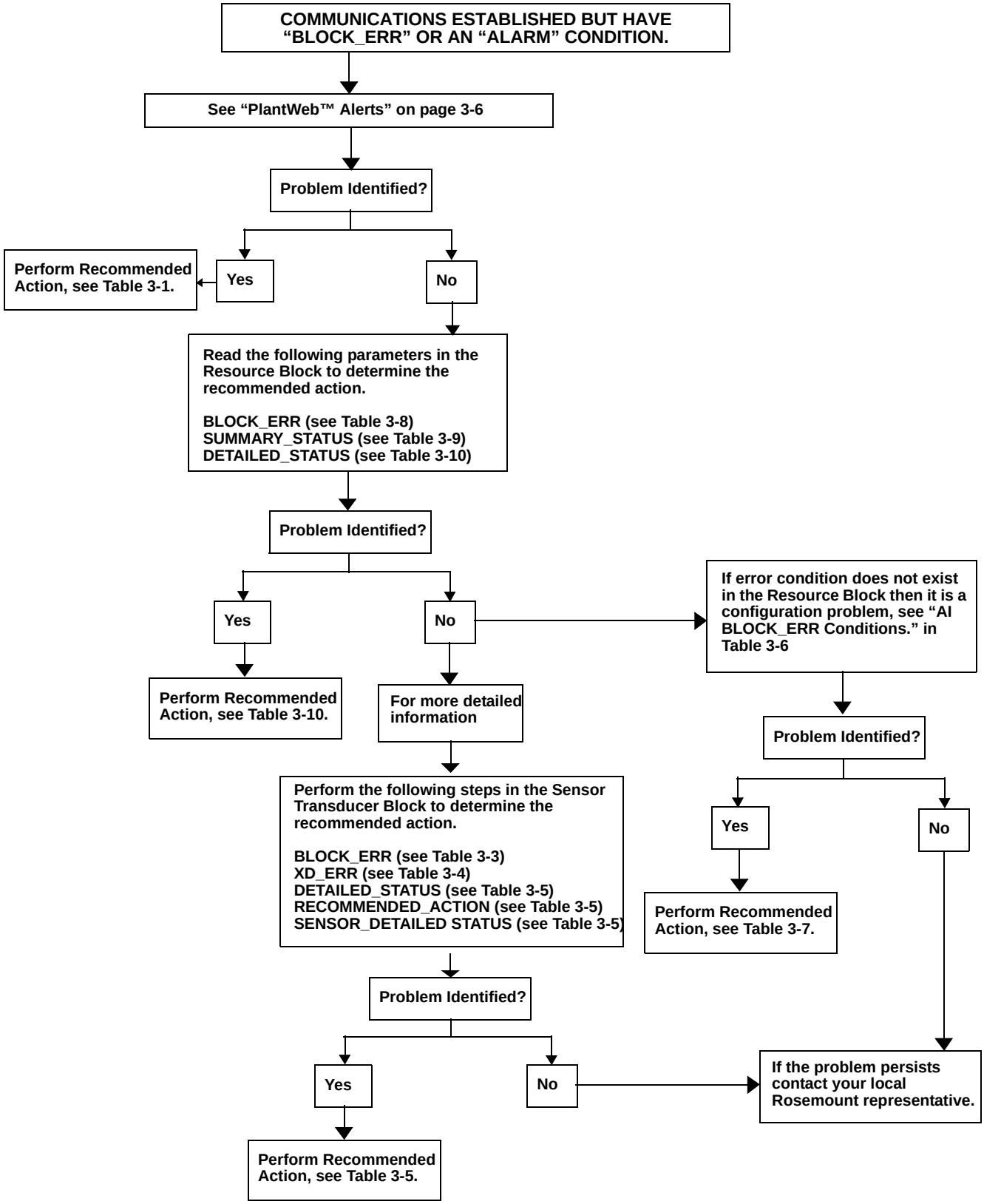


Table 3-2. Troubleshooting guide.

Symptom[1]	Cause	Recommended Actions
Device does not show up on segment	Unknown	Recycle power to device
	No power to device	1. Ensure the device is connected to the segment. 2. Check voltage at terminals. There should be 9–32Vdc. 3. Check to ensure the device is drawing current. There should be approximately 10.5 mA nominal (11 mA max.)
	Segment problems	
	Electronics failing	1. Replace device.
	Incompatible network settings	Change host network parameters. Refer to host documentation for procedure.
Device does not stay on segment[2]	Incorrect signal levels. Refer to host documentation for procedure.	1. Check for two terminators. 2. Excess cable length. 3. Bad Power supply or conditioner
	Excess noise on segment. Refer to host documentation for procedure.	1. Check for incorrect grounding. 2. Check for correct shielded wire. 3. Tighten wire connections. 4. Check for corrosion or moisture on terminals. 5. Check for Bad power supply.
	Electronics failing	1. Replace device.
	Other	1. Check for water around the transmitter.

(1) The corrective actions should be done with consultation of your system integrator.
(2) Wiring and installation 31.25 kbit/s, voltage mode, wire medium application guide AG-140 available from the Fieldbus Foundation.

Figure 3-2. Problems with communications flowchart



Sensor Transducer Block

Sensor Calibration, Lower and Upper Trim Methods

⚠ In order to calibrate the transmitter, run the Lower and Upper Trim Methods. If your system does not support methods, manually configure the Transducer Block parameters listed below.

1. Set MODE_BLK.TARGET to OOS.
2. Set SENSOR_CAL_METHOD to User Trim.
3. Set CAL_UNIT to supported engineering units in the Transducer Block.
4. Apply temperature that corresponds to the lower calibration point and allow the temperature to stabilize. The temperature must be between the range limits defined in PRIMRY_VALUE_RANGE.
5. Set values of CAL_POINT_LO to correspond to the temperature applied by the sensor.
6. Apply temperature, temperature corresponding to the upper calibration.
7. Allow temperature to stabilize.
8. Set CAL_POINT_HI.

NOTE
CAL_POINT_HI must be within PRIMARY_VALUE_RANGE and greater than CAL_POINT_LO + CAL_MIN_SPAN

9. Set SENSOR_CAL_DATE to the current date.
10. Set SENSOR_CAL_WHO to the person responsible for the calibration.
11. Set SENSOR _CAL_LOC to the calibration location.
12. Set MODE_BLK.TARGET to AUTO.

NOTE
If trim fails, the transmitter will automatically revert to factory trim.

Excessive correction or sensor failure could cause device status to read “calibration error.” To clear this, trim the transmitter.

Recall Factory Trim

⚠ To recall a factory trim on the transmitter, run the Recall Factory Trim. If your system does not support methods, manually configure the Transducer Block parameters listed below.

1. Set MODE_BLK.TARGET to OOS.
2. Set SENSOR_CAL_METHOD to Factory Trim.
3. Set SET_FACTORY_TRIM to Recall.
4. Set SENSOR_CAL_DATE to the current date.
5. Set SENSOR_CAL_WHO to the person responsible for the calibration.
6. Set SENSOR _CAL_LOC to the calibration location.
7. Set MODE_BLK.TARGET to AUTO.

NOTE
When sensor type is changed, the transmitter reverts to the factory trim. Changing sensor type causes you to loose any trim performed on the transmitter.

Table 3-3. Sensor Transducer Block BLOCK_ERR messages

Condition Name and Description
Other
Out of Service: The actual mode is out of service.

Table 3-4. Sensor Transducer Block XD_ERR messages

Condition Name and Description
Electronics Failure: An electrical component failed.
I/O Failure: An I/O failure occurred.
Software Error: The software has detected an internal error.
Calibration Error: An error occurred during calibration of the device.
Algorithm Error: The algorithm used in the transducer block produced an error due to overflow, data reasonableness failure, etc.

Diagnostics

Table 3-5 lists the potential errors and the possible corrective actions for the given values. The corrective actions are in order of increasing system level compromises. The first step should always be to reset the transmitter and then if the error persists, try the steps in Table 3-5. Start with the first corrective action and then try the second.

Table 3-5. Sensor Transducer Block STB.SENSOR_ DETAILED_ STATUS messages

STB.SENSOR_DETAILED_STATUS	Description
Invalid Configuration	Wrong sensor connection with wrong sensor type
ASIC RCV Error	The micro detected a chksum or start/stop bit failure with ASIC communication
ASIC TX Error	The A/D ASIC detected a communication error
ASIC Interrupt Error	ASIC interrupts are too fast or slow
Reference Error	Reference resistors are greater than 25% of known value
ASIC Configuration Error	Citadel registers were not written correctly. (Also CALIBRATION_ERR)
Sensor Open	Open sensor detected
Sensor Shorted	Shorted sensor detected
Terminal Temperature Failure	Open PRT detected
Sensor Out of Operating Range	Sensor readings have gone beyond PRIMRY_VALUE_RANGE values
Sensor beyond operating limits	Sensor readings have gone below 2% of lower range or above 6% of upper range of sensor.
Terminal Temperature Out of Operating Range	PRT readings have gone beyond SECONDARY_VALUE_RANGE values
Terminal Temperature Beyond Operating Limits	PRT readings have gone below 2% of lower range or above 6% of upper range of PRT. (These ranges are calculated and are not the actual range of the PRT which is a PT100 A385)
Sensor Degraded	For RTDs, this is excessive EMF detected. This is thermocouple degradation for thermocouples.
Sensor Error	The user trim has failed due to excessive correction or sensor failure during the trim method

Analog Input (AI) Function Block

Status

Along with the measured or calculated PV value, every FOUNDATION fieldbus block passes an additional parameter called STATUS. The PV and STATUS are passed from the Transducer Block to the Analog Input Block. The STATUS can be one of the following: GOOD, BAD, or UNCERTAIN. When there are no problems detected by the self-diagnostics of the block, the STATUS will be GOOD. If a problem occurs with the hardware in the device or the quality of the process variable is compromised for some reason, the STATUS will become either BAD or UNCERTAIN depending upon the nature of the problem. It is important that the Control Strategy that makes use of the Analog Input Block is configured to monitor the STATUS and take action where appropriate when the STATUS is no longer GOOD.

Simulation

⚠ Simulate replaces the channel value coming from the Sensor Transducer Block. For testing purposes, it is possible to manually drive the output of the Analog Input Block to a desired value. There are two ways to do this.

Manual Mode

To change only the OUT_VALUE and not the OUT_STATUS of the AI Block, place the TARGET MODE of the block to MANUAL. Then, change the OUT_VALUE to the desired value.

Simulate

1. If the SIMULATE switch is in the OFF position, move it to the ON position. If the SIMULATE jumper is already in the ON position, you must move it to off and place it back in the ON position.

NOTE

As a safety measure, the switch must be reset every time power is interrupted to the device in order to enable SIMULATE. This prevents a device that is tested on the bench from getting installed in the process with SIMULATE still active.

2. To change both the OUT_VALUE and OUT_STATUS of the AI Block, set the TARGET MODE to AUTO.
3. Set SIMULATE_ENABLE_DISABLE to ‘Active.’
4. Enter the desired SIMULATE_VALUE to change the OUT_VALUE and SIMULATE_STATUS_QUALITY to change the OUT_STATUS. If errors occur when performing the above steps, be sure that the SIMULATE jumper has been reset after powering up the device.

Table 3-6. AI BLOCK_ERR Conditions.

Condition Number	Condition Name and Description
0	Other
1	**Block Configuration Error:** the selected channel carries a measurement that is incompatible with the engineering units selected in XD_SCALE, the L_TYPE parameter is not configured, or CHANNEL = zero.
3	**Simulate Active:** Simulation is enabled and the block is using a simulated value in its execution.
7	**Input Failure/Process Variable has Bad Status:** The hardware is bad, or a bad status is being simulated.
14	**Power Up**
15	**Out of Service:** The actual mode is out of service.

Table 3-7. Troubleshooting the AI block

Symptom	Possible Causes	Recommended Actions
Bad or no temperature readings (Read the AI “BLOCK_ERR” parameter)	BLOCK_ERR reads OUT OF SERVICE (OOS)	1. AI Block target mode target mode set to OOS. 2. Resource Block OUT OF SERVICE.
	BLOCK_ERR reads CONFIGURATION ERROR	1. Check CHANNEL parameter (see “CHANNEL” on page 3-9) 2. Check L_TYPE parameter (see “L_TYPE” on page 3-10) 3. Check XD_SCALE engineering units. (see “XD_SCALE and OUT_SCALE” on page 2-10
	BLOCK_ERR reads POWERUP	Download Schedule into block. Refer to host for downloading procedure.
	BLOCK_ERR reads BAD INPUT	1. Sensor Transducer Block Out Of Service (OOS) 2. Resource Block Out of Service (OOS)
	No BLOCK_ERR but readings are not correct. If using Indirect mode, scaling could be wrong.	1. Check XD_SCALE parameter. 2. Check OUT_SCALE parameter. (see “XD_SCALE and OUT_SCALE” on page 3-10)
	No BLOCK_ERR. Sensor needs to be calibrated or Zero trimmed.	See Section 3: Operation and Maintenance to determine the appropriate trimming or calibration procedure.
OUT parameter status reads UNCERTAIN and substatus reads EngUnitRangViolation.	Out_ScaleEU_0 and EU_100 settings are incorrect.	See “XD_SCALE and OUT_SCALE” on page 3-10.

Resource Block

This section describes error conditions found in the Resource block. Read Table 3-8 through Table 3-10 to determine the appropriate corrective action.

Block Errors

Table 3-8. Resource Block BLOCK_ERR messages

Table 3-8 lists conditions reported in the BLOCK_ERR parameter.

Condition Name and Description
Other
Device Needs Maintenance Now
Memory Failure: A memory failure has occurred in FLASH, RAM, or EEPROM memory.
Lost NV Data: Non-volatile data that is stored in non-volatile memory has been lost.
Device Needs Maintenance Now.
Out of Service: The actual mode is out of service.

Table 3-9. Resource Block SUMMARY_STATUS messages

Condition Name
No repair needed
Repairable
Call Service Center

Table 3-10. Resource Block RB.DETAILED_STATUS

RB.DETAILED_STATUS	Description
Sensor Transducer block error.	Active when any SENSOR_DETAILED_STAUS bit is on.
Manufacturing Block integrity error	The manufacturing block size, revision, or checksum is wrong.
Hardware/software incompatible	Verify the manufacturing block revision and the hardware revision are correct/compatible with the software revision.
Non-volatile memory integrity error	Invalid checksum on a block of NV data.
ROM integrity error	Invalid application code checksum.
Lost deferred NV data	Device has been power-cycled while non-volatile writes were being deferred to prevent premature memory failure, the write operations have been deferred.
NV Writes Deferred	A high number of writes has been detected to non-volatile memory. To prevent premature failure, the write operations have been deferred.

LCD Transducer block

This section describes error conditions found in the LCD Transducer Block. Read Table 3-11 and to determine the appropriate corrective action.

Self Test Procedure for the LCD

The SELF_TEST parameter in the Resource block will test LCD segments. When running, the segments of the display should light up for about five seconds.

If your host system supports methods refer to your host documentation on how to run the “Self Test” method. If your host system does not support methods, then you can run this test manually be following the steps below.

1. Put Resource block into “OOS” (Out of Service).
2. Go to the parameter called “SELF_TEST” and write the value Self test (0x2).
3. Observe the LCD screen when you are doing this. All of the segments should light up.
4. Put the Resource block back into “AUTO.”

Table 3-11. LCD Transducer Block BLOCK_ERR messages

Condition Name and Description
Other
Out of Service: The actual mode is out of service.

Symptom	Possible Causes	Recommended Action
The LCD displays “DSPLY#INVLID.” Read the BLOCK_ERR and if it says “BLOCK CONFIGURATION” perform the Recommended Action	One or more of the display parameters are not configured properly.	See “LCD Transducer Block” on page 3-14.
The AI.OUT readings do not match.	The OUT_SCALE of the AI block is not configured properly.	See “Analog Input (AI) Function Block” on page 3-21.
“644” is being displayed or not all of the values are being displayed.	The LCD block parameter “DISPLAY_PARAMETER_SELECT is not properly configured.	See “LCD Transducer Block (index number 1200)” on page 3-4.
The display reads OOS.	The resource and or the LCD Transducer block are OOS.	Verify that both blocks are in “AUTO.”
The display is hard to read.	Some of the LCD segments may have gone bad.	See XXXX (Self Test). If some of the segment is bad, replace the LCD.
	Device is out o the temperature limit for the LCD. (-20 to 80 °C)	Check ambient temperature of the device.

Appendix A Specifications and Reference Data

SPECIFICATIONS

Functional

Inputs
User-selectable; sensor terminals rated to 42.4 Vdc. See “Accuracy” on page A-6 for sensor options.

Output
Single 2-wired device with a completely digital output with FOUNDATION fieldbus communication (ITK 5.1 compliant).

Isolation
Input/output isolation tested to 500 Vdc/ac rms (707 Vdc) at 50/60 Hz

Local Display
The optional five-digit integral LCD Display includes a floating or fixed decimal point. It can also display engineering units (°F, °C, °R, K, Ω, and millivolts), milliampere, and percent of span. The display can be configured to alternate between selected display options. Display settings are preconfigured at the factory according to the standard transmitter configuration. They can be reconfigured in the field using FOUNDATION fieldbus communications.

Humidity Limits
0–99% relative humidity

Update Time
≤ 0.5 seconds

Accuracy (default configuration) PT 100
FOUNDATION fieldbus: ±0.15 °C

Physical

Electrical Connections

Model	Power and Sensor Terminals
644H	Compression screws permanently fixed to terminal block
WAGO® Spring clamp terminals are optional (option code G5)	

Field Communicator Connections

Communication Terminals	
644H	Clips permanently fixed to terminal block

Materials of Construction

Electronics Housing and Terminal Block	
644H	*Noryl*® glass reinforced
Enclosure (Option code J5 or J6)	
Housing	Low-copper aluminum
Paint	Polyurethane
Cover O-ring	Buna-N

Materials of Constructions (Stainless Steel Housing for Biotechnology, Pharmaceutical Industries, and Sanitary Applications)

Housing and Standard Meter Cover

- 316 SST

Cover O-Ring

- Buna-N

Mounting

The 644R attaches directly to a wall or a DIN rail. The 644H installs in a connection head or universal head mounted directly on a sensor assembly, apart from a sensor assembly using a universal head, or to a DIN rail using an optional mounting clip.

Weight

Code	Options	Weight
644H	Head Mount Transmitter	92 g (3.25 oz)
M5	LCD Display	38 g (1.34 oz)
J5, J6	Universal Head, Standard Cover	577 g (20.35 oz)
J5, J6	Universal Head, Meter Cover	667 g (23.53 oz)

Weight (Stainless Steel Housing for Biotechnology, Pharmaceutical Industries, and Sanitary Applications)

Option Code	Standard Cover	Meter Cover
S1	840 g (27 oz)	995 g (32 oz)
S2	840 g (27 oz)	995 g (32 oz)
S3	840 g (27 oz)	995 g (32 oz)
S4	840 g (27 oz)	995 g (32 oz)

Enclosure Ratings (644H)

All option codes (S1, S2, S3, S4, J5 and J6, J7 and J8) are NEMA 4X, IP66, and IP68. Option code J6 is CSA Enclosure Type 4X.

Sanitary Housing Surface

Surface finish is polished to 32 RMA. Laser etched product marking on housing and standard covers.

Performance

EMC (ElectroMagnetic Compatibility)

NAMUR NE 21 Standard

The 644H HART meets the requirements for NAMUR NE 21 Rating.

CE Mark

The 644 is compliant with Directive 2004/108/EC. Meets the criteria under IEC 61326:2006.

Power Supply Effect

Less than ±0.005% of span per volt

Stability

RTDs and thermocouples have a stability of ±0.15% of output reading or 0.15 °C (whichever is greater) for 24 months.

Self Calibration

The analog-to-digital measurement circuitry automatically self-calibrates for each temperature update by comparing the dynamic measurement to extremely stable and accurate internal reference elements

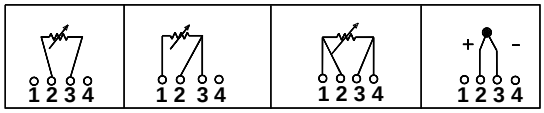
Vibration Effect

The 644 is tested to the following specifications with no effect on performance per IEC 60770-1, 1999:

Frequency	Vibration
10 to 60 Hz	0.21 mm displacement
60 to 2000 Hz	3 g peak acceleration

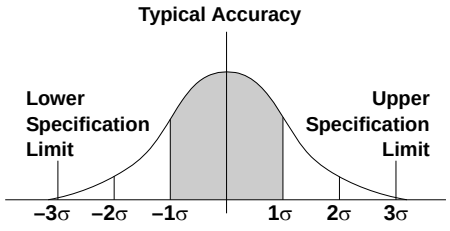
Sensor Connections

644244EH Sensor Connections Diagram



2-wire RTD and Ω | **3-wire RTD and Ω*** | **4-wire RTD and Ω** | **T/C and mV**

** Rosemount Inc. provides 4-wire sensors for all single element RTDs. You can use these RTDs in 3-wire configurations by leaving the unneeded leads disconnected and insulated with electrical tape.*

Rosemount Conformance to Specifications	
A Rosemount product not only meets its published specifications, but most likely exceeds them. Advanced manufacturing techniques and the use of Statistical Process Control provide specification conformance to at least ± 3σ(1). Our commitment to continual improvement ensures that product design, reliability, and performance will improve annually. For example, the Reference Accuracy distribution for the 644 is shown to the right. Our Specification Limits are ± 0.15 °C, but, as the shaded area shows, approximately 68% of the units perform three times better than the limits. Therefore, it is very likely that you will receive a device that performs much better than our published specifications. Conversely, a vendor who "grades" product without using Process Control, or who is not committed to ± 3σ performance, will ship a higher percentage of units that are barely within advertised specification limits.	 *Accuracy distribution shown is for the 644, Pt 100 RTD sensor, Range 0 to 100 °C*

3144-GRAPH

(1) Sigma (σ) is a statistical symbol to designate the standard deviation from the mean value of a normal distribution.

FOUNDATION FIELDBUS SPECIFICATIONS

Function Blocks

Resource Block

- The resource block contains physical transmitter information including available memory, manufacture identification, device type, software tag, and unique identification.

Transducer Block

- The transducer block contains the actual temperature measurement data, including sensor 1 and terminal temperature. It includes information about sensor type and configuration, engineering units, linearization, reranging, damping, temperature correction, and diagnostics.

LCD Block

- The LCD block is used to configure the local display, if an LCD Display is being used.

Analog Input (AI)

- Processes the measurement and makes it available on the fieldbus segment.
- Allows filtering, alarming, and engineering unit changes.

PID Block

- The transmitter provides control functionality with one PID function block in the transmitter. The PID block can be used to perform single loop, cascade, or feedforward control in the field.

Instantiable Function Blocks

- All the function blocks used by the transmitter are instantiable, meaning the total number of function blocks is only limited by the physical memory available in the transmitter. Since only the instantiable blocks can use physical memory, any combination of function blocks can be used at any given time as long as the physical memory size is not violated.

Block	Execution Time (milliseconds)
Resource	–
Transducer	–
LCD Block	–
Analog Input 1	45
Analog Input 2	45
PID 1	60

Turn-on Time

Performance within specifications in less than 20 seconds after power is applied, when damping value is set to 0 seconds.

Status

If self-diagnostics detect a sensor burnout or a transmitter failure, the status of the measurement will be updated accordingly. Status may also send the PID output to a safe value.

Power Supply

Powered over FOUNDATION fieldbus with standard fieldbus power supplies. The transmitter operates between 9.0 and 32.0 Vdc, 11 mA maximum. The power terminals are rated to 42.4 Vdc max.

Alarms

The AI function block allows the user to configure the alarms to HI-HI, HI, LO, or LO-LO with a variety of priority levels and hysteresis settings.

Backup Link Active Scheduler (LAS)

The transmitter is classified as a device link master, which means it can function as a Link Active Scheduler (LAS) if the current link master device fails or is removed from the segment.

The host or other configuration tool is used to download the schedule for the application to the link master device. In the absence of a primary link master, the transmitter will claim the LAS and provide permanent control for the H1 segment.

FOUNDATION fieldbus Parameters

Schedule Entries	25(1)
Links	16(1)
Virtual Communications Relationships (VCR)	12(1)

(1) Minimum quantity.

Software Upgrade in the Field

Software for the 644 with FOUNDATION fieldbus will be easy to upgrade in the field. Users will be able to take advantage of software enhancements by loading new application software into the device memory.

Accuracy

Table A-1. Rosemount 644 Input Options and Accuracy

Sensor Options	Sensor Reference	Input Ranges		Recommended Min. Span[1]		Digital Accuracy[2]		D/A Accuracy[3]
2-, 3-, 4-wire RTDs		°C	°F	°C	°F	°C	°F	
Pt 100 (α = 0.00385)	IEC 751	–200 to 850	–328 to 1562	10	18	± 0.15	± 0.27	±0.03% of span
Pt 200 (α = 0.00385)	IEC 751	–200 to 850	–328 to 1562	10	18	± 0.15	± 0.27	±0.03% of span
Pt 500 (α = 0.00385)	IEC 751	–200 to 850	–328 to 1562	10	18	± 0.19	± 0.34	±0.03% of span
Pt 1000 (α = 0.00385)	IEC 751	–200 to 300	–328 to 572	10	18	± 0.19	± 0.34	±0.03% of span
Pt 100 (α = 0.003916)	JIS 1604	–200 to 645	–328 to 1193	10	18	± 0.15	± 0.27	±0.03% of span
Pt 200 (α = 0.003916)	JIS 1604	–200 to 645	–328 to 1193	10	18	± 0.27	± 0.49	±0.03% of span
Ni 120	Edison Curve No. 7	–70 to 300	–94 to 572	10	18	± 0.15	± 0.27	±0.03% of span
Cu 10	Edison Copper Winding No. 15	–50 to 250	–58 to 482	10	18	±1.40	± 2.52	±0.03% of span
Pt 50 (α = 0.00391)	GOST 6651-94	–200 to 550	–328 to 1022	10	18	± 0.30	± 0.54	±0.03% of span
Pt 100 (α = 0.00391)	GOST 6651-94	–200 to 550	–328 to 1022	10	18	± 0.15	± 0.27	±0.03% of span
Cu 50 (α = 0.00426)	GOST 6651-94	–50 to 200	–58 to 392	10	18	±1.34	± 2.41	±0.03% of span
Cu 50 (α = 0.00428)	GOST 6651-94	–185 to 200	–301 to 392	10	18	±1.34	± 2.41	±0.03% of span
Cu 100 (α = 0.00426)	GOST 6651-94	–50 to 200	–58 to 392	10	18	±0.67	± 1.20	±0.03% of span
Cu 100 (α = 0.00428)	GOST 6651-94	–185 to 200	–301 to 392	10	18	±0.67	± 1.20	±0.03% of span
Thermocouples[4]								
Type B[5]	NIST Monograph 175, IEC 584	100 to 1820	212 to 3308	25	45	± 0.77	± 1.39	±0.03% of span
Type E	NIST Monograph 175, IEC 584	–50 to 1000	–58 to 1832	25	45	± 0.20	± 0.36	±0.03% of span
Type J	NIST Monograph 175, IEC 584	–180 to 760	–292 to 1400	25	45	± 0.35	± 0.63	±0.03% of span
Type K[6]	NIST Monograph 175, IEC 584	–180 to 1372	–292 to 2501	25	45	± 0.50	± 0.90	±0.03% of span
Type N	NIST Monograph 175, IEC 584	–200 to 1300	–328 to 2372	25	45	± 0.50	± 0.90	±0.03% of span
Type R	NIST Monograph 175, IEC 584	0 to 1768	32 to 3214	25	45	± 0.75	± 1.35	±0.03% of span
Type S	NIST Monograph 175, IEC 584	0 to 1768	32 to 3214	25	45	± 0.70	± 1.26	±0.03% of span
Type T	NIST Monograph 175, IEC 584	–200 to 400	–328 to 752	25	45	± 0.35	± 0.63	±0.03% of span
DIN Type L	DIN 43710	–200 to 900	–328 to 1652	25	45	± 0.35	± 0.63	±0.03% of span
DIN Type U	DIN 43710	–200 to 900	–328 to 1112	25	45	± 0.35	± 0.63	±0.03% of span
Type W5Re/W26Re	ASTM E 988-96	0 to 2000	32 to 3632	25	45	± 0.70	± 1.26	±0.03% of span
GOST Type L	GOST R 8.585-2001	–200 to 800	–328 to 1472	25	45	± 1.00	± 1.26	±0.03% of span
Other Input Types								
Millivolt Input		–10 to 100 mV				±0.015 mV		±0.03% of span
2-, 3-, 4-wire Ohm Input		0 to 2000 ohms				±0.45 ohm		±0.03% of span

(1) No minimum or maximum span restrictions within the input ranges. Recommended minimum span will hold noise within accuracy specification with damping at zero seconds.
(2) The published digital accuracy applies over the entire sensor input range. Digital output can be accessed by HART or FOUNDATION fieldbus Communications or Rosemount control system.
(3) Total Analog accuracy is the sum of digital and D/A accuracies. This is not applicable for FOUNDATION fieldbus.
(4) Total digital accuracy for thermocouple measurement: sum of digital accuracy +0.5 °C. (cold junction accuracy).
(5) Digital accuracy for NIST Type B T/C is ±3.0 °C (±5.4 °F) from 100 to 300 °C (212 to 572 °F).
(6) Digital accuracy for NIST Type K T/C is ±0.70 °C (±1.26 °F) from –180 to –90 °C (–292 to –130 °F).

Accuracy Example

When using a Pt 100 (α = 0.00385) sensor input:

- Total accuracy = ±0.15 °C.
- No D/A accuracy effects apply

Ambient Temperature Effect

Table A-2. Ambient Temperature Effect

Sensor Options	Sensor Reference	Input Range (°C)	Temperature Effects per 1.0 °C (1.8 °F) Change in Ambient Temperature[1]	Range	D/A Effect[2]
2-, 3-, 4-wire RTDs					
Pt 100 (α = 0.00385)	IEC 751	-200 to 850	0.003 °C (0.0054 °F)	Entire Sensor Input Range	0.001% of span
Pt 200 (α = 0.00385)	IEC 751	-200 to 850	0.004 °C (0.0072 °F)	Entire Sensor Input Range	0.001% of span
Pt 500 (α = 0.00385)	IEC 751	-200 to 850	0.003 °C (0.0054 °F)	Entire Sensor Input Range	0.001% of span
Pt 1000 (α = 0.00385)	IEC 751	-200 to 300	0.003 °C (0.0054 °F)	Entire Sensor Input Range	0.001% of span
Pt 100 (α = 0.003916)	JIS 1604	-200 to 645	0.003 °C (0.0054 °F)	Entire Sensor Input Range	0.001% of span
Pt 200 (α = 0.003916)	JIS 1604	-200 to 645	0.004 °C (0.0072 °F)	Entire Sensor Input Range	0.001% of span
Ni 120	Edison Curve No. 7	-70 to 300	0.003 °C (0.0054 °F)	Entire Sensor Input Range	0.001% of span
Cu 10	Edison Copper Winding No. 15	-50 to 250	0.03 °C (0.054 °F)	Entire Sensor Input Range	0.001% of span
Pt 50 (α = 0.00391)	GOST 6651-94	-200 to 550	0.004 °C (0.0072 °F)	Entire Sensor Input Range	0.001% of span
Pt 100 (α = 0.00391)	GOST 6651-94	-200 to 550	0.003 °C (0.0054 °F)	Entire Sensor Input Range	0.001% of span
Cu 50 (α = 0.00426)	GOST 6651-94	-50 to 200	0.008 °C (0.0144 °F)	Entire Sensor Input Range	0.001% of span
Cu 50 (α = 0.00428)	GOST 6651-94	-185 to 200	0.008 °C (0.0144 °F)	Entire Sensor Input Range	0.001% of span
Cu 100 (α = 0.00426)	GOST 6651-94	-50 to 200	0.004 °C (0.0072 °F)	Entire Sensor Input Range	0.001% of span
Cu 100 (α = 0.00428)	GOST 6651-94	-185 to 200	0.004 °C (0.0072 °F)	Entire Sensor Input Range	0.001% of span
Thermocouples					
Type B	NIST Monograph 175, IEC 584	100 to 1820	0.014 °C	T ≥ 1000 °C	0.001% of span
			0.032 °C – (0.0025% of (T – 300))	300 °C ≤ T < 1000 °C	0.001% of span
			0.054 °C – (0.011% of (T – 100))	100 °C ≤ T < 300 °C	0.001% of span
Type E	NIST Monograph 175, IEC 584	-50 to 1000	0.005 °C + (0.0043% of T)	All	0.001% of span
Type J	NIST Monograph 175, IEC 584	-180 to 760	0.0054 °C + (0.00029%of T)	T ≥ 0 °C	0.001% of span
			0.0054 °C + (0.0025% of absolute value T)	T < 0 °C	0.001% of span
Type K	NIST Monograph 175, IEC 584	-180 to 1372	0.0061 °C + (0.0054% of T)	T ≥ 0 °C	0.001% of span
			0.0061 °C + (0.0025% of absolute value T)	T < 0 °C	0.001% of span
Type N	NIST Monograph 175, IEC 584	-200 to 1300	0.0068 °C + (0.00036% of T)	All	0.001% of span
Type R	NIST Monograph 175, IEC 584	0 to 1768	0.016 °C	T ≥ 200 °C	0.001% of span
			0.023 °C – (0.0036% of T)	T < 200 °C	0.001% of span
Type S	NIST Monograph 175, IEC 584	0 to 1768	0.016 °C	T ≥ 200 °C	0.001% of span
			0.023 °C – (0.0036% of T)	T < 200 °C	0.001% of span
Type T	NIST Monograph 175, IEC 584	-200 to 400	0.0064 °C	T ≥ 0 °C	0.001% of span
			0.0064 °C +(0.0043% of absolute value T)	T < 0 °C	0.001% of span
DIN Type L	DIN 43710	-200 to 900	0.0054 °C + (0.00029% of T)	T ≥ 0 °C	0.001% of span
			0.0054 °C + (0.0025% of absolute value T)	T < 0 °C	0.001% of span
DIN Type U	DIN 43710	-200 to 900	0.0064 °C	T ≥ 0 °C	0.001% of span
			0.0064 °C + (0.0043% of absolute value T)	T < 0 °C	0.001% of span
Type W5Re/W26Re	ASTM E 988-96	0 to 2000	0.016 °C	T ≥ 200 °C	0.001% of span
			0.023 °C – (0.0036% of T)	T < 200 °C	0.001% of span
GOST Type L	GOST R 8.585-2001	-200 to 800	0.007 °C	T ≥ 0 °C	0.001% of span
			0.007 °C – (0.003% of absolute value T)	T < 0 °C	0.001% of span

Table A-2. Ambient Temperature Effect

Sensor Options	Sensor Reference	Input Range (°C)	Temperature Effects per 1.0 °C (1.8 °F) Change in Ambient Temperature[1]	Range	D/A Effect[2]
Other Input Types					
Millivolt Input		-10 to 100 mV	0.0005 mV	Entire Sensor Input Range	0.001% of span
2-, 3-, 4-wire Ohm		0 to 2000 Ω	0.0084 Ω	Entire Sensor Input Range	0.001% of span

(1) Change in ambient is with reference to the calibration temperature of the transmitter 68 °F (20 °C) from factory.
(2) Does not apply to FOUNDATION fieldbus.

Transmitters can be installed in locations where the ambient temperature is between –40 and 85 °C (–40 and 185 °F). In order to maintain excellent accuracy performance, each transmitter is individually characterized over this ambient temperature range at the factory.

Temperature Effects Examples

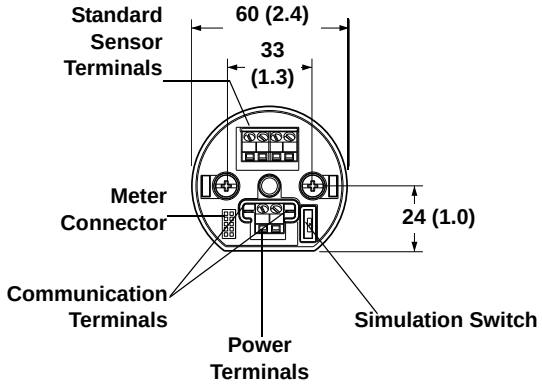
When using a Pt 100 (α = 0.00385) sensor input at 30 °C span at 30 °C ambient temperature:

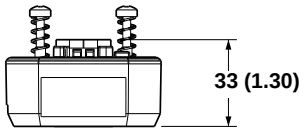
- Digital Temperature Effects: 0.003 °C x (30 - 20) = 0.03 °C
- D/A Effects: No D/A effects apply
- Worst Case Error: Digital + Digital Temperature Effects = 0.15 °C + 0.03 °C = 0.18 °C
- Total Probable Error: $\sqrt{0.15^2 + 0.03^2} = 0.153°C$

DIMENSIONAL DRAWINGS

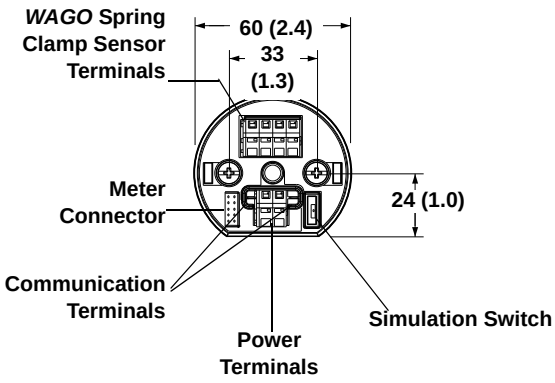
644H (DIN A Head Mount)

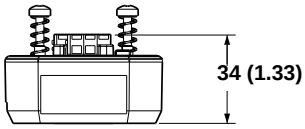
Shown with Standard Compression Screw Terminals



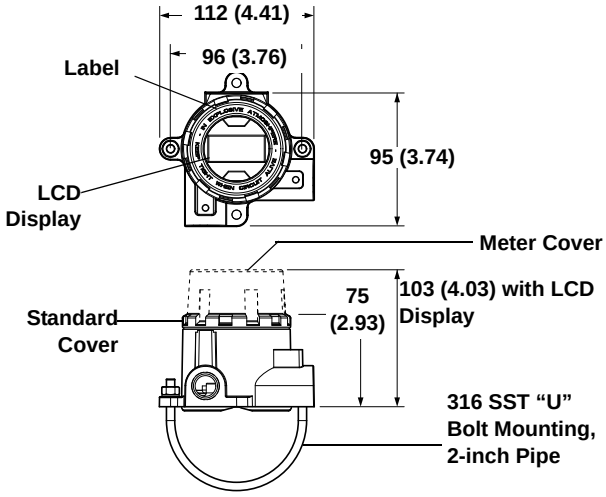


Shown with WAGO® Spring Clamp Terminals



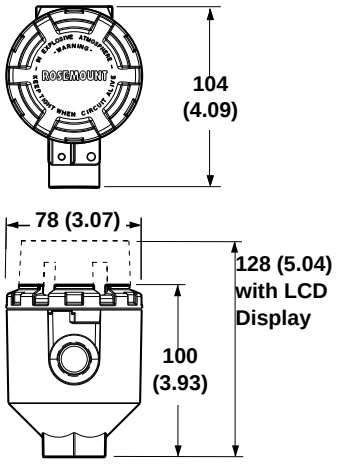


Threaded-Sensor Universal Head (Option code J5 or J6)



Note: A "U" Bolt is shipped with each universal head unless assembly option X1, X2, or X3 is ordered. Since the head is integrally mounted to the sensor, it may not need to be used.

Integral DIN Style Sensor Connection Head

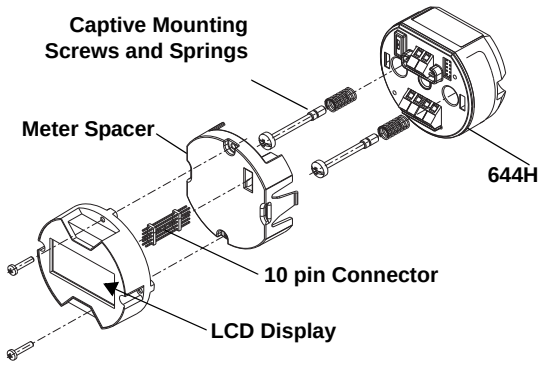


Note: The DIN Style Integral sensor connection head is only available through Volume 2 of the Rosemount Temperature Sensors and Accessories Product Data Sheet (document number 00810-0101-2654).

Dimensions are in millimeters (inches)

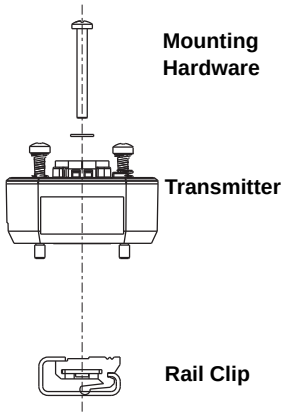
LCD Display

Head Mount Transmitter

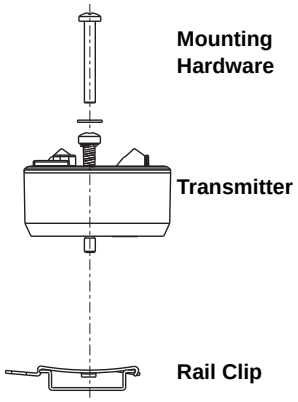


Mounting

G-Rail (asymmetric)

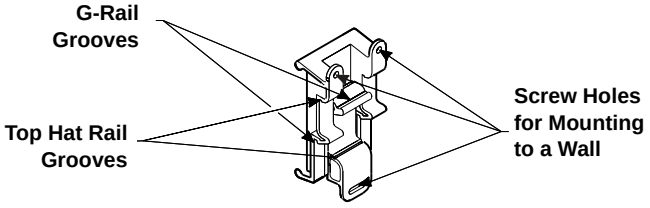


Top Hat Rail (symmetric)

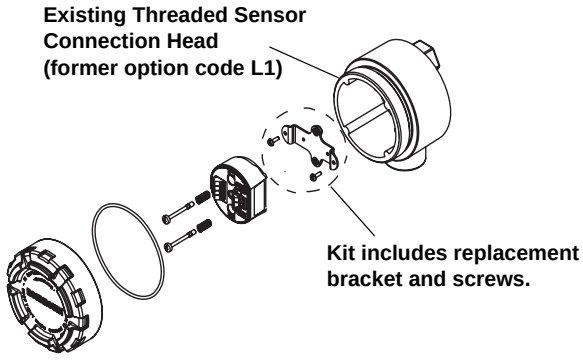


Note: Kit (part number 00644-5301-0010) includes mounting hardware and both types of rail kits.

Universal Clip for Mounting to a Wall or a Rail (part number 03044-4103-0001)



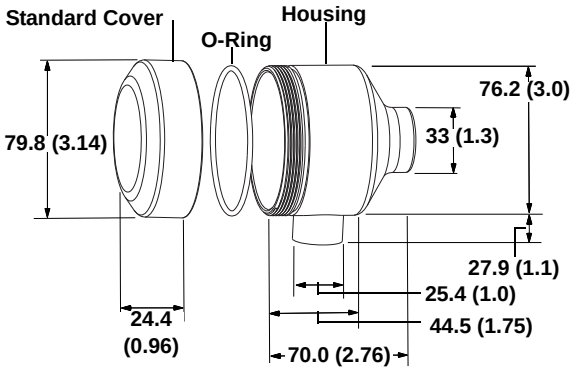
644H Retrofit Kit



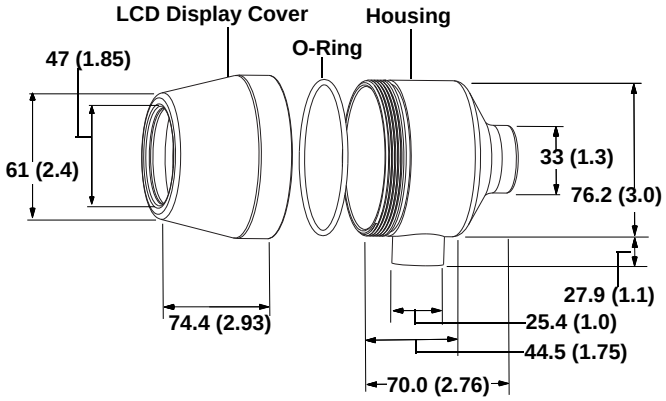
Note: Kit (part number 00644-5321-0010) includes a new mounting bracket and the hardware necessary to facilitate the installation.

Sanitary Housing Covers

Standard Cover



LCD Display Cover



Dimensions are in millimeters (inches)

ORDERING INFORMATION

Table A-3. Rosemount 644 Smart Temperature Transmitter Ordering Information

★ The Standard offering represents the most common models and options. These options should be selected for best delivery.
The Expanded offering is manufactured after receipt of order and is subject to additional delivery lead time.

● = Available
– = Not Available

Model	Product Description					
644	Temperature Transmitter					
Transmitter Type						
Standard						**Standard**
H	DIN A Head Mount (suitable for mounting in the field with enclosure options below)					★
R	Rail Mount					★
Output		**Head**			**Rail**	
Standard						**Standard**
A	4–20 mA with digital signal based on HART protocol	●			●	★
F	FOUNDATION fieldbus digital signal (includes 2 AI function blocks and Backup Link Active Scheduler)	●			–	★
W	Profibus PA digital signal	●			–	★
Product Certifications						
Hazardous Locations Certificates (consult factory for availability)		**A**	**F**	**W**	**A**	
Standard						**Standard**
NA	No approval	●	●	●	●	★
E5(1)	FM Explosion–Proof	●	●	●	–	★
I5(2)	FM Intrinsically Safe	●	●	●	●	★
K5(2)(1)	FM Intrinsically Safe, Explosion-Proof Combination	●	●	●	–	★
KC	FM/CSA Intrinsically Safe and Non-incendive Approval	–	–	–	●	★
I6(2)	CSA Intrinsically Safe	●	●	●	–	★
K6(1)(3)	CSA Intrinsically Safe, Explosion-Proof Combination	●	●	●	–	★
E1(1)	ATEX Flameproof	●	●	●	–	★
I1(2)	ATEX Intrinsically Safe	●	●	●	●	★
N1(1)	ATEX Type n	●	●	●	–	★
NC	ATEX Type n Component	●	●	●	●	★
ND(1)	ATEX Dust Ignition–Proof	●	●	●	–	★
E7(1)	IECEx Flameproof and Dust	●	●	●	–	★
I7(2)	IECEx Intrinsically Safe	●	●	●	●	★
N7(1)	IECEx Type n	●	●	●	–	★
NG	IECEx Type n Component	●	●	●	●	★
E2(1)	INMETRO Flameproof	●	●	●	–	★
E4(1)(3)	TIIS Explosion–Proof	●	●	●	●	★
E3(1)	China Flameproof	●	●	●	–	★
I3	China Intrinsic Safety	●	●	●	–	★

Options

		A	**F**	**W**	**A**	
PlantWeb Control Functionality						
Standard						**Standard**
A01	FOUNDATION fieldbus Advanced Control Function Block Suite	–	●	–	–	★

Table A-3. Rosemount 644 Smart Temperature Transmitter Ordering Information

★ The Standard offering represents the most common models and options. These options should be selected for best delivery.
The Expanded offering is manufactured after receipt of order and is subject to additional delivery lead time.

● = Available
– = Not Available

Assemble To Options						
Standard						**Standard**
XA	Sensor Specified Separately and Assembled To Transmitter	●	●	●	–	★
		Head			**Rail**	
		A	**F**	**W**	**A**	
Enclosure Options						
Standard						**Standard**
J5[4][5]	Universal Head (junction box), aluminum alloy with 50.8 mm (2-in.) SST pipe bracket (M20 entries)	●	●	●	–	★
J6[4]	Universal Head (junction box), aluminum alloy with 50.8 mm (2-in.) SST pipe bracket ($^1/_2$–14 NPT entries)	●	●	●	–	★
J7[4][5]	Universal Head (junction box), cast SST with 50.8 mm (2-in.) SST pipe bracket (M20 entries)	●	●	●	–	★
J8[4]	Universal Head (junction box), cast SST with 50.8 mm (2-in.) SST pipe bracket ($^1/_2$–14 NPT entries)	●	●	●	–	★
Expanded						
S1	Connection Head, Polished Stainless Steel ($^1/_2$–14 NPT entries)	●	●	●	–	
S2	Connection Head, Polished Stainless Steel ($^1/_2$–14 NPSM entries)	●	●	●	–	
S3	Connection Head, Polished Stainless Steel (M20 x 1.5 conduit and entries)	●	●	●	–	
S4	Connection Head, Polished Stainless Steel (M20 x 1.5 conduit entries, M24 x 1.5 head entry)	●	●	●	–	
Display						
Standard						**Standard**
M5	LCD Display	●	●	●	–	★
Expanded						
M6	LCD Display with Polycarbonate Meter Face	●	●	●	–	
Software Configuration						
Standard						**Standard**
C1	Custom Configuration of Date, Descriptor and Message (Requires CDS with order)	●	●	●	●	★
Alarm Level Configuration						
Standard						**Standard**
A1	NAMUR alarm and saturation levels, high alarm	●	–	–	●	★
CN	NAMUR alarm and saturation levels, low alarm	●	–	–	●	★
C8	Low Alarm (Standard Rosemount Alarm and Saturation Values)	●	–	–	●	★
Line Filter						
Standard						**Standard**
F6	60 Hz Line Voltage Filter	●	●	●	●	★
Sensor Trim						
Standard						**Standard**
C2	Transmitter-Sensor Matching - Trim to Specific Rosemount RTD Calibration Schedule (CVD constants)	●	●	●	●	★
5-Point Calibration Option						
Standard						**Standard**
C4	5-point calibration. *Use option code Q4 to generate a calibration certificate*	●	●	●	●	★
Calibration Certificate						
Standard						**Standard**
Q4	Calibration certificate. *3-Point calibration with certificate*	●	●	●	●	★
External Ground						
Standard						**Standard**
G1	External ground lug assembly (see “External Ground Screw Assembly” on page A-15)	●	●	●	–	★

Table A-3. Rosemount 644 Smart Temperature Transmitter Ordering Information

★ The Standard offering represents the most common models and options. These options should be selected for best delivery.
The Expanded offering is manufactured after receipt of order and is subject to additional delivery lead time.

		● = Available – = Not Available				
Cable Gland Option						
Standard						**Standard**
G2	Cable gland[6] (7.5 mm - 11.99 mm)	●	●	●	–	★
G7	Cable gland, M20x1.5, Ex e, Blue Polyamide (5 mm - 9 mm)	●	●	●	–	★
Cover Chain Option						
Standard						**Standard**
G3	Cover chain	●	●	●	–	★
Terminal						
Standard						**Standard**
G5	WAGO spring clamp terminals	●	●		–	★
Conduit Electrical Connector						
Standard						**Standard**
GE[7]	M12, 4-pin, Male Connector (eurofast®)	●	●	●	–	★
GM[7]	A size Mini, 4-pin, Male Connector (minifast®)	●	●	●	–	★
External Label						
Standard						**Standard**
EL	External label for ATEX Intrinsic Safety	●	●	●	–	★
Typical Rail Mount Model Number: 644 R A I5 **Typical Head Mount Model Number: 644 H F I5 M5 J5 C1**						

(1) Requires enclosure option J5, J6, J7, or J8.
(2) When IS approval is ordered on a FOUNDATION fieldbus, both standard IS and FISCO IS approvals apply. The device label is marked appropriately.
(3) Consult factory for availability.
(4) Suitable for remote mount configuration.
(5) When ordered with XA, 1/2-in. NPT enclosure will come equipped with an M20 adapter with the sensor installed as process ready.
(6) Only available with Enclosure option code J5.
(7) Available with Intrinsically Safe approvals only. For FM Intrinsically Safe or non-incendive approval (option code I5), install in accordance with Rosemount drawing 03151-1009 to maintain NEMA 4X rating.

NOTE
For additional options (e.g. “K” codes), please contact your local Emerson Process Management representative.

Tagging

Hardware

- 13 characters total
- Tags are adhesive labels
- Permanently attached to transmitter
- Character height is 1/16-in (1.6 mm)

Software

- The transmitter can store up to 13 characters for FOUNDATION fieldbus and Profibus PA. If no characters are specified, the first 8 characters of the hardware tag are the default.

Considerations

Special Mounting Considerations

See “Mounting” on page A-10 for the special hardware that is available to:

- Mount a 644H to a DIN rail. (see Table 1 on page A-15)
- Retrofit a new 644H to replace an existing 644H transmitter in an existing threaded sensor connection head (see Table 1 on page A-15).

External Ground Screw Assembly

The external ground screw assembly can be ordered by specifying code G1 when an enclosure is specified. However, some approvals include the ground screw assembly in the transmitter shipment, hence it is not necessary to order code G1. The table below identifies which approval options include the external ground screw assembly and which do not.

Approval Type	External Ground Screw Assembly Included?
E5, I1, I2, I5, I6, I7, K5, K6, NA, I4	No–Order option code G1
E1, E2, E3, E4, E7, K7, N1, N7, ND	Yes

TABLE 1. Transmitter Accessories

Part Description	Part Number
Aluminum alloy Universal Head, standard cover—M20 entries	00644-4420-0002
Aluminum alloy Universal Head, meter cover—M20 entries	00644-4420-0102
Aluminum alloy Universal Head, standard cover—1/2-14 NPT entries	00644-4420-0001
Aluminum alloy Universal Head, meter cover—1/2-14 NPT entries	00644-4420-0101
LCD Display (includes meter and meter spacer assembly)	00644-4430-0002
LCD Display kit (includes meter and meter spacer assembly, and meter cover)	00644-4430-0001
Ground screw assembly kit	00644-4431-0001
Kit, Hardware for mounting a 644H to a DIN rail (includes clips for symmetrical and asymmetrical rails)	00644-5301-0010
Kit, Hardware for retrofitting a 644H in an existing threaded sensor connection head (former option code L1)	00644-5321-0010
Kit, 316 U-Bolt for Universal Housing	00644-4423-0001
Universal clip for rail or wall mount	03044-4103-0001
24 Inches of symmetric (top hat) rail	03044-4200-0001
24 Inches of asymmetric (G) Rail	03044-4201-0001
Ground clamp for symmetric or asymmetric rail	03044-4202-0001
End clamp for symmetric or asymmetric rail	03044-4203-0001
Snap rings kit (used for assembly to a DIN sensor – quantity 12)	00644-4432-0001
SST Universal Head, standard cover—M20 entries	00644-4433-0002
SST Universal Head, meter cover—M20 entries	00644-4433-0102
SST Universal Head, standard cover—1/2 -14 NPT entries	00644-4433-0001
SST Universal Head, meter cover—1/2-14 NPT entries	00644-4433-0101
Polished SST Connection Head, standard cover—1/2-14 NPT entries	00079-0312-0011
Polished SST Connection Head, meter cover—1/2-14 NPT entries	00079-0312-0111
Polished SST Connection Head, standard cover—1/2-14 NPSM entries	00079-0312-0022
Polished SST Connection Head, meter cover—1/2-14 NPSM entries	00079-0312-0122
Polished SST Connection Head, standard cover—M20 x 1.5 entries	00079-0312-0033
Polished SST Connection Head, meter cover—M20 x 1.5 entries	00079-0312-0133
Polished SST Connection Head, standard cover—M20 x 1.5 / M24 x 1.5 entries	00079-0312-0034
Polished SST Connection Head, meter cover—M20 x 1.5 / M24 x 1.5 entries	00079-0312-0134

Configuration

Transmitter Configuration

The transmitter is available with standard configuration setting for FOUNDATION fieldbus (see “Custom configurations are to be specified when ordering. This configuration must be the same for all sensors. The following table lists the necessary requirements to specify a custom configuration.”). The configuration settings and block configuration may be changed in the field with DeltaV®, with AMS, or other FOUNDATION fieldbus host or configuration tool.

Standard FOUNDATION fieldbus Configuration

Unless otherwise specified, the transmitter will be shipped as follows for all sensors:

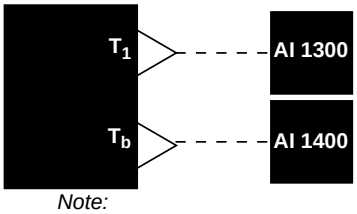
Sensor Type: 4-wire Pt 100 (α = 0.00385) RTD
Damping: 5 seconds
Units of Measurement: °C
Line Voltage Filter: 50 Hz
Software Tag: See “Tagging” on page A-14
Function Blocks Tags: • Resource Block: RB • Transducer Block: TB • LCD Block: LCD • Analog Input Blocks: AI1, AI2
Alarm Range: 0
Alarm Limits of AI1 and AI2: • HI-HI: 100 °C (212 °F) • HI: 95 °C (203 °F) • LO: 5 °C (41 °F) • LO-LO: 0 °C (32 °F)
Local Display (when installed): Engineering Units of Temperature

Custom Configuration

Custom configurations are to be specified when ordering. This configuration must be the same for all sensors. The following table lists the necessary requirements to specify a custom configuration.

Option Code	Requirements/ Specification
C1: Factory Configuration Data (CDS required)	Date: day/month/year Descriptor: 16 alphanumeric characters Message: 32 alphanumeric character Analog Output: Alarm and saturation levels
C2:Transmitter – Sensor Matching	The transmitters are designed to accept Callendar-Van Dusen constants from a calibrated RTD. Using these constants, the transmitter generates a custom curve to match the sensor-specific curve. Specify a Series 65, 65, or 78 RTD sensor on the order with a special characterization curve (V or X8Q4 option). These constants will be programmed into the transmitter with this option.
C4: Five Point Calibration	Will include 5-point calibration at 0, 25, 50, 75, and 100% analog and digital output points. Use with Calibration Certificate Q4.
F6: 60 Hz Line Filter	Calibrated to a 60 Hz line voltage filter instead of 50 Hz filter

Standard Block Configuration



Note:
T_1 = Sensor Temperature
T_b = Terminal Temperature

Final Station

AI Blocks are scheduled for 1 second. AI Blocks are linked as shown above.

Appendix B Product Certifications

APPROVED MANUFACTURING LOCATIONS

Emerson Process Management Rosemount Division. – Chanhassen, Minnesota, USA

Rosemount Temperature GmbH – Germany

Emerson Process Management Asia Pacific – Singapore

EUROPEAN UNION DIRECTIVE INFORMATION

The EC declaration of conformity for all applicable European directives for this product can be found on the Rosemount website at www.rosemount.com. A hard copy may be obtained by contacting our local sales representative.

ATEX Directive (94/9/EC)

Rosemount Inc. complies with the ATEX Directive.

CE Electromagnetic Compatibility Compliance Testing

The 644 meets the criteria under IEC 61326:2006

HAZARDOUS LOCATIONS CERTIFICATES

Rosemount 644 with FOUNDATION fieldbus

North American Certifications

Factory Mutual (FM) Approvals

I5 FM Intrinsically Safe and Non-incendive
Intrinsically Safe FISCO for use in Class I, II, III, Division 1, Groups A, B, C, D, E, F, and G; when installed per control drawing 00644-2075.
Temperature Code: T4A (T_{amb} = – 50 °C to 60 °C).

Nonincendive for use in Class I, Division 2, Groups A, B, C, and D.
Temperature Code: T5 (T_{amb} = – 50 °C to 85 °C);
T6 (T_{amb} = – 50 °C to 70 °C)

When installed per Rosemount control drawing 00644-2075

E5 FM Explosion Proof
Explosion Proof for Class I, Division 1, Groups B, C, and D.

Nonincendive for use in Class 1, Division 2, Groups A, B, C, and D.

Temperature Code: T5 (T_{amb} = – 50 °C to 85 °C)
When installed per Rosemount control drawing 00644-1049

Dust Ignition Proof for Class II/III, Division 1, Groups E, F, G.
Temperature Code: T5 (T_a = – 50 °C to 85 °C)

When installed per Rosemount drawing 00644-1049.
(J5, J6 and J8 options only.)

Canadian Standards Association (CSA) Approvals

I6 CSA Intrinsically Safe
Intrinsically Safe and FISCO for Class I, Division 1, groups A, B, C, and D when connected per Rosemount drawing 00644-2076.

Temperature code: T4 (T_{amb} = – 50 °C to 60 °C);

Suitable for Class I, Division 2, groups A, B, C, and D (must be installed in a suitable enclosure)

K6 CSA Intrinsically Safe, Explosion-proof
Includes Intrinsically Safe “I6” and Explosion-Proof for Class I, Division 1, groups B, C, and D.
Dust-Ignition Proof for Class II, Division 1, Groups E, F, and G.
Dust-Ignition Proof for Class III, Division 1
Seal not required.
CSA Enclosure Type 4X

Temperature Code: T4 (T_{amb} = – 50 °C to 60 °C);
T5 (T_{amb} = – 50 °C to 85 °C)

NOTE:
(For J5 and J6 enclosure options only)

European Certifications

E1 ATEX Flame-Proof
Certificate Number: KEMA99ATEX8715X
ATEX Marking: ⟨Ex⟩ II 2 G
CE 1180
Ex d IIC T6 (–50 °C ≤ T_{amb} ≤ 65 °C)
U_i = 32 Vdc

Special Conditions for Safe Use (X):
For information on the dimensions of the flameproof joints the manufacturer shall be contacted.

I1 ATEX Intrinsic Safety
Certificate Number: Baseefa03ATEX0499X
ATEX Marking: ⟨Ex⟩ II 1 G
CE 1180
Ex ia IIC T4 (-50 °C ≤ T_{amb} ≤ 60 °C)

I.S. Loop/Power Terminals
U_i = 30 V
I_i = 300 mA
P_i = 1.3 W
C_i = 2.1 nF
L_i = 0
FISCO Loop/Power Terminals
U_i = 17.5 V
I_i = 380 mA
P_i = 5.32 W
C_i = 2.1 nF
L_i = 0
Sensor Terminals
U_o = 13.9 V
I_o = 23 mA
P_o = 79 mW
C_i = 7.7 nF
L_i = 0

Special Conditions for Safe Use (X):
The apparatus must be installed in an enclosure which affords it a degree of protection of at least IP20. Non-metallic enclosures must have a surface resistance of less than 1GΩ, light alloy or zirconium enclosures must be protected from impact and friction when installed.

N1 ATEX Type n
Certificate Number: BAS00ATEX3145
ATEX Marking: ⟨Ex⟩ II 3 G
Ex nL IIC T5 (-40 °C ≤ T_{amb} ≤ 70 °C)
U_i = 32 V

NC ATEX Type n Component
Certificate Number: BAS99ATEX3084U
ATEX Marking: ⟨Ex⟩ II 3 G
Ex nL IIC T5 (-40 °C ≤ T_{amb} ≤ 70 °C)
Max Input Voltage: U_i = 42.4 Vdc

NOTE:
The equipment must be installed in an enclosure meeting the requirements of IP54 and the requirements of the impact tests described in EN50021.

ND ATEX Dust Ignition-Proof
Certificate Number: KEMA99ATEX8715X
ATEX Marking: ⟨Ex⟩ II 1 D
tD A20 T95°C (-50 °C ≤ T_{amb} ≤ 85 °C)
CE 1180
IP66

Special Conditions for Safe Use (X):
For information on the dimensions of the flameproof joints the manufacturer shall be contacted.

IECEx Certifications

E7 IECEx Flameproof and Dust
Certificate Number: IECEx KEM 09.0015X
Ex d IIC T6 (Flameproof)
Ex tD A20 IP 66 T 95 °C (Dust)
Vmax = 42.4 V

Special Conditions for Safe Use (X):

For information on the dimensions of the flameproof joints the manufacturer shall be contacted.

Table B-1. Electrical Data

Transmitter	Sensor
V_{max} = 32 Vdc	U_{max} = 5 Vdc
I_{max} = 12.0 mA	I_{max} = 2.0 mA

I7 IECEx Intrinsic Safety
Certificate Number: IECEx BAS 07.0053X
Ex ia IIC T4/T5/T6

Table B-2. Temperature Classification

$P_{i\ (W)}$	Temperature Class	T_{amb}
1.3	T4	-50 °C to 60 °C
5.32 (FISCO Group IIC)	T4	-60 °C to 80 °C

Special Conditions for Safe Use (X):

The apparatus must be installed in an enclosure which affords it a degree of protection of at least IP20.

Non-metallic enclosures must have a surface resistance of less than 1 GΩ; light alloy or zirconium enclosures must be protected from impact and friction when installed.

Table B-3. Entity Parameters

Transmitter (I.S.)	Transmitter (FISCO)	Sensor
U_i = 30 Vdc	U_i = 17.5 Vdc	U_o = 13.9 Vdc
I_i = 300 mA	I_i = 380 mA	I_o = 23 mA
P_i = 1.3 W	P_i = 5.32 W	P_o = 79 mW
C_i = 2.1 nF	C_i = 2.1 nF	C_i = 7.7 nF
L_i = 0 mH	L_i = 0 mH	L_i = 0 mH

N7 IECEx Type n
Certificate Number: IECEx BAS 07.0055
Ex nA nL IIC T5 (-40 °C ≤ T_{amb} ≤ 70 °C)

Table B-4. Electrical Data

Transmitter	Sensor	
	RTD	Thermocouple
U_i = 32 V	U_i = 5 V	U_i = 0

NG IECEx Type n Component
Certificate Number: IECEx BAS 07.0054U
Ex nA nL IIC T5 (-40 °C ≤ T_{amb} ≤ 75 °C)

Schedule of Limitations:

The component must be housed in a suitably certified enclosure that provides a degree of protection of at least IP54.

Japanese Certifications

Japanese Industrial Standard (JIS) Approvals

I4 JIS Intrinsic Safety

E4 JIS Explosion Proof

Table B-5. Certificate and Description

Certificate	Description	Approval Group	Temp Code
C15744	644H with meter and no sensor	Ex d II C	T6
C15745	644H without meter and no sensor	Ex d II C	T6
C15749	644H without meter and with RTD	Ex d II B	T4
C15750	644H without meter and with thermocouple	Ex d II B	T4
C15751	644H with meter and thermocouple	Ex d II B	T4
C15752	644H with meter and RTD	Ex d II B	T4
C15910	644H without meter and with thermocouple	Ex d II B + H2	T4
C15911	644H with meter and thermocouple	Ex d II B + H2	T4
C15912	644H without meter and with RTD	Ex d II B + H2	T4
C15913	644H with meter and RTD	Ex d II B + H2	T4

Combination Approvals

K5 Combination of I5 and E5.

Russian GOST Certifications

PPC BA-13006:

0 Ex ia IIC T4/T5/T6

Kazakhstan GOST

Pattern approval Certificate for Measuring Instruments

See Certificate

Ukraine GOST

Pattern Approval for Measuring Instruments

See Certificate

INSTALLATION DRAWINGS

The installation guidelines presented by the drawings must be followed in order to maintain certified ratings for installed transmitters.

Rosemount Drawing 00644-1064, 1 Sheet,
Canadian Standards Association Intrinsic Safety Installation Drawing

Rosemount Drawing 00644-1059, 1 Sheet;
Canadian Standards Association Explosion-Proof Installation Drawing

Rosemount Drawing 00644-2076, 3 Sheets;
Canadian Standards Association 644 Fieldbus Intrinsic Safety/FISCO Installation Drawing

Rosemount Drawing 00644-0009, 2 Sheet
Factory Mutual Intrinsic Safety Installation Drawing

Rosemount Drawing 00644-1049, 1 Sheet;
Factory Mutual Explosion-proof Installation Drawing

Rosemount Drawing 00644-2075, 3 Sheets;
Factory Mutual 644 Fieldbus Intrinsic Safety/FISCO Installation Drawing

IMPORTANT
Once a device labeled with multiple approval types is installed, it should not be reinstalled using any of the other labeled approval types. To ensure this, the approval label should be permanently marked to distinguish the used from the unused approval type(s).

Figure B-1. CSA Intrinsic Safety Installation Drawing 00644-1064, Rev. AB

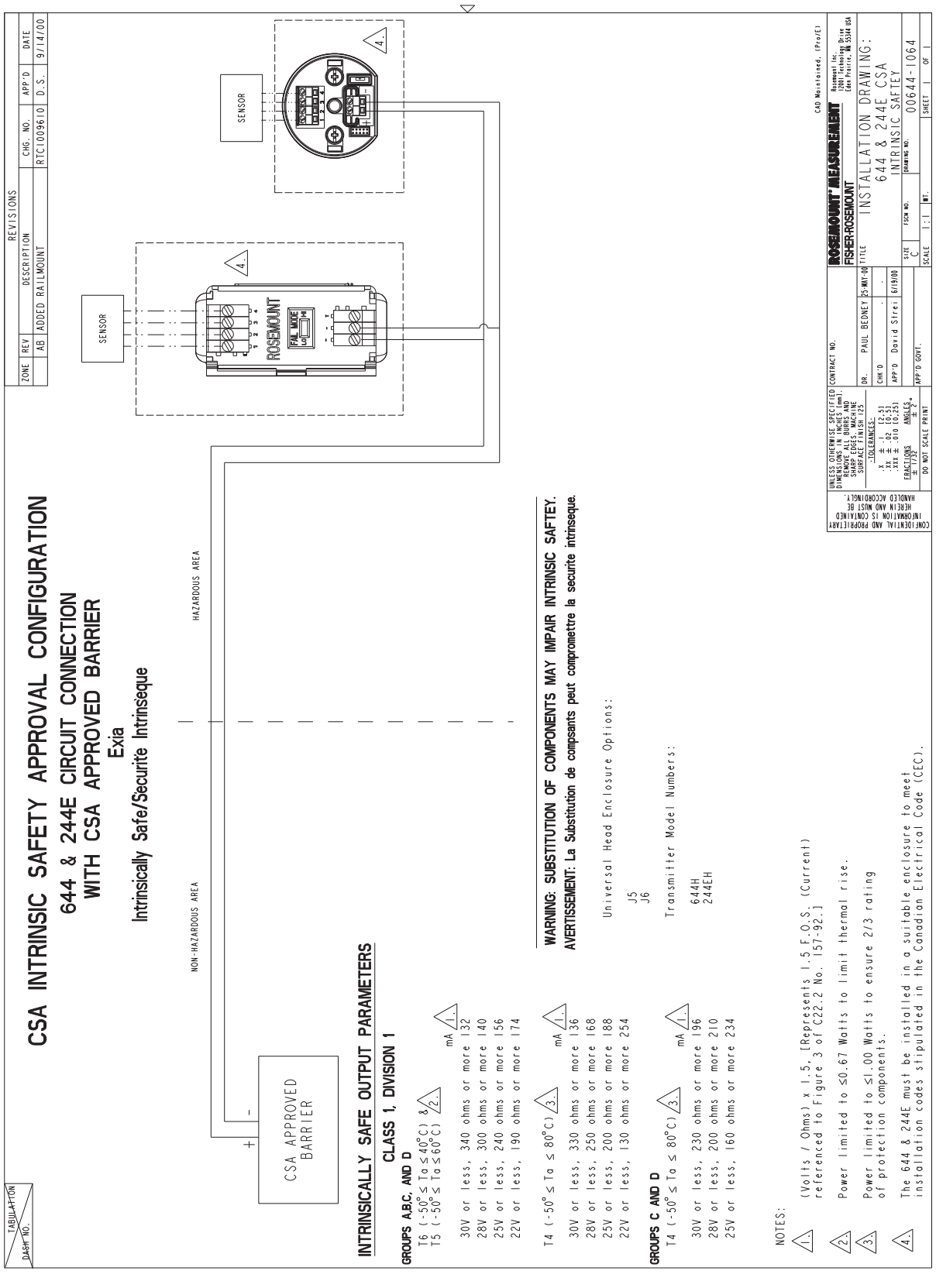


Figure B-2. CSA Explosion-Proof Installation Drawing 00644-1059, Rev. AH

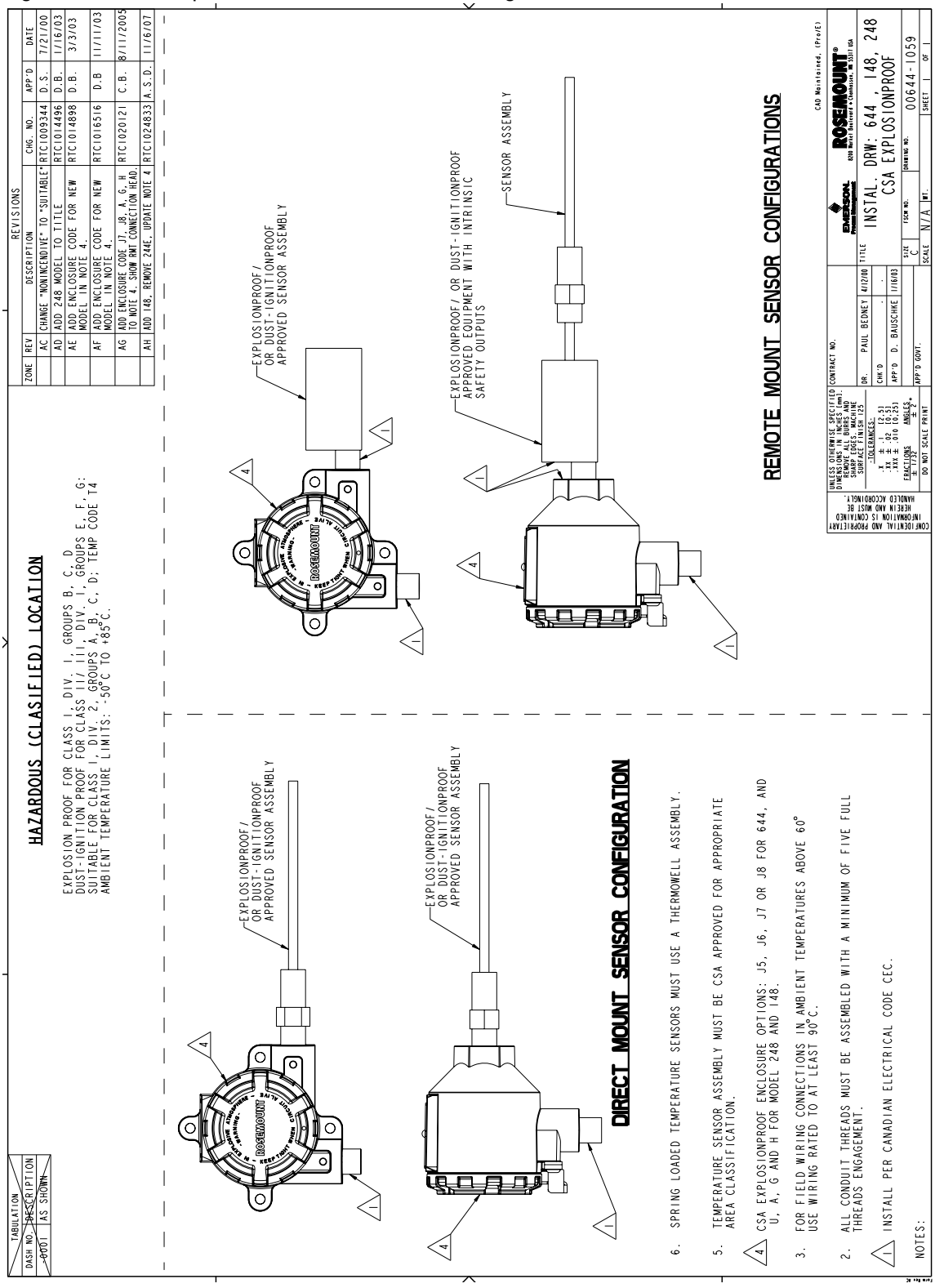
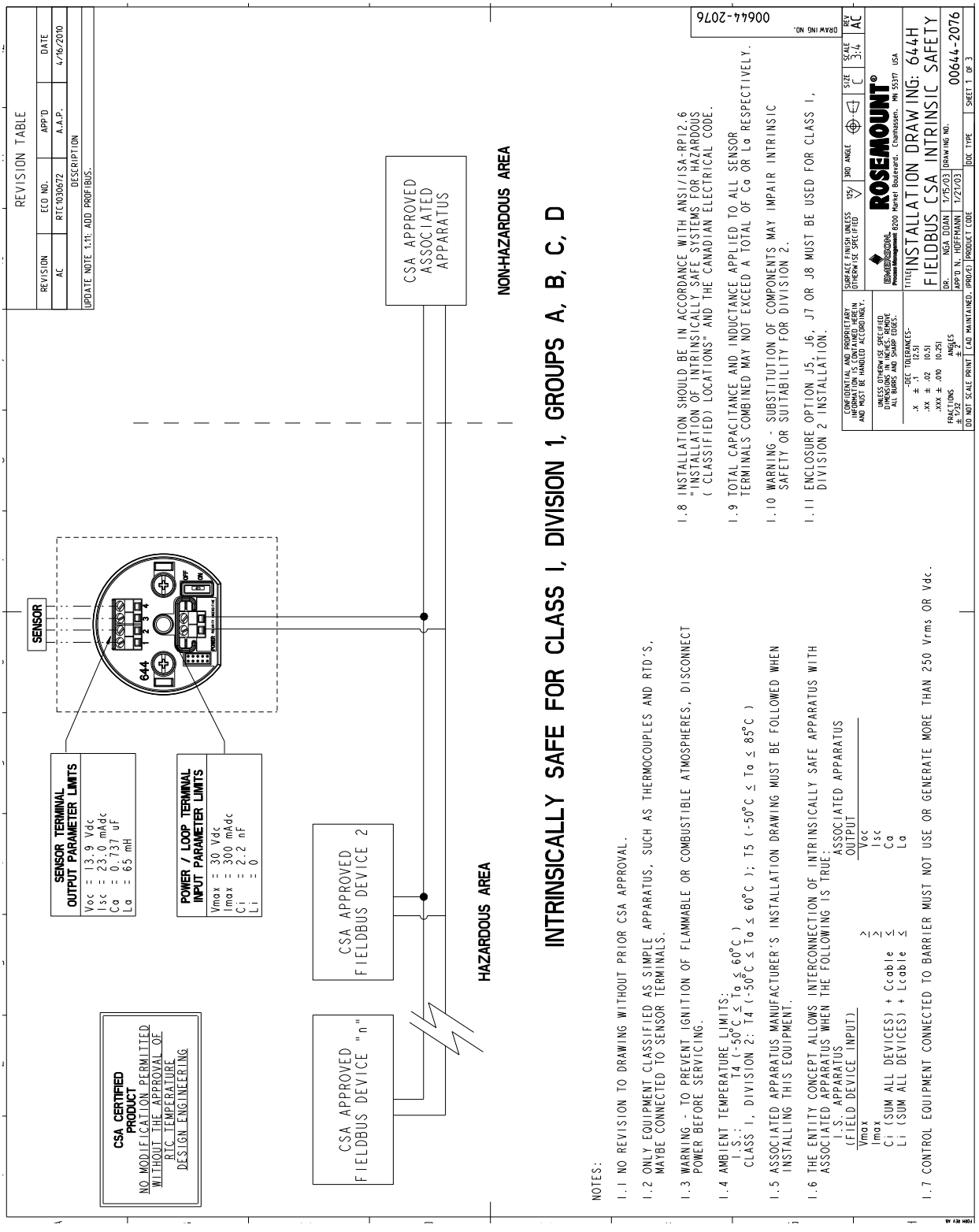
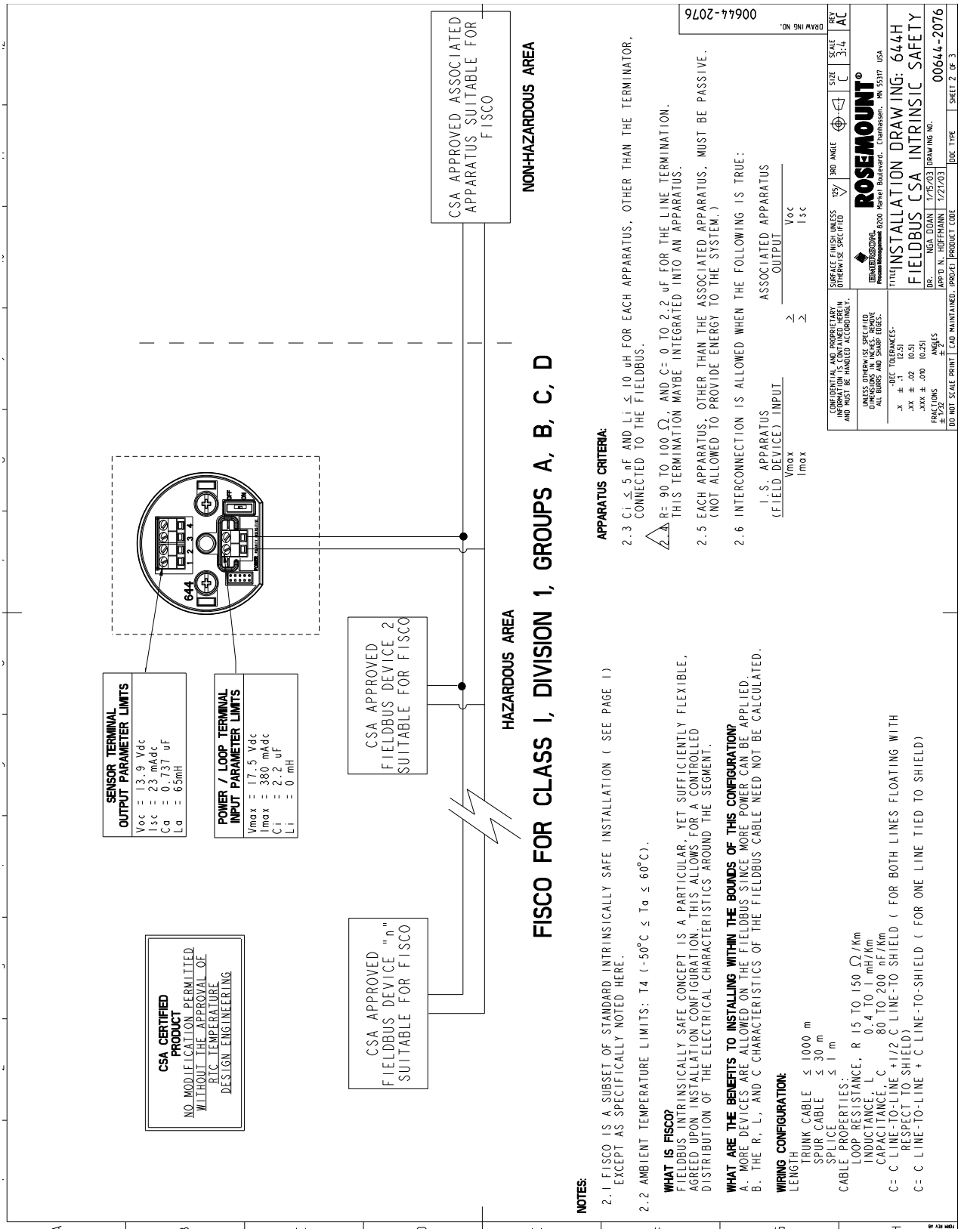


Figure B-3. CSA 644 Fieldbus Intrinsic Safety, FISCO Installation Drawing 00644-2076, Rev. AC Sheet 1 of 3



Sheet 2 of 3


FISCO FOR CLASS I, DIVISION 1, GROUPS A, B, C, D
HAZARDOUS AREA
NON-HAZARDOUS AREA
CSA APPROVED ASSOCIATED APPARATUS SUITABLE FOR FISCO
CSA APPROVED FIELDBUS DEVICE 2 SUITABLE FOR FISCO
CSA APPROVED FIELDBUS DEVICE "n" SUITABLE FOR FISCO
644
SENSOR TERMINAL OUTPUT PARAMETER LIMITS
Voc = 13.9 Vdc
Isc = 23 mAdc
Ca = 0.737 uF
La = 65mH
POWER / LOOP TERMINAL INPUT PARAMETER LIMITS
Vmax = 17.5 Vdc
Imax = 380 mAdc
Ci = 2.2 uF
Li = 0 mH
CSA CERTIFIED PRODUCT
NO MODIFICATION PERMITTED WITHOUT THE APPROVAL OF RTC TEMPERATURE DESIGN ENGINEERING
NOTES:
2.1 FISCO IS A SUBSET OF STANDARD INTRINSICALLY SAFE INSTALLATION (SEE PAGE 1) EXCEPT AS SPECIFICALLY NOTED HERE.
2.2 AMBIENT TEMPERATURE LIMITS: T4 (-50°C ≤ Ta ≤ 60°C).
WHAT IS FISCO?
FIELDBUS INTRINSICALLY SAFE CONCEPT IS A PARTICULAR, YET SUFFICIENTLY FLEXIBLE, AGREED UPON INSTALLATION CONFIGURATION. THIS ALLOWS FOR A CONTROLLED DISTRIBUTION OF THE ELECTRICAL CHARACTERISTICS AROUND THE SEGMENT.
WHAT ARE THE BENEFITS TO INSTALLING WITHIN THE BOUNDS OF THIS CONFIGURATION?
A. MORE DEVICES ARE ALLOWED ON THE FIELDBUS SINCE MORE POWER CAN BE APPLIED.
B. THE R, L, AND C CHARACTERISTICS OF THE FIELDBUS CABLE NEED NOT BE CALCULATED.
WIRING CONFIGURATION:
LENGTH
TRUNK CABLE ≤ 1000 m
SPUR CABLE ≤ 30 m
SPLICE ≤ 1 m
CABLE PROPERTIES:
LOOP RESISTANCE, R 15 TO 150 Ω/Km
INDUCTANCE, L 0.4 TO 1 mH/Km
CAPACITANCE, C 80 TO 200 nF/Km
C= C LINE-TO-LINE +1/2 C LINE-TO-SHIELD (FOR BOTH LINES FLOATING WITH RESPECT TO SHIELD)
C= C LINE-TO-LINE + C LINE-TO-SHIELD (FOR ONE LINE TIED TO SHIELD)
APPARATUS CRITERIA:
2.3 Ci ≤ 5 nF AND Li ≤ 10 uH FOR EACH APPARATUS, OTHER THAN THE TERMINATOR, CONNECTED TO THE FIELDBUS.
2.4 R= 90 TO 100 Ω, AND C= 0 TO 2.2 uF FOR THE LINE TERMINATION. THIS TERMINATION MAYBE INTEGRATED INTO AN APPARATUS.
2.5 EACH APPARATUS, OTHER THAN THE ASSOCIATED APPARATUS, MUST BE PASSIVE. (NOT ALLOWED TO PROVIDE ENERGY TO THE SYSTEM.)
2.6 INTERCONNECTION IS ALLOWED WHEN THE FOLLOWING IS TRUE:
I.S. APPARATUS (FIELD DEVICE) INPUT
Vmax ≥ Voc
Imax ≥ Isc
ASSOCIATED APPARATUS OUTPUT
CONFIDENTIAL AND PROPRIETARY INFORMATION IS CONTAINED HEREIN AND MUST BE HANDLED ACCORDINGLY.
UNLESS OTHERWISE SPECIFIED DIMENSIONS IN INCHES. REMOVE ALL BURRS AND SHARP EDGES.
-DEC TOLERANCES-
.x ± .1 [2.5]
.xx ± .02 [0.5]
.xxx ± .010 [0.25]
FRACTIONS ± 1/32 ANGLES ± 2°
DO NOT SCALE PRINT
SURFACE FINISH UNLESS OTHERWISE SPECIFIED 125
3RD ANGLE
EMERSON PROCESS MANAGEMENT
ROSEMOUNT®
8200 Market Boulevard, Chanhassen, MN 55317 USA
TITLE INSTALLATION DRAWING: 644H FIELDBUS CSA INTRINSIC SAFETY
DR. NGA DOAN 1/15/03
APP'D N. HOFFMANN 1/21/03
DRAWING NO. 00644-2076
CAD MAINTAINED, (PROJ?) PRODUCT CODE
DOC. TYPE
SIZE C
SCALE 3:4
REV AC
SHEET 2 OF 3
DRAWING NO. 00644-2076

Sheet 3 of 3

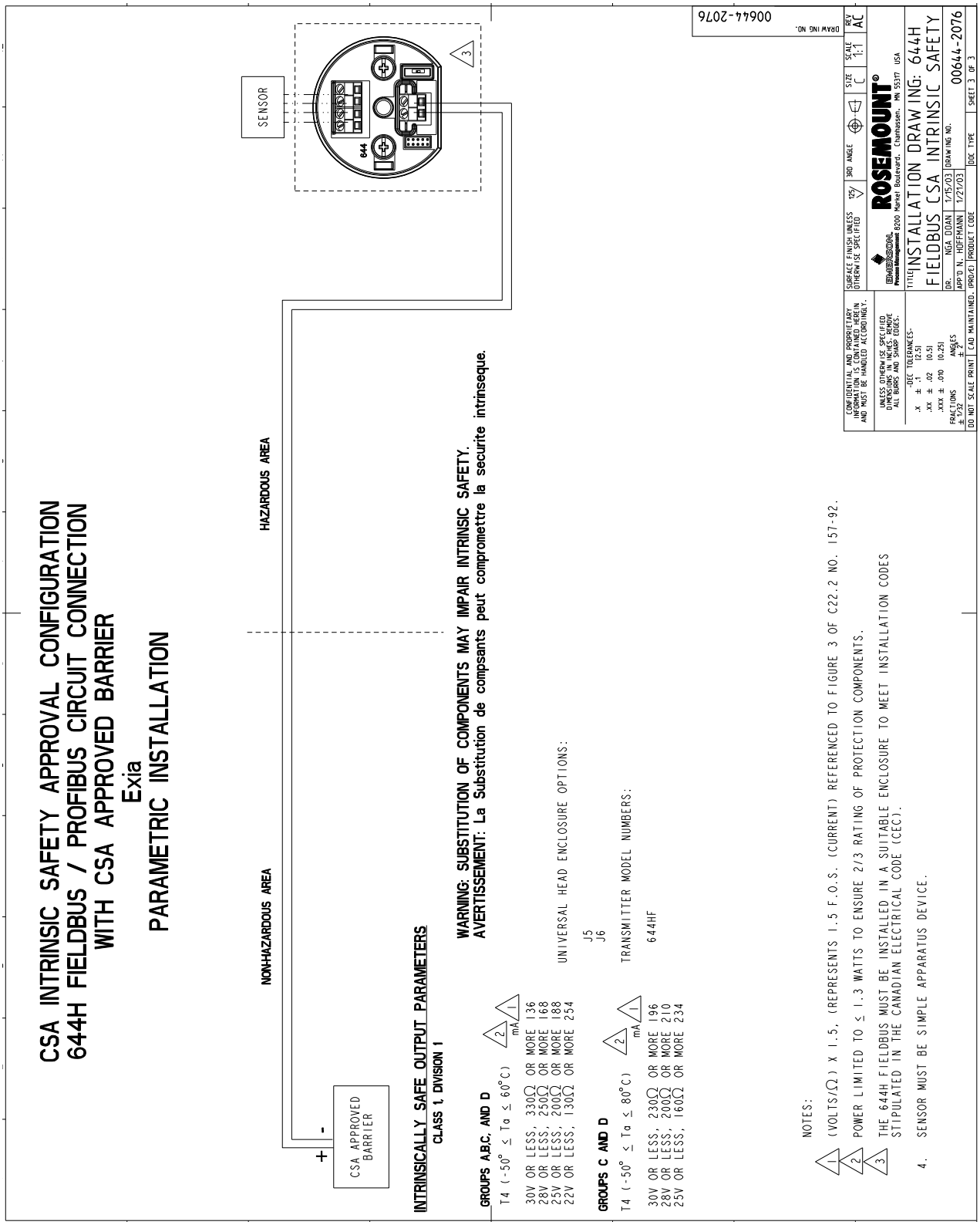
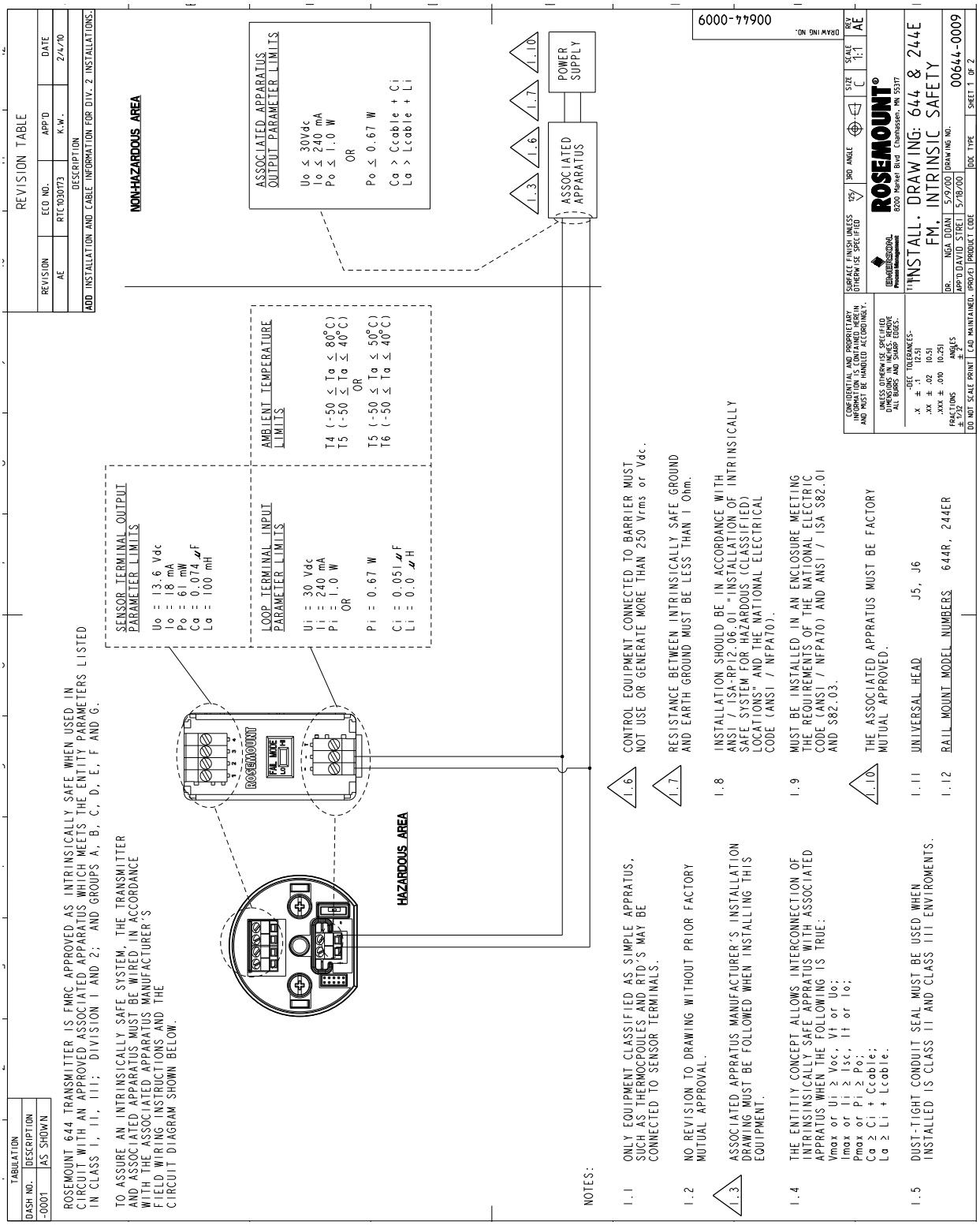

CSA INTRINSIC SAFETY APPROVAL CONFIGURATION
644H FIELDBUS / PROFIBUS CIRCUIT CONNECTION
WITH CSA APPROVED BARRIER
Exia
PARAMETRIC INSTALLATION
NONHAZARDOUS AREA
HAZARDOUS AREA
SENSOR
644
CSA APPROVED BARRIER
+
-
WARNING: SUBSTITUTION OF COMPONENTS MAY IMPAIR INTRINSIC SAFETY.
AVERTISSEMENT: La Substitution de compsants peut compromettre la securite intrinseque.
INTRINSICALLY SAFE OUTPUT PARAMETERS
CLASS 1, DIVISION 1
GROUPS A,B,C, AND D
T4 (-50° ≤ Ta ≤ 60°C)
30V OR LESS, 330Ω OR MORE 136
28V OR LESS, 250Ω OR MORE 168
25V OR LESS, 200Ω OR MORE 188
22V OR LESS, 130Ω OR MORE 254
UNIVERSAL HEAD ENCLOSURE OPTIONS:
J5
J6
GROUPS C AND D
T4 (-50° ≤ Ta ≤ 80°C)
30V OR LESS, 230Ω OR MORE 196
28V OR LESS, 200Ω OR MORE 210
25V OR LESS, 160Ω OR MORE 234
TRANSMITTER MODEL NUMBERS:
644HF
NOTES:
1. (VOLTS/Ω) X 1.5, (REPRESENTS 1.5 F.O.S. (CURRENT) REFERENCED TO FIGURE 3 OF C22.2 NO. 157-92.
2. POWER LIMITED TO ≤ 1.3 WATTS TO ENSURE 2/3 RATING OF PROTECTION COMPONENTS.
3. THE 644H FIELDBUS MUST BE INSTALLED IN A SUITABLE ENCLOSURE TO MEET INSTALLATION CODES STIPULATED IN THE CANADIAN ELECTRICAL CODE (CEC).
4. SENSOR MUST BE SIMPLE APPARATUS DEVICE.
DRAWING NO. 00644-2076
CONFIDENTIAL AND PROPRIETARY INFORMATION IS CONTAINED HEREIN AND MUST BE HANDLED ACCORDINGLY.
UNLESS OTHERWISE SPECIFIED DIMENSIONS IN INCHES. REMOVE ALL BURRS AND SHARP EDGES.
-DEC TOLERANCES-
.X ± .1 (2.5)
.XX ± .02 (0.5)
.XXX ± .010 (0.25)
FRACTIONS ± 1/32
ANGLES ± 2°
SURFACE FINISH UNLESS OTHERWISE SPECIFIED 125
3RD ANGLE
ROSEMOUNT
Emerson Process Management 8200 Market Boulevard, Chanhassen, MN 55317 USA
TITLE INSTALLATION DRAWING: 644H FIELDBUS CSA INTRINSIC SAFETY
DR. NGA DOAN 1/15/03
APP'D N. HOFFMANN 1/23/03
DRAWING NO. 00644-2076
SIZE C
SCALE 1:1
REV AC
DO NOT SCALE PRINT
CAD MAINTAINED
PRODFI
PRODUCT CODE
DOC TYPE
SHEET 3 OF 3

Figure B-4. FM Explosion-Proof Installation Drawing 00644-1049, Rev. AE Sheet 1of 2



Sheet 2 of 2

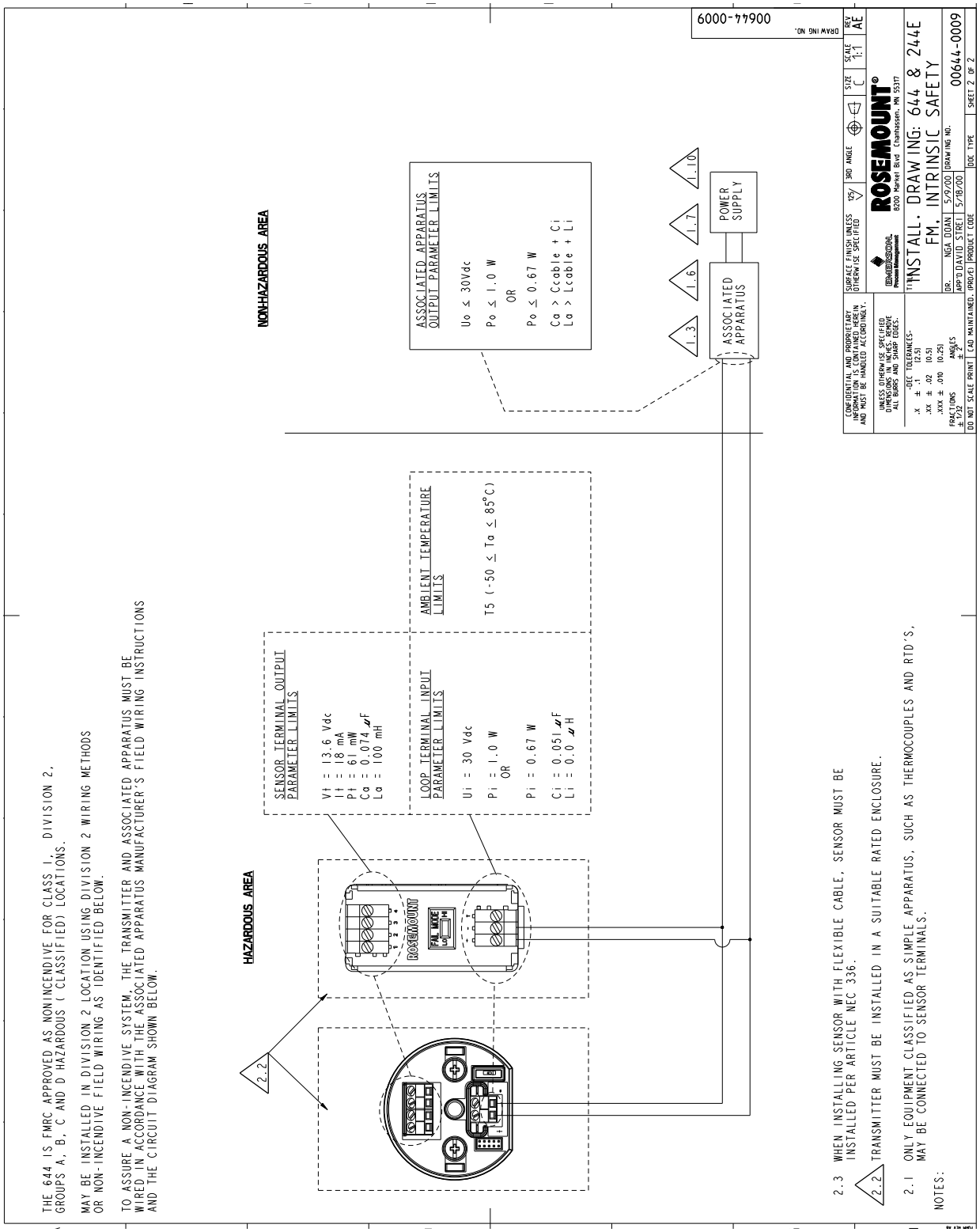

00644-0009
DRAWING NO.
REV AE
SIZE C
SCALE 1:1
ROSEMOUNT
8200 Market Blvd Chanhassen, MN 55317
INSTALL. DRAWING: 644 & 244E
FM, INTRINSIC SAFETY
00644-0009
SHEET 2 OF 2
NON-HAZARDOUS AREA
HAZARDOUS AREA
ASSOCIATED APPARATUS OUTPUT PARAMETER LIMITS
Uo ≤ 30Vdc
Po ≤ 1.0 W
OR
Po ≤ 0.67 W
Ca > Ccable + Ci
La > Lcable + Li
SENSOR TERMINAL OUTPUT PARAMETER LIMITS
Vt = 13.6 Vdc
It = 18 mA
Pt = 61 mW
Ca = 0.074 µF
La = 100 mH
LOOP TERMINAL INPUT PARAMETER LIMITS
Ui = 30 Vdc
Pi = 1.0 W
OR
Pi = 0.67 W
Ci = 0.051 µF
Li = 0.0 µH
AMBIENT TEMPERATURE LIMITS
T5 (-50 ≤ Ta ≤ 85°C)
ASSOCIATED APPARATUS
POWER SUPPLY
1.3
1.6
1.7
1.10
2.2
THE 644 IS FMRC APPROVED AS NONINCENDIVE FOR CLASS I, DIVISION 2, GROUPS A, B, C AND D HAZARDOUS (CLASSIFIED) LOCATIONS.
MAY BE INSTALLED IN DIVISION 2 LOCATION USING DIVISION 2 WIRING METHODS OR NON-INCENDIVE FIELD WIRING AS IDENTIFIED BELOW.
TO ASSURE A NON-INCENDIVE SYSTEM, THE TRANSMITTER AND ASSOCIATED APPARATUS MUST BE WIRED IN ACCORDANCE WITH THE ASSOCIATED APPARATUS MANUFACTURER'S FIELD WIRING INSTRUCTIONS AND THE CIRCUIT DIAGRAM SHOWN BELOW.
NOTES:
2.1 ONLY EQUIPMENT CLASSIFIED AS SIMPLE APPARATUS, SUCH AS THERMOCOUPLES AND RTD'S, MAY BE CONNECTED TO SENSOR TERMINALS.
2.2 TRANSMITTER MUST BE INSTALLED IN A SUITABLE RATED ENCLOSURE.
2.3 WHEN INSTALLING SENSOR WITH FLEXIBLE CABLE, SENSOR MUST BE INSTALLED PER ARTICLE NEC 336.

Figure B-5. FM Explosion-Proof Installation Drawing 00644-1049, Rev. AE

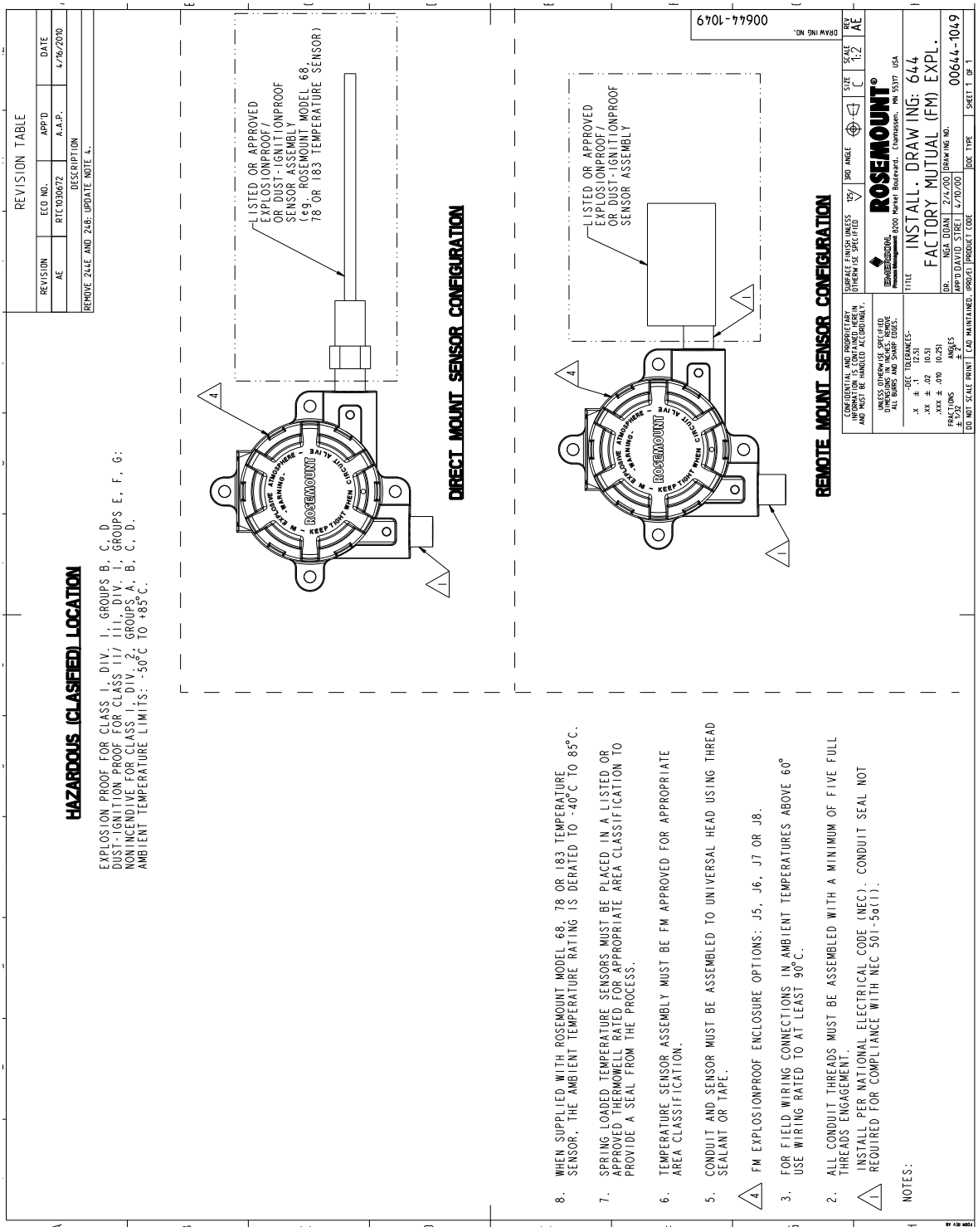
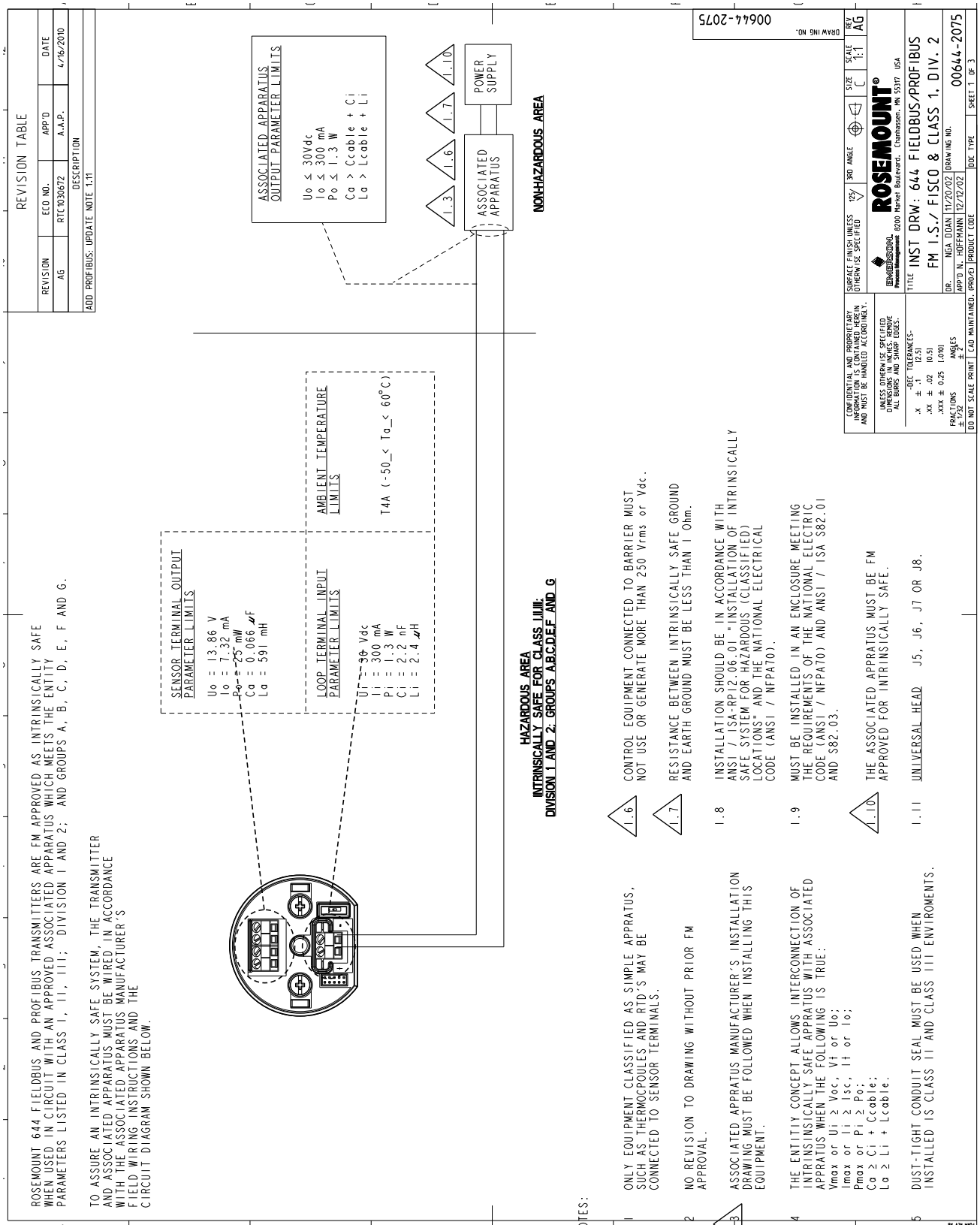
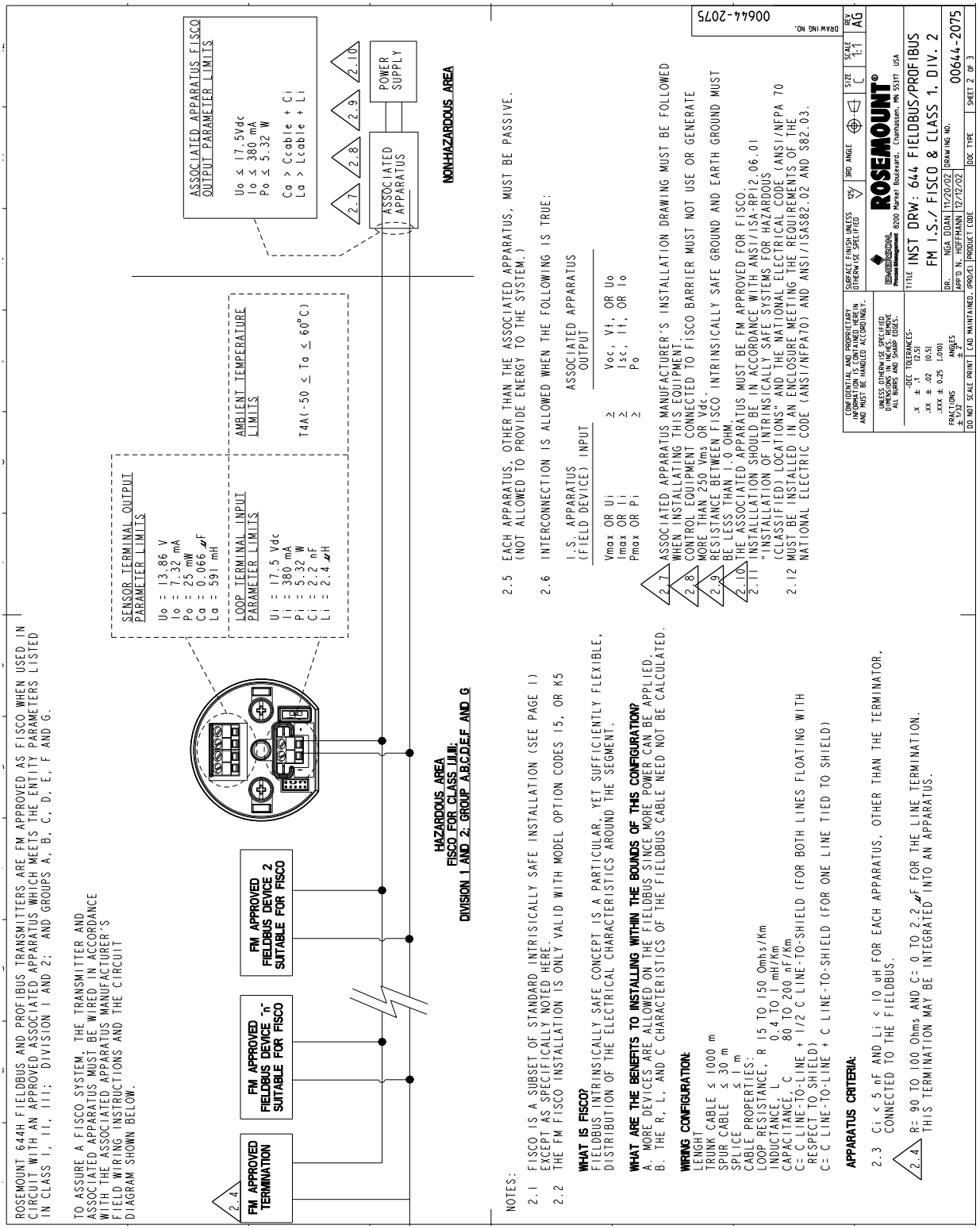


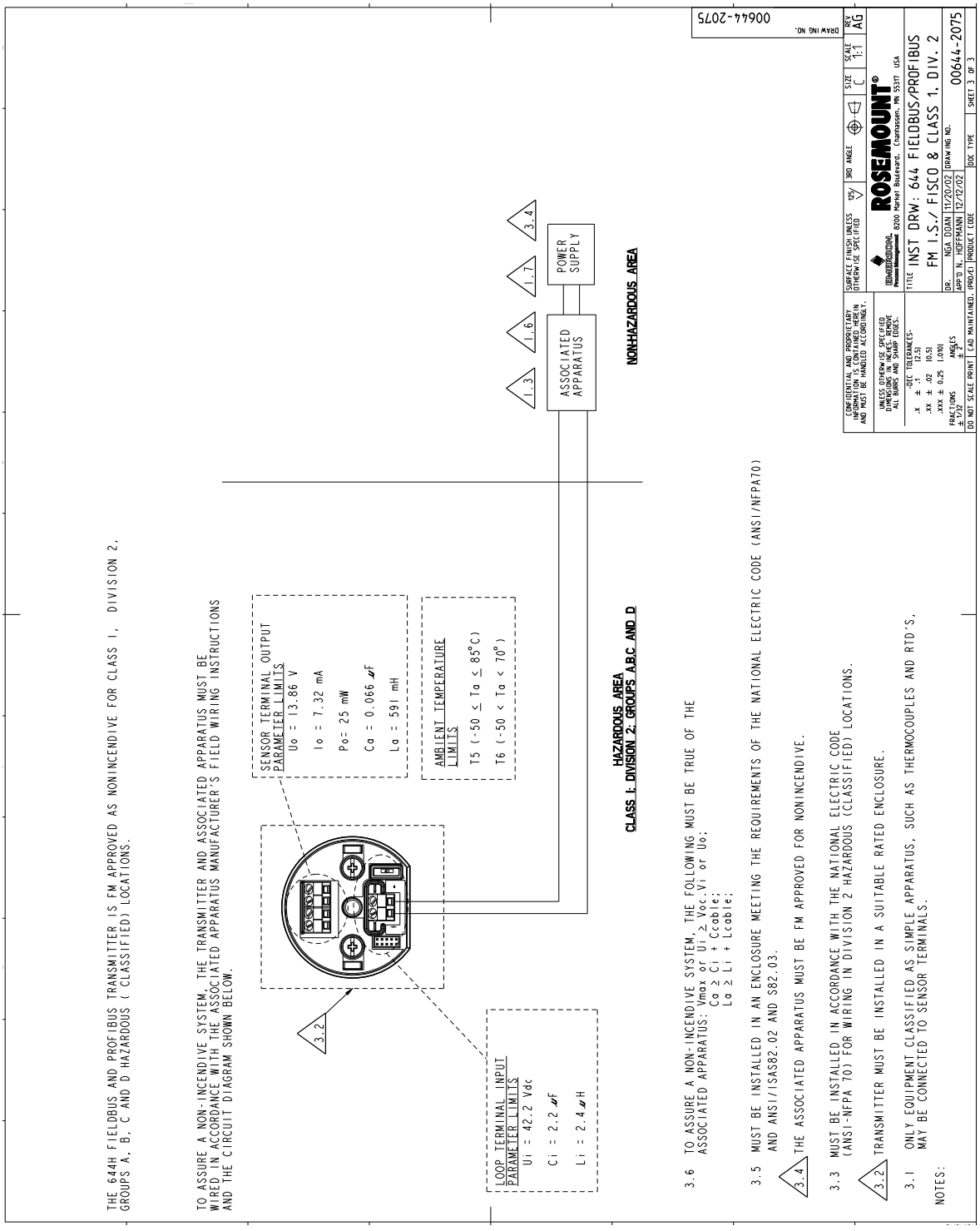
Figure B-6. FM 644 Fieldbus Intrinsic Safety and FISCO Installation Drawing 00644-2075, Rev. AG Sheet 1 of 3



Sheet 2 of 3


ROSEMOUNT 644H FIELDBUS AND PROFIBUS TRANSMITTERS ARE FM APPROVED AS FISCO WHEN USED IN CIRCUIT WITH AN APPROVED ASSOCIATED APPARATUS WHICH MEETS THE ENTITY PARAMETERS LISTED IN CLASS I, II, III; DIVISION 1 AND 2; AND GROUPS A, B, C, D, E, F AND G.
TO ASSURE A FISCO SYSTEM, THE TRANSMITTER AND ASSOCIATED APPARATUS MUST BE WIRED IN ACCORDANCE WITH THE ASSOCIATED APPARATUS MANUFACTURER'S FIELD WIRING INSTRUCTIONS AND THE CIRCUIT DIAGRAM SHOWN BELOW.
SENSOR TERMINAL OUTPUT PARAMETER LIMITS
Uo = 13.86 V
Io = 7.32 mA
Po = 25 mW
Ca = 0.066 µF
La = 591 mH
LOOP TERMINAL INPUT PARAMETER LIMITS
Ui = 17.5 Vdc
Ii = 380 mA
Pi = 5.32 W
Ci = 2.2 nF
Li = 2.4 µH
AMBIENT TEMPERATURE LIMITS
T4A(-50 ≤ Ta ≤ 60°C)
ASSOCIATED APPARATUS FISCO OUTPUT PARAMETER LIMITS
Uo ≤ 17.5Vdc
Io ≤ 380 mA
Po ≤ 5.32 W
Ca > Ccable + Ci
La > Lcable + Li
2.4
FM APPROVED TERMINATION
FM APPROVED FIELDBUS DEVICE "n" SUITABLE FOR FISCO
FM APPROVED FIELDBUS DEVICE 2 SUITABLE FOR FISCO
HAZARDOUS AREA
FISCO FOR CLASS I,II,III;
DIVISION 1 AND 2; GROUP A,B,C,D,E,F AND G
2.7
2.8
ASSOCIATED APPARATUS
2.9
2.10
POWER SUPPLY
NON-HAZARDOUS AREA
NOTES:
2.1 FISCO IS A SUBSET OF STANDARD INTRISICALLY SAFE INSTALLATION (SEE PAGE 1) EXCEPT AS SPECIFICALLY NOTED HERE.
2.2 THE FM FISCO INSTALLATION IS ONLY VALID WITH MODEL OPTION CODES 15, OR K5
WHAT IS FISCO?
FIELDBUS INTRINSICALLY SAFE CONCEPT IS A PARTICULAR, YET SUFFICIENTLY FLEXIBLE, DISTRIBUTION OF THE ELECTRICAL CHARACTERISTICS AROUND THE SEGMENT.
WHAT ARE THE BENEFITS TO INSTALLING WITHIN THE BOUNDS OF THIS CONFIGURATION?
A. MORE DEVICES ARE ALLOWED ON THE FIELDBUS SINCE MORE POWER CAN BE APPLIED.
B. THE R, L, AND C CHARACTERISTICS OF THE FIELDBUS CABLE NEED NOT BE CALCULATED.
WIRING CONFIGURATION:
LENGHT
TRUNK CABLE ≤ 1000 m
SPUR CABLE ≤ 30 m
SPLICE ≤ 1 m
CABLE PROPERTIES:
LOOP RESISTANCE, R 15 TO 150 Ohms/Km
INDUCTANCE, L 0.4 TO 1 mH/Km
CAPACITANCE, C 80 TO 200 nF/Km
C= C LINE-TO-LINE + 1/2 C LINE-TO-SHIELD (FOR BOTH LINES FLOATING WITH RESPECT TO SHIELD)
C= C LINE-TO-LINE + C LINE-TO-SHIELD (FOR ONE LINE TIED TO SHIELD)
APPARATUS CRITERIA:
2.3 Ci < 5 nF AND Li < 10 uH FOR EACH APPARATUS, OTHER THAN THE TERMINATOR, CONNECTED TO THE FIELDBUS.
2.4 R= 90 TO 100 Ohms AND C= 0 TO 2.2 µF FOR THE LINE TERMINATION. THIS TERMINATION MAY BE INTEGRATED INTO AN APPARATUS.
2.5 EACH APPARATUS, OTHER THAN THE ASSOCIATED APPARATUS, MUST BE PASSIVE. (NOT ALLOWED TO PROVIDE ENERGY TO THE SYSTEM.)
2.6 INTERCONNECTION IS ALLOWED WHEN THE FOLLOWING IS TRUE:
I.S. APPARATUS (FIELD DEVICE) INPUT
ASSOCIATED APPARATUS OUTPUT
Vmax OR Ui ≥ Voc, Vt, OR Uo
Imax OR Ii ≥ Isc, It, OR Io
Pmax OR Pi ≥ Po
2.7 ASSOCIATED APPARATUS MANUFACTURER'S INSTALLATION DRAWING MUST BE FOLLOWED WHEN INSTALLATING THIS EQUIPMENT.
2.8 CONTROL EQUIPMENT CONNECTED TO FISCO BARRIER MUST NOT USE OR GENERATE MORE THAN 250 Vms OR Vdc.
2.9 RESISTANCE BETWEEN FISCO INTRINSICALLY SAFE GROUND AND EARTH GROUND MUST BE LESS THAN 1.0 OHM.
2.10 THE ASSOCIATED APPARATUS MUST BE FM APPROVED FOR FISCO.
2.11 INSTALLATION SHOULD BE IN ACCORDANCE WITH ANSI/ISA-RP12.06.01 "INSTALLATION OF INTRINSICALLY SAFE SYSTEMS FOR HAZARDOUS (CLASSIFIED) LOCATIONS" AND THE NATIONAL ELECTRICAL CODE (ANSI/NFPA 70
2.12 MUST BE INSTALLED IN AN ENCLOSURE MEETING THE REQUIREMENTS OF THE NATIONAL ELECTRIC CODE (ANSI/NFPA70) AND ANSI/ISA82.02 AND S82.03.
CONFIDENTIAL AND PROPRIETARY INFORMATION IS CONTAINED HEREIN AND MUST BE HANDLED ACCORDINGLY.
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETERS ALL BURRS AND SHARP EDGES:
SURFACE FINISH UNLESS OTHERWISE SPECIFIED
ROSEMOUNT
8200 Market Boulevard, Chanhassen, MN 55317 USA
DEC TOLERANCES-
.X ± .1 (2.5)
.XX ± .02 (0.5)
.XXX ± 0.25 (.010)
FRACTIONS ± 1/32
ANGLES ± 2°
TITLE INST DRW: 644 FIELDBUS/PROFIBUS FM I.S./ FISCO & CLASS 1, DIV. 2
DR: NGA DOAN 11/20/02
APP'D N. HOFFMANN 12/12/02
DRAWING NO. 00644-2075
DOC TYPE
SIZE C
SCALE 1:1
REV AG
DRAWING NO. 00644-2075
DO NOT SCALE PRINT | CAD MAINTAINED. (PROVE) | PRODUCT CODE
SHEET 2 OF 3

Sheet 3 of 3


THE 644H FIELDBUS AND PROFIBUS TRANSMITTER IS FM APPROVED AS NONINCENDIVE FOR CLASS I, DIVISION 2, GROUPS A, B, C AND D HAZARDOUS (CLASSIFIED) LOCATIONS.
TO ASSURE A NON-INCENDIVE SYSTEM, THE TRANSMITTER AND ASSOCIATED APPARATUS MUST BE WIRED IN ACCORDANCE WITH THE ASSOCIATED APPARATUS MANUFACTURER'S FIELD WIRING INSTRUCTIONS AND THE CIRCUIT DIAGRAM SHOWN BELOW.
SENSOR TERMINAL OUTPUT PARAMETER LIMITS
Uo = 13.86 V
Io = 7.32 mA
Po= 25 mW
Ca = 0.066 µF
La = 591 mH
AMBIENT TEMPERATURE LIMITS
T5 (-50 ≤ Ta ≤ 85°C)
T6 (-50 < Ta < 70°)
LOOP TERMINAL INPUT PARAMETER LIMITS
Ui = 42.2 Vdc
Ci = 2.2 µF
Li = 2.4 µH
3.2
HAZARDOUS AREA
CLASS 1, DIVISION 2, GROUPS A,B,C AND D
NONHAZARDOUS AREA
1.3
1.6
1.7
3.4
ASSOCIATED APPARATUS
POWER SUPPLY
3.6 TO ASSURE A NON-INCENDIVE SYSTEM, THE FOLLOWING MUST BE TRUE OF THE ASSOCIATED APPARATUS: Vmax or Ui ≥ Voc.Vt or Uo;
Ca ≥ Ci + Ccable;
La ≥ Li + Lcable;
3.5 MUST BE INSTALLED IN AN ENCLOSURE MEETING THE REQUIREMENTS OF THE NATIONAL ELECTRIC CODE (ANSI/NFPA70) AND ANSI/ISAS82.02 AND S82.03.
3.4 THE ASSOCIATED APPARATUS MUST BE FM APPROVED FOR NONINCENDIVE.
3.3 MUST BE INSTALLED IN ACCORDANCE WITH THE NATIONAL ELECTRIC CODE (ANSI-NFPA 70) FOR WIRING IN DIVISION 2 HAZARDOUS (CLASSIFIED) LOCATIONS.
3.2 TRANSMITTER MUST BE INSTALLED IN A SUITABLE RATED ENCLOSURE.
3.1 ONLY EQUIPMENT CLASSIFIED AS SIMPLE APPARATUS, SUCH AS THERMOCOUPLES AND RTD'S, MAY BE CONNECTED TO SENSOR TERMINALS.
NOTES:
CONFIDENTIAL AND PROPRIETARY INFORMATION IS CONTAINED HEREIN AND MUST BE HANDLED ACCORDINGLY.
UNLESS OTHERWISE SPECIFIED DIMENSIONS IN INCHES REMOVE ALL BURRS AND SHARP EDGES.
DECIMAL TOLERANCES: .x ± .1 (2.5) .xx ± .02 (0.5) .xxx ± 0.25 (.010)
FRACTIONS ± 1/32 ANGLES ± 2°
SURFACE FINISH UNLESS OTHERWISE SPECIFIED
3RD ANGLE
ROSEMOUNT
8200 Market Boulevard, Chanhassen, MN 55317 USA
TITLE INST DRW: 644 FIELDBUS/PROFIBUS FM I.S./ FISCO & CLASS 1, DIV. 2
DR. NGA DOAN 11/20/02
APP'D N. HOFFMANN 12/12/02
DRAWING NO. 00644-2075
SIZE C
SCALE 1:1
REV AG
DO NOT SCALE PRINT
CAD MAINTAINED: (PROJ-D)
PRODUCT CODE
DOC TYPE
SHEET 3 OF 3
DRAWING NO. 00644-2075

Appendix C FOUNDATION fieldbus Block Information

BASIC SETUP

RESOURCE BLOCK

This section contains information on the 644 Resource Block. Descriptions of all Resource Block Parameters, errors, and diagnostics are included. Also the modes, alarm detection, status handling, and troubleshooting are discussed.

Definition

The resource block defines the physical resources of the device. The resource block also handles functionality that is common across multiple blocks. The block has no linkable inputs or outputs.

Parameters and Descriptions

The table below lists all of the configurable parameters of the Resource Block, including the descriptions and index numbers for each.

Table C-1. Resource Block Parameters and Descriptions

Parameter	Index Number	Description
ACK_OPTION	38	Selection of whether alarms associated with the function block will be automatically acknowledged.
ADVISE_ACTIVE	82	Enumerated list of advisory conditions within a device.
ADVISE_ALM	83	Alarm indicating advisory alarms. These conditions do not have a direct impact on the process or device integrity.
ADVISE_ENABLE	80	Enabled ADVISE_ALM alarm conditions. Corresponds bit for bit to the ADVISE_ACTIVE. A bit on means that the corresponding alarm condition is enabled and will be detected. A bit off means the corresponding alarm condition is disabled and will not be detected.
ADVISE_MASK	81	Mask of ADVISE_ALM. Corresponds bit of bit to ADVISE_ACTIVE. A bit on means that the condition is masked out from alarming.
ADVISE_PRI	79	Designates the alarming priority of the ADVISE_ALM
ALARM_SUM	37	The current alert status, unacknowledged states, unreported states, and disabled states of the alarms associated with the function block.
ALERT_KEY	04	The identification number of the plant unit.
BLOCK_ALM	36	The block alarm is used for all configuration, hardware, connection failure or system problems in the block. The cause of the alert is entered in the subcode field. The first alert to become active will set the Active status in the Status parameter. As soon as the Unreported status is cleared by the alert reporting task, another block alert may be reported without clearing the Active status, if the subcode has changed.
BLOCK_ERR	06	This parameter reflects the error status associated with the hardware or software components associated with a block. It is a bit string, so that multiple errors may be shown.
CLR_FSTATE	30	Writing a Clear to this parameter will clear the device FAIL_SAFE if the field condition has cleared.
CONFIRM_TIME	33	The time the resource will wait for confirmation of receipt of a report before trying again. Retry will not happen when CONFIRM_TIME=0.
CYCLE_SEL	20	Used to select the block execution method for this resource. The 644 supports the following: Scheduled: Blocks are only executed based on the function block schedule. Block Execution: A block may be executed by linking to another blocks completion.
CYCLE_TYPE	19	Identifies the block execution methods available for this resource.
DD_RESOURCE	09	String identifying the tag of the resource which contains the Device Description for this resource.
DD_REV	13	Revision of the DD associated with the resource - used by an interface device to locate the DD file for the resource.
DEFINE_WRITE_LOCK	60	Allows the operator to select how WRITE_LOCK behaves. The initial value is “lock everything”. If the value is set to “lock only physical device” then the resource and transducer blocks of the device will be locked but changes to function blocks will be allowed.
DETAILED_STATUS	55	Indicateds the state of the transmitter. See Resource Block detailed status codes.
DEV_REV	12	Manufacturer revision number associated with the resource - used by an interface device to locate the DD file for the resource.
DEV_STRING	43	This is used to load new licensing into the device. The value can be written but will always read back with a value of 0.
DEV_TYPE	11	Manufacturer’s model number associated with the resource - used by interface devices to locate the DD file for the resource.
DIAG_OPTIONS	46	Indicates which diagnostics licensing options are enabled.
DISTRIBUTOR	42	Reserved for use as distributor ID. No Foundation enumerations defined at this time.
DOWNLOAD_MODE	67	Gives access to the boot block code for over-the-wire downloads. 0 = Uninitialized 1 = Run mode 2 = Download mode

Table C-1. Resource Block Parameters and Descriptions

Parameter	Index Number	Description
FAULT_STATE	28	Condition set by loss of communication to an output block, fault promoted to an output block or physical contact. When FAIL_SAFE condition is set, then output function blocks will perform their FAIL_SAFE actions.
FAILED_ACTIVE	72	Enumerated list of failure conditions within a device.
FAILED_ALM	73	Alarm indicating a failure within a device which makes the device non-operational.
FAILED_ENABLE	70	Enabled FAILED_ALM alarm conditions. Corresponds bit for bit to the FAILED_ACTIVE. A bit on means that the corresponding alarm condition is enabled and will be detected. A bit off means the corresponding alarm condition is disabled and will not be detected.
FAILED_MASK	71	Mask of FAILED_ALM. Corresponds bit of bit to FAILED_ACTIVE. A bit on means that the condition is masked out from alarming.
FAILED_PRI	69	Designates the alarming priority of the FAILED_ALM.
FB_OPTIONS	45	Indicates which function block licensing options are enabled.
FEATURES	17	Used to show supported resource block options. See Error! Reference source not found. The supported features are: SOFT_WRITE_LOCK_SUPPORT, HARD_WRITE_LOCK_SUPPORT, REPORTS, and UNICODE
FEATURE_SEL	18	Used to select resource block options.
FINAL_ASSY_NUM	54	The same final assembly number placed on the neck label.
FREE_SPACE	24	Percent of memory available for further configuration. Zero in a preconfigured device.
FREE_TIME	25	Percent of the block processing time that is free to process additional blocks.
GRANT_DENY	14	Options for controlling access of host computers and local control panels to operating, tuning, and alarm parameters of the block. Not used by device.
HARD_TYPES	15	The types of hardware available as channel numbers.
HARDWARE_REV	52	Hardware revision of the hardware that has the resource block in it.
ITK_VER	41	Major revision number of the inter operability test case used in certifying this device as interoperable. The format and range are controlled by the Fieldbus Foundation.
LIM_NOTIFY	32	Maximum number of unconfirmed alert notify messages allowed.
MAINT_ACTIVE	77	Enumerated list of maintenance conditions within a device.
MAINT_ALM	78	Alarm indicating the device needs maintenance soon. If the condition is ignored, the device will eventually fail.
MAINT_ENABLE	75	Enabled MAINT_ALM alarm conditions. Corresponds bit for bit to the MAINT_ACTIVE. A bit on means that the corresponding alarm condition is enabled and will be detected. A bit off means the corresponding alarm condition is disabled and will not be detected.
MAINT_MASK	76	Mask of MAINT_ALM. Corresponds bit of bit to MAINT_ACTIVE. A bit on means that the condition is masked out from alarming.
MAINT_PRI	74	Designates the alarming priority of the MAINT_ALM
MANUFAC_ID	10	Manufacturer identification number – used by an interface device to locate the DD file for the resource.
MAX_NOTIFY	31	Maximum number of unconfirmed notify messages possible.
MEMORY_SIZE	22	Available configuration memory in the empty resource. To be checked before attempting a download.
MESSAGE_DATE	57	Date associated with the MESSAGE_TEXT parameter.
MESSAGE_TEXT	58	Used to indicate changes made by the user to the device's installation, configuration, or calibration.
MIN_CYCLE_T	21	Time duration of the shortest cycle interval of which the resource is capable.
MISC_OPTIONS	47	Indicates which miscellaneous licensing options are enabled.
MODE_BLK	05	The actual, target, permitted, and normal modes of the block: Target: The mode to “go to” Actual: The mode the “block is currently in” Permitted: Allowed modes that target may take on Normal: Most common mode for actual
NV_CYCLE_T	23	Minimum time interval specified by the manufacturer for writing copies of NV parameters to non-volatile memory. Zero means it will never be automatically copied. At the end of NV_CYCLE_T, only those parameters which have changed need to be updated in NVRAM.
OUTPUT_BOARD_SN	53	Output board serial number.

Table C-1. Resource Block Parameters and Descriptions

Parameter	Index Number	Description
RB_SFTWR_REV_ALL	51	The string will contains the following fields: Major rev: 1-3 characters, decimal number 0-255 Minor rev: 1-3 characters, decimal number 0-255 Build rev: 1-5 characters, decimal number 0-255 Time of build: 8 characters, xx:xx:xx, military time Day of week of build: 3 characters, Sun, Mon,... Month of build: 3 characters, Jan, Feb. Day of month of build: 1-2 characters, decimal number 1-31 Year of build: 4 characters, decimal Builder: 7 characters, login name of builder
RB_SFTWR_REV_BUILD	50	Build of software that the resource block was created with.
RB_SFTWR_REV_MAJOR	48	Major revision of software that the resource block was created with.
RB_SFTWR_REV_MINOR	49	Minor revision of software that the resource block was created with.
RECOMMENDED_ACTION	68	Enumerated list of recommended actions displayed with a device alert.
RESTART	16	Allows a manual restart to be initiated. Several degrees of restart are possible. They are the following: 1 Run – nominal state when not restarting 2 Restart resource – not used 3 Restart with defaults – set parameters to default values. See START_WITH_DEFAULTS below for which parameters are set. 4 Restart processor – does a warm start of CPU.
RS_STATE	07	State of the function block application state machine.
SAVE_CONFIG_BLOCKS	62	Number of EEPROM blocks that have been modified since last burn. This value will count down to zero when the configuration is saved.
SAVE_CONFIG_NOW	61	Allows the user to optionally save all non-volatile information immediately.
SECURITY_IO	65	Status of security switch.
SELF_TEST	59	Instructs resource block to perform self-test. Tests are device specific.
SET_FSTATE	29	Allows the FAIL_SAFE condition to be manually initiated by selecting Set.
SHED_RCAS	26	Time duration at which to give up on computer writes to function block RCas locations. Shed from RCas shall never happen when SHED_ROUT = 0
SHED_ROUT	27	Time duration at which to give up on computer writes to function block ROut locations. Shed from ROut shall never happen when SHED_ROUT = 0
SIMULATE_IO	64	Status of simulate switch.
SIMULATE_STATE	66	The state of the simulate switch: 0 = Uninitialized 1 = Switch off, simulation not allowed 2 = Switch on, simulation not allowed (need to cycle jumper/switch) 3 = Switch on, simulation allowed
ST_REV	01	The revision level of the static data associated with the function block.
START_WITH_DEFAULTS	63	0 = Uninitialized 1 = do not power-up with NV defaults 2 = power-up with default node address 3 = power-up with default pd_tag and node address 4 = power-up with default data for the entire communications stack (no application data)
STRATEGY	03	The strategy field can be used to identify grouping of blocks.
SUMMARY_STATUS	56	An enumerated value of repair analysis.
TAG_DESC	02	The user description of the intended application of the block.
TEST_RW	08	Read/write test parameter - used only for conformance testing.
UPDATE_EVT	35	This alert is generated by any change to the static data.
WRITE_ALM	40	This alert is generated if the write lock parameter is cleared.
WRITE_LOCK	34	If set, no writes from anywhere are allowed, except to clear WRITE_LOCK. Block inputs will continue to be updated.
WRITE_PRI	39	Priority of the alarm generated by clearing the write lock.
XD_OPTIONS	44	Indicates which transducer block licensing options are enabled.

SENSOR TRANSDUCER BLOCK

The transducer block contains the actual measurement data, including a pressure and temperature reading. The transducer block includes information about sensor type, engineering units, linearization, reranging, temperature compensation, and diagnostics.

Parameters and Descriptions

Table C-2. Sensor Transducer Block Parameters and Descriptions

Parameter	Index Number	Description	Notes on how changing this parameter effects transmitter operation.
ALERT_KEY	04	The identification number of the plant unit.	No effect on operation of transmitter but may affect the way alerts are sorted on the host end.
BLOCK_ALM	08	The block alarm is used for all configuration, hardware, connection failure or system problems in the block. The cause of the alert is entered in the subcode field. The first alert to become active will set the Active status in the Status parameter. As soon as the Unreported status is cleared by the alert reporting task, another block alert may be reported without clearing the Active status, if the subcode has changed.	No effect.
BLOCK_ERR	06	This parameter reflects the error status associated with the hardware or software components associated with a block. It is a bit string, so that multiple errors may be shown.	No effect.
CAL_MIN_SPAN	18	The minimum calibration span value allowed. This minimum span information is necessary to ensure when calibration is done, the two calibrated points are not too close together.	No effect.
CAL_POINT_HI	16	The highest calibrated value.	Assigns a value to the calibration high point.
CAL_POINT_LO	17	The lowest calibrated value.	Assigns a value to the calibration low point.
CAL_UNIT	19	The device description engineering units code index for the calibration values.	Device must be calibrated using the appropriate engineering units.
COLLECTION_DIRECTORY	12	A directory that specifies the number, starting indices, and DD Item ID's of the data collections in each transducer.	No effect.
ASIC_REJECTION	42	Indicates the type of material that the drain vents on the flange are made of. See Drain Vent Material Codes.	
FACTORY_CAL_RECALL	32	Recalls the sensor calibration set at the factory.	
USER_2W_OFFSET	36	Indicates the type of material that the flange is made of. See Flange Material Codes.	
INTER_DETECT_THRESH	35	Indicates the type of flange that is attached to the device. See Flange Type Codes.	
MODE_BLK	05	The actual, target, permitted, and normal modes of the block. Target: The mode to “go to” Actual: The mode the “block is currently in” Permitted: Allowed modes that target may take on Normal: Most common mode for target	Assigns the device mode.
CALIBRATOR_MODE	33	Indicates the type of sensor module.	
PRIMARY_VALUE	14	The measured value and status available to the function block.	No effect.

Table C-2. Sensor Transducer Block Parameters and Descriptions

Parameter	Index Number	Description	Notes on how changing this parameter effects transmitter operation.
PRIMARY_VALUE_RANGE	15	The high and low range limit values, the engineering unit code, and the number of digits to the right of the decimal point to be used to display the final value. Valid engineering units are the following: 1130 = Pa 1133 = kPa 1137 = bar 1138 = mbar 1139 = torr 1140 = atm 1141 = psi 1144 = g/cm^2 1145 = kg/cm^2 1148 = inH_2O @ 68 °F 1151 = mmH_2O @ 68 °F 1154 = ftH_2O @ 68 °F 1156 = inHg @ 0 °C 1158 = mmHg @ 0 °C	No effect.
PRIMARY_VALUE_TYPE	13	Type of measurement represented by the primary value. 107 = Differential pressure 108 = Gage pressure 109 = Absolute pressure	No effect.
SENSR_DETAILED_STATUS	37	Indicates the number of remote seals that are attached to the device. See Remote Seal Number Codes.	
CAL_VAN_DUSEN_COEFF	38	Indicates the type of remote seals that are attached to the device. See Remote Seal Type Codes.	
SECONDARY_VALUE_RANG	30	The secondary value, related to the sensor.	No effect.
SECONDARY_VALUE_UNIT	29	Engineering units to be used with SECONDARY_VALUE. 1001 °C 1002 °F	No effect.
SENSOR_CAL_DATE	25	The last date on which the calibration was performed.This is intended to reflect the calibration of that part of the sensor that is usually wetted by the process.	No effect.
SENSOR_CAL_LOC	24	The last location of the sensor calibration. This describes the physical location at which the calibration was performed.	No effect.
SENSOR_CAL_METHOD	23	The method of last sensor calibration.	No effect.
OPEN_SNSR_HOLDOFF	34	The type of last sensor calibration.	No effect.
SENSOR_CAL_WHO	26	The name of the person responsible for the last sensor calibration.	No effect.
SECONDARY_VALUE	28	Defines the type of fill fluid used in the sensor.	No effect.
SENSOR_CONNECTION	27	Defines the construction material of the isolating diaphragms.	No effect.
SENSOR_RANGE	21	The high and low range limit values, the engineering units code, and the number of digits to the right of the decimal point for the sensor.	No effect.
SENSOR_SN	22	Serial number of the sensor.	No effect.
SENSOR_TYPE	20	Type of sensor connected with the transducer block.	No effect.
ST_REV	01	The revision level of the static data associated with the function block.	No effect.

Table C-2. Sensor Transducer Block Parameters and Descriptions

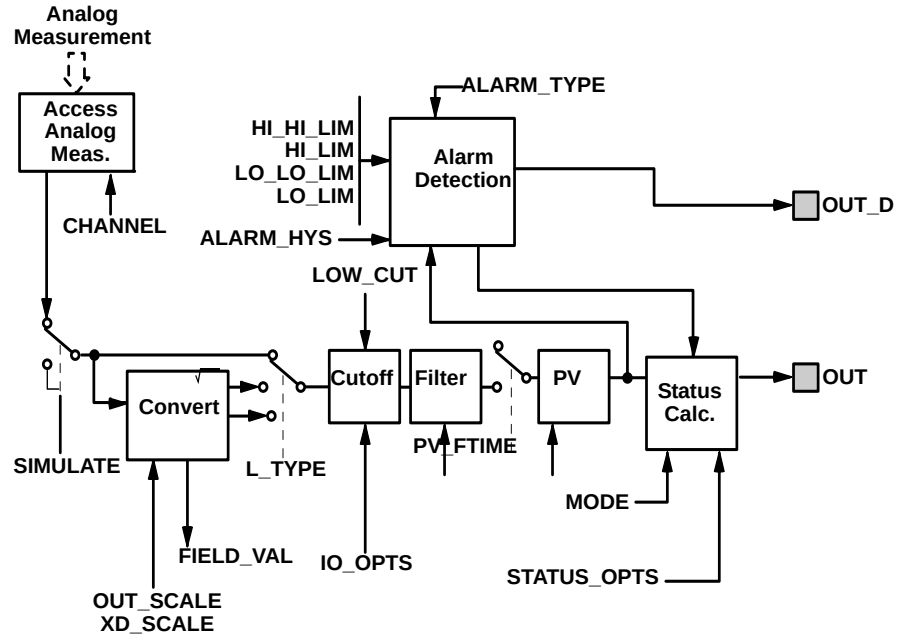
Parameter	Index Number	Description	Notes on how changing this parameter effects transmitter operation.
STRATEGY	03	The strategy field can be used to identify grouping of blocks.	No effect.
TAG_DESC	02	The user description of the intended application of the block.	No effect.
SESNOR_1_DAMPING	31	Indicates the state of the transmitter. The parameter contains specific codes relating to the transducer block and the pressure sensor specifically.	No effect.
TRANSDUCER_DIRECTORY	09	Directory that specifies the number and starting indices of the transducers in the transducer block.	No effect.
TRANSDUCER_TYPE	10	Identifies the transducer that follows.	No effect.
UPDATE_EVT	07	This alert is generated by any change to the static data.	No effect.
XD_ERROR	11	Provides additional error codes related to transducer blocks.	No effect.

ANALOG INPUT (AI) FUNCTION BLOCK

The Analog Input (AI) function block processes field device measurements and makes them available to other function blocks. The output value from the AI block is in engineering units and contains a status indicating the quality of the measurement. The measuring device may have several measurements or derived values available in different channels. Use the channel number to define the variable that the AI block processes.

The AI block supports alarming, signal scaling, signal filtering, signal status calculation, mode control, and simulation. In Automatic mode, the block's output parameter (OUT) reflects the process variable (PV) value and status. In Manual mode, OUT may be set manually. The Manual mode is reflected on the output status. A discrete output (OUT_D) is provided to indicate whether a selected alarm condition is active. Alarm detection is based on the OUT value and user specified alarm limits. Figure C-1 illustrates the internal components of the AI function block, and Table C-3 lists the AI block parameters and their units of measure, descriptions, and index numbers.

Figure C-1. AI Function Block



NOTES:
OUT = block output value and status.
OUT_D = discrete output that signals a selected alarm condition.

AI Parameter Table

Table C-3. Definitions of Analog Input Function Block System Parameters

Parameter	Index No.	Available Values	Units	Default	Read/Write	Description
ACK_OPTION	23	0 = Auto Ack Disabled 1 = Auto Ack Enabled	None	0 all Disabled	Read and Write	Used to set auto acknowledgment of alarms.
ALARM_HYS	24	0 – 50	Percent	0.5	Read and Write	The amount the alarm value must return within the alarm limit before the associated active alarm condition clears.
ALM_SEL	38	HI_HI, HI, LO, LO_LO	None	Non selected	Read and Write	Used to select the process alarm conditions that will cause the OUT_D parameter to be set.
ALARM_SUM	22	Enable/Disable	None	Enable	Read and Write	The summary alarm is used for all process alarms in the block. The cause of the alert is entered in the subcode field. The first alert to become active will set the Active status in the Status parameter. As soon as the Unreported status is cleared by the alert reporting task, another block alert may be reported without clearing the Active status, if the subcode has changed.
ALERT_KEY	04	1 – 255	None	0	Read and Write	The identification number of the plant unit. This information may be used in the host for sorting alarms, etc.
BLOCK_ALM	21	Not applicable	None	Not applicable	Read only	The block alarm is used for all configuration, hardware, connection failure or system problems in the block. The cause of the alert is entered in the subcode field. The first alert to become active will set the Active status in the Status parameter. As soon as the Unreported status is cleared by the alert reporting task, another block alert may be reported without clearing the Active status, if the subcode has changed.
BLOCK_ERR	06	Not applicable	None	Not applicable	Read only	This parameter reflects the error status associated with the hardware or software components associated with a block. It is a bit string, so that multiple errors may be shown.
CAP_STDDEV	40	> = 0	Seconds	0	Read and Write	The time over which the VAR_INDEX is evaluated.
CHANNEL	15	1 = Pressure 2 = Housing temperature	None	AI[1]: Channel = 1 AI2: Channel = 2	Read and Write	The CHANNEL value is used to select the measurement value. Refer to the appropriate device manual for information about the specific channels available in each device. You must configure the CHANNEL parameter before you can configure the XD_SCALE parameter.
FIELD_VAL	19	0 – 100	Percent	Not applicable	Read only	The value and status from the transducer block or from the simulated input when simulation is enabled.
GRANT_DENY	12	Program Tune Alarm Local	None	Not applicable	Read and Write	Normally the operator has permission to write to parameter values, but Program or Local remove that permission and give it to the host controller or a local control panel.
HI_ALM	34	Not applicable	None	Not applicable	Read only	The HI alarm data, which includes a value of the alarm, a timestamp of occurrence and the state of the alarm.
HI_HI_ALM	33	Not applicable	None	Not applicable	Read only	The HI HI alarm data, which includes a value of the alarm, a timestamp of occurrence and the state of the alarm.
HI_HI_LIM	26	Out_Scale[2]	Out_Scale[2]	Not applicable	Read and Write	The setting for the alarm limit used to detect the HI HI alarm condition.
HI_HI_PRI	25	0 – 15	None	1	Read and Write	The priority of the HI HI alarm.
HI_LIM	28	Out_Scale[2]	Out_Scale[2]	Not applicable	Read and Write	The setting for the alarm limit used to detect the HI alarm condition.
HI_PRI	27	0 – 15	None	1	Read and Write	The priority of the HI alarm.
IO_OPTS	13	Low Cutoff Enable/Disable	None	Disable	Read and Write	Allows the selection of input/output options used to alter the PV. Low cutoff enabled is the only selectable option.
L_TYPE	16	Direct Indirect Indirect Square Root	None	Direct	Read and Write	Linearization type. Determines whether the field value is used directly (Direct), is converted linearly (Indirect), or is converted with the square root (Indirect Square Root).

Table C-3. Definitions of Analog Input Function Block System Parameters

Parameter	Index No.	Available Values	Units	Default	Read/Write	Description
LO_ALM	35	Not applicable	None	Not applicable	Read only	The LO alarm data, which includes a value of the alarm, a timestamp of occurrence and the state of the alarm.
LO_LIM	30	Out_Scale(2)	Out_Scale(2)	Not applicable	Read and Write	The setting for the alarm limit used to detect the LO alarm condition.
LO_LO_ALM	36	Not applicable	None	Not applicable	Read only	The LO LO alarm data, which includes a value of the alarm, a timestamp of occurrence and the state of the alarm.
LO_LO_LIM	32	Out_Scale(2)	Out_Scale(2)	Not applicable	Read and Write	The setting for the alarm limit used to detect the LO LO alarm condition.
LO_LO_PRI	31	0 – 15	None	1	Read and Write	The priority of the LO LO alarm.
LO_PRI	29	0 – 15	None	1	Read and Write	The priority of the LO alarm.
LOW_CUT	17	> = 0	Out_Scale(2)	0	Read and Write	If percentage value of transducer input fails below this, PV = 0.
MODE_BLK	05	Auto Manual Out of Service	None	Not applicable	Read and Write	The actual, target, permitted, and normal modes of the block. Target: The mode to “go to” Actual: The mode the “block is currently in” Permitted: Allowed modes that target may take on Normal: Most common mode for target
OUT	08	Out_Scale(2) ± 10%	Out_Scale(2)	Not applicable	Read and Write	The block output value and status.
OUT_D	37	Discrete_State 1 – 16	None	Disabled	Read and Write	Discrete output to indicate a selected alarm condition.
OUT_SCALE	11	Any output range	All available	none	Read and Write	The high and low scale values, engineering units code, and number of digits to the right of the decimal point associated with OUT.
PV	07	Not applicable	Out_Scale(2)	Not applicable	Read only	The process variable used in block execution.
PV_FTIME	18	> = 0	Seconds	0	Read and Write	The time constant of the first-order PV filter. It is the time required for a 63% change in the IN value.
SIMULATE	09	Not applicable	None	Disable	Read and Write	A group of data that contains the current transducer value and status, the simulated transducer value and status, and the enable/disable bit.
ST_REV	01	Not applicable	None	0	Read only	The revision level of the static data associated with the function block. The revision value will be incremented each time a static parameter value in the block is changed.
STATUS_OPTS	14	Propagate fault forward Uncertain if Limited Bad if Limited Uncertain if Man Mode		0	Read and Write	
STDDEV	39	0 – 100	Percent	0	Read and Write	The average absolute error between the PV and its previous mean value over that evaluation time defined by VAR_SCAN.
STRATEGY	03	0 – 65535	None	0	Read and Write	The strategy field can be used to identify grouping of blocks. This data is not checked or processed by the block.
TAG_DESC	02	32 text characters	None	none	Read and Write	The user description of the intended application of the block.
UPDATE_EVT	20	Not applicable	None	Not applicable	Read only	This alert is generated by any change to the static data.
XD_SCALE	10	Any sensor range	inH_2O (68 °F) inHg (0 °C) ftH_2O (68 °F) mmH_2O (68 °F) mmHg (0 °C) psi bar mbar g/cm^2 kg/cm^2 Pa kPa torr atm deg C deg F	AI1(1): Customer specification or inH_2O (68 °F) for DP/GP rng 1, 2, 3) or psi for DP/GP rng 4, 5 AP/644 all rng AI2 deg C		In all Rosemount devices the units of the transducer block is forced to match the unit code.

(1) The host system may write over default values pre-configured by Rosemount Inc.
(2) Assume that when L_Type = Direct, the user configures Out_Scale which is equal to XD_Scale

LCD TRANSDUCER BLOCK

Table C-4. LCD Transducer Block Parameters and Descriptions

Parameter	Index	Description
ALERT_KEY	4	The identification number of the plant unit.
BLK_TAG_1	15	The tag of the block containing DP1.
BLK_TAG_2	21	The tag of the block containing DP2.
BLK_TAG_3	27	The tag of the block containing DP3.
BLK_TAG_4	33	The tag of the block containing DP4.
BLK_TYPE_1	14	The enumerated block type for DP1's block.
BLK_TYPE_2	20	The enumerated block type for DP2's block.
BLK_TYPE_3	26	The enumerated block type for DP3's block.
BLK_TYPE_4	32	The enumerated block type for DP4's block.
BLOCK_ALM	8	The BLOCK_ALM is used for all configuration, hardware, connection failure or system problems in the block. The cause of the alert is entered in the subcode field. The first alert to become active will set the Active status in the Status attribute. As soon as the Unreported status is cleared by the alert reporting task, another block alert may be reported without clearing the Active status, if the subcode has changed.
BLOCK_ERR	6	This parameter reflects the error status associated with the hardware or software components associated with a block. it is a bit string, so that multiple errors may be shown.
COLLECTION_DIRECTORY	12	A directory that specifies the number, starting indicies, and DD Item ID's of the data collections in each transducer block.
CUSTOM_TAG_1	17	The block description that is displayed for DP1.
CUSTOM_TAG _2	23	The block description that is displayed for DP2.
CUSTOM_TAG _3	29	The block description that is displayed for DP3.
CUSTOM_TAG _4	35	The block description that is displayed for DP4.
CUSTOM_UNITS_1	19	This is the user entered units that are displayed when UNITS_TYPE_1=Custom.
CUSTOM_UNITS _2	25	This is the user entered units that are displayed when UNITS_TYPE_2=Custom.
CUSTOM_UNITS _3	31	This is the user entered units that are displayed when UNITS_TYPE_3=Custom.
CUSTOM_UNITS _4	37	This is the user entered units that are displayed when UNITS_TYPE_4=Custom.
DISPLAY_PARAM_SEL	13	This will determine which Display Parameters are active. Bit 0 = DP1 Bit 1 = DP2 Bit 2 = DP3 Bit 3 = DP4 Bit 4 = Bar Graph enable
MODE_BLK	5	The actual, target, permitted, and normal modes of the block.
PARAM_INDEX_1	16	The relative index of DP1 within its block.
PARAM_INDEX_2	22	The relative index of DP2 within its block.
PARAM_INDEX_3	28	The relative index of DP3 within its block.
PARAM_INDEX_4	34	The relative index of DP4 within its block.
ST_REV	1	The revision level of the static data associated with the function block.
STRATEGY	3	The strategy field can be used to identify grouping of blocks.
TAG_DESC	2	The user description of the intended application of the block.
TRANSDUCER_DIRCTORY	9	A directory that specifies the number and starting indicies of the transducers in the transducer block.
TRANSDUCER_TYPE	10	Identifies the transducer that follows.
UNITS_TYPE_1	18	This parameter determines where the units for the display parameter come from.
UNITS_TYPE_2	24	This parameter determines where the units for the display parameter come from.
UNITS_TYPE_3	30	This parameter determines where the units for the display parameter come from.
UNITS_TYPE_4	36	This parameter determines where the units for the display parameter come from.
UPDATE_EVT	7	This alert is generated by any change to the staic data.
XD_ERROR	11	Provides additional error codes related to transducer blocks.

PID BLOCK

Table C-5. PID Block Parameters and Descriptions

Parameter	Index		Parameter	Index		Parameter	Index
ACK_OPTIONS	46		HI_HI_LIM	49		SP_LO_LIM	22
ALARM_HYS	47		HI_HI_PRI	48		SP_RATE_DN	19
ALARM_SUM	45		HI_LIM	51		SP_RATE_UP	20
ALERT_KEY	4		HI_PRI	50		SP_WORK	68
BAL_TIME	25		IDEADBAND	74		ST_REV	1
BETA	73		IN	15		STATUS_OPTS	14
BIAS	66		LO_ALM	62		STDDEV	75
BKCAL_HYS	30		LO_LIM	53		STRATEGY	3
BKCAL_IN	27		LO_LO_ALM	63		STRUCTURECONFIG	71
BKCAL_OUT	31		LO_LO_LIM	55		T_AOPERIODS	92
BLOCK_ALARM	44		LO_LO_PRI	54		T_AUTO_EXTRA_DT	90
BLOCK_ERR	6		LO_PRI	52		T_AUTO_HYSTERESIS	91
BYPASS	17		MATHFORM	70		T_GAIN_MAGNIFIER	89
CAP_STDDEV	76		MODE_BLK	5		T_HYSTER	87
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Emerson Process Management

Rosemount Inc.
8200 Market Boulevard
Chanhassen, MN 55317 USA
T (U.S.) 1-800-999-9307
T (International) (952) 906-8888
F (952) 906-8889

www.rosemount.com

Emerson Process Management Temperature GmbH
Frankenstrasse 21
63791 Karlstein
Germany
T 49 (6188) 992 0
F 49 (6188) 992 112

Emerson Process Management Asia Pacific Private Limited
1 Pandan Crescent
Singapore 128461
T (65) 6777 8211
F (65) 6777 0947
Enquiries@AP.EmersonProcess.com

00809-0400-4728 Rev AA, 6/11

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