
**User's
Manual**

**YTA series
Temperature Transmitter
(HART Protocol)**

YTA SERIES

IM 01C50T01-01E

vigilantplant.™

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REVISION RECORD

1. INTRODUCTION

Thank you for purchasing the YTA series Temperature Transmitter.

The YTA series Temperature Transmitters are correctly calibrated at the factory before shipment. To ensure correct and efficient use of the instrument, please read this manual thoroughly and fully understand how to operate the instrument before operating it.

This manual describes that communication function of YTA series conforms to HART protocol and offers instruction for setting parameters for models YTA110, YTA310 and YTA320 Temperature Transmitters via HART 275 handheld terminal. In regards to the installation, wiring and maintenance of the YTA series Temperature Transmitters, please refer to the Instruction Manual “YTA series Temperature Transmitters Hardware Manual IM 01C50B01-01E.”

■ Regarding This Manual

- This manual should be passed on to the end user.
- The contents of this manual are subject to change without prior notice.
- All rights reserved. No part of this manual may be reproduced in any form without Yokogawa’s written permission.
- Yokogawa makes no warranty of any kind with regard to this manual, including, but not limited to, implied warranty of merchantability and fitness for a particular purpose.
- If any question arises or errors are found, or if any information is missing from this manual, please inform the nearest Yokogawa sales office.
- The specifications covered by this manual are limited to those for the standard type under the specified model number break-down and do not cover custom-made instrument.
- Please note that changes in the specifications, construction, or component parts of the instrument may not immediately be reflected in this manual at the time of change, provided that postponement of revisions will not cause difficulty to the user from a functional or performance standpoint.
- The following safety symbol marks are used in this Manual:



WARNING

Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.



CAUTION

Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.



IMPORTANT

Indicates that operating the hardware or software in this manner may damage it or lead to system failure.



NOTE

Draws attention to information essential for understanding the operation and features.

■ For Safe Use of Product

For the protection and safety of the operator and the instrument or the system including the instrument, please be sure to follow the instructions on safety described in this manual when handling this instrument. In case the instrument is handled in contradiction to these instructions, Yokogawa does not guarantee safety. Please give your attention to the followings.

(a) Installation

- The instrument must be installed by an expert engineer or a skilled personnel. The procedures described about INSTALLATION are not permitted for operators.
- In case of high process temperature, care should be taken not to burn yourself because the surface of the case reaches a high temperature.
- All installation shall comply with local installation requirement and local electrical code.

(b) Wiring

- The instrument must be installed by an expert engineer or a skilled personnel. The procedures described about WIRING are not permitted for operators.
- Please confirm that voltages between the power supply and the instrument before connecting the power cables and that the cables are not powered before connecting.

(c) Maintenance

- Please do not carry out except being written to a maintenance descriptions. When these procedures are needed, please contact nearest YOKOGAWA office.
- Care should be taken to prevent the build up of drift, dust or other material on the display glass and name plate. In case of its maintenance, soft and dry cloth is used.

(d) Modification

- Yokogawa will not be liable for malfunctions or damage resulting from any modification made to this instrument by the customer.

■ Warranty

- The warranty shall cover the period noted on the quotation presented to the purchaser at the time of purchase. Problems occurred during the warranty period shall basically be repaired free of charge.
- In case of problems, the customer should contact the Yokogawa representative from which the instrument was purchased, or the nearest Yokogawa office.
- If a problem arises with this instrument, please inform us of the nature of the problem and the circumstances under which it developed, including the model specification and serial number. Any diagrams, data and other information you can include in your communication will also be helpful.
- Responsible party for repair cost for the problems shall be determined by Yokogawa based on our investigation.
- The Purchaser shall bear the responsibility for repair costs, even during the warranty period, if the malfunction is due to:
 - Improper and/or inadequate maintenance by the purchaser.
 - Failure or damage due to improper handling, use or storage which is out of design conditions.
 - Use of the product in question in a location not conforming to the standards specified by Yokogawa, or due to improper maintenance of the installation location.
 - Failure or damage due to modification or repair by any party except Yokogawa or an approved representative of Yokogawa.
 - Malfunction or damage from improper relocation of the product in question after delivery.
 - Reason of force majeure such as fires, earthquakes, storms/floods, thunder/lightening, or other natural disasters, or disturbances, riots, warfare, or radioactive contamination.

■ ATEX Documentation

This procedure is only applicable to the countries in European Union.

GB

All instruction manuals for ATEX Ex related products are available in English, German and French. Should you require Ex related instructions in your local language, you are to contact your nearest Yokogawa office or representative.

DK

Alle brugervejledninger for produkter relateret til ATEX Ex er tilgængelige på engelsk, tysk og fransk. Skulle De ønske yderligere oplysninger om håndtering af Ex produkter på eget sprog, kan De rette henvendelse herom til den nærmeste Yokogawa afdeling eller forhandler.

I

Tutti i manuali operativi di prodotti ATEX contrassegnati con Ex sono disponibili in inglese, tedesco e francese. Se si desidera ricevere i manuali operativi di prodotti Ex in lingua locale, mettersi in contatto con l'ufficio Yokogawa più vicino o con un rappresentante.

E

Todos los manuales de instrucciones para los productos antiexplosivos de ATEX están disponibles en inglés, alemán y francés. Si desea solicitar las instrucciones de estos artículos antiexplosivos en su idioma local, deberá ponerse en contacto con la oficina o el representante de Yokogawa más cercano.

NL

Alle handleidingen voor producten die te maken hebben met ATEX explosiebeveiliging (Ex) zijn verkrijgbaar in het Engels, Duits en Frans. Neem, indien u aanwijzingen op het gebied van explosiebeveiliging nodig hebt in uw eigen taal, contact op met de dichtstbijzijnde vestiging van Yokogawa of met een vertegenwoordiger.

SF

Kaikkien ATEX Ex -tyyppisten tuotteiden käyttöohjeet ovat saatavilla englannin-, saksan- ja ranskankielisinä. Mikäli tarvitsette Ex -tyyppisten tuotteiden ohjeita omalla paikallisella kielellänne, ottakaa yhteyttä lähimpään Yokogawa-toimistoon tai -edustajaan.

P

Todos os manuais de instruções referentes aos produtos Ex da ATEX estão disponíveis em Inglês, Alemão e Francês. Se necessitar de instruções na sua língua relacionadas com produtos Ex, deverá entrar em contacto com a delegação mais próxima ou com um representante da Yokogawa.

F

Tous les manuels d'instruction des produits ATEX Ex sont disponibles en langue anglaise, allemande et française. Si vous nécessitez des instructions relatives aux produits Ex dans votre langue, veuillez bien contacter votre représentant Yokogawa le plus proche.

D

Alle Betriebsanleitungen für ATEX Ex bezogene Produkte stehen in den Sprachen Englisch, Deutsch und Französisch zur Verfügung. Sollten Sie die Betriebsanleitungen für Ex-Produkte in Ihrer Landessprache benötigen, setzen Sie sich bitte mit Ihrem örtlichen Yokogawa-Vertreter in Verbindung.

S

Alla instruktionsböcker för ATEX Ex (explosionssäkra) produkter är tillgängliga på engelska, tyska och franska. Om Ni behöver instruktioner för dessa explosionssäkra produkter på annat språk, skall Ni kontakta närmaste Yokogawakontor eller representant.

GR

Όλα τα εγχειρίδια λειτουργίας των προϊόντων με ATEX Ex διατίθενται στα Αγγλικά, Γερμανικά και Γαλλικά. Σε περίπτωση που χρειάζεστε οδηγίες σχετικά με Ex στην τοπική γλώσσα παρακαλούμε επικοινωνήστε με το πλησιέστερο γραφείο της Yokogawa ή αντιπρόσωπο της.

1.1 Matching of DD and Instruments

To setup the YTA via HART handheld communicator, it is necessary that the correct version of DD(Device Description) is installed in the communicator. The matching of the instrument and the DD in the communicator can be checked by the following procedures. If the correct DD is not installed in your communicator, contact your nearest official programming site for HART Communicator and ask for an update.

For the instruments or software other than the HART handheld communicator, contact a vendor of each instrument / software and ask for information.

1. Check the revision of the instrument.
 - 1) Connect the communicator with the instrument.
 - 2) Call "Review" display, and find the parameter "Fld dev rev" there. The device revision of the instrument is shown in it.
2. Check the revision of DD
 - 1) Turn on the communicator without connecting with the instrument.
 - 2) Call "Simulation" display. [Menu → 4.Utility → Simulation]
 - 3) The list of the manufacturers is shown. Find YOKOGAWA and select it.
 - 4) The list of the devices is shown. Find YTA and check if the dev rev number shown there matches the number confirmed in the step 1.

2. HART COMMUNICATOR OPERATION

2.1 Conditions of Communication Line

2.1.1 Interconnection Between YTA and HART Communicator

The HART communicator can interface with the transmitter from the control room, the transmitter site, or any other wiring termination point in the loop, provided there is a minimum of 250W between the connection and the power supply. To communicate, it must be connected in parallel with the transmitter; the connections are non-polarized. Figure 2.1 illustrates the wiring connections for direct interface at the transmitter site for the YTA. The HART communicator can be used for remote access from any terminal strip as well.

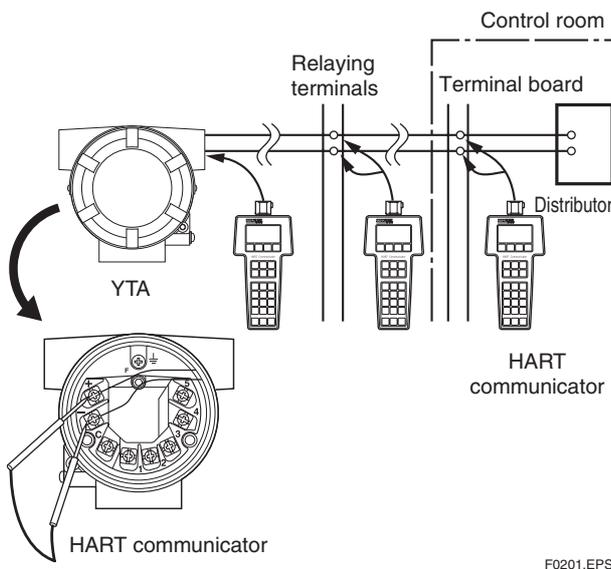


Figure 2.1 Interconnection Diagram

2.1.2 Communication Line Requirements

Specifications for Communication Line:

Supply voltage

General use type; 16.4 to 42 V DC

Load resistance; 250 to 600Ω

(Including cable resistance)

Minimum cable size; 24 AWG,

(0.51 mm diameter)

Cable type; Single pair shielded or

multiple pair with overall shield

Maximum twisted-pair length; 10,000 ft

(3,048 m)

Maximum multiple twisted-pair length;

5,000 ft (1,524 m)

Use the following formula to determine cable length for a specific application;

$$L = \frac{65 \times 10^6}{(R \times C)} - \frac{(C_f + 10,000)}{C}$$

where: L = length in feet or meters.

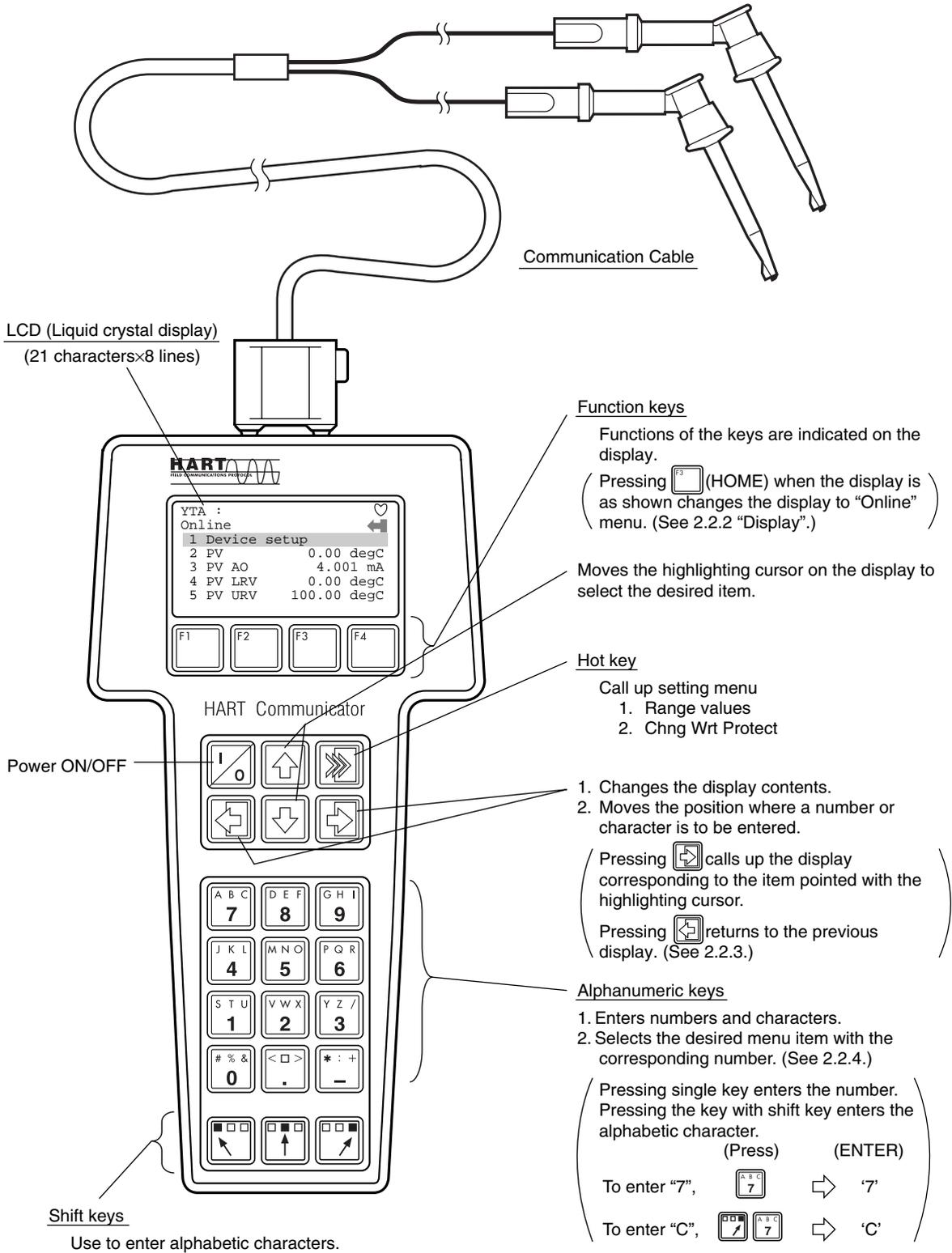
R = resistance in ohms, current sense
resistance plus barrier resistance.

C = cable capacitance in pF/ft or pF/m.

C_f = Maximum shunt capacitance of field
devices in pF.

2.2 Basic Operation of the HART Communicator (Model 275)

2.2.1 Keys and Functions



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Figure 2.2 The HART Communicator

2.2.2 Display

The HART communicator searches for transmitter on the 4 to 20 mA loop when it is turned on. When the HART communicator is connected to the transmitter, “Online” menu (Top menu) is started automatically and the following display appears. If no transmitter is found, you select “Online” menu.

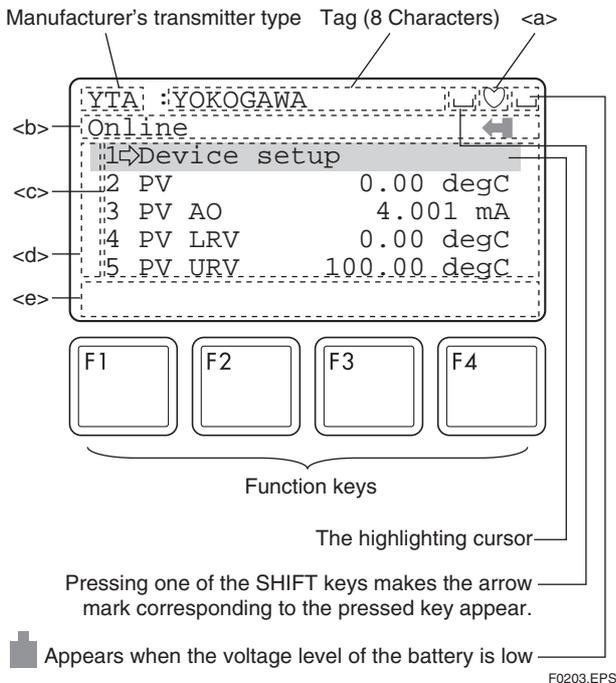


Figure 2.3 Display

- <a> ♥ appears and flashes during communication between the HART communicator and the transmitter. In Burst mode, ♥ appears.
- The menu items selected from the previous menu.
- <c> The items to be used from the menu of .
- <d> ↓ or ↑ appears when the item is scrolled out of the display.
- <e> The labels of function corresponding to each function key appears. These labels reflect currently available choices.

Function Key Labels

F1	F2	F3	F4
HELP access on-line help	ON/OFF activates or deactivates a binary variable	ABORT terminate current task	OK acknowledge information on screen
RETRY try to re-establish communication	DEL delete current character or Hot Key Menu item	ESC leave value unchanged	ENTER accept user-entered data
EXIT leave the current menu	SEND send data to device, or mark data to send	QUIT terminate session because of a communication error	NEXT leave the current menu
YES answer to yes/no question	PGUP move up one help screen	PGDN move down one help screen	NO answer to yes/no question
ALL include current Hot Key item on Hot Key Menu for all devices	PREV go to previous message in a list of messages	NEXT go to next message in the list of messages	ONE include Hot Key item for one device
NEXT go to the next variable in offline edit	SAVE save information to memory module or data pack	HOME go to the top menu in the device description	
FILTR opens customization menu to sort configurations	MARK toggles marked configuration variables for sending to field device	BACK go back to menu from which HOME was pressed	
	XPAND opens detailed configuration information	EDIT edit a variable value	
	CMPRS closes detailed configuration information	ADD add current item to Hot Key Menu	

Figure 2.4 Function Key Labels

2.2.3 Calling Up Menu Addresses

Clause 3.2 shows the configuration of all menu items available with the HART communicator. The desired item can be displayed with ease by understanding the menu configuration.

When the HART communicator is connected to the transmitter, “Online” menu will be displayed after power is turned on (See Figure 2.2). Call up the desired item as follows:

Key operation

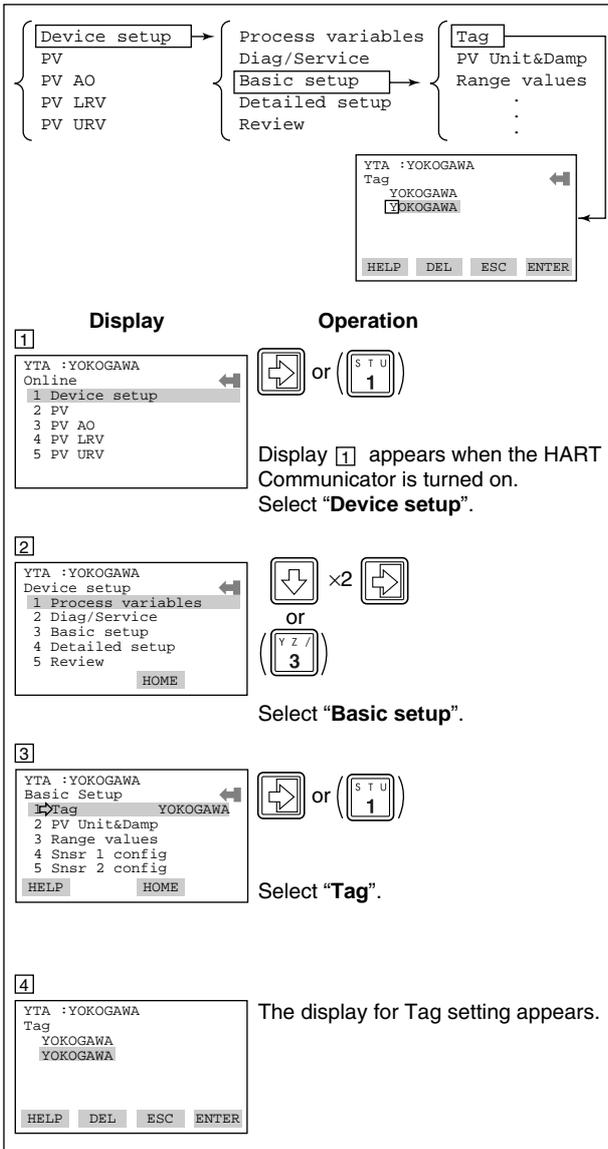
There are two choices to select the desired menu item.

- Use the or key to select the desired item, and then press the key.
- Press the number key displayed for the desired item.

- To return to the previous display, press the key.
- * If **ABORT**, **ESC** and **EXIT** are displayed, press the desired function key.

Example: Call up the “Tag” to change the tag.

Check to see where item “Tag” is located in the menu configuration. Then, call up “Tag” item on the display according to the menu configuration.



2.2.4 Entering, Setting and Sending Data

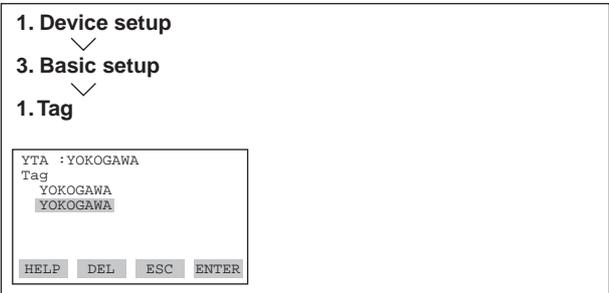
The data input using the keys are stored in the HART communicator by pressing **ENTER (F4)**. Then, by pressing **SEND (F2)**, the data is sent to the transmitter. Note that the data is not stored in the transmitter if **SEND (F2)** is not pressed. All the data stored with the HART communicator is held in memory unless power is turned off, all data can be sent to the transmitter at once.

Operation

Entering data on the “Tag” setting display.

Example: To change from Tag “YOKOGAWA” to “FIC-1A”.

Call up the “Tag” setting display.



When the setting display shown above appears, enter the data as follows:

Character to be entered	Operation	Display
F	DEF 8	F O K O G A W A
I	GHI 9	F I K O G A W A
C	ABC 7	F I C O G A W A
-		F I C - G A W A
1		F I C - 1 A W A
A	ABC 7	F I C - 1 A W A
Deletes characters.	x2 (DEL)	F I C - 1 A

Display	Operation
<p>5</p> <pre>YTA :YOKOGAWA Tag YOKOGAWA FIC-1A █ HELP DEL ESC ENTER</pre>	<p>F4</p> <p>(ENTER)</p> <p>After entering the data, set the HART communicator with the data entered by pressing ENTER (F4).</p>
<p>6</p> <pre>YTA :YOKOGAWA Basic setup 1 Tag FIC-1A ← 2 PV Unit&Damp 3 Range values 4 Snsr 1 config 5 Snsr 2 config HELP SEND HOME</pre>	<p>F2</p> <p>(SEND)</p> <p>Send the data to the transmitter by pressing SEND (F2).</p>
<p>7</p> <pre>YTA :FIC-1A Basic setup 1 Tag FIC-1A ← 2 PV Unit&Damp 3 Range values 4 Snsr 1 config 5 Snsr 2 config HELP HOME</pre>	<p>* ♥ is flashed during communication.</p> <p>SEND disappears, and the transmission is complete.</p>

3. OPERATION



IMPORTANT

Do not turn off the power to the transmitter immediately after transfer of the data from HART Communicator. If the transmitter is turned off in less than 30 seconds after parameters has been set, the setting data will not be stored and the transmitter will return to the previous settings.



NOTE

Parameters and functions in regards to Sensor2 are offered only for Model YTA320, and not available with YTA110/YTA310.

- **Tag No., Message, Descriptor** (→ 3.4.6 , 3.5.1)

Setting data in Tag, Message, and Descriptor parameters.

- **Test Output** (→ 3.5.2)

Make the transmitter output a fixed current from -2.5 through 110 % in 0.1% increments for loop checks.

- **Sensor Burnout** (→ 3.5.3)

Configure the current output value in sensor failure. Selectable from High, Low and User setting value.

- **Integral Indicator Display Mode** (→ 3.5.4)

To change items to be displayed on the Integral Indicator.

- **Write Protection** (→ 3.5.5)

To enable / disable write protection of parameters.

- **Sensor Backup Function** (→ 3.5.8)

To configure a transmitter to automatically transfer the input from Sensor1 to Sensor2 when Sensor1 fails.

- **Burst Mode** (→ 3.5.9)

In the burst mode, a transmitter continuously sends a selected set of data.

- **Sensor trim** (→ 3.5.6)

The trim adjustment function allows the user to add a compensation to the factory set characterization curve to more closely match the input signal.

- **Output trim** (→ 3.5.7)

Adjust the output value. See “IM01C50B01-01E 6. Calibration” also.

3.1 Parameter Description

The followings outline the functions of the HART parameters for YTA. Table 3.1 shows the name, usage and selection of each parameter.

- **Review Configuration Data** (→ 3.3)

- **Sensor Configuration** (→ 3.4.1)

When changing the sensor type from the current setting to another, it is necessary to change some parameter settings.

- **Process variable mapping** (→ 3.4.2)

Process variable is to be assigned as primary(PV), secondary(SV), tertiary(TV) and fourth(4V) Variable and can be monitored on the Integral indicator or Handheld terminal. Primary variable(PV) is output as the 4 to 20mA analog signal.

- **Unit Setting** (→ 3.4.3)

Choose the engineering unit for the process variables assigned as PV,SV, TV and 4V from °C, Kelvin, °F and °R . When mV or ohm is specified as an input type, the unit is automatically set as mV or ohm.

- **Range setting** (→ 3.4.4)

Changing the range of PV to be output as the 4 to 20mA DC. There's two ways to set the range value.

<a> Setting by keypad

 Setting by applying value

- **Damping time constant** (→ 3.4.5)

Setting the response time of the transmitter smooths the output with rapid changes in input.

Table 3.1 Parameters list

Item		HART Communicator	Description	Page
Memory		Tag	Tag number, up to 8 characters	3-11
		Tag Ex	Extension of Tag, up to 8 characters	3-11
		Descriptor	Up to 16 characters	3-11
		Message	Up to 32 characters	3-11
		Date	mm/dd/yy	3-11
		Sensor1(2) snsr s/n	To describe a serial number of sensor. 0 to 16777215	—
Process Variable	Engineering Unit	PV units (SV,TV,4V)	°C, K, °F, °R (Note 1)	3-8
	Range	LRV/URV	Set the calibration range using the keypad.	3-9
		Apply values	Value for 4 and 20 mA signal is set with actual input applied.	3-10
	Damping time constant	PV Damp (SV,TV,4V)	Adjust the output response speed of the 4 to 20 mA DC. Enter integer value from 0 to 99 seconds.	3-10
	PV damping holding point	PV damp point	Set the % of PV where the damping function is disabled. When PV exceeds this value, the damping is disabled and the output follows the PV.	3-10
	Variable mapping	PV is (SV,TV,4V)	Specify the value to be used as PV from: "Sensor1", "Terminal Temperature(Term)" and "Sensor1-Term". The SV, TV and 4V can also be specified and monitored from the HART communicator or Integral Indicator. The YTA320 variables include above plus: "Sensor2", "Sensor2-Term", "Average" and "Differential temperature".	3-6
	Differential Direction	Diff direction (YTA320 only)	When using differential value, select whichever is desired; Sensor1-Sensor2 or Sensor2-Sensor1.	3-8
Sensor1 Configuration	Sensor1 type	Snsr1 Type	Specify input type.	3-5
	Sensor1 wire	Snsr1 Wire	Specify the number of wire for RTD or ohm input.	3-5
	Sensor1 unit	Snsr1 unit	Select a unit from °C, K, °F, or °R. (See note 1). This unit is automatically referred as a PV, SV, TV or 4V unit when Sensor1 is mapped.	3-5
	Sensor matching function (Note 2)	Snsr1 Match Enbl	Enable / disable sensor matching function. When it is set to "enable", sensor coefficient parameter can be entered.	3-17
		Snsr1 Match coefs	Sensors specific co-efficients (by Callender vanDusen or IEC)	3-17
Terminal Temperature	Terminal Temp. unit	Term unit	Select a unit from °C, K, °F, or °R. (See note 1). This unit is automatically referred as a PV, SV, TV or 4V unit when Terminal Temperature is mapped.	—
	CJC Function	CJC Select	Select CJC function	3-18
		CNST CJC Temp	Specify constant value to be used for CJC function.	3-18
Sensor2 Configuration (YTA320 only)	Sensor2 type	Snsr2 Type	Specify input type.	3-5
	Sensor2 wire	Snsr2 Wire	Specify the number of wires.	3-5
	Sensor2 unit	Snsr2 unit	Select a unit from °C, K, °F, or °R. (See note 1). This unit is automatically referred as a PV, SV, TV or 4V unit when Sensor2 is mapped.	3-5
	Sensor matching function (Note 2)	Snsr2 Match Enbl	Enable/disable sensor matching function. When it is set to "enable", sensor coefficient parameter can be set.	3-17
		Snsr2 Match coefs	Sensors specific co-efficients (by Callender vanDusen or IEC)	3-17
	Sensor Back-up Function (YTA320 only)	Enbl Snsr Bkup	Enables/disables sensor back-up mode.	3-16
		Bkup state	Shows the back-up status.	3-16
Bkup Return Snsr1		Enables the recovery from Sensor2 to sensor1 in back-up operation.	3-16	

Note 1: °F and °R are available only when option code /D2 is specified.

Note 2: The parameters are available only when option code /CM1 is specified with YTA310/YTA320.

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Item		HART Communicator	Description	Page
Output	Sensor burn-out Output	Snsr burnout type	Select the output direction/value upon Sensor failure from Low, High, off or user-setting value (mA or %).	3-11
	Output in CPU failure	AO Alm typ	Show the current setting of the output direction in CPU failure which is set by hardware switch on a CPU assembly.	3-11
	Burst mode	Burst option	Select a set of data to be continuously sent; (1)PV, (2)output in % range & current, (3)PV and output in current.	3-16
		Burst mode	Enable/disable the burst mode.	3-16
Multi-drop mode	Poll addr	Setting the polling address (0 to 15).	3-17	
Display (Note 3)	Display select	Process Disp, %/mA Disp, Err-No Disp, Bar graph, Matrix Disp	Select variables/information to be displayed on an integral indicator.	3-12
	Display update period	Disp update	Select the update period form fast, normal, and slow.	3-13
Monitoring	Process Variable	PV,SV,TV,4V	Process variables.	—
	Output in %	PV % rng	% Output variable	—
	Output in mA	PV AO	4 to 20 mA Output variable	—
	Terminal Temperature	Term	Terminal temperature variable	—
Maintenance	Test Output	Loop test	Used for loop checks. Output can be set from 4, 20 mA or the designated value within 3.6 to 21.6 mA.	3-11
	Self-diagnostics	Self test	Check the transmitter status. If an error is detected, the corresponding message is displayed.	3-19
		Master test	Reset the CPU of the transmitter and check the status.	—
		Status	Display of the result of self-test.	3-19
		Set warning enbl	Show/not show warning messages.	3-22
		Error log view	Up to 4 error histories are stored in EEPROM.	3-22
		Max/Min log	Maximum and Minimum value of PV, SV, TV, 4V and Terminal Temperature during the operation.	3-22
		Operate Time	Operation time from last power-up.	3-22
		Power Check	Unintentional power-loss during operation may be detected.	3-22
	Write Protect	Write protect	Displays the permit/protect status for setting changes.	3-13
		Enable wrt 10 min	Write protect status is released for 10 minutes when the password is entered.	3-14
		New password	Setting a new password.	3-14
		Software Seal	Shows if the "joker" password has been used during the operation.	3-14
Adjustment	Sensor trim (Sensor1/2)	Input trimming mode	Select input trimming mode. The mode depends on the kind of calibration device and the number of calibration points.	3-14
		Snsr1(2) trim act	Select the action type of input trimming.	3-14
		S1(2) trim zero/gain	Input an additional compensation to the factory set characterization curve stored in the transmitter.	3-14
	Analog output trim	D/A trim, Scaled D/A trim	Adjust the 4 mA to 20 mA output.	3-15
Referential Information		Distributor Model Dev.id Final asmbly num Universal rev Fld dev rev Software rev PV LSL PV USL Snsr1(2) LSL Snsr1(2) USL Snsr1(2) snsr Term LSL Term USL	Yokogawa YTA110/YTA310/YTA320 Lower Limit for PV. Upper Limit for PV. Lower Limit for Sensor 1(2) input. Upper Limit for Sensor 1(2) input. serial number information Lower Limit for terminal temperature. Upper Limit for terminal temperature.	—

Note 3: Appears only when Integral Indicator is specified.

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3.2 Menu Tree

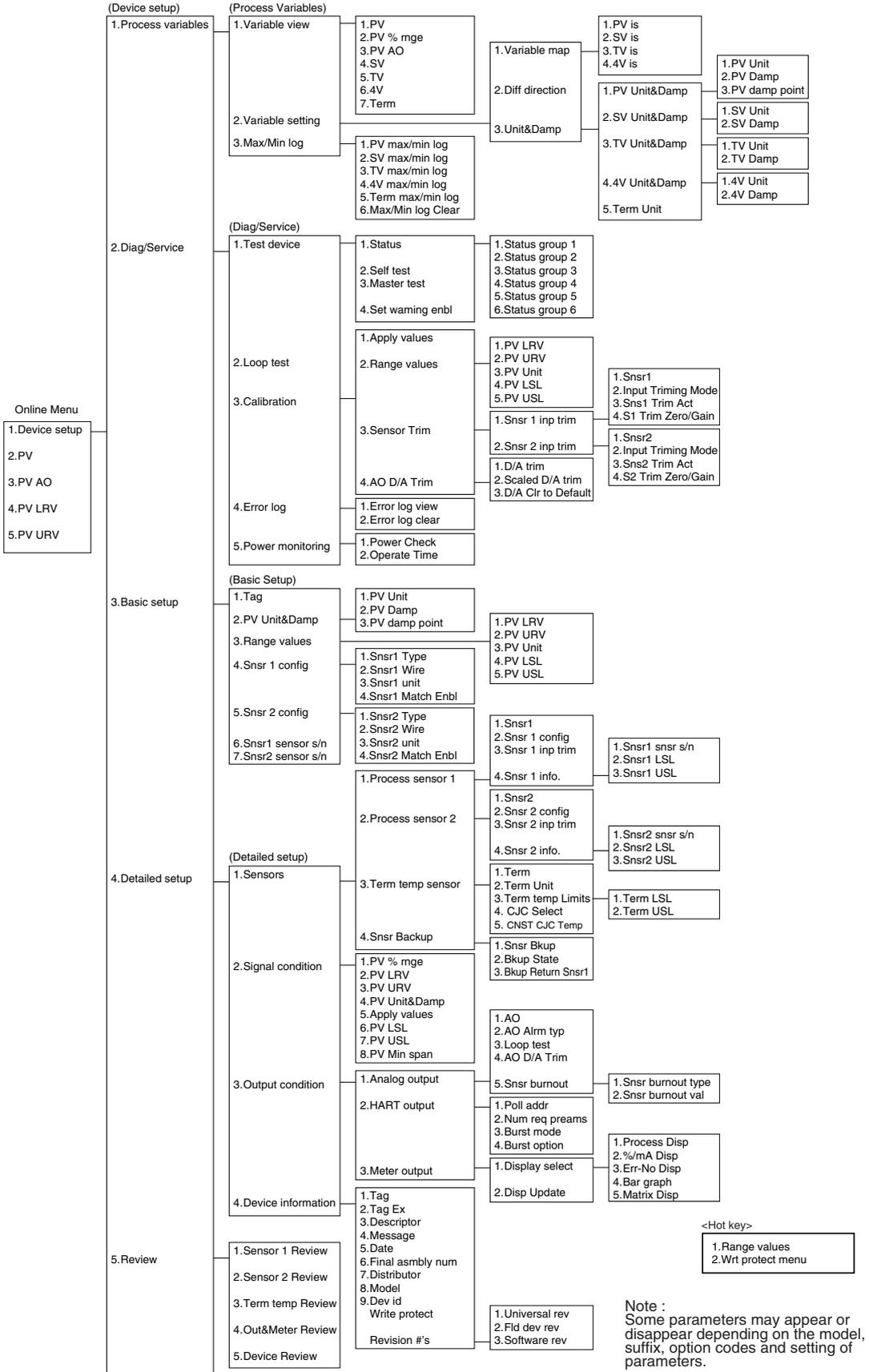


Figure 3.1 Menu Tree

3.3 Review

Before starting operation, review all the configuration of the transmitter to confirm that it meets the current application.

<p>1. Device setup</p> <p>▼</p>	<p>Call up “Review” display. Parameters are grouped by type and listed in review display of each group.</p>
<p>5. Review</p> <div style="border: 1px solid black; padding: 5px; width: fit-content;"> <p>YTA : Review 1. Sensor 1 Review 2. Term Temp Review 3. Out & Meter Rev 4. Device Review</p> <p>SAVE HOME</p> </div>	<p>Call up each review display, and scroll through the list to check each variable.</p> <p>If a change is necessary, refer to the “3.4 Basic Setup” in this manual.</p>

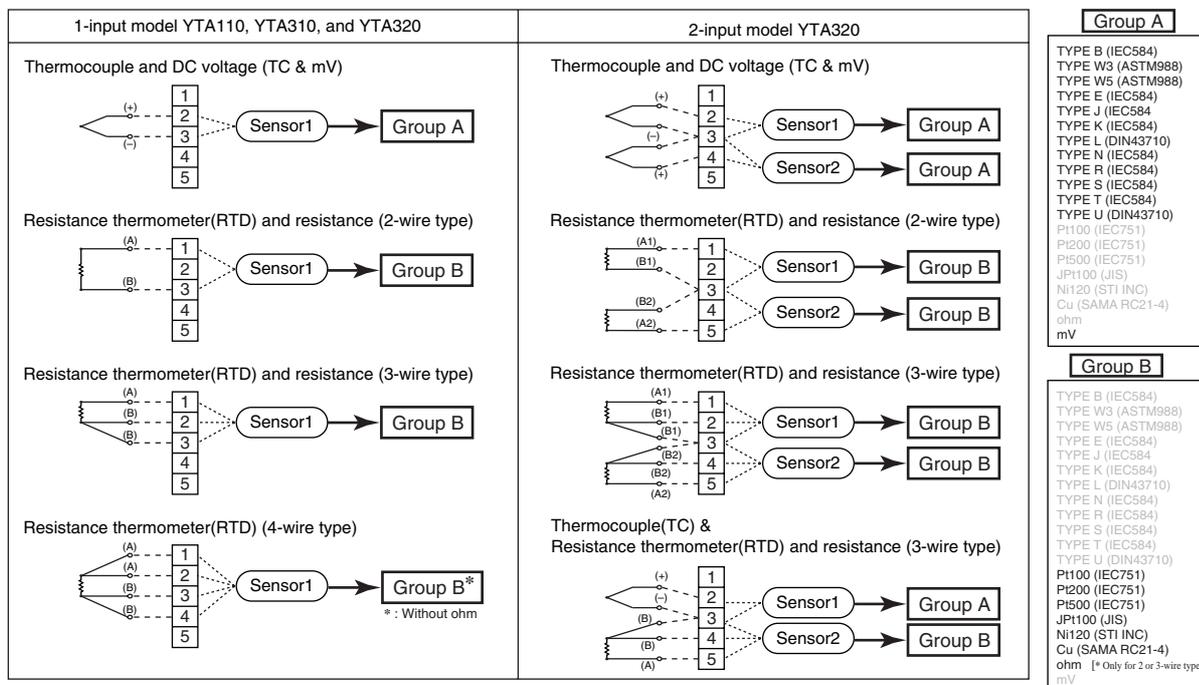
3.4 Basic Setup

3.4.1 Sensor Configuration

When changing sensor type, it is necessary to change the parameters related to the sensor type.

Figure 3.1 diagram shows the wire connections to the input terminals of the transmitter and sensor type selections for the parameters in each connection case. Note that TCs and mV are categorized as Group A and RTDs and ohm as Group B.

Check the connections between the input terminals and temperature sensors and set the correct sensor type and the number of wire connections for the parameters.



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Example: To set Pt100, 4-wire sensor as “Sensor1” input.
Also set a unit for Sensor1 as “°C”.

1. Device setup Call up the “Snsr 1 config” display.
↓
3. Basic setup
↓
4. Snsr 1 config

1

```

YTA :
Snsr 1 config
1. Snsr1 Type
2. Snsr1 Wire 3 Wire
3. Snsr1 unit deg C
  
```

Press “1” to call up “Snsr1 Type” display.

2

```

YTA :
Snsr1 type
Pt100(IEC751)
↑PT100(IEC751)
PT200(IEC751)
PT500(IEC751)
↓JPt100(JIS)
  
```

Scroll with the up/down key until designated sensor type is high-lightened. Press **ENTER[F4]** to set the type.

When selecting input type from T/C or mV, the number of the wires is automatically set to “2 Wire”. It is not necessary to change the setting in “Snsr1 Wire”.

3

```

YTA :
Snsr 1 config
1. Snsr1 Type
2. Snsr1 Wire 3 Wire
3. Snsr1 unit deg C
  
```

Enter “2” to call up “Snsr1 Wire” setting display.

4

```

YTA :
Snsr1 Wire
3 Wire
2 Wire
3 Wire
4 Wire
  
```

Press down key until designated wire number is high-lightened. Press **ENTER[F4]**.

5

```

YTA :
Snsr 1 config
1. Snsr1 Type
2. Snsr1 Wire 4 Wire
3. Snsr1 unit deg C
  
```

Select “3.Snsr1 unit” to set the unit for Sensor1.

6

```

YTA :
Sensor1 unit
degC
degC
Kelvin
  
```

Use   key to scroll the list until designated unit is highlighted. Press **ENTER[F4]**.

7

```

YTA :
Snsr 1 config
1. Snsr1 Type
2. Snsr1 Wire 4 Wire
3. Snsr1 unit deg C
  
```

Press **SEND[F2]** to transfer the data to the transmitter. Check that **SEND** disappears.

3.4.2 Process Variable Mapping

Process variable can be assigned as primary(PV), secondary(SV), tertiary(TV) or fourth(4V) Variable and can be monitored on Integral indicator or Handheld terminal. The primary variable(PV) is output as a 4 to 20mA analog signal, and thus it is necessary to map the variable as PV. Other variable can be left as “Not Used” when they are not required.

Configuration of Sensor 1 (and Sensor 2 for YTA320) must be done before changing the process variable mapping. (See 3.4.1)

1. Device setup
 ↓
 1. Process Variables
 ↓
 2. Variable setting
 ↓
 1. Variable map

Calling up the “Variable map” display.

1

```
YTA :
PV is Snsr1
SV is Term
TV is Not used
4V is Not used
Pressing 'OK' to change
them.
  ABORT  OK
```



The display in the left shows the current setting of the map. Press **OK[F4]**.

2

```
YTA :
PV is
Snsr1
  Snsr1
  Snsr1-Term
  Term
  ABORT  ENTER
```



Scroll with the up/down key until the designated sensor type is highlighted. Press **ENTER[F4]** to set the type. The selection is as follows.

[For YTA110, YTA310]

Sensor1
 Sensor1 - Terminal Temperature
 Terminal Temperature

[For YTA320]

Above plus ;
 Sensor2
 Sensor2 - Terminal Temperature
 Diff : Sensor2-Sensor1 or
 Sensor1-Sensor2
 Average : (Sensor1+Sensor2)/2

3

```
YTA :
SV is
Not used
  Snsr1
  Snsr1-Term
  Term
Not used
  ABORT  ENTER
```



Follow the same procedures for SV, TV and 4V. When you want to leave the setting as it is, just press **ENTER [F4]** to move to the next variable display. Pressing **ABORT[F3]** will cancel all the previous procedures for mapping.

4

```
YTA :
PV is Snsr1
SV is Term
TV is Not used
4V is Not used
Pressing 'OK' will
send them.
  ABORT  OK
```



Press **OK[F4]** to send the new setting to the transmitter.



NOTE

Sensor type “Non-standard 1” “Non-standard 2” are always shown, but cannot be used unless a necessary function is pre-installed in the transmitters upon shipment.



NOTE

- When SV, TV or 4V are not required, it is recommended to leave them as “**Not used**” to improve the performance.
- Each process variable, for example “**Sensor1**”, can be assigned to only one variable. If “**Sensor1**” is already set as PV, it cannot be set as SV, TV or 4V simultaneously.
- When “**Diff**”, “**Avg**”, “**Snsr1-Trem**”, or “**Snsr2-Trem**” are selected, the sensor types to be set for Sensor1 and Sensor2 should be selected from any one of the following three groups; Temperature sensor(T/C and RTD), DC voltage or resistance. The combination(for example, temperature sensor and DC voltage input) would cause an incorrect computation due to the different unit system and is not allowed.
- When “**Snsr1-Trem**” or “**Snsr2-Trem**” are selected, DC voltage and resistance input should not be set for Sensor1 or Sensor2.

— Differential Direction — (For YTA320)

If “Diff” is selected as Process variables, it is necessary to set which is designated; Sensor1-Sensor2 or Sensor2-Sensor1.

1

```

YTA :
Variable setting
1 Variable map
2 Diff direction
3 Unit&Damp
SAVE HOME
  
```

Enter “2” to select Differential direction.

2

```

YTA :
Diff direction
Snsr1-Snsr2
Snsr1-Snsr2
Snsr2-Snsr1
ESC ENTER
  
```

Press up/down key to select the differential direction. Press **ENTER[F4]**.

3

```

YTA :
Variable setting
1 Variable map
2 Diff direction
3 Unit&Damp
SEND HOME
  
```

Press **SEND[F2]** to transfer the data to the transmitter. Check that **SEND** disappears.

3.4.3 Unit

The unit for PV is set at the factory before shipment. When Sensor1(or Sensor2) or Terminal temperature is mapped as PV, SV, TV or 4V, the unit that is selected for Sensor1(orSensor2) or Terminal temperature is automatically referred as a unit for these process variables. (See 3.4.1 Sensor Configuration) When another value is mapped as PV, SV, TV or 4V, it is possible to set an independent unit for those variables.

Example: To change the PV unit from “°C” to “°F”.

* “F” degree appears only when /D2 code is specified.

1

```

YTA :
Hot key
1. Range values
2. Chng Wrt Protect
HELP DEL ESC ENTER
  
```

Press Hot key and select “1. Range values”.

2

```

YTA :
Range values
1 PV LRV 0.00 degC
2 PV URV 100.00 degC
3 PV Unit degC
4 PV LSL -200.00 degC
5 PV USL 850.00 degC
HELP DEL ESC ENTER
  
```

Select the “3. PV Unit” to set the unit.

3

```

YTA :
Snsr1 unit
degC
degF
degR
Kelvin
DEL ESC ENTER
  
```

Select designated unit and press **ENTER[F4]**.

4

```

YTA :
Range values
1 PV LRV 0.00 degC
2 PV URV 100.00 degC
3 PV Unit degF
4 PV LSL -200.00 degC
5 PV USL 850.00 degC
HELP SEND
  
```

Press **SEND[F2]** to send the new setting to the transmitter.

5

```

YTA :
Hot key
1 PV LRV 32.00 degF
2 PV URV 212.00 degF
3 PV Unit degF
4 PV LSL -328 degF
5 PV USL 1562 degF
HELP
  
```

Check that **SEND** disappears.

The unit for SV, TV and 4V can be changed in “Unit&Damping” display. Call up “Unit&Damp” display. (1. Device setup → 1. Process variables → 2. Variable setting → Unit&Damp.)

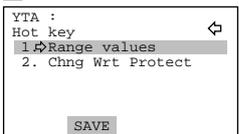
3.4.4 PV Range

The range for PV corresponding to the 4 to 20mA output signal is set at the factory before shipment. Following are the procedures to change the range.

Example: To change the range from "0 to 100 °C" to "50 to 200 °C".

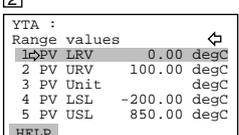
(1) Changing the range with Keypad – LRV, URV –

1



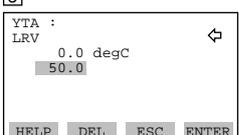
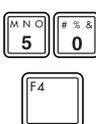

Press Hot key and call up "Range values".

2



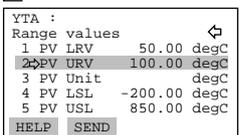

Select the "1. PV LRV" to set the Lower Range Value. Setting limit dependig on the selected sensor type is shown as "4. PV LSL." And "5. PV USL".

3

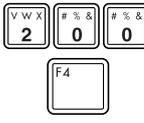
Enter "50", and press ENTER[F4].

4



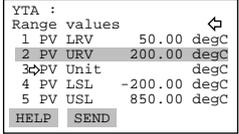

To set the Upper Range Value, select the "2 PV URV". Setting limit is shown as "4 PV LSL" and "5 PV USL".

5

Enter "200", and press ENTER[F4].

6




Press SEND[F2] to send the new range value to the transmitter. Confirm that [SEND] disappears.



NOTE

It is possible to set LRV>URV. This setting reverses the 4 to 20 mA output signal.

Setting Conditions: LSL <= LRV <= USL
LSL <= URV <= USL
|URV – LRV| >= Recom
mended Min. span

(2) Changing the range while applying an actual input – Apply values –

This feature allows the lower and upper range values to be setup automatically with the actual input applied.

1. Device setup Call up “Apply Values” display.

↓

2. Diag/Service

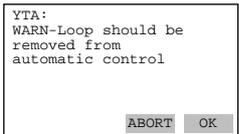
↓

3. Calibration

↓

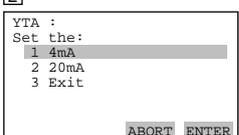
1. Apply values

1



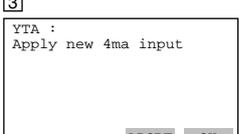
Press **OK[F4]** to make the control loop manual.

2



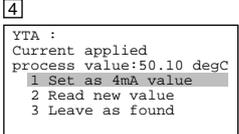
To set the lower range value, select “1. 4mA” and press **ENTER[F4]**.

3



Apply the input which corresponds to 4mA. After obtaining stable input, press **OK[F4]**.

4

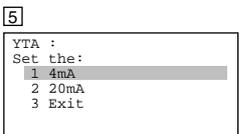


The LRV to be changed is 50.10 degC.

- Selecting item 1 sets LRV to 50.10degC.
- Selecting item 2 reads LRV again.

To set LRV to “50.10”, select item 1 and press **ENTER[F4]**.

5



Select “2. 20mA” and press **ENTER[F4]**. Apply the value which corresponding to 20mA and enter it as URV. (Refer to procedures [3] and [4].)

After completing the range change, select “3.Exit” and press **ENTER[F4]**.

3.4.5 Damping Time Constant

Setting the response time of each Process Variable to make it vary slowly with a rapid change in input. Set the value from 0 to 99 seconds.

If the time constant is set to 2 seconds, Transmitter calculates a reading every cycle time using the damping equation, to make the output 63 percent of the input range after 2 seconds.

This damping time constant is normally set to work when the temperature makes a step change within 2 percent of the output range. The damping can be changed using the “PV damp point” parameter .

Example: To set the damping time constant for PV to “5” seconds.

1. Device setup Call up “PV Unit&Damp” display.

↓

1. Process variables

↓

2. Variable setting

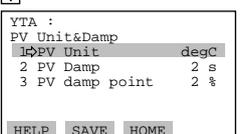
↓

Unit & Damp

↓

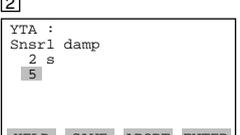
1. PV Unit&Damp

1



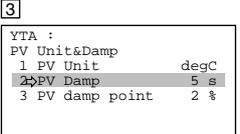
Enter “2” to call up “PV damp” display.

2



Enter new value, and press **ENTER[F4]**.

3



Press **SEND[F2]** to send the setting to the transmitter. Check that **SEND** disappears.

When necessary, change the setting of “PV damp point”.

3.4.6 Tag No.

To change the Tag, see section 2.2.4 “Entering, setting and Sending Data”.

Up to 8 characters can be set with “Tag”.

Example: To change from Tag “YOKOGAWA” to “FIC-1A.”

1. Device setup
 ↓
3. Basic Setup
 ↓
1. Tag

Call up the “Tag” setting display.

```

YTA : YOKOGAWA
Tag No.
YOKOGAWA
YOKOGAWA
HELP DEL ESC ENTER
          
```

Enter new setting and press
ENTER[F4].

See Section 2.2.4.

3.5 Detailed Setup

3.5.1 Device Information

Following Device information can be entered.

Tag :	Up to 8 characters.
Tag Extension:	Extension of Tag description. Up to 8 characters.
Descriptor:	Up to 16 characters
Message:	Up to 32 characters
Date:	mm/dd/yy mm:month, dd:day, yy:year

Call up the “Device Information” display. [1.Device setup → 4.Detailed setup → 4.Device information]

3.5.2 Test Output

This feature can be used to output a fixed current from 3.6 mA (-2.5%) to 21.6 mA (110%) for loop checks.

Call up the “Loop test ” display. [1.Device setup. → 2.Diag/Service → 2.Loop test]

Put the control loop in manual mode by pressing **OK[F4]**. The following output selections are offered.

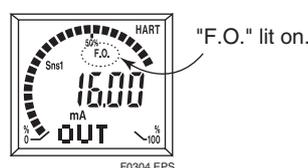
4mA:	Outputs 4 mA current
20 mA:	Outputs 20 mA current
Other:	Sets a desired output in mA using alphanumeric keys.
End:	Exits

CAUTION

1. Test output is held for approximately 10 minutes, and then released automatically after the time has elapsed. If the HART communicator power supply is turned off or communication connector is disconnected during the test output operation, it is held for approximately 10 minutes.
2. Press the  key to release the test output immediately.

NOTE

If the transmitter is equipped with the integral indicator, the LCD displays F.O.



3.5.3 Burnout Function

a) Sensor burnout

Configure the burnout mode in the case of sensor failure or disconnection.

Call up the “Snsr burnout type” display. [1.Device setup → 4.Detailed setup → 3.Output condition → 1.Analog output → 5.Snsr burnout]

When the sensor failure is detected, the transmitter outputs one of the following values.

Low:	Outputs 3.6mA
High:	Outputs 21.6mA
User(mA):	Outputs user set value in mA. Settable within 3.6 to 21.6 mA.
User(%):	Outputs user set value in %. Settable within -2.5 to 110 %.
Off:	The burn out output is NOT defined

NOTE

When sensor burnout is set to “off”, the transmitter's output will go undefined at sensor failure. It is necessary to understand this point well when setting “off”.

During sensor burn out time, the Sensor1 failure or the Sensor2 failure error message is generated. (See Section 3.6.1 for details.)

If the transmitter is equipped with the integral indicator, the LCD displays “Abn.” as shown in Figure 3.2.



Displays "Abn."

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Figure 3.2 Integral Indicator Display in Sensor Burn Out

b) Burnout in hardware failure

The output status of the transmitter in hardware failure is set using a jumper on the CPU assembly. The current setting can be checked in parameter “AO Alrm type”.

Call up the “AO Alrm type parameter” display.

[1.Device setup → 4.Detailed setup → 3.Output condition → 1.Analog output → 2.AO Alrm typ].

3.5.4 Integral Indicator Display Mode

When an integral indicator is specified with the transmitter, the display items and update speed can be configured.

Call up the “Meter output” display [1.Device setup → 4.Detailed setup → 3.Output condition → 3.Meter output]

Displays PV value.



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1) Display selection

(a) Process Disp

To Specify process variables to be shown on the digital display. Process variables and output value(see (b)) are shown on the digital display in turn. Selectable from followings;

- PV
- SV
- TV
- 4V
- PV, SV
- PV, SV, TV
- PV, SV, TV, 4V
- Inhibit

If two or more variables are specified, each value appears one after another in order. The unit corresponding to each

Displays output value.



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(b) % /mA Disp

To Specify output value to be shown on the digital display. Select from following;

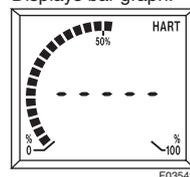
- mA
- %
- mA, %
- Inhibit

If two values are selected, they will appear on the display one after another. Process variables and output value(see (a)) is shown on the digital display in turn. The unit corresponding to each output value is lit. If “Inhibit” is selected, no output value will be displayed.

(c) Err-No Disp

To Select whether error codes are shown on the digital display or not when an error occurs. When “Show” is selected, error code will be shown on the digital display. When “Inhibit” is selected, no error code will be shown on the digital display.

Displays bar graph.



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(d) Bar graph

To select whether the output bar-graph display is lit or not. When “Show” is selected, The output value is shown in a 32-segment bar-graph. If “Inhibit” is selected, the bar-graph is off.

(e) Matrix Disp

To select information to be shown on the dot matrix display.

Process: Display name of the process variable shown on the digital display. (Ex. PV)

Type:

Display type of the input sensor

Wire:

Display the number of wires of the input sensor.

Displays PV value and sensor type



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Process, Type:

Display Process Variable name and Sensor Type in turn.

Type, Wire:

Display Sensor Type and the number of wires in turn

Inhibit: Display none.

2) Disp Update

Update period of the display is selected from Normal, Fast and Slow.



NOTE

When the transmitter is used at temperatures under -10 °C, the response speed of the display may become slow. It is recommended to set the display speed to normal or slow in such case.

3.5.5 Write Protect

The write protect function is used to prevent unauthorized configuration data changes in the transmitter. There are two ways to set this function; by hardware and by software, and hardware write protect function is given priority.

Press Hot key and select "2. Wrt protect menu."
Current status is shown in "1. Write protect."

3.5.5.1 Write Protect Status

Press Hot key and select "2. Wrt protect menu."
Current status is shown in "1. Write protect."

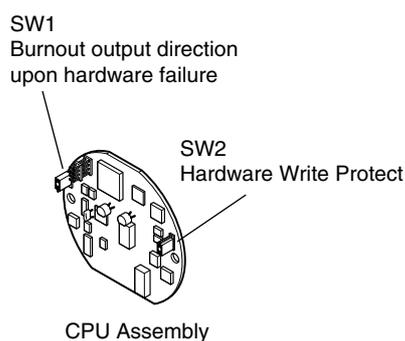
Yes: Hardware or software write protect function is activated. Under this status, any change operation is denied with the message. [In write protect mode] .

No : Neither protect function is activated.

3.5.5.2 Hardware Write Protect Function

Hardware write protect function is set up by Switch (SW2) on the CPU assembly.

Pin position of SW2	Write Protect Status
	No
	Yes



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Figure 3.3 SW2 setting



NOTE

1. Turn off the power supply before changing the setting of SW2.
2. To change the SW2, it is necessary to remove the LCD assembly with LCD model. Refer to "6.3 Disassembly and Assembly" in "YTA series Hardware Instruction Manual" about the procedures.

3.5.5.3 Software Write Protect Function

● To activate write protect function

1. Press Hot key and select “2. Wrt protect menu”.
2. Select “3.New password”.
3. Enter up to 8 alphanumeric string from key-pads.
Press **ENTER[F4]**.
4. Re enter the strings and press **ENTER[F4]**.
5. Press **OK[F4]** to set the password. The status is changed to “Write protect YES”.

● To change the password or to release the write protect mode

1. Press Hot key and select “2. Wrt protect menu” .
2. Select “2. Enable wrt 10 min”. Enter the password.
By this operation, the write protection is released for 10 minutes. It is possible to change the paramters.
3. Select “3.New password”.
4. To change the password, enter new password and press **ENTER[F4]**.
To release the write protect mode, enter 8 spaces in the new password field and press **ENTER[F4]**.
5. Press **OK[F4]** to set the new password or to release the write protect mode.



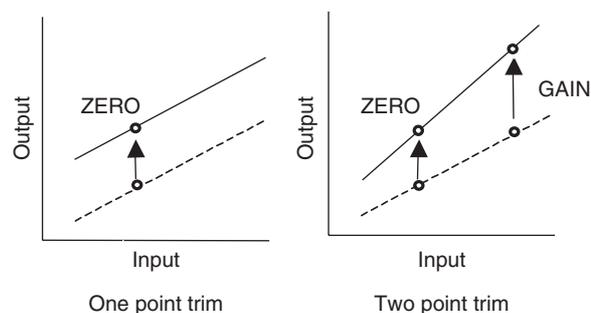
NOTE

1. “Enable Wrt 10 min” releases write protect status for 10 minutes. While write protect is released, enter a new password in the “New Password” field. It will not be possible to set a new password after 10 minutes have elapsed.
2. “Joker Password” and “Software Seal”
When you forget the password that has been registered, it is possible to release the mode for 10 minutes by using a joker password. Enter **YOKOGAWA** to release write protect status for 10 minutes. If this joker password is used, the status shown in the parameter “Software seal” is changed from “Keep” to “Break”. Press Hot key and select “2. Wrt Protect menu” . Current status is shown in “4. Software seal”. This status will be returned from “Break” to “Keep” by registering a new password.

3.5.6 Sensor Trim

Each YTA transmitter is factory-characterized based on the standard sensor curve, and uses this information to produce a process variable output. The sensor trim function is used to make an adjustment to the internal interpretation of the input signal and the factory characterization in the transmitter. (See Figure 3.4)

Since the factory characterization is kept even after applying the trim operation, it is possible to ignore the trim function when the original settings are recovered.



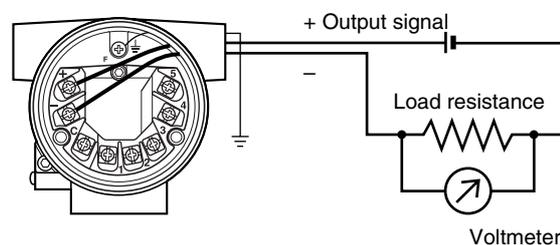
F0307.EPS

Figure 3.4 Trim function images

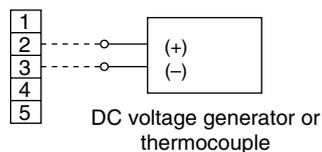
● The Procedures (For Sensor 1)

Before performing the sensor trim, complete the configuration of the sensor input. (See 3.4.1-2)

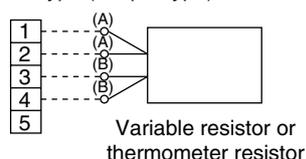
1. Connect the calibration device to the transmitter.
 - a. Wiring of power supply and output



- b. Example of wiring of thermocouple or DC voltage input (1-input type)



- c. Example of wiring of thermometer resistor 4-wire type (1-input type)



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Figure 3.5 Example of wiring for calibration equipment

2. Call up the “Snsr1 inp trim” display. [1.Device setup → 2. Diag/Service → 3.Calibration → 3.Sensor Trim → 1.Snsr 1 inp trim]
3. Select “2.Input Trimming Mode”. The following selections are offered.
 - V.R. / ZERO&GAIN
 - V.R. / ZERO
 - Temp / ZERO&GAIN
 - Temp / ZERO
 Select “V.R. / ZERO&GAIN” or “V.R. / ZERO” when the calibration device is DC voltage generator or Variable resistor or select “TEMP / ZERO&GAIN” or “TEMP / ZERO” when the device is Temperature sensor.
4. Enable the user trim. Select “3. Snsr1 Trim Act”. The following selections are offered.
 - On: Use User trim value
 - Off: Ignore User trim value, and return to the factory setting.
 - Clear: Clear User trim value and return to the factory setting.
 Select “On” to enable trim function and Press **ENTER[F4]**.
5. Perform zero-adjustment. Call up the “4. S1 Trim Zero/Gain”.
 - (a) When the input trimming mode is “V.R. / ZERO&GAIN” or “V.R. / ZERO”, apply the value for the zero-point shown in the table 3.2 depending on the specified sensor type. Wait until the input from the calibration device becomes stable.
 - (b) When the input trimming mode is “TEMP / ZERO&GAIN” or “TEMP / ZERO”, expose the temperature sensor to calibration temperature for the zero-point. Wait until the input from the temperature sensor becomes stable.

Table 3.2

Sensor type		Zero-point value
TC, mV	B,R,S,T	0 mV
	E,J,K,N,W3,W5,L,U,mV	0 mV
RTD, ohm	Pt100, JPt100, Ni120, Cu	40 Ω
	Pt200, Pt500, ohm	40 Ω

Sensor type		Gain-point value
TC, mV	B,R,S,T	25 mV
	E,J,K,N,W3,W5,L,U,mV	75 mV
RTD, ohm	Pt100, JPt100, Ni120, Cu	330 Ω
	Pt200, Pt500, ohm	1600 Ω

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6. Press **OK[F4]**.
7. Enter Zero trim reference value from key pad, and press **ENTER[F4]**.

Perform the following steps when the input trimming mode is “V.R. / ZERO&GAIN” or “Temp / ZERO&GAIN”.

8. Perform gain-point adjustment.
 - (a) When the input trimming mode is “V.R. / ZERO&GAIN”, apply the value for the gain-point shown in the table 3.2 depending on the specified sensor type. Wait until the input from the calibration device becomes stable.
 - (b) When the input trimming mode is “Temp / ZERO&GAIN”, expose the temperature sensor to calibration temperature for the gain-point. Wait until the input from the temperature sensor becomes stable.
9. Press **OK[F4]**.
10. Enter Gain trim reference value from key pad, and press **ENTER[F4]**.

Follow outlined procedures to perform Sensor2 trim.

3.5.7 Analog Output Trim

Fine output adjustment is performed with “D/A trim” or “Scaled D/A trim”.

● D/A Trim

D/A trim is to be performed if the digital ammeter used for calibration does not read 4.000mA and 20.000mA exactly when the output signal is 0% and 100%.

Procedures

1. Call up the “D/A trim” display. [1.Device setup → 2. Diag/Service → 3.Calibration → 4.AO D/A Trim → 1.D/A trim]
2. Press **OK[F4]** to set the transmitter to manual mode.
3. Connect the ammeter($\pm 1\mu\text{A}$ is measurable) and press **OK[F4]**.
4. Press **OK[F4]** to make the transmitter output 4 mA(0%) . Check the reading of the ammeter, and enter this value using the key pad and Press **ENTER[F4]**.
5. Next, press **OK[F4]** to make the transmitter output 20 mA (100%) . Check the reading on the ammeter, and enter this value using the key pad.
6. After completing the above steps, return the transmitter to automatic control.

● Scaled D/A trim

Scaled D/A trim can be performed to adjust the output when using a voltmeter or the other meters scaled to 0 to 100 %.

Example: To adjust using a voltmeter.

Procedures

1. Call up the “Scaled D/A trim” display. [1.Device setup → 2.Diag/Service → 3.Calibration → 4.AO D/A Trim → 2.Scaled D/A trim]
2. Press **OK[F4]** to set the transmitter to manual mode .
3. Select “2. Change” and press **ENTER[F4]**.
4. Enter the value read on the meter when the signal is 4 mA. In this case, enter the value of the voltage across the 250Ω resistor (1V) and press **ENTER[F4]**.
5. Enter the value read on the meter when the signal is 20 mA. In this case, enter the value of the voltage across the 250Ω resistor (5V) and press **ENTER[F4]**.
6. Select “1. Proceed” and press **ENTER[F4]**.
7. Connect voltmeter and press **ENTER[F4]**.
8. Press **OK[F4]** to make the transmitter output 4 mA(0%) . Check the reading on the voltmeter, and enter this value using the key pad.
9. Next, press **OK[F4]** to make the transmitter output 20 mA (100%) . Check the reading on the voltmeter, and enter this value using the key pad.
10. After completing the above steps, return the transmitter to automatic control.

3.5.8 Sensor Backup (For Model YTA320 only)

The sensor backup command sets the transmitter to automatically use Sensor2 as output if Sensor1 fails. When the sensor backup mode is activated, the transmitter will output the Sensor1 which is mapped as PV. Sensor2 is mapped as SV. If sensor1 fails, the transmitter starts Sensor Backup operation and Sensor2(SV) is output in place of PV. There's no disruption in 4 to 20 mA output. The Error code for sensor1 failure is shown on an Integral Indicator, if it is specified. Error message is sent to the HART communicator that the sensor1 failed and the sensor backup mode has started. In backup operation, even if the Sensor1 recovers, the transmitter will continue to use Sensor2 until the backup operation is reset by parameter or power is turned off. If Sensor2 fails during backup operation, the transmitter will send an error code for Sensor2 failure to the Integral Indicator and HART communicator and output the “Sensor burnout” value.

● To enable Sensor backup function

1. Set the sensor type, wire and unit for Sensor1 and 2. (See 3.4.1)
Any Sensor type except “Non-connection” can be selected.
2. Map **Sensor1** as **PV**, and **Sensor2** as **SV**. (See 3.4.2)
TV and 4V can be set to any designated value except for “Sensor1” and “Sensor2” from the selection. Sets damping time constant and unit for each process variable.
3. Set the sensor burnout type to High, Low or user setting value.
If the sensor burnout type is set to "off", the sensor failure will not be detected and the backup function will not act.
4. Send all the setting data to a transmitter.
5. Call up the “Snsr Backup” display. [1.Device setup → 4.Detailed Setup → 1.Sensors → 4.Snsr Backup → 1.Snsr Bkup]
6. Select Sensor Backup “Enable”. Press **ENTER[F4]** .

● To make the transmitter return to using Sensor1 in Backup Operation

1. Confirm that the Sensor1 is recovered
2. Call up the “Bkup Return Snsr1” parameter. [1.Device setup → 4.Detailed Setup → 1.Sensors → 4.Snsr Backup → 3.Bkup Return Snsr1]
3. Press **OK[F4]**. Backup status returns to “Waiting.”



NOTE

Don't change the sensor type, wire and setting of PV and SV while Sensor Backup mode is “Enable.” When the change is necessary, turn Sensor Backup mode “Disable” before changing.

3.5.9 Burst Mode

The transmitter continuously sends the data stored in it when the burst mode is set ON. The data is sent intermittently as a digital signal with 75ms intervals when the transmitter is set in the burst mode. Therefore, communications with the HART communicator is also possible.

Any one of the following values can be selected.

PV	
% range/current:	Output in % and mA
Process vars/ crnt:	Output in mA and Process variables (PV, SV, TV and 4V)

1. Call up the “HART output” display. [1.Device setup → 4.Detailed setup → 3.Output condition → 2.HART output]
2. Select “4. Burst option”. Select a set of data to be sent.
3. Return to “HART output” display and select “3. Burst mode”. Select “On” to start the burst option. Press **SEND[F2]** to send the setting. To release the burst mode, select “Off” in this display.

If the transmitter is equipped with the integral indicator, the LCD displays “B.M.”

3.5.10 Multi Drop

“Multi dropping” transmitters refers to the connection of several transmitters to a single communication transmission line. Up to 15 transmitters can be connected when set in the multidrop mode. To activate multi drop communication, the transmitter address must be changed to a number from 1 to 15. This change deactivates the 4 to 20 mA analog output, sending it to 4mA . The alarm current is also disabled.

● Setting of Multi drop

- Call up the “HART output” display. [1.Device setup → 4.Detailed setup → 3.Output condition → 2.HART output]
- Select “1. Poll addr” and set the polling address.(a number from 1 to 15).
- Press **SEND[F2]** to send the setting.

If the transmitter is equipped with the integral indicator, the LCD displays “M.D.” and “F.O.”



NOTE

1. When the identical address is set for two or more transmitters in multidrop mode, communication with these transmitters is disabled.
2. Multi drop mode and Burst mode should not be operated together at the same time.

● Releasing the Multidrop mode

- First, call up the “HART output” display. [1.Device setup → 4.Detailed setup → 3.Output condition → 2.HART output]
- Select “1. Poll addr” and set the polling address to “0”. Press **SEND[F2]**.

3.5.11 Sensor Matching Function

This function is available only when optional specification /CM1 is specified with YTA310 or YTA320.

Significant temperature measurement accuracy improvement can be obtained using a temperature sensor that is matched to a transmitter. This matching process entails teaching the transmitter the relationship between resistance and temperature for a specific RTD sensor. This relationship, approximated by the Callender-van Dusen equation, is described as following :

$$R_t = R_0 \{ 1 + \alpha (1 + 0.01\delta) t - \alpha\delta / 10^4 t^2 - \alpha\beta / 10^8 (t - 100) t^3 \}$$

- where :
- R_t = Resistance (ohms) at Temperature t (°C)
 - R₀ = Sensor -specific constant (Resistance at t=0 °C)
 - α (alpha) = Sensor-specific constant
 - δ (delta) = Sensor-specific constant
 - β (beta) = Sensor-specific constant (0 at t>0 °C)

Although the sensor curve is standardized, the exact values for R₀, α, δ and β are specific to each RTD sensor and are obtained by testing each individual sensor at various temperatures. These constants are known as Callender-van Dusen constants.

Generally, the constants R₀, A, B, and C are also used as the characteristic coefficients of the RTD instead of R₀, α, δ and β. These are derived from IEC Standard Curve and the relationship is described as followings ;

$$R_t = R_0 \{ 1 + At - Bt^2 + C (t - 100) t^3 \}$$

- where :
- R_t = Resistance (ohms) at Temperature t (°C)
 - R₀ = Sensor-specific constant (Resistance at t=0 °C)
 - A = Sensor-specific constant
 - B = Sensor-specific constant
 - C = Sensor-specific constant (0 at t > 0 °C)

These two equations are equivalent. A model YTA can cope with either case as above-mentioned.

**NOTE**

1. This function is effective only in three kinds of sensors; Pt100, Pt200 and Pt500.
2. Input relations between the sensor type and the value of R₀ properly. When Pt100 is specified as an input type, the value close to 100 must be set to R₀. When Pt500 is specified as an input type, the value close to 500 must be set to R₀.
3. When the sensor type is changed, the sensor matching function must be set up again or set to "Disable".

● **Setting the Sensor Matching Function (by using alpha delta and beta co-efficient)**

1. Set the designated sensor type and the number of wires. (Refer to "3.4.1 Sensor Configuration" in this manual.)
2. Call up the "Snsr1 Match Enbl" display.
[1.Device setup → 3. Basic setup → 4. Snsr1 config → 4. Snsr1 Match Enbl]
3. Select "Enable" and press **ENTER[F4]**.
4. Call up the "Snsr1 Match coefs" display.
[1. Device setup → 3. Basic setup → 4. Snsr1 config → 5. Snsr1 Match coefs]
5. Select "2. alpha delta beta" and press **ENTER[F4]** .
6. The display shows the current setting of the R₀, alpha, delta, and beta values. Press **OK[F4]** .
7. The communicator prompts you to enter R₀, alpha, delta and beta value successively. Enter the R₀, alpha, delta and beta values and press **ENTER[F4]** accordingly.
8. Press **OK[F4]** to confirm the new values.
9. Press **SEND[F2]** to transfer the data to the transmitter. Check that **[SEND]** disappears.

When "Disable" is selected in the above step 3, temperature is calculated by using the default value of R₀, alpha, delta and beta.

● **Setting up the Sensor Matching Function (by using A,B and C co-efficient)**

If using the R₀, A,B and C parameters in place of alpha delta and bata co-efficients, replace "2. alpha delta beta" with "1. A B C" in the step 5 in the above.

● **For Setting up two sensors (For model YTA320)**

If using two sensors with a model YTA320, repeat the procedures for the Sensor2. [1. Device setup → 3. Basic setup → 5. Snsr 2 config]

Table 3-3

Item		Initial Setting Value
R ₀		100
IEC	A	3.9083 E-3
	B	-5.775 E-7
	C	-4.183 E-12
Callender vanDusen	α	3.8506 E-3
	δ	1.4998
	β	1.0863 E-1

Note : "E-3" stands for 10⁻³

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3.5.12 CJC Selection

For thermocouple input, the terminal temperature measured by an internal sensor is used for Cold Junction Compensation function. In YTA, constant value set by users can be used for the compensation function in place of the measured terminal temperature. If the constant value is set to "0", compensation will not be applied.

1. Call up the parameter "CJC Select" . [1.Device setup → 4. Detailed setup → 1. Sensors → 3. Term temp sensor → 4. CJC Select]
2. Select "Constant CJC" and press **ENTER[F4]**.
3. Call up the parameter "CNST CJC Temp" .
[1.Device setup → 4. Detailed setup → 1. Sensors → 3. Term temp sensor → 5. CNST CJC Temp
4. Enter temperature value in constant and press **ENTER[F4]**.

3.6 Self-Diagnostics

3.6.1 Checking for Problems

(1) Identifying Problems with the HART Communicator

Self diagnostics of the transmitter and check of incorrect data settings can be carried out with the HART communicator. There are two methods for self-diagnosis of the transmitter; self-diagnosis for every transmission and manually executing the Self test command.

In YTA series, there're two classes to show the result of diagnostics; errors and warnings. Errors are the serious status for operation which must be corrected

immediately. Warnings are the light errors and indication of the status which is important for operation.

When an error message appears, see table 3.4 “List of Errors” for details. If warning messages are set to be shown, the warning status will also be shown on the HART communicator. See table 3.5 “List of Warnings” for details.

1. Device setup Diagnostic by “Self test”
 ↓
2. Diag/Service
 ↓
1. Test device

1

YTA :
 Test device
 1 Status
 2 Self test
 3 Master test
 4 Set warning enbl
 HELP SAVE HOME

Call up the “Test device” display, and select “Self test”.

2

YTA :
 Self test OK
 ABORT OK

OK

If there is no error detected, “Self test OK” will be displayed. When an error occurs, an error message appears, and the results of self-diagnosis appears in the Status item.

3

YTA :
 Test device
 1 Status
 2 Self test
 3 Master test
 4 Set warning enbl
 HELP SAVE HOME

Call up the “1. Status”.

The Error status is in groups 1 and 2.
 The Warning status is in groups 3 through 6. Highlight the group to show the status Errors. If Error is not detected, the result of diagnostics is indicated as “OFF”.
 If “ON” is indicated, a countermeasure for that error is necessary.

4

YTA :
 Status
 1 Status group 1
 2 Status group 2
 3 Status group 3
 4 Status group 4
 5 Status group 5
 HELP SAVE HOME

 **NOTE**

Note that if the Set warning enbl is set to “OFF (not display)”, the status in this display remains “OFF” even when the warning status occurs. (See 3.6.2)

Table 3.4 List of Errors

Indicator	HART display	Cause	Output operation upon error	Action
N/A	Good			
Er-01	Output Too Low	Input value is lower than the PV low range value.	Output goes to minimum value(-2.0%).	Check the LRV setting and adjust.
Er-02	Output Too High	Input value is higher than the PV upper range value.	Output goes to maximum value(105%).	Check the URV setting and adjust.
Er-03	Sensor1 Failure	Sensor1 fails or disconnects from the terminal block.	If sensor1 is set as PV, the burnout value is output. When sensor backup mode is set in YTA320, sensor2 input is used as output.	<ul style="list-style-type: none"> • Check sensor for damage. • Check terminal connection. • If sensor backup mode is set, refer to "Er-09".
Er-04	Sensor2 Failure (YTA320 only)	Sensor2 fails or disconnects from the terminal block.	If sensor2 is set as PV, or the sensor backup mode is in effect, sensor burnout value is output.	<ul style="list-style-type: none"> • Check sensor for damage. • Check terminal connection. • If sensor backup mode is set, repair wiring or replace damaged sensors.
Er-05	S1 Signal Error	Sensor1 input value greatly exceeds the sensor measurement range. Sensor type setting or connection polarity may be incorrect.	Output goes to minimum value(-2.0%) or maximum value(105%).	<ul style="list-style-type: none"> • Check sensor connections. • Check the sensor type selected.
Er-06	S2 Signal Error (YTA320 only)	Sensor2 input value greatly exceeds sensor measurement range. Sensor type setting or connection polarity may be incorrect.	Output goes to minimum value(-2.0%) or maximum value(105%).	<ul style="list-style-type: none"> • Check sensor connections. • Check sensor type selected.
Er-07	Amb Temp Low	The ambient temperature exceeds the lower ambient temp limit and the specified accuracy cannot be achieved.	Continues to operate and output.	Use a heater to raise the ambient temperature, or reset to a higher level.
Er-08	Amb Temp High	The ambient temperature exceeds the upper ambient temp limit and the specified accuracy cannot be achieved.	Continues to operate and output.	Take enough distance from the source of heat, or reset to a lower level.
Er-09	Snsr Backup Start (YTA320 only)	Sensor backup mode is in effect.	Sensor2 input is used as output. If sensor2 also fails, the transmitter operate with burnout settings.	Repair or replace the sensor1. Then enable sensor1 return parameter, or turn the power OFF and repower it.
Er-10	Illegal PV MAP	There is a problem with the PV mapping settings.	Output status immediately before error is retained (HOLD).	Check the setting for PV mapping and correct the setting.
Er-11	Term Sns Failure	Terminal block temperature sensor failed.	Operation and output continues.	Contact service personnel.
Er-12	EEPROM Failure	EEPROM failure.	The output goes to the value set by the hardware failure mode jumper.	Contact service personnel.
Er-13	CPU Failure	Output side hardware failure.	The output goes to the value set by the hardware failure mode jumper.	Contact service personnel.
Er-14	AD Conv Failure	Input circuit hardware failure.	The output goes to the value set by the hardware failure mode jumper.	Contact service personnel.
Er-15	Reverse Cal Fail	Confirmation calculation result is bad.	The output goes to the value set by the hardware failure mode jumper.	Contact service personnel.

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Table 3.5 List of Warnings

Group(note)	Parameter	Status	Countermeasure
group1	LRV Too Low	The LRV setting is lower than the temperature range (GS guaranteed value).	Check the LRV setting.
	LRV Too High	The LRV setting is higher than the temperature range (GS guaranteed value).	Check the LRV setting.
	URV Too Low	The URV setting is lower than the temperature range (GS guaranteed value).	Check the URV setting.
	URV Too High	The URV setting is higher than the temperature range (GS guaranteed value).	Check the URV setting.
	Span Too Small	The setting is lower than the recommended minimum span.	Set URV-LRV to be greater than recommended minimum span.
	Snsr1 Temp Low	Sensor 1 input temperature is lower than the measurement range of YTA series.	Check process: Verify correct sensor selection for temperature range.
	Snsr1 Temp High	Sensor 1 input temperature is higher than the measurement range of YTA series.	Check process: Verify correct sensor selection for temperature range.
group2	Snsr2 Temp Low	Sensor 2 input temperature is lower than the measurement range of YTA series.	Check process: Verify correct sensor selection for temperature range.
	Snsr2 Temp High	Sensor 2 input temperature is higher than the measurement range of YTA series.	Check process: Verify correct sensor selection for temperature range.
	Illegal SV Map	There is a problem with input (setting status) specified to SV map.	Correct SV mapping.
	Illegal TV Map	There is a problem with input (setting status) specified to TV map.	Correct TV mapping.
	Illegal 4V Map	There is a problem with input (setting status) specified to 4V map.	Correct 4V mapping.
	Fixed Current	Fixed current value is output now.	The transmitter is now in Test output mode or multi-drop mode. Return to normal operation, if desired.
	Snsr Backup Set	The sensor backup mode is set.	Turn the sensor backup mode OFF.
group3	Soft Not Protect	The software write protection is not set. Unexpected write cannot be prevented.	Set the protect parameter to Yes to enable the write protect mode and prevent unexpected changes.
	Last Sum Area	The EEPROM checksum field is using the spare 4 (the last area). This means there is no spare area for writing the EEPROM checksum.	There is no problem with current operation; however, if EEPROM is damaged, EEPROM FAILURE will be indicated.
group4	Hard Not Protect	The hardware write protection is not set. Unexpected write cannot be prevented.	Set the jumper(SW2) on the CPU assembly to "Y" to prevent unexpected parameter changes.

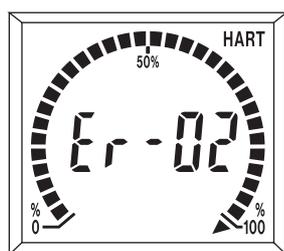
Note: Group in "Set warning enbl." See 3.6.2

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(2) Checking with the Integral Indicator

If an error is detected in the self-diagnostic, an error code is displayed on the digital indicator. If there is more than one error, the error codes appear in turns.

Refer to "List of Errors" to check the error contents and the countermeasure.



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Figure 3.6 Example of Error Code Display

3.6.2 Warnings

When non-fatal errors or unusual status such as invalid setting of parameters has happened, it can be detected and shown on the HART communicator as a warning message. Whether displaying each warning message or not can be configured by parameters.

1. Device setup
 ↓
2. Diag/Service
 ↓
1. Test device

1

```

YTA :
Test device
  1 Status
  2 Self Test
  3 Master Test
  4 Set warning enbl
HELP SAVE HOME
        
```

Call up the “Test device” display, and select “4. Set warning enbl”.

2

```

YTA :
Set warning enbl
  1 Warn enbl group 1
  2 Warn enbl group 2
  3 Warn enbl group 3
  4 Warn enbl group 4
SAVE HOME
        
```

Select group, and select “ON”(Display) or “OFF”(Not display) for each warning message to decide whether the message should appear on the HART communicator when a warning status occurs.

```

YTA :
Warn enbl group1
  LRV Too Low ON
  LRV Too High OFF
  URV Too Low OFF
  URV Too High OFF
  Span Too Small OFF
OFF BESC ENTER
        
```

3.6.3 Logging Functions

The YTA series have the capability to store the data useful for diagnosis of the problems.

(1) Error log

Up to four error histories are stored in the transmitter memory, and can be seen using the following procedures.

1. Call up the “Error log” display. [1.Device setup → 2.Diag/Service → 4.Error log]
2. Select “1. Error log view” to show logged errors.
3. To clear the logged errors, return to the “Error log” display and select “2. Error log Clear”

(2) Max/Min log

Minimum value and Maximum value of the Process variables during the operation from the last Power-up are stored in the transmitter memory and can be checked. The logged data for Process Variables except for terminal temperature shall be reset at every Power-off.

1. Call up the “Max/Min log” display. [1.Device setup → 1.Process variables → 3.Max/Min log]
2. Enter the log display for each process variable.

3. To clear the logged data for Process variables, return the “Max/Min log” display and select “Max/Min log Clear”. Select “Execute” and press **ENTER[F4]**. Even after this operation, the logged data for terminal temperature shall remain.

(3) Power Check

This parameter is always reset at power-off.

Therefore, by setting this parameter to “start” after power-on, the transmitter can be checked if a temporary loss of power has occurred.

Call up the “Power Check” display. [1.Device setup → 2.Diag/Service → 5.Power monitoring → 1.Power Check]. Select “Start” and press **ENTER[F4]**. If the parameter is changed to “STOP” during the normal operation, the transmitter may have experienced a loss of power.

(4) Operate Time

Transmitter’s operation time from the last power-on is counted. This parameter is reset at every power off. Call up the “Operate Time” display to check the time. [1.Device setup → 2. Diag/Service → 5.Power monitoring → 2.Operate Time].

4. PARAMETERS LISTS

Initial setting value marked with “ * ” is as of specified upon ordering.

Item		HART Communicator	Selection/ Setting Range	Initial Setting
Memory		Tag	Up to 8 characters	—*
		Tag Ex	Up to 8 characters	—
		Descriptor	Up to 16 characters	—
		Message	Up to 32 characters	—
		Date	mm/dd/yy	—
		Snsr1(2) snsr s/n	0 to 16777215	—
Process Variable	Engineering Unit	PV unit (SV,TV,4V)	°C, K, °F, or °R (see note 1)	°C*
	Range	LRV/URV	Set the calibration range using the keypad.	LRV:0* URV:100*
		Apply values	Value for 4 and 20 mA signal is set with actual input applied.	—
	Damping time constant	PV Damp (SV,TV,4V)	0 to 99 seconds.	2 s
	Damping holding point	PV Damp point	0 to 99%.	2%
	Variable mapping	PV is (SV,TV,4V)	“Sensor1”, “Terminal Temperature(term)” or “Sensor1-Term”. For YTA320, above plus “Sensor2”, “Sensor2-Term”, “Average” or “Differential” temperature.	PV: Sensor1 SV(YTA320): Sensor2
	Differential Direciton	Diff direction (YTA320 only)	Sensor1-Sensor2 or Sensor2-Sensor1.	Sensor1-Sensor2
Sensor1 Configuration	Sensor1 type	Snsr1 Type	Specify input type.	Pt100*
	Sensor1 wire	Snsr1 Wire	2, 3 or 4 wire.	3 wire*
	Sensor1 unit	Snsr1 unit	°C, K, °F, or °R. (See note 1).	°C*
	Enable sensor match function	Snsr1 Match Enbl (Note 3)	Enable or disable	disable
Terminal Temperature	Terminal Temp. unit	Term Unit	°C, K, °F, or °R. (See note 1).	°C*
	CJC Function	CJC Select	Internal CJC, Constant CJC	Internal CJC
		CNST CJC Temp	-10000 to 10000	0
Sensor2 Configuration (YTA320 only)	Sensor2 type	Snsr2 Type	Specify input type.	Pt100*
	Sensor2 wire	Snsr2 Wire	2, 3 or 4 wire.	3 wire*
	Sensor2 unit	Snsr2 unit	°C, K, °F, or °R. (See note 1).	°C*
	Enable sensor match function	Snsr2 Match Enbl (Note 2)	Enable or disable	disable
	Sensor Backup Function	Snsr Bkup	Enables/disables sensor backup mode.	disable
		Bkup state&Cntl	Shows the backup status. (Waiting or Start.)	—
		Bkup Return Snsr1	Enables the recovery to sensor1 during backup operation.	—

Note 1: °F and °R are available only when option code /D2 is specified.

Note 2: Appears only when Sensor Matching Function(/CM1) is specified.

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4. PARAMETERS LISTS

Item		HART Communicator	Selection / Setting Range	Initial Setting
Display (see note 3)	Display select	Process Disp	(1)PV (2)SV (3)TV (4)4V (5)PV,SV (6)PV,SV,TV (7)PV,SV,TV,4V (8)Inhibit	PV
		%/mA Disp	(1)mA (2)% (3)mA,% (4)Inhibit	mA
		Error-No Disp	Show or Inhibit	Show
		Bar graph	Show or Inhibit	Show
		Matrix Disp	(1)Process (2)Type (3)Wire (4)Process,Type (5)Type,Wire (6)Inhibit	Process
Display update period	Disp update	Fast, normal, or slow.	Normal	
Output	Sensor burn-out Output	Snsr burnout type	Low, High, off, or user-setting value (mA or %).	High*
	Output in CPU failure	AO Alm typ	Show the current setting of the output direction in hardware failure which is set using jumper on a CPU assembly.	High*
	Burst mode	Burst option	(1)PV, (2)output in % range & current, (3)PV and output in current.	—
		Burst mode	Enable/disable the burst mode.	disable
	Multi-drop mode	Poll addr	0 to 15.	0
Monitoring	Process Variable	PV,SV,TV,4V	Process variables.	—
	Output in %	PV % rng	% Output variable	—
	Output in mA	PV AO	4 to 20 mA Output variable	—
	Terminal Temperature	Term	Terminal temperature variable	—
Maintenance	Test Output	Loop test	Output can be set from 4, 20 mA or the designated value within 3.6 to 21.6 mA.	—
		Self-diagnostics	Self test	Check the transmitters's status. If an error is detected, the corresponding message is displayed.
		Master test	Reset the CPU and check the transmitters's status.	—
		Status	Display of the result of self-test transmitter.	—
		Set warning enbl	Show/not show warning messages. OFF or ON.	All OFF
		Error log view	Up to 4 error histories are stored in EEPROM.	—
		Max/Min log	Maximum and Minimum value of PV, SV, TV, 4V and Terminal Temperature during the operation.	—
		Operate Time	Operation time from last power-on.	—
		Power Check	Un-intentional loss of during the operation may be detected. START or STOP.	STOP
	Write Protect	Write protect	Displays the permit/protect status for setting changes.	NO
		Enable wrt 10 min	Write protect status is released for 10 minutes when the password is entered.	—
		New password	Setting a new password. 8 alpha numeric characters.	—
		Software seal	Show the status if the joker password was used. Keep(not used), Break(used)	—
Adjustment	Sensor trim (Sensor1/2)	Input trimming mode	(1)V.R. / ZERO&GAIN (2)V.R. / ZERO (3)Temp / ZERO&GAIN (4)Temp / ZERO	—
		Snsr1(2) trim act	(1)On (2)Off (3)Clear	—
		S1(2) trim zero/gain	Give correction to the interpretation of a temperature input to the characterization curve stored in a transmitter.	—
	Analog output trim	D/A trim, Scaled D/A trim	Adjust the output points of 4 mA and 20 mA.	
Referential Information		Destributor Model Dev.id Final asmbly num Universal rev Fld dev rev Software rev PV LSL PV USL Snsr1(2) LSL Snsr1(2) USL Snsr1(2) Snsr s/n	Yokogawa YTA110/YTA310/YTA320 Lower Limit for PV setting. Upper Limit for PV setting. Lower Limit for Sensor 1(2) Upper Limit for Sensor 1(2) Sensor1(2) serial number information	

Note 3: Appears only when Integral Indicator is specified.

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APPENDIX A. SAFETY INSTRUMENTED SYSTEMS INSTALLATION



WARNING

The contents of this appendix are cited from exida.com safety manual on the YTA series pressure transmitters specifically observed for the safety transmitter purpose. When using the YTA for Safety Instrumented Systems (SIS) application, the instructions and procedures in this section must be strictly followed in order to preserve the transmitter for that safety level.

A.1 Scope and Purpose

This section provides an overview of the user responsibilities for installation and operation of the YTA in order to maintain the designed safety level for Safety Instrumented Systems (SIS) applications. Items that will be addressed are proof testing, repair and replacement of the transmitter, reliability data, lifetime, environmental and application limits, and parameter settings.

A.2 Using the YTA for an SIS Application

A.2.1 Safety Accuracy

The YTA has a specified safety accuracy of 2%. This means that the internal component failures are listed in the device failure rate if they will cause an error of 2% or greater.

A.2.2 Diagnostic Response Time

The YTA will report an internal failure within 8 seconds of the fault occurrence.

A.2.3 Setup

During installation the transmitter must be setup with engineering units parameters. This is typically done with a handheld terminal. These parameters must be verified during the installation to insure that the correct parameters are in the transmitter. Engineering range parameters can be verified by reading these parameters from the optional local display or by checking actual calibration of the transmitter.

The calibration of the transmitter must be performed after parameters are set.

A.2.4 Required Parameter Settings

The following parameters need to be set in order to maintain the designed safety integrity.

Table A.2.4 Required Parameter Settings

Item	Description
Burnout direction switch	To specify if the output should go 21.6 mA or higher or 3.6 mA or lower upon detection of an internal failure.
Write protection switch	The write function should be disabled.

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A.2.5 Proof Testing

The objective of proof testing is to detect failures within the transmitter that are not detected by the diagnostics of the transmitter. Of main concern are undetected failures that prevent the safety instrumented function from performing its intended function. See table A2.5 for proof testing method.

The frequency of the proof tests (or the proof test interval) is to be determined in the reliability calculations for the safety instrumented functions for which the YTA is applied. The actual proof tests must be performed more frequently or as frequently as specified in the calculation in order to maintain required safety integrity of the safety instrumented function.

The following tests need to be specifically executed when a proof test is performed. The results of the proof test need to be documented and this documentation should be part of a plant safety management system. Failures that are detected should be reported to Yokogawa.

The personnel performing the proof test of the transmitter should be trained in SIS operations including bypass procedures, YTA temperature transmitter maintenance, and company management of change procedures.

Table A.2.5 Proof Testing

Testing method	Tools required	Expected outcome	Remarks
<p>Analog Output Loop Test:</p> <ol style="list-style-type: none"> 1. Bypass the safety PLC or take other appropriate action to avoid a false trip. 2. Send a HART or BRAIN command to the transmitter to go to the high alarm current output and verify that the analog current reaches that value. 3. Send a HART or BRAIN command to the transmitter to go to the low alarm current output and verify that the analog current reaches that value. 4. Use the HART or BRAIN communicator to view detailed device status to ensure no alarms or warnings are present in the transmitter. 5. Perform reasonability check on the sensor value(s) versus an independent estimate (i.e. from direct monitoring of BPCS value) to show current reading is good. 6. Restore the loop to full operation. 7. Remove the bypass from the safety PLC or otherwise restore normal operation. 	<ul style="list-style-type: none"> • Handheld terminal 	<p>Proof Test Coverage =61%</p>	<p>The output needs to be monitored to assure that the transmitter communicates the correct signal.</p>
<p>Analog Output Loop Test and Temperature Spot Check:</p> <ol style="list-style-type: none"> 1. Bypass the safety PLC or take other appropriate action to avoid a false trip. 2. Perform Analog Output Loop Test. 3. Verify the measurement for two temperature points. 4. Perform reasonability check of the housing temperature. 5. Restore the loop to full operation. 6. Remove the bypass from the safety PLC or otherwise restore normal operation. 	<ul style="list-style-type: none"> • Handheld terminal 	<p>Proof Test Coverage =96%</p>	<p>The output needs to be monitored to assure that the transmitter communicates the correct signal.</p>

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A.2.6 Repair and Replacement

If repair is to be performed with the process online, the YTA will need to be bypassed during the repair. The user should setup appropriate bypass procedures.

In the unlikely event that the YTA has a failure, the failures that are detected should be reported to Yokogawa.

When replacing the YTA, the procedure in the installation manual should be followed.

The personnel performing the repair or replacement of the YTA should have a sufficient skill level.

A.2.7 Startup Time

The YTA generates a valid signal within 5 seconds of power-on startup.

A.2.8 Firmware Update

In case firmware updates are required, they will be performed at factory. The replacement responsibilities are then in place. The user will not be required to perform any firmware updates.

A.2.9 Reliability Data

A detailed Failure Mode, Effects, and Diagnostics Analysis (FMEDA) report is available from Yokogawa with all failure rates and failure modes.

The YTA is certified up to SIL2 for use in a simplex (1oo1) configuration, depending on the PFDavg respectively PFH calculation of the entire Safety Instrumented Function.

The development process of the YTA is certified up to SIL3, allowing redundant use of the transmitter up to this Safety Integrity Level, depending the PFDavg respectively PFH calculation of the entire Safety Instrumented Function.

When using the transmitter in a redundant configuration, the use of a common cause factor (β -factor) of 5% is suggested. If the owner-operator of the plant would institute common cause failure training and more detailed maintenance procedures for avoiding common cause failure, a beta factor of 2% would be applicable.

A.2.10 Lifetime Limits

The expected lifetime of the YTA is 50 years. The reliability data listed in the FMEDA report is only valid for this period. The failure rates of the YTA may increase sometime after this period. Reliability calculations based on the data listed in the FMEDA report for YTA lifetimes beyond 50 years may yield results that are too optimistic, i.e. the calculated Safety Integrity Level will not be achieved.

A.2.11 Environmental Limits

The environmental limits of the YTA are specified in the user’s manual IM 01C50B01-01E.

A.2.12 Application Limits

The application limits of the YTA are specified in the user’s manual IM 01C50B01-01E. If the transmitter is used outside of the application limits, the reliability data listed in A.2.9 becomes invalid.

A.3 Terms and Definitions

FMEDA	Failure Mode Effect and Diagnostic Analysis
SIF	Safety Instrumented Function
SIL	Safety Integrity Level
SIS	Safety Instrumented System – Implementation of one or more Safety Instrumented Functions.

A SIS is composed of any combination of sensor(s), logic solver(s), and final element(s).

SLC	Safety Lifecycle
Safety	Freedom from unacceptable risk of harm
Functional Safety	The ability of a system to carry out the actions necessary to achieve or to maintain a defined safe state for the equipment / machinery / plant / apparatus under control of the system
Basic Safety	The equipment must be designed and manufactured such that it protects against risk of damage to persons by electrical shock and other hazards and against resulting fire and explosion. The protection must be effective under all conditions of the nominal operation and under single fault condition
Verification	The demonstration for each phase of the life-cycle that the (output) deliverables of the phase meet the objectives and requirements specified by the inputs to the phase. The verification is usually executed by analysis and / or testing
Validation	The demonstration that the safety-related system(s) or the combination of safety-related system(s) and external risk reduction facilities meet, in all respects, the Safety Requirements Specification. The validation is usually executed by testing.
Safety Assessment	The investigation to arrive at a judgment - based on evidence - of the safety achieved by safety-related systems

Further definitions of terms used for safety techniques and measures and the description of safety related systems are given in IEC 61508-4.

◆ Revision Record

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Written by Product Marketing Dept.
Transmitters Center
Industrial Automation Systems Business Div.
Yokogawa Electric Corporation

Published by Yokogawa Electric Corporation
2-9-32 Nakacho, Musashino-shi, Tokyo 180,
JAPAN
