Model RTT15S Optical Temperature Transmitter OTTPlus

Installation, Startup, Troubleshooting, and Maintenance

Schneider Electric

Contents

Figures

Tables

Important Information

Read these instructions carefully and look at the equipment to become familiar with the device before trying to install, operate, service, or maintain it. The following special messages may appear throughout this manual or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.

The addition of either symbol to a "Danger" or "Warning" safety label indicates that an electrical hazard exists which will result in personal injury if the instructions are not followed.

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

⚠ DANGER
DANGER indicates a hazardous situation which, if not avoided, **will result in** death or serious injury.

⚠ WARNING
WARNING indicates a hazardous situation which, if not avoided, **could result in** death or serious injury.

⚠ CAUTION
CAUTION indicates a hazardous situation which, if not avoided, **could result in** minor or moderate injury.

NOTICE
NOTICE is used to address practices not related to physical injury.

Please Note

Electrical equipment should be installed, operated, and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

A qualified person is one who has skills and knowledge related to the construction, installation, and operation of electrical equipment and has received safety training to recognize and avoid the hazards involved.

1. Introduction

⚠ WARNING
RISK OF IMPROPER INSTALLATION
Only technicians who are familiar with the technical terms, warnings, and instructions in the manual and who are able to follow these should connect the device.
If there be any doubt as to the correct handling of the device, please contact your local distributor or Global Customer Support.
Mounting and connection of the device must comply with national legislation for mounting of electric materials.
Failure to follow these instructions can result in death or serious injury.

⚠ DANGER
HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH
Do not remove the transmitter cover in explosive atmospheres when the circuit is alive.
The transmitter cover must be fully engaged to meet the explosion proof requirements.
For installation in hazardous area the corresponding installation drawing must be followed in detail.
Take care not to generate mechanical sparking when accessing the instrument and peripheral devices in a hazardous location.
Failure to follow these instructions will result in death or serious injury.

NOTICE
RISK OF VOIDING WARRANTY
The transmitter module (inside the housing) is completely sealed and cannot be repaired. Any attempt to open the transmitter module voids the warranty.
Failure to follow these instructions can void the warranty.

NOTICE
POTENTIAL EQUIPMENT DAMAGE
If installed under high-vibration conditions, the transmitter may required supplementary support.
Failure to follow this instructions can result in equipment damage.

General Description

The RTT15S Temperature Transmitter is a microprocessor-based temperature transmitter that receives input signals from thermocouples, RTDs, resistance (ohms), or millivolt sources. It communicates with HART® protocol versions 5 and 7.

The transmitter is available as an intrinsically safe basic module, or in an explosion proof housing made of low copper aluminum (copper content is <0.05%) or 316 ss. For transmitters with a housing, two integral LCD displays are offered. One option has optical buttons that allow local configuration of the instrument through the glass cover of the housing. The second option serves as a display only, without configuration buttons.

Reference Documents

For additional and related information, refer to the documents listed in Table 1.

Table 1. Reference Documents

Document	Description
PSS 2A-1F5 B	Product Specifications - Model RTT15S Optical Temperature Transmitter OTTPlus
DP 020-470	Dimensional Print – Temperature Transmitter Model RTT15S
PL 008-663	Parts List – Temperature Transmitter Model RTT15S
MI 020-524	Safety Information - Temperature Transmitter Model RTT15S
MAN 4250	HART Communicator Product Manual (supplied with the communicator)

Transmitter Identification

See Figure 1 for a typical agency data label. For transmitters enclosed in a housing, the basic unit agency label is located on the basic unit and the applicable agency and data labels are externally mounted on the transmitter housing.

> **NOTE**
> The year of manufacture is the last two digits in the production number in the lower left corner of the label.

Figure 1. Marking - Transmitter with Housing

Figure 2. Marking - Transmitter without Housing
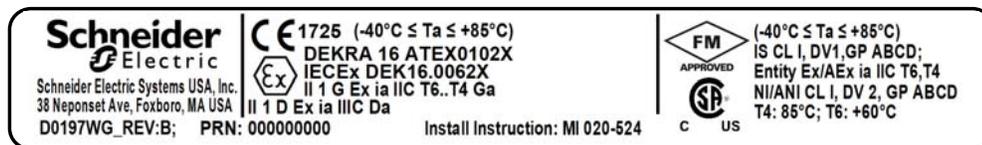
> **NOTE**
> The ambient temperature range depends on T rating, type of protection and sealing materials. Refer to installation drawings in MI 020-524.

Standard Specifications

Ambient temperature limits:

-40 and +85°C (-40 and +185°F) for no housing, or housing with silicone o-ring, or no housing

-20 and +85°C (-4 and +185°F) for housing with FKM o-ring

Reduced LCD performance below -20°C and above +70°C (-40°F and +158°F)

Storage temperature: -40 to +85°C (-40 to +185°F)

Calibration temperature: 20 to 28°C (68 to 82°F)

Relative humidity limits:

   0 and 100% RH (condensing) with housing

   < 95% RH (non-condensing) without housing

Ingress Protection: IP54/IP66/IP68/NEMA Type 4X

Vibration: IEC 60068-2-6:2007

   1.6 mm (0.06 in) from 2 to 25 Hz

   4 g from 25 to 100 Hz

Supply voltage, DC:

   Ex ia, intrinsically safe:

       10 to 30 VDC (12 to 30 VDC with backlight)

   Other

       10 to 35 VDC (12 to 35 VDC with backlight)

       12 to 35 VDC with optional display)

Supply voltage effect:

   0.005% 0f span per volt change

Isolation - test/working: 1.5 kVAC/50 VAC

Signal/noise ratio: >60 dB

Programming: HART

Start-up time (transmitter to display): Maximum 5 s

Damping (programmable): 1-60 s

Long-term stability (Drift): 0.1% of span/year

Input Specifications

RTD Input Specifications

Cable resistance per wire (max): 5 Ω (up to 50 Ω per wire is possible with reduced measurement accuracy)

Sensor current: Nom. 0.2 mA

Table 2. RTD Range Limits and Span

RTD Type	Range Limits	Min. Span	Standard
Pt100	-200 and +850°C -328 and +1,562°F	10°C (18°F)	IEC 60751:2008
Ni100	-60 and +250°C -76 and +482°F	10°C (18°F)	DIN 43760 IPTS-68
Linear R	0 - 7000 Ω	25 Ω	-

Thermocouple Input Specifications

Cold junction compensation: Constant, internal, or external via a Pt100 or Ni100 sensor

Table 3. Thermocouple Range Limits and Span

TC Type	Range Limits	Min. Span	Standard
B	0 and 1,820°C (32 and 3,308°F)	100°C (180°F)	IEC584
E	-100 and +1,000°C (-148 and +1,832°F)	50°C (90°F)	IEC584
J	-100 and +1,200°C (-148 and +2,192°F)	50°C (90°F)	IEC584
K	-180 and +1,372°C (-292 and +2,501.6°F)	50°C (90°F)	IEC584
L	-200 and +900°C (-328 and +1,652°F)	50°C (90°F)	DIN 43710
Lr	-200 and +800°C (-328 and +1,472°F)	50°C (90°F)	GOST 3044-84
N	-180 and +1,300°C (-292 and +2,372°F)	50°C (90°F)	IEC584
R	-50 and +1,760°C (-58 and +3,200°F)	100°C (180°F)	IEC584
S	-50 and +1,760°C (-58 and +3,200°F)	100°C (180°F)	IEC584
T	-200 and +400°C (-328 and +752°F)	50°C (90°F)	IEC584
U	-200 and +600°C (-328 and 1,112°F)	50°C (90°F)	DIN 43710
W3	0 and 2,300°C (32 and 4,172°F)	100°C (180°F)	ASTM E988-90
W5	0 and 2,300°C (32 and 4,172°F))	100°C (180°F)	ASTM E988-90

Millivolt Input Specifications

Table 4. Millivolt Input Range Limits and Span

Range Limits	Min. Span	Input Resistance
-800 and +800 mV	2.5 mV	10 MΩ

Ohms Resistance Input Specifications

Table 5. Ohms Resistance Input Range Limits and Span

Range Limits	Min. Span
0 and 7,000 Ω	25 Ω

Output Specifications

Signal range: 4 to 20 mA

Min. signal range: 16 mA

Updating time: 440 ms

Load resistance: ≤ (Vsupply - 10) / 0.023 [Ω]
  with backlight: ≤ (Vsupply - 12) / 0.023 [Ω]

Sensor error detection, programmable: 3.5 to 23 mA
  (shorted sensor error detection is ignored at TC and mV input)

NAMUR NE43 upscale: 23 mA

NAMUR NE43 downscale: 3.5 mA

HART protocol revisions: HART 7 and HART 5

Accuracy

Accuracy is the larger value from Table 6 or Table 7.

Table 6. General Values

Input Type	Absolute Accuracy	Temperature Coefficient
All	≤ ±0.05% of span	≤ ±0.005% of span/°C

Table 7. Basic Values

Input Type	Basic Accuracy	Temperature Coefficient
Pt50 - Pt1000	≤ ±0.1°C	≤ ±0.005°C/°C
Ni50 - Ni1000	≤ ±0.2°C	≤ ±0.005°C/°C
Resistance	≤ ±0.1 Ω	≤ ±5 mΩ/°C
Volt	≤ ±10 µV	≤ ±0.5 µV/°C
TC type E, J, K, L, N, T, U	≤ ±0.5°C	≤ ±0.025°C/°C
TC type B[1], R, S, W3, W5	≤ ±1°C	≤ ±0.1°C/°C
TC type B[2]	≤ ±3°C	≤ ±0.3°C/°C
TC type B[3]	≤ ±8°C	≤ ±0.8°C/°C
TC type B[4]	not specified	not specified

TC B[1] accuracy specification range: > 400°C

TC B[2] accuracy specification range: > 160°C < 400°C

TC B[3] accuracy specification range: > 85°C < 160°C

TC B[4] accuracy specification range: < 85°C

TC cold junction compensation: < ±1.0°C

Max. offset on input signal: 50% of selec. max. value

EMC - immunity influence: < ±0.1% of span

Extended EMC immunity: NAMUR NE 21, A criterion, burst < ±1% of span

Variable Assignments

Table 8. Suggested HART Variable Assignments

Setup	Primary	Secondary	Tertiary	Fourth
RTD 2-, 3-, 4-wire	RTD			Electronic Temp
Differential RTD 2-wire	RTD Diff	RTD 1	RTD 2	Electronic Temp
Average RTD 2-wire	RTD Avg	RTD 1	RTD 2	Electronic Temp
TC with Internal or Constant CJC	TC			CJC Temp
TC with External CJC	TC			CJC Temp
Differential TC with Internal or Constant CJC	TC Diff	TC 1	TC 2	CJC Temp
Average TC with Internal or Constant CJC	TC Avg	TC 1	TC 2	CJC Temp
Differential TC with External CJC	TC Diff	TC 1	TC 2	CJC Temp
Average TC with External CJC	TC Avg	TC 1	TC 2	CJC Temp
mV	mV			Electronic Temp
Differential mV	mV Diff	mV 1	mV 2	Electronic Temp
Average mV	mV Avg	mV 1	mV 2	Electronic Temp

Block Diagram

Figure 3. Block Diagram for RTT15S
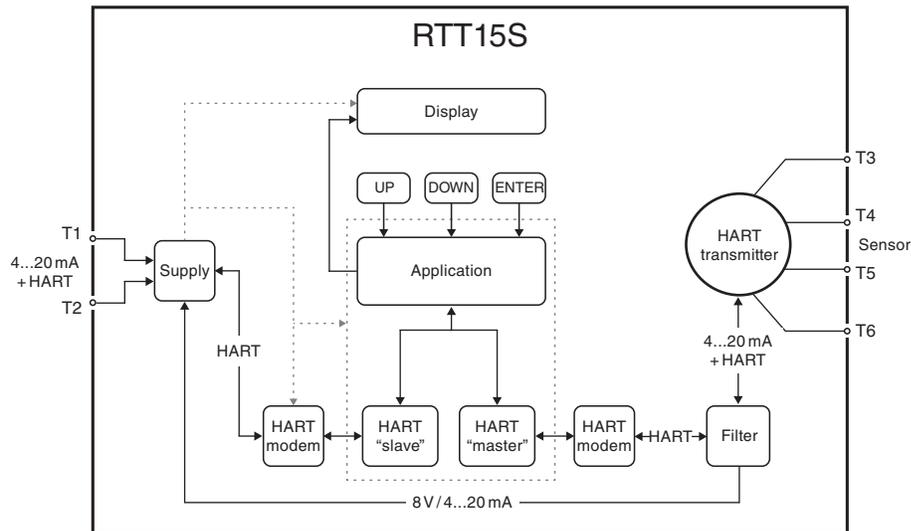
Electrical Safety Specifications

These transmitters have been designed to meet the electrical safety descriptions listed in the tables below when installed in accordance with MI 020-524. For detailed information or status of testing laboratory approvals/certifications, contact Global Customer Support.

Table 9. Electrical Safety Specifications - Transmitter with Housing

Agency Certification, Type of Protection, and Area Classification	Application Conditions	Electrical Safety Design Code

ATEX intrinsic safe
II 1 G Ex ia IIC T6...T4 Ga
II 1 D Ex ia IIIC T100°C Da
	T4: -40 ≤ Ta ≤ 85°C T100°C
	   (RTT15S-T…1, RTT15S-T…2)
	T4: -40 ≤ Ta ≤ 80°C T100°C
	   (RTT15S-T…3, RTT15S-T…4)
	T5: -40 ≤ Ta ≤ 60°C T75°C
	T6: -40 ≤ Ta ≤ 45°C T60°C
		AA

ATEX non sparking II 3 G Ex nA IIC T6...T4 Gc II 3 G Ex ic IIC T6...T4 Gc II 3 D Ex ic IIIC T100°C Dc Zone 2, 22	**For Ex nA:** **O-Ring Sealing: Silicone** T4: -40 ≤ Ta ≤ 85°C T4 (RTT15S-T…1, RTT15S-T…2) T4: -40 ≤ Ta ≤ 80°C T4 (RTT15S-T…3, RTT15S-T…4) T6: -40 ≤ Ta ≤ 60°C T6 **O-Ring Sealing: FKM** T4: -20 ≤ Ta ≤ 85°C (RTT15S-T…1, RTT15S-T…2) T4: -20 ≤ Ta ≤ 80°C (RTT15S-T…3, RTT15S-T…4) T6: -20 ≤ Ta ≤ 60°C **For Ex ic:** T4: -40 ≤ Ta ≤ 85°C T100°C (RTT15S-T…1, RTT15S-T…2) T4: -40 ≤ Ta ≤ 80°C T100°C (RTT15S-T…3, RTT15S-T…4) T6: -40 ≤ Ta ≤ 60°C T85°C	AN
ATEX Ex d (flameproof) II 2 G Ex d IIC T6...T4 Gb II 2 D Ex tb IIIC T100°C Db Zone 1, 2, 21, 22	**For Ex d:** T4, T5: -40 ≤ Ta ≤ 85°C (RTT15S-T…1, RTT15S-T…2) T4, T5: -40 ≤ Ta ≤ 80°C (RTT15S-T…3, RTT15S-T…4) T6: -40 ≤ Ta ≤ 70°C **For Ex tb:** **O-Ring Sealing: Silicone** -40 ≤ Ta ≤ 85°C T100°C (RTT15S-T…1, RTT15S-T…2) -40 ≤ Ta ≤ 80°C T100°C (RTT15S-T…3, RTT15S-T…4) -40 ≤ Ta ≤ 70°C T85°C **O-Ring Sealing: FKM** -20 ≤ Ta ≤ 85°C T100°C (RTT15S-T…1, RTT15S-T…2) -20 ≤ Ta ≤ 80°C T100°C (RTT15S-T…3, RTT15S-T…4) -20 ≤ Ta ≤ 70°C T85°C	AD

CSA intrinsic safe
Class I, Division1, Groups ABCD;
Class II, Group EFG;
Class III, Division 1.
Class I, Zone 0, IIC
Ex/AEx ia IIC Ga
	T4: -40 ≤ Ta ≤ 85°C T100°C
	   (RTT15S-T…1, RTT15S-T…2)
	T4: -40 ≤ Ta ≤ 80°C T100°C
	   (RTT15S-T…3, RTT15S-T…4)
	T5: -40 ≤ Ta ≤ 60°C T75°C
	T6: -40 ≤ Ta ≤ 45°C T60°C
		CA

CSA explosion proof Class I, Division 1, Groups ABCD; Class II, Division 1, Groups EFG; Class III Ex d IIC, Class I, Zone 1	T4,T5: -20/-40 ≤ Ta ≤ 85°C T100°C T6: -20/-40 ≤ Ta ≤ 70°C T85°C Silicone o-ring: -40°C ≤ Ta ≤ +85°C FKM o-ring: -20°C ≤ Ta ≤ +85°C	CD

Table 9. Electrical Safety Specifications - Transmitter with Housing (Continued)

Agency Certification, Type of Protection, and Area Classification	Application Conditions	Electrical Safety Design Code
FM intrinsic safe Class I, II, III, Division 1, Groups ABCDEFG Class 1, Zone 0, IIC, Zone 20	T4: -40 ≤ Ta ≤ 85°C T5: -40 ≤ Ta ≤ 60°C T6: -40 ≤ Ta ≤ 40°C Zone 20 Temperature Class: T4: -40 ≤ Ta ≤ 85°C T100°C T5: -40 ≤ Ta ≤ 60°C T75°C T6: -40 ≤ Ta ≤ 40°C T60°C	FA
FM nonincendive Class I, II, III, Division 2, Groups ABCDFG Class I, Zone 2, IIC	T4: -20/-40 ≤ Ta ≤ 85°C T6: -20/-40 ≤ Ta ≤ 60°C T60°C Silicone o-ring: -40°C ≤ Ta ≤ +85°C FKM o-ring: -20°C ≤ Ta ≤ +85°C	FN
FM explosion proof, dust ignition proof Class I, II, III, Division 1, Groups ABCDEFG Class I Zone 1, Ex/AEx d IIC T6	T6: -20/-40 ≤ Ta ≤ 70°C T5,T4: -20/-40 ≤ Ta ≤ 85°C Silicone o-ring: -40°C ≤ Ta ≤ +85°C FKM o-ring: -20°C ≤ Ta ≤ +85°C	FD
IECEx intrinsic safe Ex ia IIC T6...T4 Ga, Ex ia IIIC T100°C Da,	T4: -40 ≤ Ta ≤ 85°C T100°C (RTT15S-T…1, RTT15S-T…2) T4: -40 ≤ Ta ≤ 80°C T100°C (RTT15S-T…3, RTT15S-T…4) T5: -40 ≤ Ta ≤ 60°C T75°C T6: -40 ≤ Ta ≤ 45°C T60°C	EA
IECEx non sparking Ex nA IIC T6...T4 Gc Ex ic IIC T6...T4 Gc Ex ic IIIC T100°C Dc Zone 2, 22	**For Ex nA:** **O-Ring Sealing: Silicone** T4: -40 ≤ Ta ≤ 85°C T4 (RTT15S-T…1, RTT15S-T…2) T4: -40 ≤ Ta ≤ 80°C T4 (RTT15S-T…3, RTT15S-T…4) T6: -40 ≤ Ta ≤ 60°C T6 **O-Ring Sealing: FKM** T4: -20 ≤ Ta ≤ 85°C (RTT15S-T…1, RTT15S-T…2) T4: -20 ≤ Ta ≤ 80°C (RTT15S-T…3, RTT15S-T…4) T6: -20 ≤ Ta ≤ 60°C **For Ex ic:** T4: -40 ≤ Ta ≤ 85°C T100°C (RTT15S-T…1, RTT15S-T…2) T4: -40 ≤ Ta ≤ 80°C T100°C (RTT15S-T…3, RTT15S-T…4) T6: -40 ≤ Ta ≤ 60°C T85°C	EN
IECEx Ex d (flameproof) Ex d IIC T6...T4 Gb Ex tb IIIC T100°C Db Zone 1, 2, 21, 22	**For Ex d:** T4, T5: -40 ≤ Ta ≤ 85°C (RTT15S-T…1, RTT15S-T…2) T4, T5: -40 ≤ Ta ≤ 80°C (RTT15S-T…3, RTT15S-T…4) T6: -40 ≤ Ta ≤ 70°C **For Ex tb:** **O-Ring Sealing: Silicone** -40 ≤ Ta ≤ 85°C T100°C (RTT15S-T…1, RTT15S-T…2) -40 ≤ Ta ≤ 80°C T100°C (RTT15S-T…3, RTT15S-T…4) -40 ≤ Ta ≤ 70°C T85°C **O-Ring Sealing: FKM** -20 ≤ Ta ≤ 85°C T100°C (RTT15S-T…1, RTT15S-T…2) -20 ≤ Ta ≤ 80°C T100°C (RTT15S-T…3, RTT15S-T…4) -20 ≤ Ta ≤ 70°C T85°C	ED
INMETRO intrinsic safe Ex ia IIC T6...T4 Ga Ex ia IIIC T100°C Da	T4: -40 ≤ Ta ≤ 85°C T100°C (RTT15S-T…1, RTT15S-T…2) T4: -40 ≤ Ta ≤ 80°C T100°C (RTT15S-T…3, RTT15S-T…4) T5: -40 ≤ Ta ≤ 60°C T100°C T6: -40 ≤ Ta ≤ 45°C T100°C	BA

Table 9. Electrical Safety Specifications - Transmitter with Housing (Continued)

Agency Certification, Type of Protection, and Area Classification	Application Conditions	Electrical Safety Design Code
INMETRO non sparking Ex nA IIC T6...T4 Gc Ex ic IIC T6...T4 Gc Zone 2	**For Ex nA:** **O-Ring Sealing: Silicone** T4: -40 ≤ Ta ? 85°C T4 (RTT15S-T…1, RTT15S-T…2) T4: -40 ≤ Ta ? 80°C T4 (RTT15S-T…3, RTT15S-T…4) T6: -40 ≤ Ta ? 60°C T6 **O-Ring Sealing: FKM** T4: -20 ≤ Ta ≤ 85°C (RTT15S-T…1, RTT15S-T…2) T4: -20 ≤ Ta ≤ 80°C (RTT15S-T…3, RTT15S-T…4) T6: -20 ≤ Ta ≤ 60°C **For Ex ic:** T4: -40 ≤ Ta ≤ 85°C (RTT15S-T…1, RTT15S-T…2) T4: -40 ≤ Ta ≤ 80°C (RTT15S-T…3, RTT15S-T…4) T6: -40 ≤ Ta ≤ 60°C	BN
INMETRO Ex d (flameproof) Ex d IIC T6...T4 Gb Ex tb IIIC T100°C Db Zone 1, 2, 21, 22	**For Ex d:** T4, T5: -40 ≤ Ta ≤ 85°C (RTT15S-T…1, RTT15S-T…2) T4, T5: -40 ≤Ta ≤ 80°C (RTT15S-T…3, RTT15S-T…4) T6: -40 ≤ Ta ≤ 70°C **For Ex tb:** **O-Ring Sealing: Silicone** -40 ≤ Ta ≤ 85°C T100°C (RTT15S-T…1, RTT15S-T…2) -40 ≤ Ta ≤ 80°C T100°C (RTT15S-T…3, RTT15S-T…4) -40 ≤ Ta ≤ 70°C T100°C **O-Ring Sealing: FKM** -20 ≤ Ta ≤ 85°C T100°C (RTT15S-T…1, RTT15S-T…2) -20 ≤ Ta ≤ 80°C T100°C (RTT15S-T…3, RTT15S-T…4) -20 ≤ Ta ≤ 70°C T100°C	BD
NEPSI intrinsic safe Ex ia IIC T6...T4 Ga, Ex ia IIIC T100°C Da,	T6: -20/-40 ≤ Ta ≤ 70°C T5,T4: -20/-40 ≤ Ta ≤ 85°C Silicone o-ring: -40°C ≤ Ta ≤ +85°C FKM o-ring: -20°C ≤ Ta ≤ +85°C	NA
NEPSI non sparking Ex nA IIC T6...T4 Gc Ex ic IIC T6...T4 Gc Ex ic IIIC T100°C Dc Zone 2, 22	T4: -40 ≤ Ta ≤ 85°C T100°C (RTT15S-T…1, RTT15S-T…2) T4: -40 ≤ Ta ≤ 80°C T100°C (RTT15S-T…3, RTT15S-T…4) T5: -40 ≤ Ta ≤ 60°C T75°C T6: -40 ≤ Ta ≤ 45°C T60°C	NN
NEPSI Ex d (flameproof) Ex d IIC T6...T4 Gb Ex tb IIIC T100°C Db Zone 1, 2, 21, 22	<u>**For Ex nA:**</u> **O-Ring Sealing: Silicone** T4: -40 ≤ Ta ≤ 85°C T4 (RTT15S-T…1, RTT15S-T…2) T4: -40 ≤ Ta ≤ 80°C T4 (RTT15S-T…3, RTT15S-T…4) T6: -40 ≤ Ta ≤ 60°C T6 **O-Ring Sealing: FKM** T4: -20 ≤ Ta ≤ 85°C (RTT15S-T…1, RTT15S-T…2) T4: -20 ≤ Ta ≤ 80°C (RTT15S-T…3, RTT15S-T…4) T6: -20 ≤ Ta ≤ 60°C <u>**For Ex ic:**</u> T4: -40 ≤ Ta ≤ 85°C T100°C (RTT15S-T…1, RTT15S-T…2) T4: -40 ≤ Ta ≤ 80°C T100°C (RTT15S-T…3, RTT15S-T…4) T6: -40 ≤ Ta ≤ 60°C T85°C	ND
Ex protection method marking by user		MM
No certification (non-hazardous area)		ZZ

Table 10. Electrical Safety Specifications - Transmitter Module without Housing

Agency Certification, Type of Protection, and Area Classification	Application Conditions
ATEX intrinsic safe II 1 G Ex ia IIC T6...T4 Ga II 1 D Ex ia IIIC Da	T4: -40 ≤ Ta ≤ 85°C T6: -40 ≤ Ta ≤ 45°C
CSA intrinsic safe Ex/AEx ia IIC Ga Class I, Division1, Groups ABCD;	T4: -40 ≤ Ta ≤ 85°C T6: -40 ≤ Ta ≤ 60°C
FM intrinsic safe Class I, Division 1, Groups ABCD Class I, Zone 0, IIC	T4: -40 ≤ Ta ≤ 85°C T6: -40 ≤ Ta ≤ 60°C
FM nonincendive Class I, Division 2, Groups ABCD Class I, Zone 2, IIC	T4: -40 ≤ Ta ≤ 85°C T6: -40 ≤ Ta ≤ 60°C
IECEx intrinsic safe Ex ia IIC T6...T4 Ga Ex ia IIIC Da	T4: -40 ≤ Ta ≤ 85°C T6: -40 ≤ Ta ≤ 45°C
NEPSI intrinsic safe Ex ia IIC T6...T4 Ga Ex ia IIIC Da	T4: -40 ≤ Ta ≤ 85°C T6: -40 ≤ Ta ≤ 45°C

2. Installation

The following material provides information and procedures for installing the RTT15S transmitter. For dimensional information, refer to DP 020-470.

Installation shall be carried out in accordance with the applicable code of practice (typically IEC 60079-14) by suitably-trained personnel.

There are no special checking or maintenance conditions. All explosion-protected equipment must be periodically inspected in accordance with the applicable code of practice (typically IEC 60079-17). The interval between inspections must not normally exceed 3 years, unless justification for a longer interval is given.

With regard to explosion safety, it is not necessary to check for correct operation.

— **NOTE** —————————————————————————————————————
Use a suitable thread sealant on all connections.
———

⚠ DANGER
HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH
For RTT15S Transmitters with an aluminum or 316 ss housing: When used in a potentially explosive atmosphere requiring apparatus of equipment category 1 G, the transmitter must be installed so that, even in the event of rare instances, an ignition source due to impact or friction between the enclosure and iron/steel is excluded. This shall be considered during installation, particularly if the equipment is installed in a Zone 0 location.
Failure to follow these instructions will result in death or serious injury.

NOTICE
POTENTIAL EQUIPMENT DAMAGE
When screwing the cover on or off, verify the thread surface is free of dust, grit, or other impurities. These can cause the cover to seize or damage the threads.
Do not use force to screw on the cover.
If it is necessary to open the housing cover after operation at maximum temperature, be aware that the cover may not give when you attempt to open it by hand. If this happens, keep the cover under tension with your hand and hit the cover gently with a rubber mallet.
Failure to follow these instructions can result in equipment damage.

⚠ **CAUTION**
EQUIPMENT OPERATION HAZARD
Bare sensor or thermowell mounting to the 316 ss housing must not be used in high vibration areas.
The RTT15S is only certified for use in ambient temperatures marked on the equipment and must not be used outside this range.
Failure to follow. these instructions can result in injury.

⚠ **CAUTION**
EQUIPMENT OPERATION HAZARD
The maximum permitted ambient temperature of the RTT15S transmitter is 85°C. To avoid the effects of process temperature and other thermal effects, ensure that the electronics housing temperature does not exceed an ambient temperature of 85°C.
Failure to follow. these instructions can result in injury.

Figure 4. Protection Degree

CABLE GLANDS   BLANKING ELEMENTS

O-Ring

M20 x 1.5

Thread sealant

½ NPTmod

D3

D2

D1

O-Ring

M20 x 1.5

Thread sealant

½ NPTmod

O-Ring   Thread sealant   Sensor

M20 x 1.5   ½ NPTmod

Blind plug M20:   IP54
  With O-ring: IP66 - IP68

Blind plug 1/2 NPT: IP54
  :   IP66 - IP68

Protection degree is defined by the connection with the lowest IP rating.
It is optional to connect a sensor to any of the three conduit openings,
however, avoid mounting orientations with conduit openings facing up to
eliminate the risk of liquid entry.
Blind plugs are Ex approved only when used together with RTT15S.

Thread sealant is required to provide moisture ingress protection.

Mounting

The basic transmitter can be mounted on a DIN rail or to a flat surface. The transmitter in a field housing can be pipe mounted, surface mounted, mounted directly to a bare sensor, or thermowell mounted. See Figures 5 through 9. For extremely high process temperatures, a remote mounted sensor is recommended. Also, the mounting stability can influence how the sensor is attached to the transmitter. If the process vessel is highly insulated and the thermowell has considerable lagging, a remote mounted transmitter attached to a 50 mm (2 in) pipe is recommended. When mounting the transmitter, take into account the necessary room to remove the cover.

Figure 5. Surface Mounting
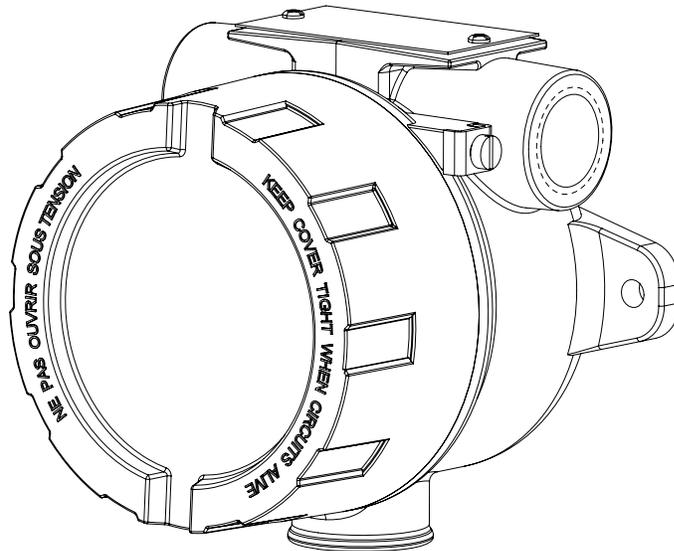
Figure 6. Pipe Mounting
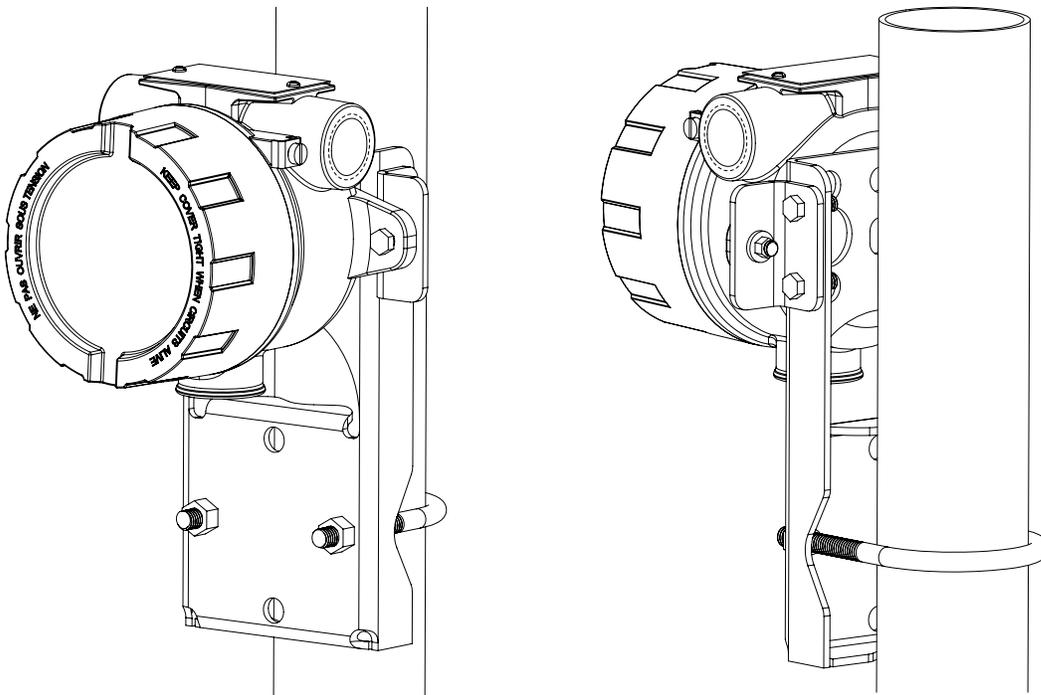
Figure 7. Mounting Bracket Assembly

Torque all bolts to 96 in-lbs (8 lbf-ft)
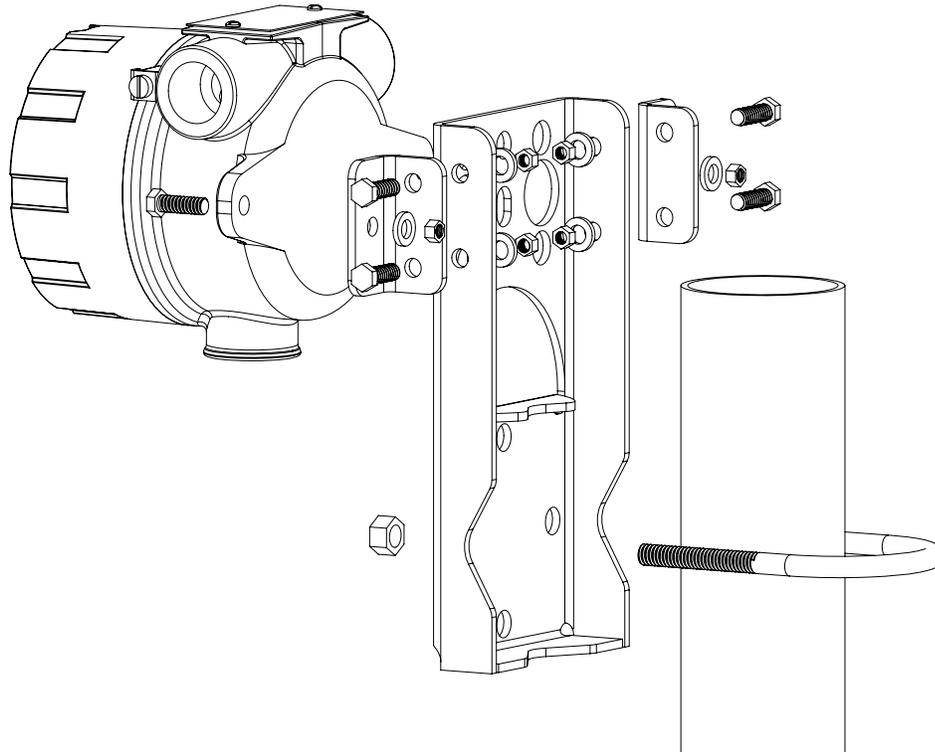
Figure 8. Basic Module Mount

SURFACE MOUNT

DIN RAIL MOUNT

SURFACE

MOUNTING
SCREWS
2 PLACES,
PROVIDED
BY USER. SEE
DP 020-470
FOR HOLE AND
COUNTERBORE
DIMENSIONS

DIN RAIL

OPTIONAL
MOUNTING
CLIP

SELF-TAPPING
SCREW,
INCLUDED

**Torque to
8±1 in-lbs
(9.2±
1.15 kgf-cm**
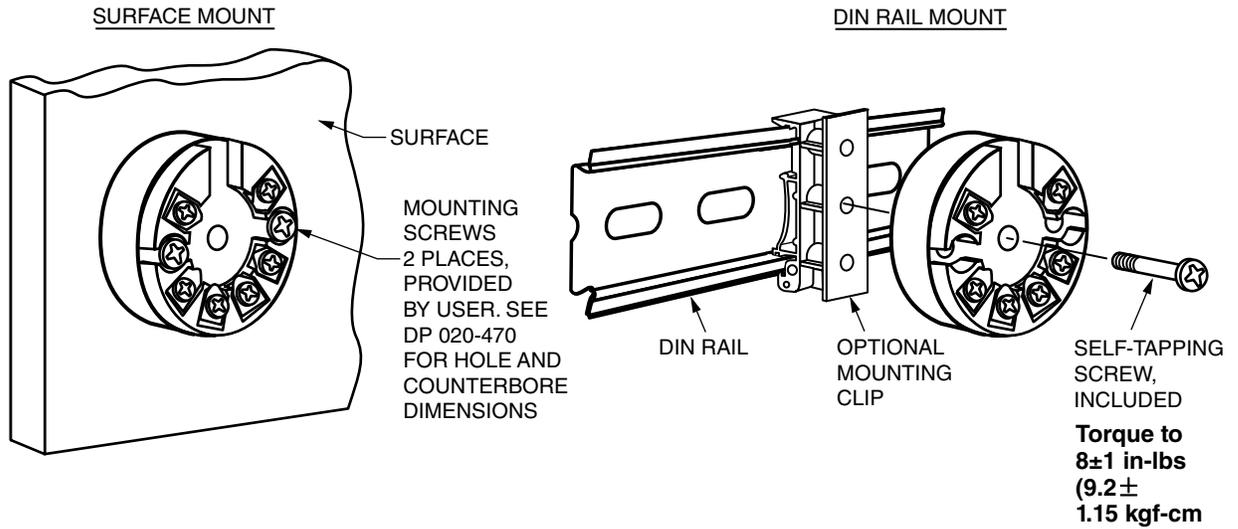
Figure 9. Thermowell Mount
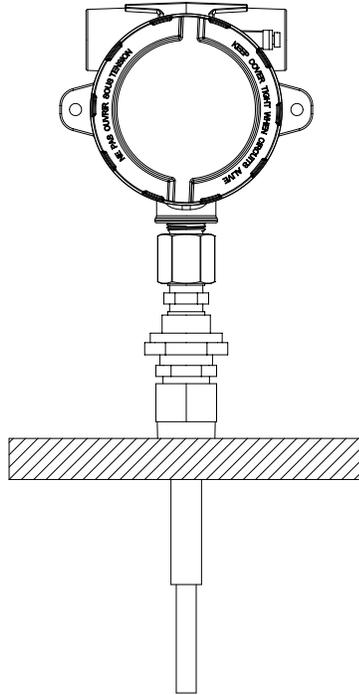
Table 11. Ground Terminal and Protection Terminal

Placement	Type	Cable Cross Section (mm^2)	
		Stranded Wire	Solid Wire
Inside	Protection terminal	1.5	2.5
Outside	Ground terminal	4.0	6.0

Wiring

Your transmitter must be installed to meet all local installation regulations, such as hazardous location requirements and electrical wiring codes. Persons involved in the installation must be trained in these code requirements. To maintain agency certification, your transmitter must also be installed in accordance with the agency requirements.

> **─ NOTE ─**
> The use of transient/shock wave protection is recommended in installations prone to high levels of electrical transients and shock waves.

Connections

There are six terminals on the basic module for input and output connections. Terminals 1 and 2 are for measurement output and terminals 3 through 6 are for RTD, TC, ohm, or mV sensor inputs. Dual inputs for average and difference measurement must be of the same linearization type (for example, a thermocouple cannot be used with an RTD).

Figure 10. Connections
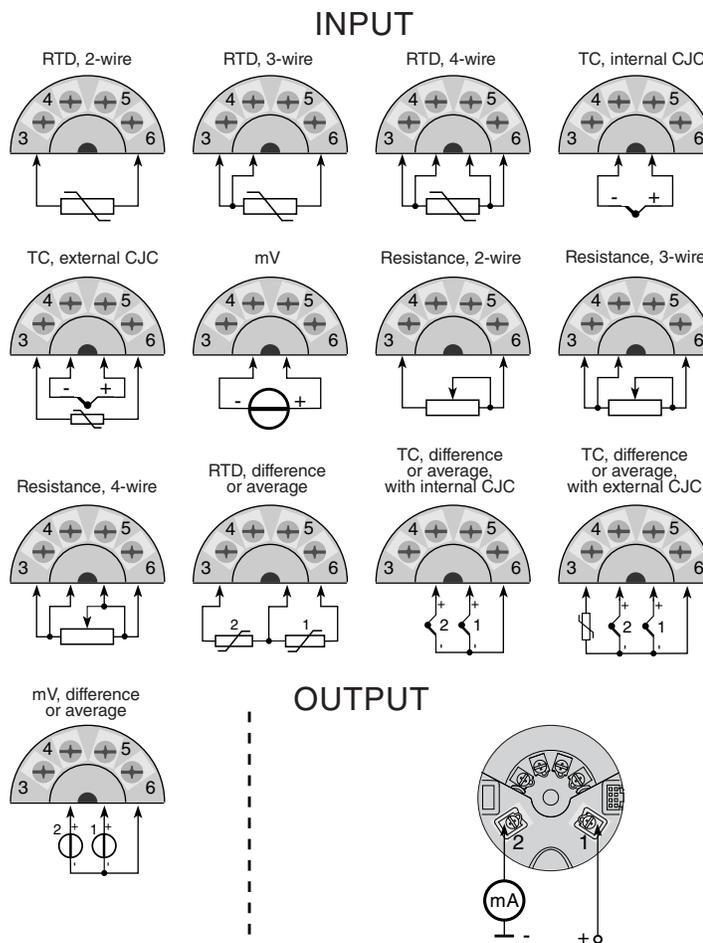
Loop Wiring

When wiring the transmitter, the supply voltage and loop load must be within specified limits. The supply output load vs. voltage relationship is:

R_{max} = (V - 8) / 0.023 and is shown in Figure 11.

Any combination of supply voltage and loop load resistance in the shaded area can be used. To determine the loop load resistance (transmitter output load), add the series resistance of each component in the loop, excluding the transmitter. The power supply must be capable of supplying 23 mA of loop current.

NOTE

The maximum voltage is 28 V dc for transmitters certified as intrinsically safe.

Figure 11. Supply Voltage and Loop Load

$$R_{MAX} = \frac{(V_S - 8)}{0.023}$$
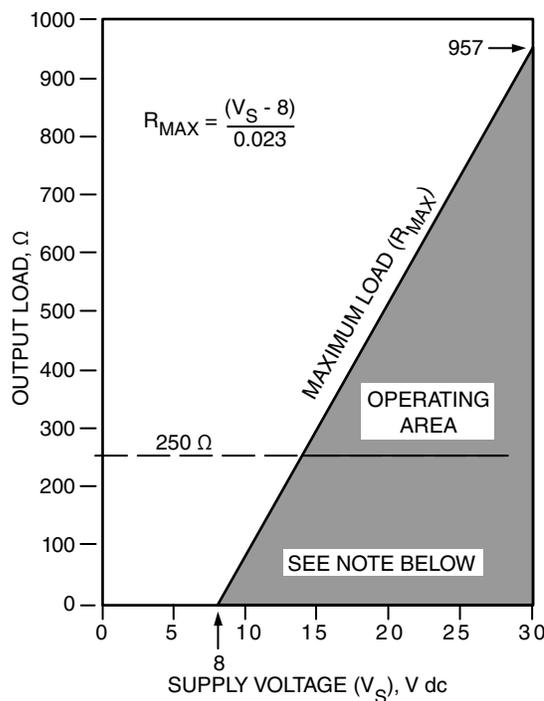
NOTE

The transmitter will function with an output load less than 250 Ω provided that a HART Communicator or PC-based Configurator is not connected to it. Use of a HART Communicator or PC-based Configurator requires 250 Ω minimum load.

Examples:

♦ For a loop load resistance of 500 Ω the supply voltage can be any value from 21.7 to 30 V dc.

♦ For a supply voltage of 24 V dc, the loop load resistance can be any value from 250 to 696 Ω (zero to 696 Ω without a HART communicator connected to the transmitter).

To wire one or more transmitters to a power supply, proceed with the following steps.

1. Remove the cover from the transmitter field terminals compartment.

2. Run signal wires (0.50 mm^2 or 20 AWG, typical) to the transmitter. Use twisted single pair to help protect the 4 to 20 mA output and/or remote communications from electrical noise. Maximum recommended length for signal wires is:

   ♦ 3050 m (10,000 ft) **using single pair cable** and adhering to requirements of HART physical layer implementation defined in HART Document HCF_SPEC-53. Use CN=1 when calculating max. lengths.

   ♦ 1525 m (5000 ft) in a multidrop mode (15 devices recommended maximum). Shielded cable could be required in some locations.

─── **NOTE** ───────────────────────────────────────
Do not run transmitter wires in same conduit as mains (ac power) wires.
──

3. If shielded cable is used, ground the shield at the power supply **only**. Do not ground the shield at the transmitter.

4. If housing is used, plug any unused conduit connection with a metal plug.

5. Connect a ground wire to the ground terminal in accordance with local practice.

⚠ CAUTION
EQUIPMENT OPERATION HAZARD
If the signal circuit must be grounded, it is preferable to do so at the negative terminal of the dc power supply. To avoid errors resulting from ground loops or the possibility of short-circuiting groups of instruments in a loop, there should be only one ground in a loop.
Failure to follow these instructions can result in injury.

6. Connect receivers (such as controllers, recorders, indicators) in series with power supply and transmitter as shown in Figure 12.

7. If a housing is used, install the cover onto the housing.

8. If wiring additional transmitters to the same power supply, repeat Steps 1 through 8 for each additional transmitter. The setup with multiple transmitters connected to a single power supply is shown in Figure 13.

9. The HART communicator can be connected in the loop between the transmitter and the power supply as shown in Figure 12 and Figure 13. Note that a minimum of 250 Ω must separate the power supply from the HART communicator.

Figure 12. Transmitter Loop Wiring
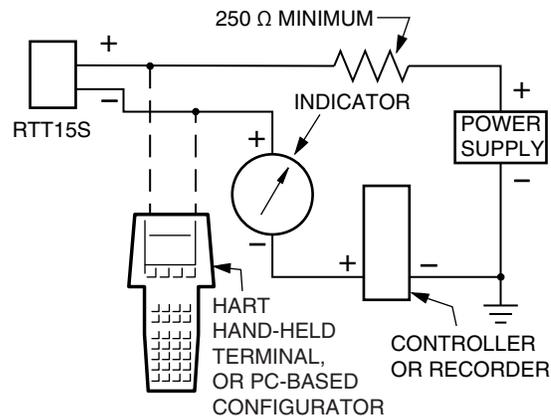
Figure 13. Wiring Several Transmitters to a Common Power Supply
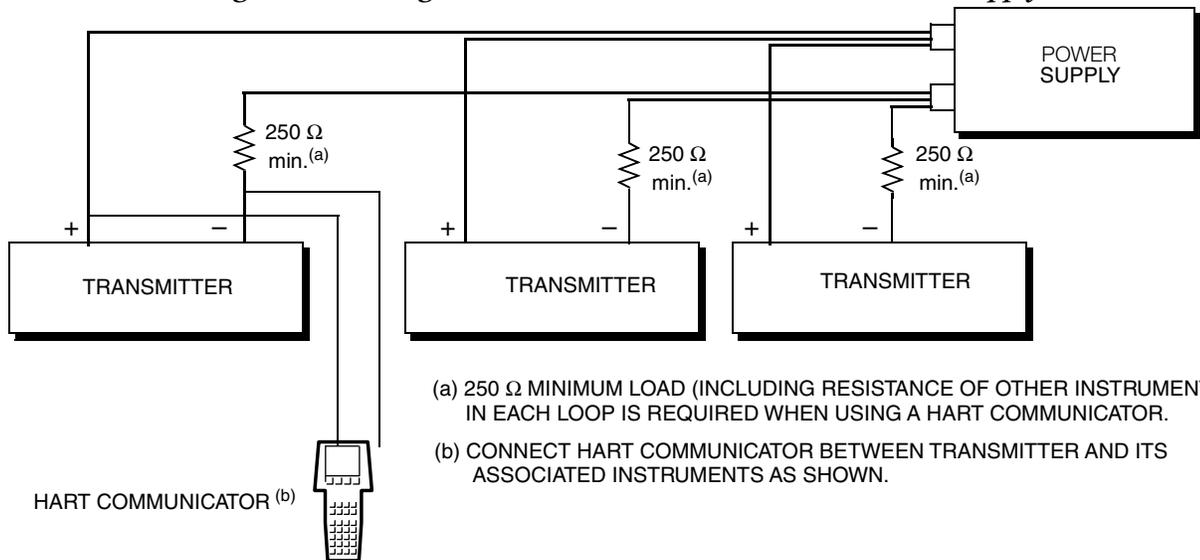
(a) 250 Ω MINIMUM LOAD (INCLUDING RESISTANCE OF OTHER INSTRUMENTS) IN EACH LOOP IS REQUIRED WHEN USING A HART COMMUNICATOR.

(b) CONNECT HART COMMUNICATOR BETWEEN TRANSMITTER AND ITS ASSOCIATED INSTRUMENTS AS SHOWN.

Assembly and Disassembly

To connect sensor wires to the RTT15S or change the orientation of the display, the housing must be disassembled, and the optional display unit (if present) must be extracted. Refer to the following diagrams.

⚠ WARNING
HAZARD OF ELECTRICAL SHOCK OR EXPLOSION
Turn off power to the device before disassembly.
Failure to follow these instructions can result in death or serious injury.

1. Using a 2 mm (0.8 in) hex key, release the locking screw on the housing. See Figure 14.

2. Unscrew the housing lid by turning it counterclockwise.

3. If the device has an optional display, press and hold the two locking tabs located on either side of the display unit. See Figure 15. Hold the tabs and pull the display unit outwards to remove it. See Figure 16. You can now rotate the display in increments of 90 degrees for the best viewing angle.

Figure 14. Locking Screw
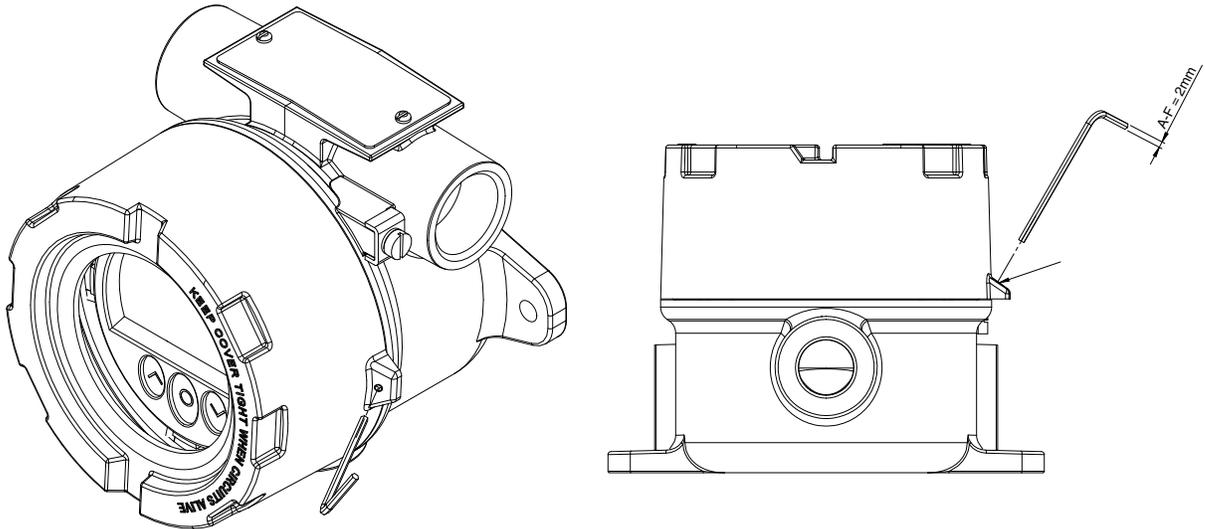
Figure 15. Locking Tabs
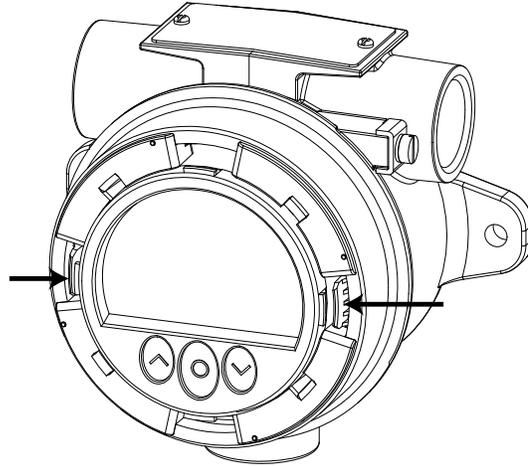
Figure 16. Removing the Display Unit
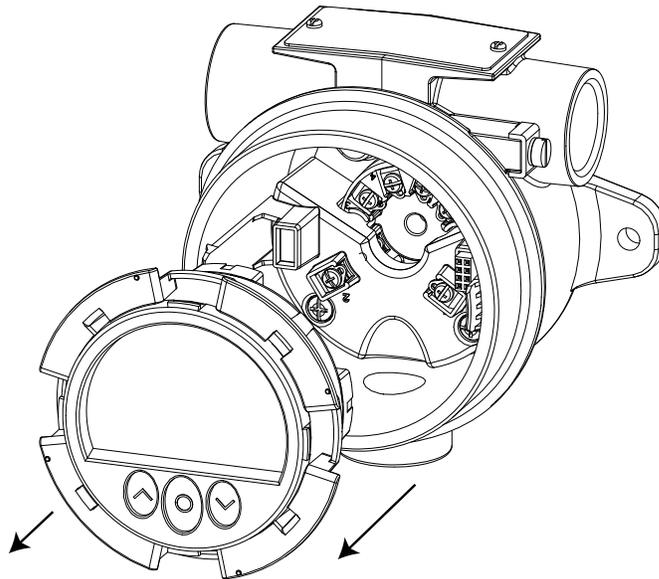
To re-assemble the RTT15S, reverse the disassembly steps, taking the following precautions when reinstalling the optional display unit:

♦ Before inserting the display, note the location of the female 8-pin connector in the housing.

♦ Insert the display unit straight into the housing. Take care not to insert it an angle.

♦ Press down on the locking tab that is on the same side as the female 8-pin connector. It will click into place. Then press the locking tab on the opposite side.

♦ Verify that the display unit is flush, as shown in Figure 17.

Figure 17. Repositioning the Display
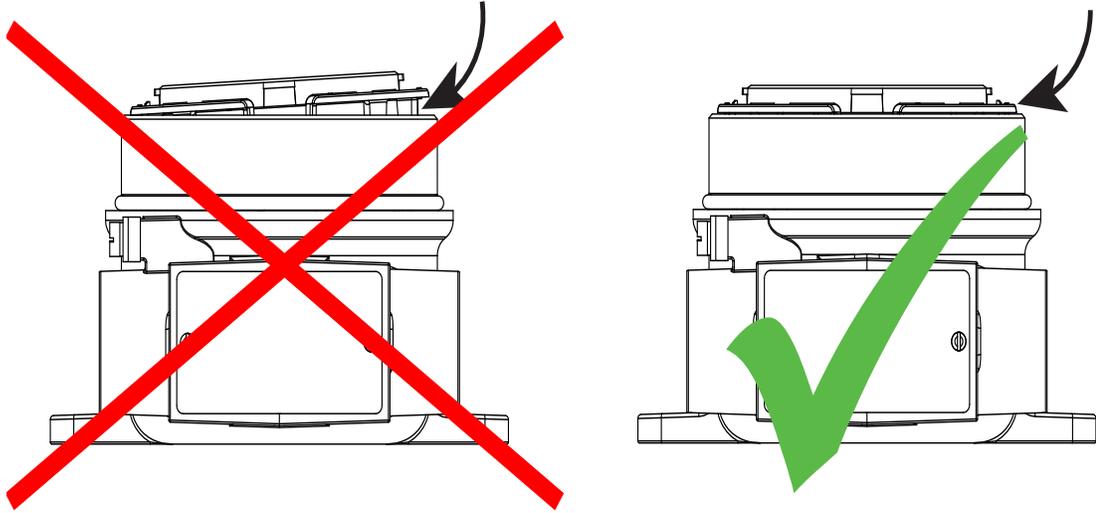
Multidrop Communication

"Multidrop" refers to the connection of several transmitters to a single communications transmission line. Communications between the host computer and the transmitters takes place digitally with the analog output of the transmitter deactivated. With the HART communications protocol, multiple transmitters can be connected on a single twisted pair of wires or over leased telephone lines.

The application of a multidrop installation requires consideration of the update rate necessary from each transmitter, the combination of transmitter models, and the length of the transmission line. Multidrop installations are not recommended where Intrinsic Safety is a requirement.

The outputs of up to 63 transmitters can be connected in parallel for a digital HART 7 communication on 2-wire connections. For HART 5, the outputs of up to 15 transmitters can be connected in the same way.

Before they are connected, each transmitter must be configured with a unique polling address ranging from 1 to 63 (HART 7) or 1 to 15 (HART 5). If two transmitters are configured with the same address, both will be excluded. The transmitter must be configured for multidrop mode with a fixed output signal of 4 mA. The maximum current in the loop is therefore 252 mA (HART 7) or 60 mA (HART 5).

Communication occurs with either a HART communicator or a HART modem. The configuration software can configure the individual transmitter for multidrop mode and provide it with a unique polling address.

Figure 18 shows a typical multidrop networks. Do not use these figures as installation diagrams. Refer to the HART Communications Foundation (http://www.hartcomm.org/) for specific requirements for multidrop applications.

Figure 18. Typical Multidrop Network
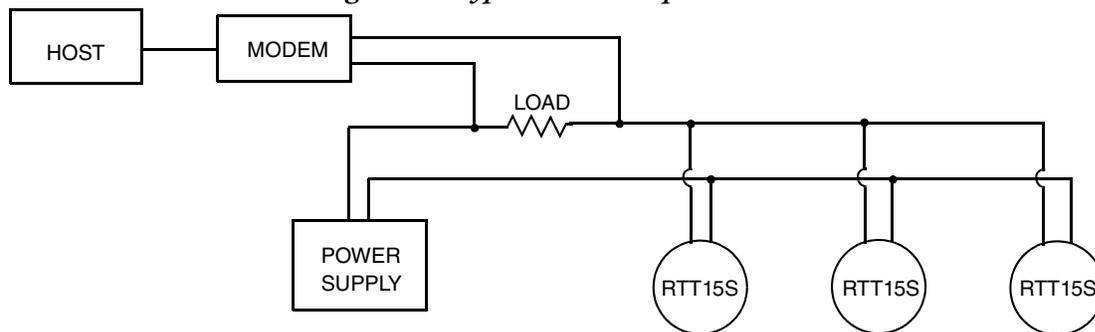
3. Configuration and Operation

Calibration

Your RTT15S temperature transmitter is a highly stable transmitter that was calibrated at the factory. There is no need to recalibrate the digital value of the measurement. Therefore, no calibration feature is provided.

Using the Optional Display

The 96 x 64 pixel display can be rotated in 90-degree increments for easy vertical or horizontal viewing. The adjustable backlight enables you to view process values in all lighting conditions without an external light source, and it flashes if an error occurs. Both the optional backlight and the flashing error backlight can be selected as red or white, or turned off completely. (See "Display Menu" on page 47.)

Using the Optical Buttons

The user interface of the optical configurator features three optical buttons. (See Table 12.) The buttons can be operated either with or without gloves.

—— **NOTE** ——————————————————————
Dark-colored gloves can cause reduced sensitivity.
————————————————————————————————

The buttons are immune to interference from ambient light sources and other panel meters, including other RTT15S devices mounted in close proximity. Additionally, the optical buttons are adaptive, meaning that they adapt to wear and smudges left on the surface. The buttons work both with and without a front cover mounted.

The buttons can actuate when a finger is held very close to a button, even if it is not touching the button or glass. To avoid inadvertent button-presses, do not allow fingers to "hover" over the buttons.

If a rapid increase in optical reflection occurs, as from mounting the cover or from dust/dirt on the glass, the buttons may activate. If a key-press is detected for a period of more than 70 seconds, it is assumed to be an erroneous key-press, and the adaptive functionality re-initializes in order to restore correct keypad functionality. This re-initialization can also be done by re-powering the device.

Table 12. Display Buttons

Button Press	Function
∧	In monitor view: Switch to the next process variable. In the optional configurator: Increase the value of the selected parameter (unless device is write-protected).
∨	In monitor view: Switch to the previous process variable. In the optional configurator: Decrease the value of the selected parameter (unless device is write-protected).
○	Accept the chosen value and/or proceed to the next parameter.
Hold ∧	Progressively increase (scroll) the numeric value (unless device is write-protected).
Hold ∨	Progressively decrease (scroll) the numeric value (unless device is write-protected).
Hold ○	Exit; ignore the chosen value and return to the previous parameter.
Hold ∧ + ∨	Unlock the monitor view and enter the configuration menu. (a)

a. If the error color (set in the Display Menu) is set to red or white and the display backlight is flashing, the first key press cancels the flashing backlight.

Key presses are reflected in the symbols bar. See Table 13.

Display Views

The appearance of the display changes to reflect the state of the device. This allows for intuitive operation and status indication, and guides you in configuring the device.

The symbols bar provides information on the state of the device.

Table 13. Symbols Bar

Icon	Meaning
↑	Up button is pressed
↓	Down button is pressed
⊙	Enter button is pressed
⬇	Saving configuration to internal memory
🔒	Device is locked or write-protected
↑↓	Current process value tendency indicators
⇆	External HART communication indicator
⠐	Internal communication indicator
✕	External HART communication error

Monitoring View

Through the housing glass, you can easily monitor the process value in the configured units. A bar graph indicates the process magnitude at a glance. The device tag is shown at the top of the display.

The device tag makes it easy to identify the displayed process value. Change it by pressing either the ⌃ or ⌄ optical button.

At the bottom of the display, the symbols present information on the current state of the device. (See Table 13.)

Figure 19. Monitoring View
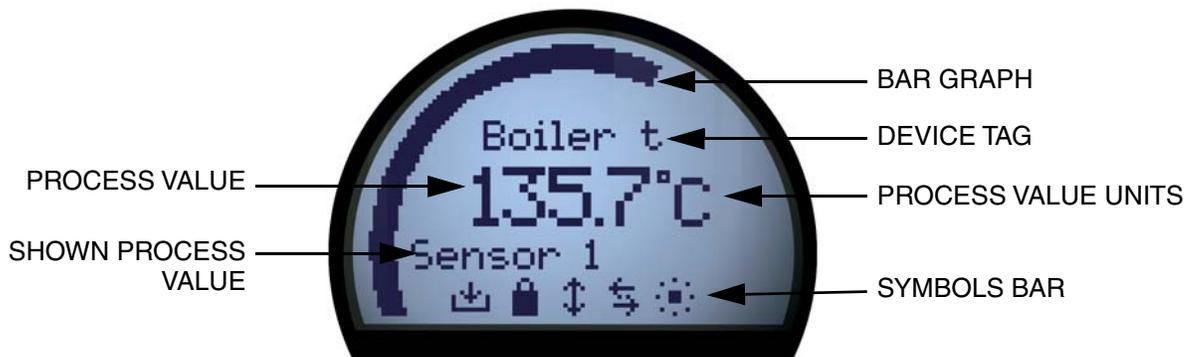
Programming View

To enter the programming view, press and hold both the ⌃ and ⌄ optical buttons. The programming views guide you in setting up the device. The name of the selected parameter is shown at the top of the display, with the selected value just below. Change the value by pressing the ⌃ or ⌄ optical button.

Where applicable, information on legal range and currently configured units is also displayed. At the bottom, scrolling text provides help on the parameter you are modifying.

Figure 20. Programming View
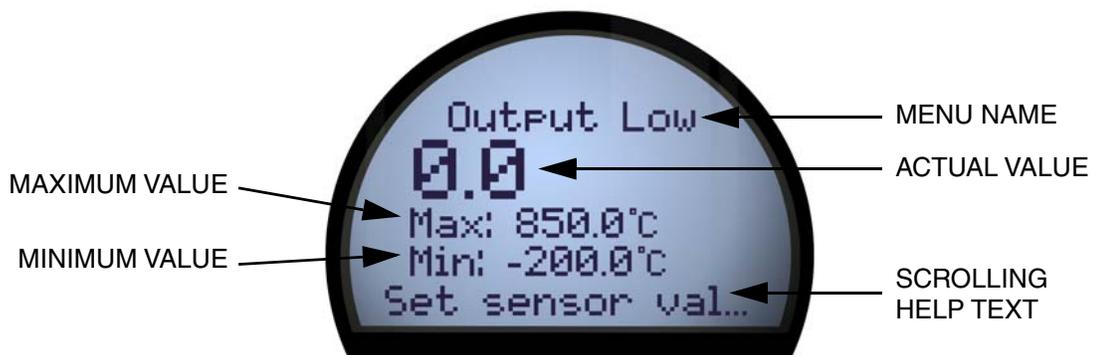
Diagnostics View

The display can be configured to flash in red or white backlight if a sensor or device error occurs. The display shows the status or error message in large letters, and scrolling text provides further information. The device tag is shown at the top of the display, and the symbols bar at the bottom indicates the state of the device.

For a detailed description of the different types of diagnostics messages, see "Device and Sensor Status Indication".

Figure 21. Diagnostics View

ERROR TYPE INDICATION FLASHING

DEVICE TAG

SCROLLING HELP TEXT

SYMBOLS BAR
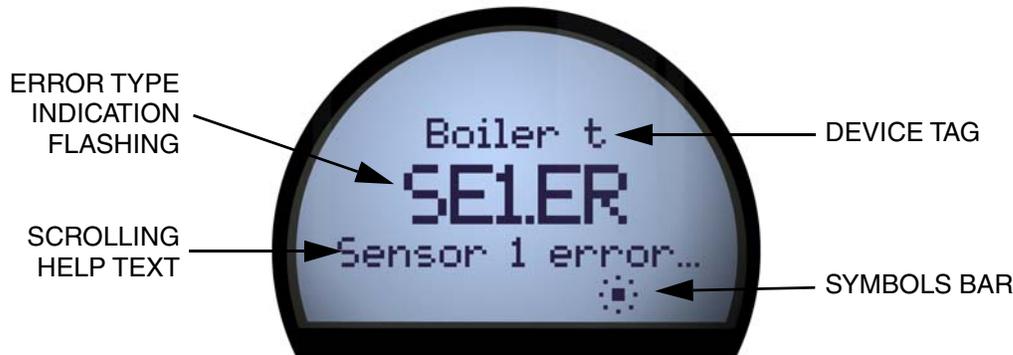
Device and Sensor Status Indication

The RTT15S is capable of displaying diagnostics information for the sensors and the device. These diagnostics can be divided into four categories: Sensor status, sensor errors, device status, and device errors.

Table 14. Sensor Status (a)

Condition	Display Text
Sensor 1 exceeds upper sensor limit	
Sensor 2 exceeds upper sensor limit	IN.HI
CJC sensor exceeds upper CJC sensor limit	
Sensor 1 exceeds lower sensor limit	
Sensor 2 exceeds lower sensor limit	IN.LO
CJC sensor exceeds lower CJC sensor limit	

a. The scrolling help text identifies the affected sensor.

Table 15. Sensor Errors (a)

Condition	Display Text
Sensor 1 error	SE1.ER
Sensor 2 error	SE2.ER
CJC sensor error	CJC.ER
Internal temperature sensor error	

a. Check wiring and replace sensor if necessary.

Table 16. Device Status

Condition	Display Text
Configuration is being re-synchronized	SYNC.DEV (a)
New device attached and configuration is being updated	NEW.DEV (a)
Last process calibration failed	CA.ER (b)

a. This message will disappear after a few seconds and the display will enter monitoring view.

b. Perform a new process calibration or reset the calibration to cancel this error. See the section "Using the Optional Display" on page 37.

Table 17. Device Errors (a)

Condition	Display Text
A/D converter error	AD.ER
EEPROM memory error	EE.ER
RAM memory error	RA.ER
Flash memory error	FL.ER
Exception error during code execution	SW.ER
Internal communication error	COM.ER

a. A device malfunction has been detected. To clear this error, re-power the device or reconfigure using the display. If the error is persistent, it will reappear and the device may have to be replaced.

Configuring the RTT15S

The RTT15S can be configured in one of the following ways:

♦ Via the optical buttons and the display; see "Using the Optical Configurator" on page 43.

♦ With a HART modem; see Figure 22.

♦ With a HART-compliant handheld communicator equipped with the RTT15S DD driver; see Figure 23.

Figure 22. Programming with a HART Modem
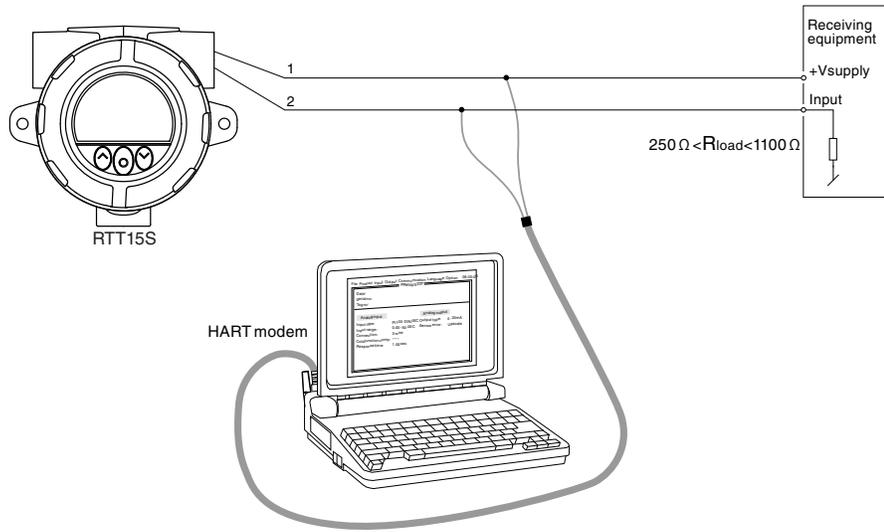
Figure 23. Programming with a HART Communicator
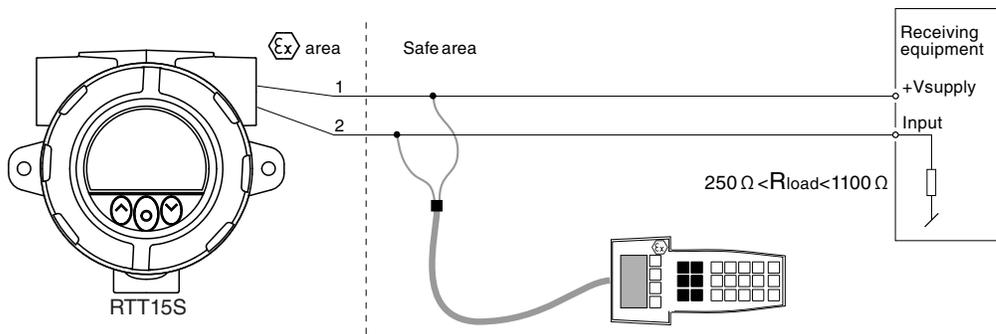
Changing the HART Protocol Version

You can change the HART protocol version of the device by means of the optical configurator; using a HART modem; or using other HART configuration tools such as a HART communicator.

Using the Optical Configurator

Changing the revision is done from the HART Revision menu under the advanced configuration menu. Use the optical buttons to select the desired HART version. Press the Enter button to accept the revision and change to the Save view. Select Yes and press Enter to acknowledge the change, or select No and press Enter to cancel.

Using a HART Communicator

1. From the Online menu, enter Device setup – Diag/Service.

2. Select Write protection and Write protect. Enter "********" (eight stars) as the password.

3. Select New password. Type "********" (eight stars) to confirm the current password, and then "HARTREV5" or "HARTREV7" as the new password, depending on the desired version.

4. Select Write enable and enter "-CHANGE-".

Using the Optical Configurator

Exiting the monitor view allows you to configure the RTT15S with the optical buttons. (See Table 12.)

The optical configurator menu is divided into 2 parts: Basic Configuration and Advanced Configuration. For each menu item, scrolling help text is automatically shown in the display.

When configuration is completed, or when the display times out, the display returns to monitor view.

If the RTT15S has been protected by setting a PIN code different from 0000 in the configurator menu, the correct PIN code must be entered to proceed to the desired menu. Resetting the code to 0000 disables PIN protection.

The menu can be temporarily locked because it is receiving a configuration on the HART interface, or because it is synchronizing configuration parameters with the internal device.

If the RTT15S has been write protected, it is still possible to proceed to the menu, but no changes can be made, and it is not possible to save the configuration. It is possible to change the write-protection state (enabled/disabled), but the correct write-protect password must be entered when prompted.

Figure 24. Accessing the Configurator Menus
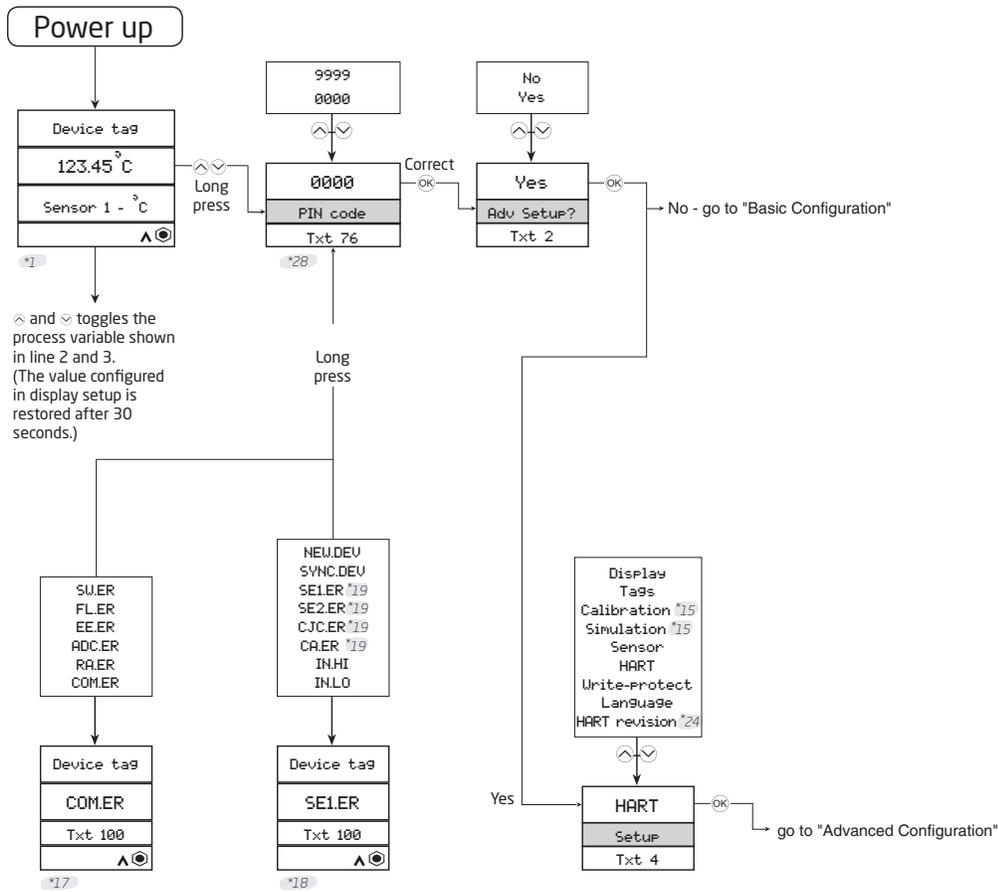
*1 If no keys are pressed for 60 s in any menu (except for Sim and Cal), no parameters are saved and the "Monitor" menu is shown.

*15 Only shown if Write-protection is disabled.

*17 Will be forced into this state if any device error occurs (from any other menu).

*18 Warning state: will be forced into this state if sensor error or overrange is present. Only from "Monitor" menu.

*19 First long press of ⌃ and ⌄ simultaneously will stop backlight flash but not exit view. Second long press will enter configuration menu (if allowed).

*24 Not shown if change of protocol is not possible.

*28 Only shown if pin-code is > 0000

Basic Configuration

Figure 25. Basic Configuration Menu (1 of 2)
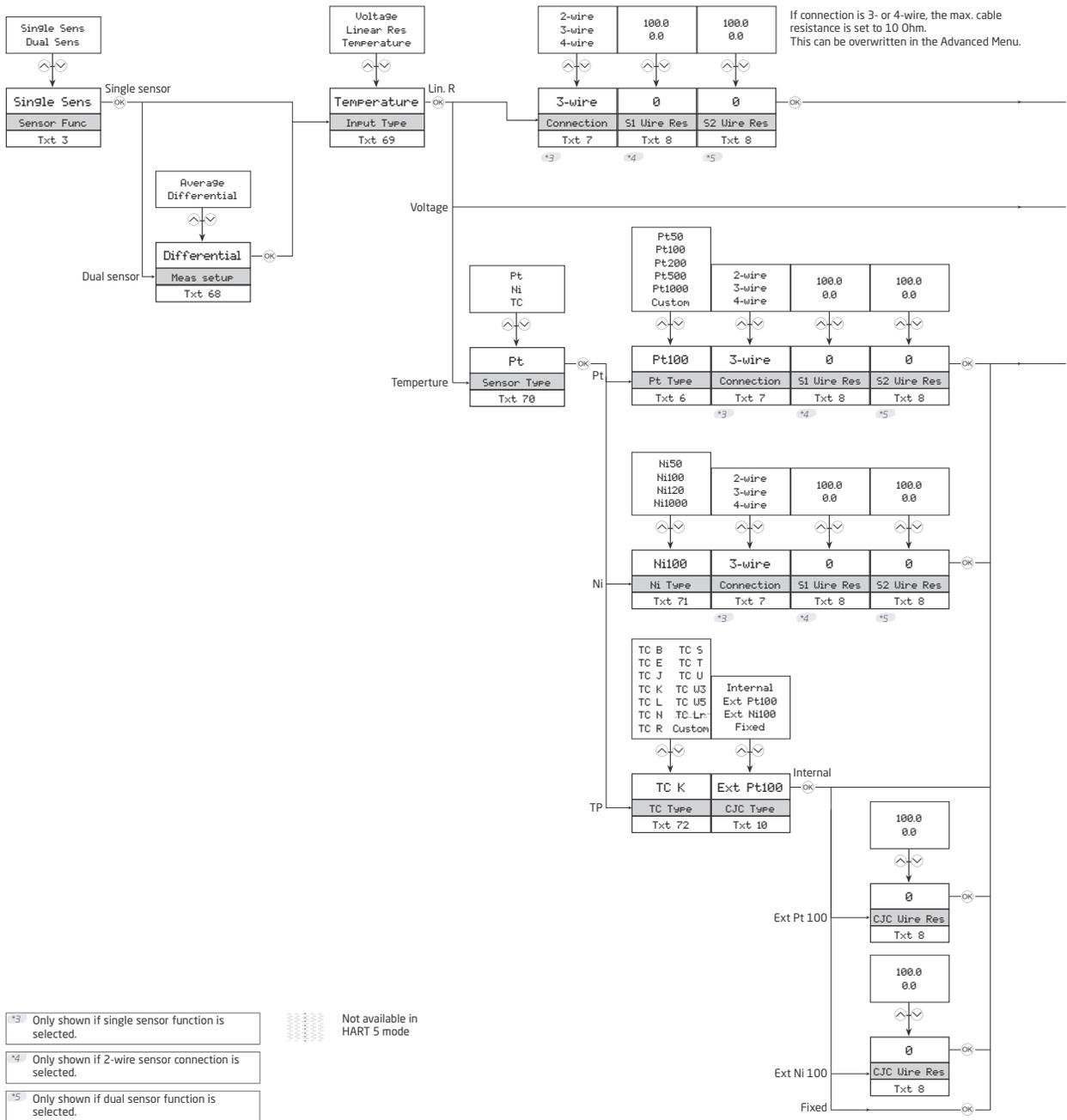
Figure 26. Basic Configuration Menu (2 of 2)

Lin. R

| Ohm / kOhm |
| **Ohm** / **Unit** / **Txt 5** | OK |

-40.0 / 135.0	-200 / 850	-200 / 850	-200 / 850
0 / Fix CJC val / Txt 12	200 / Max Diff / Txt 15	0 / Output Low / Txt 21	150 / Output High / Txt 22	OK
*21	*6		

Voltage

| uV / mV / V |
| **mV** / Unit / Txt 5 | OK |

Temperture

| °C / °F / °Ra / K |
| °C |
| Unit / Txt 5 | OK |

If HART revision = 5, units for S1, S2, Average and Difference are forced to either mV or Ohm.

1.0 / 60.0	1.0 / 60.0	1.0 / 60.0	1.0 / 60.0	1.0 / 60.0
1.0 / PV Resp / Txt 9	1.0 / S1 Resp / Txt 9	1.0 / S2 Resp / Txt 9	1.0 / Avg Resp / Txt 9	1.0 / Diff Resp / Txt 9	OK
	*5	*7	*6	

| 3.50 / 23.00 | 3.50 / 23.00 | 3.50 / 23.00 | 3.50 / 23.00 |
| 3.50 / Out Rng Lo / Txt 23 | 23.00 / Out Rng Hi / Txt 24 | 3.50 / Out Lim Lo / Txt 25 | 23.00 / Out Lim Hi / Txt 26 | OK |

Disabled / Broken / Shorted *23 / Both *23	3.50 / 23.00	3.50 / 23.00	Yes / No
Broken / Sens Error / Txt 27	23.00 / Out Broken / Txt 28	23.00 / Out Shorted / Txt 29	Yes / Save ? / Txt 16	OK → "Monitor"
*8	*9	*15	

*5 Only shown if dual sensor function is selected.

*6 Only shown if differential sensor function is selected.

*7 Only shown if average sensor function is selected.

*8 Only shown if sensor breakage detection is activated.

*9 Only shown if sensor shortage detection is activated.

*15 Only shown if Write-protection is disabled.

*21 Only shown if TC, fixed CJC is selected.

*23 Selection not available for Voltage Input Type and TC Sensor Type with internal/fixed CJC.

Not available in HART 5 mode

Not available in HART 7 mode

Advanced Configuration

The advanced configuration menu is subdivided in nine parts: Display, Tags, Calibration, Simulation, Sensor, HART, Password, Language and HART Revision.

Display Menu

Figure 27. Display Menu
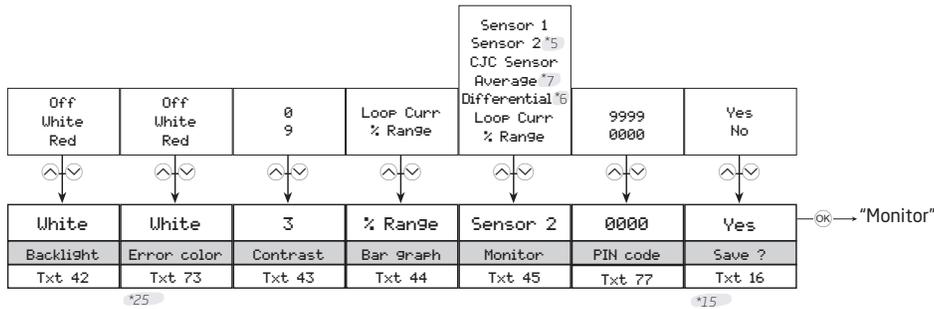
*5 Only shown if dual sensor function is selected.

*6 Only shown if differential sensor function is selected.

*7 Only shown if average sensor function is selected.

*15 Only shown if Write-protection is disabled.

*25 Not shown if backlight is off.

Tags Menu

Figure 28. Tags Menu
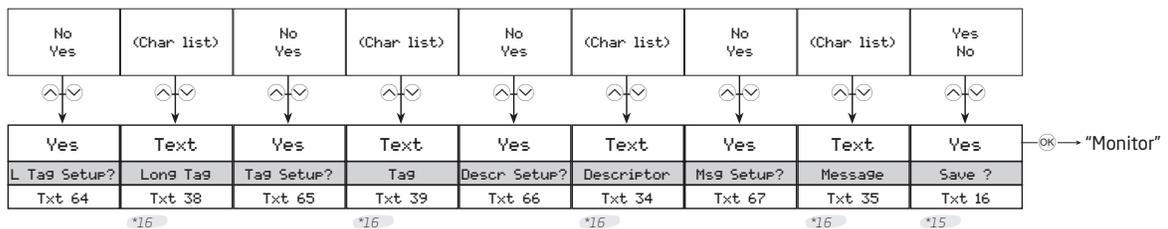
*15 Only shown if Write-protection is disabled.

*16 Only shown if "Yes" was selected in the previous menu.

Calibration Menu

This menu is available only if write protection is disabled.

The device can be process-calibrated in two points to fit a given input signal. First, a low input signal (not necessarily 0%) is applied, and the actual value is entered. Second, a high input signal (not necessarily 100%) is applied, and the actual value is entered. If you accept to use the calibration by selecting Yes in the Save menu, the device will work according to the new adjustments.

You can return the device to factory calibration points by selecting Reset Calibration from the Calibration menu.

> — **NOTE** —————————————————————
> While performing a calibration, the programming mode does not time out. Press and hold the ○ button to exit.

Figure 29. Calibration Menu
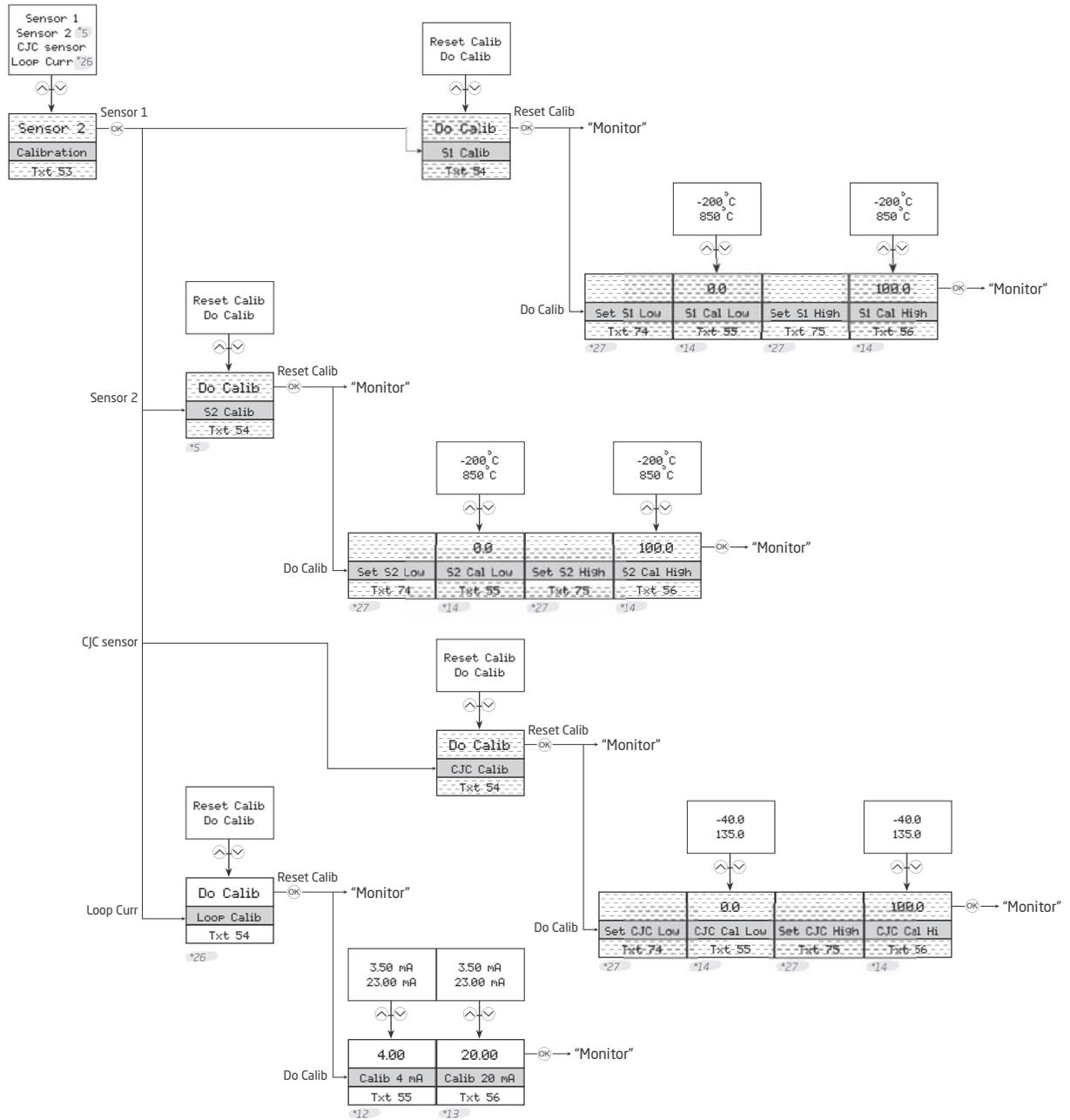
Simulation Menu

This menu is available only if write protection is disabled.

The RTT15S allows you to simulate process values by entering the simulation menu. Using the optical buttons, the simulated value can be increased and decreased (see "Using the Optional Display" on page 37).

─ **NOTE** ──
While performing a simulation, the display does not time out. Press and hold the ○ button to exit.
───

Figure 30. Simulation Menu
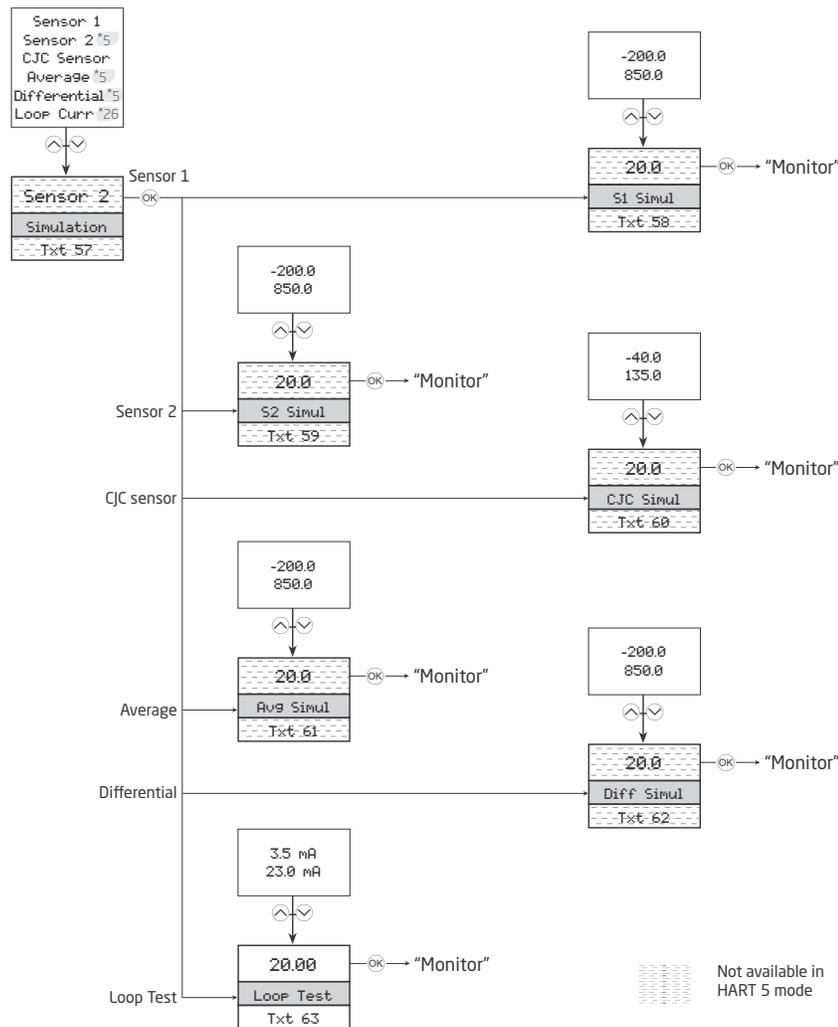
| *5 | Only shown if dual sensor function is selected. |

| *26 | Not possible if Loop Current is not active. |

Sensor Menu

The sensor menu allows you to make more detailed configuration of your sensor values, which are not available in the Basic Configuration menu. These involve selecting from a large amount of process variable units, changing the sensor assignment to PV, SV, TV, or QV, and specifying the CJC response time. Please note that performing a basic configuration overwrites these changes.

Figure 31. Sensor Menu
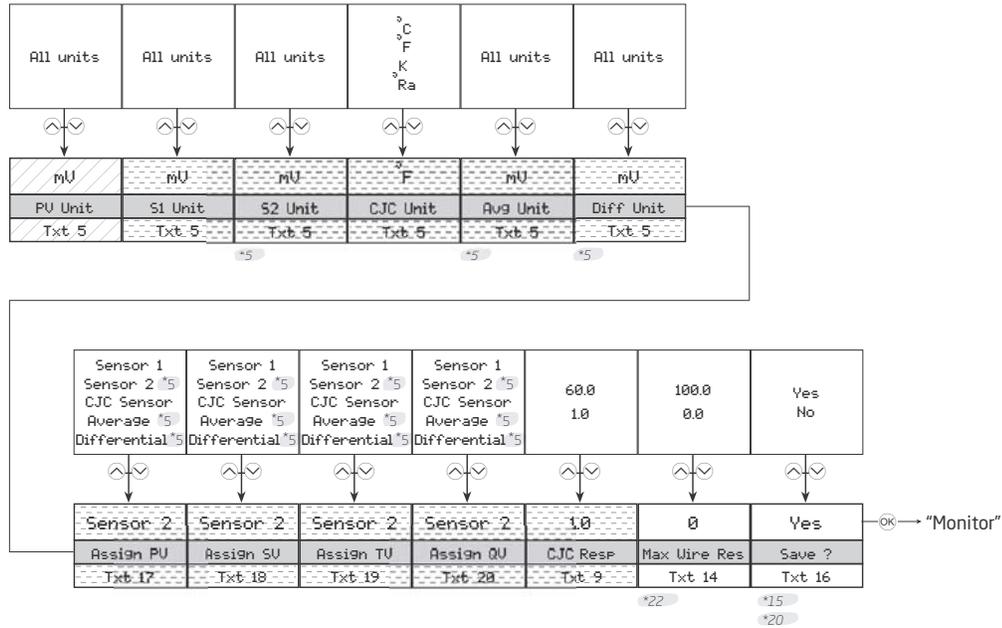
*5	Only shown if dual sensor function is selected.
*15	Only shown if Write-protection is disabled.
*20	Values may be overwritten when normal menu is saved.
*22	Only shown if 3- or 4-wire connection is selected.

Not available in HART 5 mode

Not available in HART 7 mode

HART Menu

Under this menu are special parameters pertaining to HART. It provides general information regarding the number of request preambles, software and hardware revisions, device and manufacturer IDs, and HART revision. The menu also allows you to specify the number of response preambles, polling address, assembly number, and date.

Figure 32. HART Menu
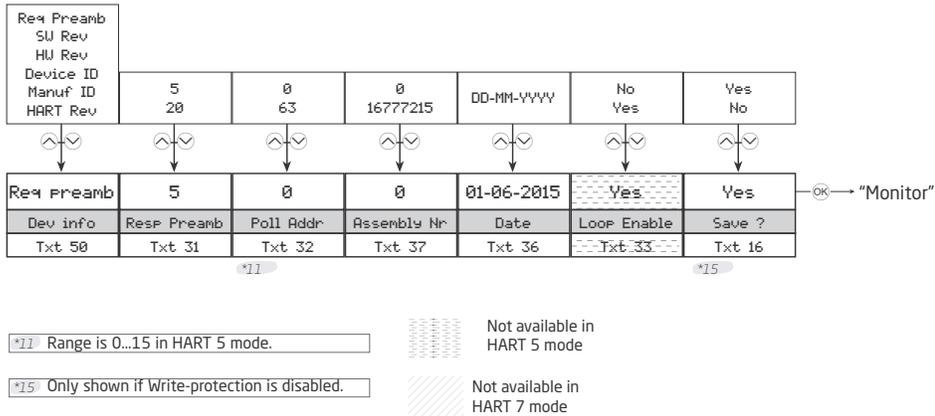
Write-Protect Menu

Here you can choose to enable or disable write protection using a password. If write-protection is already enabled, the correct password must be entered to get access. The password must consist of exactly eight characters from the Latin 1 character set, and will help protect the device against unauthorized modifications to the configuration.

The device is shipped with write-protection disabled by default.

Figure 33. Password Menu
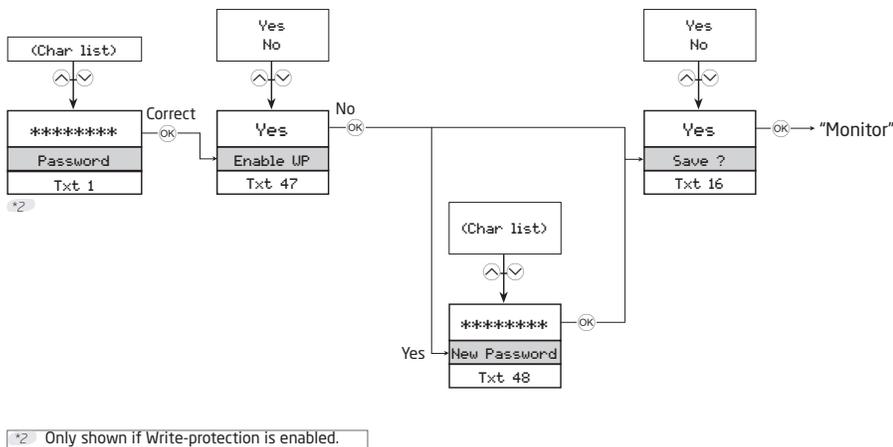
Language Menu

In this menu you can choose the language of the help text that will appear in the menu.

Figure 34. Language Menu
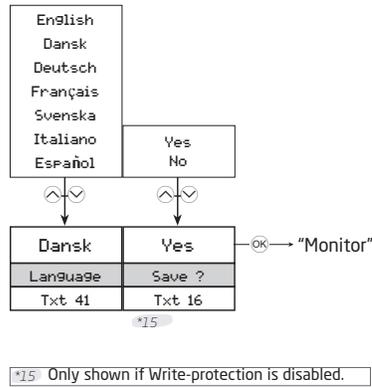
HART Revision Menu

The HART version is selected in this menu. Select the desired HART version and press the ○ button. Select Yes to save the change.

Changing the HART version reboots the device, during which the display may become blank for a few seconds.

Figure 35. HART Revision Menu
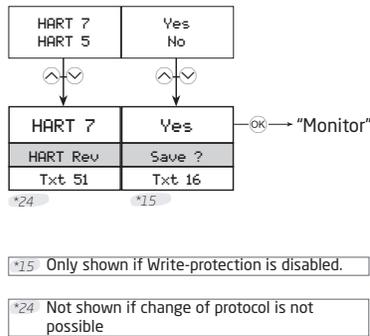
Help Text Overview

Table 18. Help Messages

ID	Description
[01]	Set correct password
[02]	Enter Advanced setup menu?
[03]	Select single sensor functionality
	Select dual sensor functionality
[04]	Enter Display setup
	Enter Tags setup
	Enter Process calibration
	Enter Simulation mode
	Enter Advanced sensor setup
	Enter HART setup
	Enter Write-protect setup
	Enter Language setup
	Enter HART Revision setup
[05]	Select measurement unit
[06]	Select custom RTD as sensor type
	Select Pt50 as sensor type
	Select Pt100 as sensor type
	Select Pt200 as sensor type
	Select Pt500 as sensor type
	Select Pt1000 as sensor type
[07]	Select 2-Wire sensor connection
	Select 3-Wire sensor connection
	Select 4-Wire sensor connection
[08]	Set actual cable resistance in 2 wires
[09]	Set response time
[10]	Select Internal CJC sensor
	Select Pt100 as external CJC sensor type
	Select Ni100 as external CJC sensor type
	Select Fixed CJC
[12]	Set fixed CJC value
[13]	Disable sensor 2
	Enable sensor 2
[14]	Set maximum cable resistance in 2 wires
[15]	Set max. value for individual sensors for differential measurement
[16]	Save configuration?
[17]	Map sensor1 to PV and output loop current
	Map sensor2 to PV and output loop current
	Map CJC sensor to PV and output loop current
	Map Internal temperature to PV and output loop current
	Map Avg measurement to PV and output loop current
	Map differential measurement to PV and output loop current
[18]	Map sensor1 to SV
	Map sensor2 to SV
	Map CJC sensor to SV
	Map Internal temperature to SV
	Map Avg measurement to SV
	Map differential measurement to SV
[19]	Map sensor1 to TV
	Map sensor2 to TV
	Map CJC sensor to TV
	Map Internal temperature to TV

Table 18. Help Messages (Continued)

ID	Description
	Map Avg measurement to TV
	Map differential measurement to TV
[20]	Map sensor1 to QV
	Map sensor2 to QV
	Map CJC sensor to QV
	Map Internal temperature to QV
	Map Avg measurement to QV
	Map differential measurement to QV
[21]	Set sensor value for analog output low
[22]	Set sensor value for analog output high
[23]	Set output current at 0% input range
[24]	Set output current at 100% input range
[25]	Set output current lower limit
[26]	Set output current upper limit
[27]	Disable sensor error detection
	Enable sensor wire breakage detection
	Enable sensor shortage detection
	Enable both sensor wire breakage and sensor shortage detection
[28]	Set output current in case of sensor wire breakage
[29]	Set output current in case of sensor shortage
[31]	Set number of preambles in HART response frames
[32]	Set polling address
[33]	Disable loop current signal (no analog output)
	Enable loop current signal (analog output)
[34]	Write description of the device
[35]	Write message on the device
[36]	Set user date on device
[37]	Set the final assembly number
[38]	Write long tag
[39]	Write tag
[41]	Select language
[42]	Disable LCD backlight
	Select white LCD backlight
	Select red LCD backlight
[43]	Adjust LCD contrast
[44]	Select loop current for bar graph indicator
	Select % of range for bar graph indicator
[45]	Select Sensor1 for process monitor view
	Select Sensor2 for process monitor view
	Select CJC Sensor for process monitor view
	Select Average measurement for process monitor view
	Select differential measurement for process monitor view
	Select loop current for process monitor view
	Select % of range for process monitor view
[47]	Enable write protection?
[48]	Set new password
[50]	Minimum number of preambles in requests
	Software revision level
	Hardware revision level
	Device identification
	Manufacturer identification
	HART protocol revision level
[51]	Set HART protocol revision 7

Table 18. Help Messages (Continued)

ID	Description
	Set HART protocol revision 5
[53]	Enter sensor1 calibration menu
	Enter sensor2 calibration menu
	Enter CJC sensor calibration menu
	Enter output loop current calibration menu
[54]	Reset calibration to factory default
	Perform process calibration
[55]	Set value for low calibration point
[56]	Set value for high calibration point
[57]	Simulate sensor1 input
	Simulate sensor2 input
	Simulate CJC sensor input
	Simulate average measurement
	Simulate differential measurement
	Simulate output loop current
[58]	Set sensor1 simulation value
[59]	Set sensor2 simulation value
[60]	Set CJC sensor simulation value
[61]	Set average measurement simulation value
[62]	Set differential measurement simulation value
[63]	Set output loop current simulation value
[64]	Edit the long tag?
[65]	Edit the tag?
[66]	Edit the descriptor?
[67]	Edit the message?
[68]	Select averaging of sensor 1 and sensor 2
	Select differential measurement: sensor 1 - sensor 2
[69]	Select voltage input
	Select linear resistance input
	Select temperature input
[70]	Select Pt sensor type
	Select Ni sensor type
	Select TC sensor type
[71]	Select Ni50 as sensor type
	Select Ni100 as sensor type
	Select Ni120 as sensor type
	Select Ni1000 as sensor type
[72]	Select TC-B as sensor type
	Select TC-E as sensor type
	Select TC-J as sensor type
	Select TC-K as sensor type
	Select TC-L as sensor type
	Select TC-N as sensor type
	Select TC-R as sensor type
	Select TC-S as sensor type
	Select TC-T as sensor type
	Select TC-U as sensor type
	Select TC-W3 as sensor type
	Select TC-W5 as sensor type
	Select TC-Lr as sensor type
	Select Custom TC as sensor type
[73]	Disable LCD error backlight
	Select white LCD error backlight

Table 18. Help Messages (Continued)

ID	Description
	Select red LCD error backlight
[74]	Apply low calibration point value and wait until stable
[75]	Apply high calibration point value and wait until stable
[76]	Set menu access PIN-code
[77]	Set menu access PIN-code (0000 will disable)
[100]	
SW.ER	Exception error during code execution
FL.ER	Flash memory error
EE.ER	EEPROM memory error
AC.ER	A/D converter error
RA.ER	RAM memory error
COM.ER	Internal communication error
NEW.DEV	New device attached – configuration is being updated – please wait
SYNC.DEV	Configuration is being re-synchronized - please wait
SE1.ER	Sensor 1 error, check wiring and replace sensor if necessary
SE2.ER	Sensor 2 error, check wiring and replace sensor if necessary
CJC.ER	CJC Sensor error, check wiring and replace sensor if necessary
CJC.ER	Internal temperature sensor error
CA.ER	Last process calibration failed to succeed - please retry
IN.HI/IN.LO	Sensor 1 is out of range
IN.HI/IN.LO	Sensor 2 is out of range
IN.HI/IN.LO	CJC sensor is out of range
IN.HI/IN.LO	Sensor 1 or Sensor 2 measurement is out of range

Available Units

The following table lists the available units. Most of these are available only on the Sensor menu.

Table 19. Available Units

Menu #	HART #	Text	Types
0	32	°C	<- Sensor specific types
1	33	°F	
2	34	°R	
3	35	K	
4	37	Ohm	
5	163	kOhm	
6	240	µV	
7	36	mV	
8	58	V	
9	39	mA	
10	57	%	
11	1	inH_2O	<- Pressure units
12	2	inHg	
13	3	ftH_2O	
14	4	mmH_2O	
15	5	mmHg	
16	6	psi	
17	7	bar	
18	8	mbar	
19	9	g/cm^2	
20	11	Pa	
21	12	kPa	
22	13	torr	
23	14	atm	
24	237	MPa	
25	17	l/min	<-Volume flow units
26	19	m^3/h	
27	22	gal/s	
28	24	l/s	
29	25	ml/d	
30	26	ft^3/s	
31	130	ft^3/h	
32	27	ft^3/d	
33	28	m^3/s	
34	29	m^3/d	
35	121	m^3n/h	
36	132	bbl/s	
37	134	bbl/h	
38	135	bbl/d	
39	136	gal/h	
40	138	l/h	
41	235	gal/d	
42	20	ft/s	<-Velocity units
43	21	m/s	
44	114	in/s	
45	120	m/h	
46	40	gal	<- Volume units
47	41	l	
48	43	m^3	
49	46	bbl	

Table 19. Available Units (Continued)

Menu #	HART #	Text	Types
50	110	bush	
51	111	yd^3	
52	112	ft^3	
53	113	in^3	
54	166	m^{3}n	
55	167	ln	
56	236	hl	
57	44	ft	<- Length units
58	45	m	
59	47	in	
60	48	cm	
61	49	mm	
62	50	min	<-Time units
63	51	s	
64	52	h	
65	53	d	
66	60	g	<- Mass units
67	61	kg	
68	62	t	
69	63	lb	
70	64	ShTon	
71	65	LTon	
72	125	oz	
73	70	g/s	<- Mass flow units
74	71	g/min	
75	72	g/h	
76	73	kg/s	
77	75	kg/h	
78	76	kg/d	
79	77	t/min	
80	78	t/h	
81	79	t/d	
82	80	lb/s	
83	82	lb/h	
84	83	lb/d	
85	90	SGU	<- Mass per volume units
86	91	g/cm^3	
87	92	kg/m^3	
88	95	g/ml	
89	96	kg/l	
90	97	g/l	
91	146	µg/L	
92	147	µg/m^3	
93	54	cSt	<- Viscosity units
94	55	cP	
95	69	N/m	<- Energy (work) units
96	128	kW/h	
97	162	Mcal	
98	164	MJ	
99	165	Btu	
100	127	kW	<- Power units
101	129	hp	
102	141	MJ/h	

Table 19. Available Units (Continued)

Menu #	HART #	Text	Types
103	142	Btu/h	
104	117	deg/s	<- Angular velocity units
105	118	rev/s	
106	119	rpm	
107	38	Hz	<- Miscellaneous
108	56	µMho	
109	59	pH	
110	66	mS/cm	
111	67	µS/cm	
112	68	N	
113	139	ppm	
114	143	deg	
115	144	rad	
116	148	%Cs	
117	149	Vol%	
118	153	pF	
119	154	ml/l	
120	155	µl/l	
121	161	%LEL	
122	169	ppb	
123	251	<blank> (a)	<- Special units
124	252	?	
125	253	Spcl	

a. No characters shown.

Using a HART Communicator

With HART version 5, the measurement process variable (`PV`), electronics temperature (`Electr`), output value in mA (`PV AO`), and process variable in percent of range (`PV % rnge`) are displayed in the main Online menu.

With HART version 7, the Online menu displays the Sensor 1 value (`Snsr 1 Value`), Sensor 2 value (`Snsr 2 Value`), electronics or CJC value (`EI/CJC value`), average value (`Avg Value`), differential value (`Diff Value`), loop current (`Loop current`), and process variable in percent of range (`PV % rnge`).

4 to 20 mA Output Trim

A `D/A trim` function is used to trim 4 and 20 mA output values to match the output of a plant standard measurement device. To trim this output, connect the HART communicator to your transmitter and access the Online menu. Then use the following path:

> For HART 5: Device Setup > Diag/Service > Calibration > D/A Trim (1,2,3,2)

> For HART 7: Device Setup > Diag/Service > Calibration > D/A Trim (1,3,2,2)

With HART 7, you can also set trim separately for each device variable:

> Device Setup > Diag/Service > Calibration > Device Variable Trim (1,3,2,4)

Rerange

To rerange your transmitter, connect the HART communicator to your transmitter and access the Online menu. Then use the following path to set the lower range value (`PV LRV`), upper range value (`PV URV`), and units (`PV Unit`):

For HART 5: Device Setup > Basic Setup > Range Values (1,3,2)

For HART 7: Device Setup > Setup > Range Variables > Range Configuration (1,4,3,1)

Configuration

To configure your transmitter, connect the HART communicator to your transmitter and select `Device Setup` from the Online menu. See "HART Online Menu" on page 63 for details.

NOTICE
POTENTIAL MISCONFIGURATION
If your transmitter has an optional display, changing the engineering units or range in your transmitter requires that you also make similar changes in the configuration of your display.
Failure to follow these instructions can result in equipment damage.

Configuration Notes

♦ You can configure your transmitter to test for a broken sensor and/or a shorted RTD sensor. However, if the sensor is a thermocouple, do **not** configure the transmitter to test for a shorted sensor.

   If this feature is used, you can set the output to go to a predetermined value if a broken or shorted sensor is detected. This can be done in three ways in the parameters `Broken sensor` and `Shorted sensor`:

   ♦ In the sub-parameters `Br sens` and `Sh sens` (with HART 5) or `Broken Snsr Value` and `Shorted Snsr Value` (with HART 7), you can set the output to go to a specific value between 3.5 and 23 mA.

   ♦ The sub-parameter `NAMUR down` sets the output to go to 3.5 mA.

   ♦ The sub-parameter `NAMUR up` sets the output to go to 23 mA.

   ── **NOTE** ──────────────────────────────
   If you select NAMUR error values, do not select the same mA value for underrange or overrange conditions.
   ───────────────────────────────────────

♦ You can also configure the output of your transmitter to go to a predetermined value if the measurement exceeds the range limits. The parameter `AO lo lim` allows you to set the output in an underrange situation to a value between 3.5 and 23 mA. Likewise, in `AO up lim` you can set the output in an overrange situation to a value between 3.5 and 23 mA. Or you can set the output in underrange and overrange situations to go to NAMUR values of 3.8 and 20.5 mA with the parameter `Set limits=NAMUR`. Note that the value of `AO up lim` must be higher than the value of `AO down lim`.

♦ In the pick list of sensor types, do **not** specify `Spcl RTD` or `Spcl T/C` unless your transmitter was supplied with custom RTD or thermocouple curves.

♦ If your transmitter was ordered with custom factory configuration to enter a custom curve or Callendar-Van Dusen (CVD) coefficients, the HART communicator can be used to select `Spcl RTD` or `Spcl T/C` to invoke the custom configuration. However, the DD for the HART communicator does not include the function to develop the custom curve or to enter the CVD coefficients. Refer to Global Customer Support for a custom configuration.

♦ When configuring your transmitter for use with a 2-wire RTD, you must enter the cable resistance in the parameter `Cable resistance` so that it is not included in the measurement. To do this, enter the total value for both leads.

With HART version 5, if you do not know the resistance, you can have the transmitter measure and enter the resistance for you via the sub-parameter `Measure Value`.

♦ With HART version 5, Platinum and nickel RTDs used with your transmitter can have a nominal resistance between 10 and 1000 ohms. For other than 100-ohm RTDs, a factor must be entered in the parameter `RTD Factor`. This factor is calculated as follows:

RTD Factor = 100/RTD Nominal Resistance

For example, for a Pt1000 RTD, the calculation is:

RTD Factor = 100/1000 = 0.1

With HART version 7, no calculation is needed. Simply select the RTD type; for example, `Pt200 RTD`.

HART Online Menu

Figure 36. RTT15S Online Menu, HART 5 (1 of 2)

1 Device Setup
2 PV
3 Electr
4 Loop current
5 PV % rnge

1 Process variables
2 Diag/Service
3 Display Setup
4 Basic Setup
5 Detailed Setup
6 Review

1 PV
2 Electr
3 Loop current
4 PV % rnge

1 Language
2 Backlight
3 Error color
4 Contrast
5 Bar Graph View
6 Process View

1 Status	**A**
2 Loop Test	**B**
3 Calibration	**C**
4 Write protection	**D**
5 Read max/min log	
6 Reset max/min log	

1 Tag	
2 Range values	**E**
3 Sensor config	
4 PV Damp	
5 Snsr s/n	

1 Sensors	**F**
2 Signal condition	**G**
3 Output condition	**H**
4 Device information	**I**

1 Input info
2 Output info
3 Device information

AO 0%
AO 100%
AO lo lim
AO up lim
Br sens
Sh sens

1 PV LRV
2 PV URV
3 PV unit
4 LSL
5 USL
6 Min span
7 PV Damp
8 Snsr typ
9 Meas typ
Const CJC value
RTD factor
Snsr s/n

1 Manufacturer
2 Model
3 Tag
4 Descriptor
5 Message
6 Date
7 Write protect
8 Final asmbly num
9 Distributor
Hardware rev
Software rev
Universal rev
Fld dev rev
Sensor 1
Sensor 2
CJC electronic sens
DV calibration
Re-synchronization
New device
ADC communication
ADC checksum
ADC timeout
EEPROM readback
EEPROM integrity
RAM integrity
ADC initialization
FLASH integrity
Software
Internal communic
OEM 0 bit 0 - 7
OEM 1 bit 0 - 7
OEM 2 bit 0 - 7

Figure 37. RTT15S Online Menu, HART 5 (2 of 2)

Figure 38. RTT15S Online Menu, HART 7 (1 of 4)

1	Device setup
2	Snsr 1 Value
3	Snsr 2 Value
4	EI/CJC Value
5	Avg Value
6	Diff Value
7	Loop current
8	PV % rnge

1	Snsr 1 Value
2	Snsr 1 Limit status
3	Snsr 1 Data Quality
4	Snsr 2 Value
5	Snsr 2 Limit status
6	Snsr 2 Data Quality
7	EI/CJC Value
8	EI/CJC Limit status
9	EI/CJC Data Quality
	Avg Value
	Avg Limit status
	Avg Data Quality
	Diff Value
	Diff Limit status
	Diff Data Quality
	Loop current
	PV % rnge

1	PV Value
2	PV Data Quality
3	PV Limit status
4	SV Value
5	SV Data Quality
6	SV Limit status
7	TV Value
8	TV Data Quality
9	TV Limit status
	4V Value
	4V Data Quality
	4V Limit status
	Loop current
	PV % rnge

1	Process variables
2	Dynamic variables
3	Diag/Service
4	Setup
5	Review

(A)
(B)

1	Status
2	Calibration
3	Write Protection
4	DV Logging
5	DV Simulation
6	Device reset
7	Loop test

1	Snsr error
2	ADC errors
3	Misc. errors
4	Ext dev status
5	Device Diag Sts 0

1	Apply values
2	D/A trim
3	Dev var zero trim
4	Device variable trim
5	Device variable trim reset
6	Loop test
7	Override D/A trim

1	Write protect
2	New password

1	Enable dv simulation
2	Disable dv simulation

1	Read dv max/min log
2	Reset dv max/min log

Figure 39. RTT15S Online Menu, HART 7 (2 of 4)

1	HART
2	Variable Mapping
3	Range Variables
4	Display Setup
5	Process Sensor
6	Sensor 1 Setup
7	Sensor 2 Setup
8	Elect/CJC Setup
9	Average Setup
	Difference Setup
	Trend Setup
	Burst Setup
	Trim Setup
	Signal Condition
	Output Condition

1	PV is
2	SV is
3	TV is
4	QV is

1	Tag
2	Long tag
3	Descriptor
4	Message
5	Date
6	Final asmbly num

1	Range Configuration
2	PV Units
3	PV URV
4	PV LRV
5	PV USL
6	PV LSL
7	PV Min span

1	Language
2	Backlight
3	Error color
4	Contrast
5	Bar Graph View
6	Process View

1	Manufacturer
2	Model
3	Device Serial Num
4	Tag
5	Long tag
6	Descriptor
7	Message
8	Date
9	Write protect
	Cfg chng count
	Final asmbly num
	Distributor
	Hardware rev
	Software rev
	Universal rev
	Fld dev rev
	Sensor 1
	Sensor 2
	CJC/electronic sensor
	DV calibration
	Re-synchronization
	ADC communication
	ADC checksum
	ADC timeout
	EEPROM readback
	EEPROM integrity
	RAM integrity
	ADC integrity
	FLASH integrity
	Software
	Internal communic...

1	Sensor 1 Info
2	Sensor 2 Info
3	Elec/CJC Info
4	Average Info
5	Difference Info

<All Sensor 1 variables>
<All Sensor 2 variables>
<All EI/CJC variables>
<All AVG variables>
<All DIFF variables>

1	AO 0%
2	AO 100%
3	AO Lower Limit
4	AO Upper Limit
5	Error detection
6	Broken Snsr Value
7	Shorted Snsr Value
8	Loop current mode

1	Input Information
2	Output Info
3	Dev Info Review

Figure 40. RTT15S Online Menu, HART 7 (3 of 4)

C →

1	Sensor Setup
2	Sensor Limits
3	Snsr 1 Value
4	Snsr 1 Units
5	Snsr 2 Value
6	Snsr 2 Units
7	EI/CJC Value
8	EI/CJC Units
9	Avg Value
	Avg Units
	Diff Value
	Diff Units

1	Sensor Configuration
2	Error Detection

1	Snsr 1 USL
2	Snsr 1 LSL
3	Snsr 1 Min span
4	Snsr 2 USL
5	Snsr 2 LSL
6	Snsr 2 Min span
7	EI/CJC USL
8	EI/CJC LSL
9	EI/CJC Min span
	Avg USL
	Avg LSL
	Avg Min span
	Diff USL
	Diff LSL
	Diff Min span

D →

1	Snsr 1 Units
2	Snsr 1 LSL
3	Snsr 1 USL
4	Snsr 1 Min span
5	Snsr 1 Damp
6	Snsr 1 Probe Type
7	Snsr 1 Probe Conn
8	Snsr 1 Num Wires
9	Snsr 1 Temp Std
	Snsr 1 CJC Type
	Snsr 1 Man CJC Temperature
	Snsr 1 Man CJC Units
	Snsr 1 Cable Resist

E →

1	Snsr 2 Units
2	Snsr 2 LSL
3	Snsr 2 USL
4	Snsr 2 Min span
5	Snsr 2 Damp
6	Snsr 2 Probe Type
7	Snsr 2 Cable Resist

F →

1	EI/CJC Units
2	EI/CJC LSL
3	EI/CJC USL
4	EI/CJC Min span
5	EI/CJC Damp
6	EI/CJC Cable Resist

G →

1	Avg Units
2	Avg LSL
3	Avg USL
4	Avg Min span
5	Avg Damp

H →

1	Diff Units
2	Diff LSL
3	Diff USL
4	Diff Min span
5	Diff Meas Max
6	Diff Damp

L →

1	Snsr 1 LSL
2	Snsr 1 USL
3	Snsr 1 Units
4	Snsr 1 Damp
5	Snsr 2 LSL
6	Snsr 2 USL
7	Snsr 2 Units
8	Snsr 2 Damp
9	EI/CJC LSL
	EI/CJC USL
	EI/CJC Units
	EI/CJC Damp
	Avg LSL
	Avg USL
	Avg Units
	Avg Damp
	Diff LSL
	Diff USL
	Diff Units
	Diff Damp

I →

1	Num Trends Supp
2	Set Real-Time Clock
3	Real Time Clk Flgs
4	Current Date
5	Current Time
6	Trend Control
7	Trend Device Varia...
8	Trend Sample Inter...
9	Trend 0 Date Stamp
	Trend 0 Time Stamp
	Results

J →

1	Total Burst Msgs
2	Burst Config 1	→ **N**
3	Burst Config 2	→ **O**
4	Burst Config 3	→ **P**
5	Event Config	→ **Q**

K →

1	Device variable trim
2	Device variable trim reset
3	Dev var zero trim
4	Sensor 1 Trim	→ **R**
5	Sensor 2 Trim	→ **S**
6	Elec/CJC Snsr Trim	→ **T**

67

Figure 41. RTT15S Online Menu, HART 7 (4 of 4)

(M) → | 1 | Analog output | → (U)
      | 2 | HART output | → (V)

(O) →
1	B[1] Update Period
2	B[1] Max upd Period
3	B[1] Command
4	B[1] Mode Select
5	B[1] Trigger Mode
6	B[1] Classificat
7	B[1] Units
8	B[1] Level
9	B[1] Cfg Var Codes

→
1	B[1] [0]
2	B[1] [1]
3	B[1] [2]
4	B[1] [3]
5	B[1] [4]

(N) →
1	B[0] Update Period
2	B[0] Max upd Period
3	B[0] Command
4	B[0] Mode Select
5	B[0] Trigger Mode
6	B[0] Classificat
7	B[0] Units
8	B[0] Level
9	B[0] Cfg Var Codes

→
1	B[0] [0]
2	B[0] [1]
3	B[0] [2]
4	B[0] [3]
5	B[0] [4]

(Q) →
1	Num Events Supp
2	Status
3	Notif Control
4	1 Unack Evt Tgr
5	Notif Retry Time
6	Max Upd Time
7	Debounce Int
8	Event Masks

→
1	Status mask
2	Snsr error mask
3	ADC errors mask
4	Misc. errors mask
5	Ext dev sts mask
6	Diag sts 0 mask

(P) →
1	B[2] Update Period
2	B[2] Max upd Period
3	B[2] Command
4	B[2] Mode Select
5	B[2] Trigger Mode
6	B[2] Classificat
7	B[2] Units
8	B[2] Level
9	B[2] Cfg Var Codes

→
1	B[2] [0]
2	B[2] [1]
3	B[2] [2]
4	B[2] [3]
5	B[2] [4]

(R) →
1	Snsr 1 L Trim
2	Snsr 1 U Trim
3	Snsr 1 Trim Support
4	Snsr 1 Min L Trim
5	Snsr 1 Max L Trim
6	Snsr 1 Min U Trim
7	Snsr 1 Max U Trim
8	Snsr 1 Min Diff Trim

(S) →
1	Snsr 2 L Trim
2	Snsr 2 U Trim
3	Snsr 2 Trim Support
4	Snsr 2 Min L Trim
5	Snsr 2 Max L Trim
6	Snsr 2 Min U Trim
7	Snsr 2 Max U Trim
8	Snsr 2 Min Diff Trim

(T) →
1	EI/CJC L Trim
2	EI/CJC U Trim
3	EI/CJC Trim Support
4	EI/CJC Min L Trim
5	EI/CJC Max L Trim
6	EI/CJC Min U Trim
7	EI/CJC Max U Trim
8	EI/CJC Min Diff Trim

(U) →
1	Output Range
2	Snsr Error Values
3	Loop current
4	Loop current mode
5	Loop test
6	D/A trim
7	Override D/A trim

→
1	AO 0%
2	AO 100%
3	AO Lower Limit
4	AO Upper Limit
5	Set lim = NAMUR

→
1	Error detection
2	Broken Sensor
3	Shorted Sensor

(V) →
1	Loop current mode
2	Poll addr
3	Num req preams
4	Num resp preams

→
1	Broken Snsr Value
2	NAMUR down
3	NAMUR up

→
1	Shorted Snsr Value
2	NAMUR down
3	NAMUR up

4. Troubleshooting and Maintenance

NOTICE
RISK OF VOIDING WARRANTY
The transmitter module (inside the housing) has no moving parts. It is completely sealed and cannot be repaired. Any attempt to open the transmitter module voids the warranty.
Failure to follow these instructions can void the warranty.

⚠ DANGER
HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH
For nonintrinsically safe installations, to help prevent a potential explosion in a Division 1 hazardous area, de-energize the transmitter before you remove the housing cover.
Failure to follow these instructions can result in death or serious injury.

Troubleshooting

See also ""Device and Sensor Status Indication" on page 40".

Table 20. Recommended Troubleshooting Steps Before Replacing Module

Indication	Action
Erratic Measurement	Check Wiring Connections – Look for any loose connections or corroded terminals.
	Check Sensor – See instrument diagnostics (a) or use a multimeter to measure sensor.
	Check Grounding – Look for ground loops or noise on the bus with a digital scope.
	Check Power Supply – Check for adequate power levels.
	Check that the sensor type configured matches the sensor type being used.
Inaccurate Measurement	Check Sensor – See instrument diagnostics (a) or use a multimeter to measure sensor.
	Check Grounding – Look for ground loops or noise on the bus with a digital scope.
	Check Sensor Calibration – User multimeter to approximate sensor input or use a temperature bath for more accuracy.
	Check Transmitter Calibration – Use a decade box or millivolt input to simulate sensor output.
	Check Instrument Configuration – Check configured ranges and check for any unintentional rescaling.

Table 20. Recommended Troubleshooting Steps Before Replacing Module (Continued)

Indication	Action
Device Will Not Communicate	Check Instrument Configuration – Check for correct addressing, correct tagging, and so forth (digital communications).
	Check Power Supply – Check for adequate power levels. Check signal strength at I/O card.
	Check Grounding – Look for ground loops or noise on the bus with a digital scope.
	Check that there is a minimum of 250 Ω loop resistance between the power supply and the HART communicator.
Transmitter Is in Failsafe	Check Sensor – See instrument diagnostics (a) or use a multimeter to measure sensor.
	Check Wiring Connections – Look for any loose connections or corroded terminals.
	Check Configuration (ranges, sensor type, and so forth).
	Check Transmitter Calibration – Use a decade box or millivolt input to simulate sensor output.

a. Using a HART communicator or PC-based configurator.

Figure 42. Troubleshooting
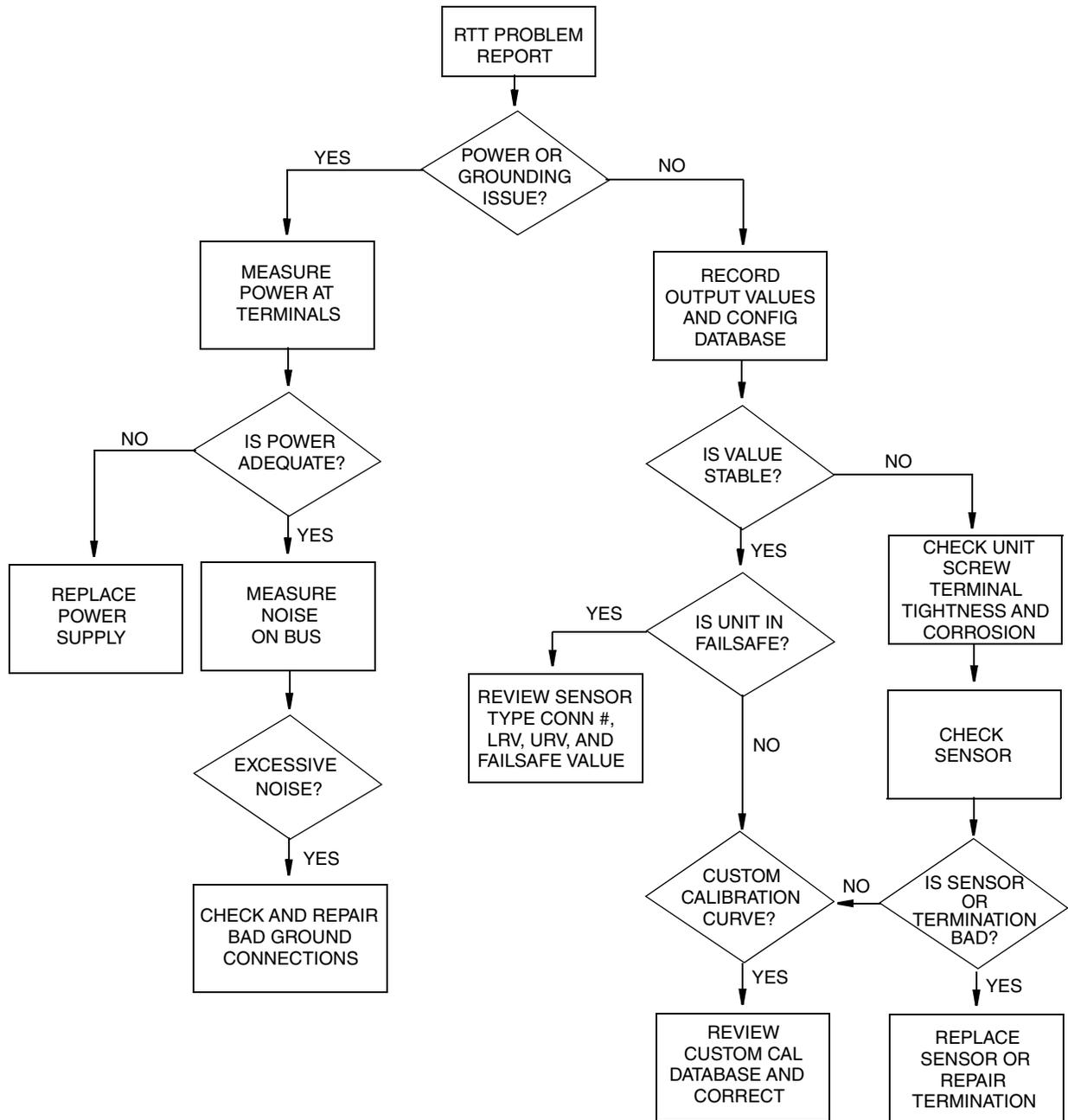
Replacing the Transmitter Module

⚠ WARNING
RISK OF UNINTENDED OPERATION
For Ex installation, verify that the replacement transmitter module has the necessary approvals applicable for the place of installation.
Once a transmitter module has been installed, it must not be taken out and used in other applications.
Failure to follow. these instructions can result in death or serious injury.

Before proceeding, please refer to "Assembly and Disassembly" on page 33 for information on extracting the transmitter module. Then follow the steps below.

1. Remove the terminal 1 and 2 screws using a screwdriver.

2. Attach the connector pins to the transmitter module connectors 1 and 2. (See Figure 43.) Tighten the screws using a 5 mm (0.2 in) socket wrench with an outer diameter of no more than 7 mm (0.28 in). Torque the connector pins to 3.5 in-lb (0.4 N-m).

3. Mount the device in the housing, making sure the connectors meet. Torque the bracket screws to 3.5 in-lbs (0.4 N-m).

─ **NOTE** ─
Over-tightening the screws can result in damage to the module.

The first time power is applied to the RTT15S, it will synchronize with the configuration parameters in the new transmitter module. This process will take approximately 30 seconds, during which NEW.DEV will appear on the display.

Figure 43. Connector Pins
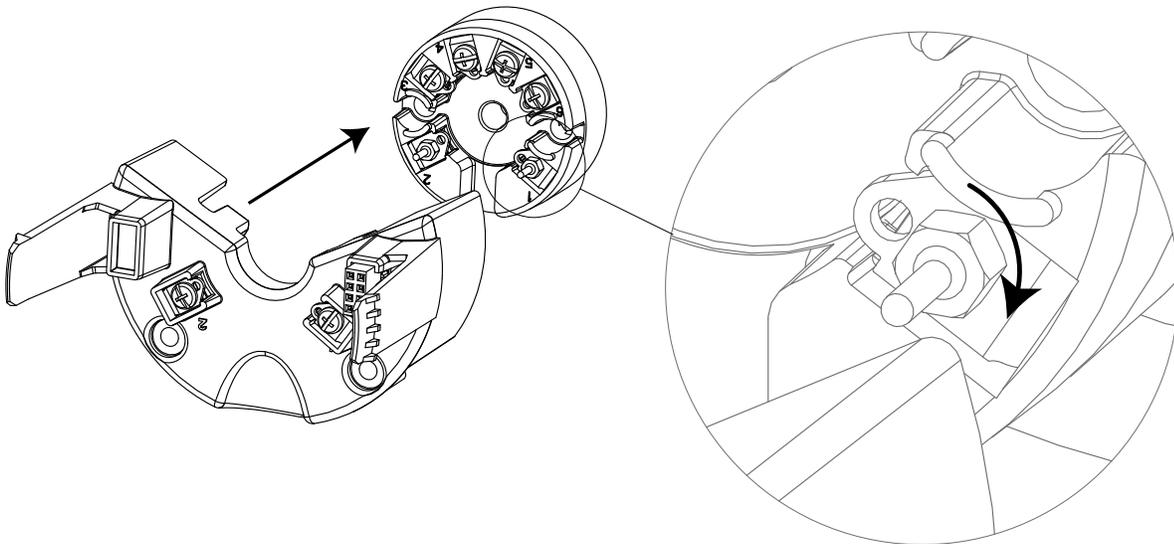
ISSUE DATES

SEP 2016
OCT 2017
JUN 2018

Vertical lines to the right of text or illustrations indicate areas changed at last issue date.

Schneider *Electric*™

0618