Field Communication Software CommStaff Model: CFS100

Instruction Manual (Smart Transmitter AT9000 Edition)

Azbil Corporation

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Instruction Manuals
Safety-related precautions, general operating procedures, and other general information related to CommStaff can be found in the Common Edition manual (No. CM2-CFS100-2001). For information on the operation of a device used with CommStaff, consult the manual for that particular device.

The Common Edition manual for CommStaff, as well as the manuals for individual devices, are included in electronic form (as PDF files) on the CommStaff installation CD-ROM

Devices Covered by This Manual
This manual pertains to AT9000 Advanced Transmitter Electronic Differential Pressure/Pressure Transmitter with the model number pattern GTX _ _ _ and JT_9_ _ _.

CONTENTS

Chapter 1. Overview

1-1.   Introduction

CommStaff is a tool for communicating with Azbil Corporation's smart field devices (DSTJ and others) that enables configuration of device settings. It is a software product that operates on Windows PCs. CommStaff communicates with Azbil Corporation's smart field devices using a USB interface connected to a Windows PC, which is then connected by communications cable to the USB port of a device.

CommStaff supports Azbil Corporation's proprietary SFN/DE communication protocol as well as the HART communication protocol.

* HART is a registered trademark of the HART Communication Foundation.

For information on the specifications common to all types of devices and information on how to install CommStaff, please refer to the main CommStaff Operation Manual. <u>Before reading this manual, make sure that you read the main CommStaff Operation Manual thoroughly.</u>
For information on smart transmitter functions and method of connection, refer to manual No. CM2-GTX100-2001, AT9000 Advanced Transmitter model GTX (CM2-GTX100-2001) or AT9000 SuperAce (CM2-ATS100-2001) Electronic Differential Pressure/ Pressure Transmitter User's Manual

1-2.   Important Notes

* When changing connected devices

CommStaff continues communicating with the device when displaying dynamic values, such as pressure, so that it can continuously update these values. If you remove the communications cable to change the device during this communication, an error will occur.
Exit CommStaff before detaching the communications cable from the device, and then start CommStaff again after connecting the communications cable to the new device.

* The use of SFN communication changes the transmission signal, so be sure to switch the process control loop to manual mode beforehand.

* For known troubleshooting issues, refer to section 7.4 of CM2-CFS100-2001, the common edition manual.

Chapter 2.   Configuration

2-1.   Menu List

Right-clicking Online on the menu tree in the left pane of the CommStaff application window displays a menu. Selecting Expand on the menu displays the expanded menu tree.

Parameters displayed in gray (Upper Range Limit in the following window) in the parameter display in the right pane are parameters that cannot be changed. Those displayed in black (Tag, Lower Range Value (0%), Upper Range Value (100%), Damping and Transfer Function in the following window) are the parameters that can be changed.

The following gives details of the menus displayed in the menu tree.

Bold items are parameters that can be changed.

□□□□□ □□□	↔	Process Variables	↔	Process Variables	↔	Pressure
					↔	Output
					↔	Analog Output *7
					↔	Sensor Temp.
					↔	Lower Range Value (0%)
					↔	Upper Range Value (100%)
			↔	Pressure	↔	Pressure
					↔	Lower Range Value (0%)
					↔	Upper Range Value (100%)
					↔	Analog Output *7
					↔	Output
			↔	Output	↔	Output
					↔	Analog Output *7
					↔	Pressure
					↔	Lower Range Value (0%)
					↔	Upper Range Value (100%)
			↔	Temperature	↔	Sensor Temp.
			↔	All Variables	↔	Pressure
					↔	Analog Output *7
					↔	Output
					↔	Sensor Temp.

	↔	Device	↔	Basic Setup	↔	**Tag**
					↔	**Lower Range Value (0%)**
					↔	**Upper Range Value (100%)**
					↔	Upper Range Limit
					↔	**Damping**
					↔	**Transfer Function**
			↔	Sensors	↔	Pressure
					↔	**Pressure Unit**
					↔	Upper Range Limit
					↔	Sensor Temp.
					↔	**Temp. Unit**
			↔	Signal Condition	↔	**Lower Range Value (0%)**
					↔	**Upper Range Value (100%)**
					↔	Upper Range Limit
					↔	**Damping**
					↔	**Transfer Function**
					↔	Change Cutoff Mode
					↔	Cutoff Mode *1
					↔	Cutoff Point *2
					↔	**Height** *3
					↔	Output
					↔	Contact Output Status
					↔	Apply Zero Value
					↔	Apply Span Value
					↔	Set LRV(Actual)

			↔	Output Condition	↔	Analog Output *7	↔	Analog Output *7
							↔	**Output Low Limit *7**
							↔	**Output High Limit *7**
							↔	Loop Test *7
					↔	Fail Safe	↔	Fail Safe Direction
							↔	Failure Alarm Simulation Mode *7
					↔	HART Output *5	↔	Polling Address *5
							↔	Num Req Params *5
					↔	Loop Test *8		

			↔	Alarm	↔	Alarm Settings	↔	**Output Alarm**
							↔	**Lower Output Alarm**
							↔	**Upper Output Alarm**
							↔	**Sensor Temp. Alarm**
							↔	**Lower Sensor Temp. Alarm**
							↔	**Upper Sensor Temp. Alarm**
							↔	**Contact Output Mode *4**
					↔	Contact Output ON/OFF *4	↔	**Contact Output ON/OFF**
							↔	**Contact Output ON/OFF**
							↔	**Contact Output ON/OFF**
							↔	**Contact Output ON/OFF**

online	↔	Device	↔	Alarm	↔	Contact Output Simulation Mode *4	↔	Open
					↔		↔	Closed
					↔	Alarm Status	↔	Alarm Status (Output Alarm Low)
							↔	Alarm Status (Output Alarm High)
							↔	Alarm Status (Sensor Temp. Alarm Low)
							↔	Alarm Status (Sensor Temp. Alarm High)
							↔	Contact Output Status *4
			↔	Display	↔	**Display Mode**		
					↔	**Display Function**		
					↔	Transfer Function		
					↔	**EULO (0%)**		
					↔	**EUHI (100%)**		
					↔	**Disp. Unit**		
					↔	**User Unit**		
					↔	**Exponent**		
			↔	Device Information	↔	Manufacturer		
					↔	Model		
					↔	Measurement Type		
					↔	Device ID *5		
					↔	**Tag**		
					↔	**Date** *5		
					↔	**Descriptor** *5		
					↔	**Message**		
					↔	Sensor Serial Number *5		
					↔	PROM No.		
					↔	**Final Assembly Number** *5		
						Software Version		
					↔	Revision Numbers *5	↔	Uiversal Rev *5
							↔	Field Device Rev *5
							↔	Software Rev *5
					↔	Write Protect	↔	Hardware Write Protect
							↔	Software Write Protect
							↔	Change SW Write Protect
			↔	Calibration	↔	Correct Input	↔	Zero Trim
							↔	Correct Input LRV
							↔	Correct Input URV
							↔	Reset Corrects
							↔	Restore Factory Setting
					↔	Output Calibration *7	↔	D/A Trim *7
							↔	Scaled D/A Trim -7
			↔	DE Configuration *6	↔	DE FS Mode *6		
					↔	DE Format *6		
					↔	DE PV type *6		
					↔	Switch Analog to DE *6 *7		
					↔	Switch DE to Analog *6 *8		
			↔	Review	↔	Model		
					↔	Measurement Type		
					↔	Transfer Function		
					↔	Cutoff Point		
					↔	Cutoff Mode		
					↔	Height *3		
					↔	PROM No.		
					↔	Software Rev *5		
					↔	Software Version *6		
					↔	Damping		
					↔	Lower Range Value (0%)		
					↔	Upper Range Value (100%)		
					↔	Upper Range Limit		
					↔	Fail Safe Direction		
					↔	Display Mode		
					↔	Disp. Unit		
					↔	User Unit		
					↔	EULO (0%)		
					↔	EUHI (100%)		
					↔	Exponent		
					↔	Output Low Limit *7		
					↔	Output High Limit *7		
					↔	Output Alarm		
					↔	Low Output Alarm		
					↔	Upper Output Alarm		
					↔	Sensor Temp. Alarm		
					↔	Lower Sensor Temp. Alarm		
					↔	Upper Sensor Temp. Alarm		
					↔	Contact Output ON/OFF *4	↔	Contact Output ON/OFF (Output Low)
							↔	Contact Output ON/OFF (Output High)
							↔	Contact Output ON/OFF (Sensor Temp. Low)
							↔	Contact Output ON/OFF (Sensor Temp. High)

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online	↔	Device	↔	Review	↔	Alarm Status	↔	Alarm Status (Output Alarm Low)
							↔	Alarm Status (Output Alarm High)
							↔	Alarm Status (Sensor Temp. Alarm Low)
							↔	Alarm Status (Sensor Temp. Alarm High)

- ↔ Contact Output Mode *4
- ↔ Contact Output Status *4
- ↔ Output
- ↔ Pressure
- ↔ Sensor Temp.
- ↔ DE FS Mode *8
- ↔ DE Format *8
- ↔ DE PV type *8

↔	Diagnostic	↔	Diagnostic Status	↔	Status

↔ Critical Status
- ↔ Status group 0 (Analog/Digital Conversion Fault)
- ↔ Status group 0 (Sensor Characteristic Data Fault)
- ↔ Status group 0 (Suspect Input)
- ↔ Status group 0 (CPU Fault)
- ↔ Status group 0 (NVM Fault)
- ↔ Status group 0 (RAM Fault)
- ↔ Status group 0 (ROM Fault)
- ↔ Status group 0 (Output Circuit Fault)

↔ Internal Data Inconsistency
- ↔ Status group 3 (Invalid Database)

↔ Non-Critical Status
- ↔ Status group 1 (Meter Body Over Temperature)
- ↔ Status group 1 (Excess Zero Correct)
- ↔ Status group 1 (Excess Span Correct)
- ↔ Status group 1 (In Output Mode)
- ↔ Status group 1 (Meter Body Overload or Fault)
- ↔ Status group 1 (Correct Reset)
- ↔ Status group 2 (External Zero/Span Adjustment Fault)
- ↔ Status group 2 (Failure Alarm Simulation Mode)
- ↔ Status group 2 (Contact Output Simulation Mode)
- ↔ Status group 2 (Output Alarm Detected)
- ↔ Status group 2 (Sensor Temp. Alarm Detected)

↔ Status Records ↔ Clear Status Records

↔ Critical Status Records
- ↔ Status Record 0 (Analog/Digital Conversion Fault)
- ↔ Status Record 0 (Sensor Characteristic Data Fault)
- ↔ Status Record 0 (Suspect Input)
- ↔ Status Record 0 (CPU Fault)
- ↔ Status Record 0 (NVM Fault)
- ↔ Status Record 0 (RAM Fault)
- ↔ Status Record 0 (ROM Fault)
- ↔ Status Record 0 (Output Circuit Fault)

↔ Internal Data Inconsistency Records
- ↔ Status Record 3 (Invalid Database)

↔ Non-Critical Status Records
- ↔ Status Record 1 (Meter Body Over Temperature)
- ↔ Status Record 1 (Excess Zero Correct)
- ↔ Status Record 1 (Excess Span Correct)
- ↔ Status Record 1 (In Output Mode)
- ↔ Status Record 1 (Meter Body Overload or Fault)
- ↔ Status Record 1 (Correct Reset)
- ↔ Status Record 2 (External Zero/Span Adjustment Fault)
- ↔ Status Record 2 (Failure Alarm Simulation Mode)
- ↔ Status Record 2 (Contact Output Simulation Mode)
- ↔ Status Record 2 (Output Alarm Detected)
- ↔ Status Record 2 (Sensor Temp. Alarm Detected)

↔ Zero-Error Int. Data
- ↔ 1 (latest)
- ↔ 2
- ↔ 3
- ↔ 4
- ↔ 5

*1 Valid when Transfer Function is set to Sq root. (Displayed.)
*2 Valid when Cutoff mode is not set to DEFAULT. (Displayed.)
*3 Valid when a GTX _ _ R or JTE model is connected. (Displayed.)
*4 Valid if the contact output option is selected. (Displayed.)
*5 Not displayed if SFN or DE communication is selected.
*6 Not displayed if HART communications is selected.
*7 Not displayed if DE communication is selected.
*8 Valid (displayed) if DE communication is selected.

Setting items and references

	Task	Parameter	Section of Manual
Preparation, Adjustment	Tag No., set or check	TAG	2.2
	Measurement range, check or change	Basic Setup	2.6
	Linear/square root output signal, check or set	Transefer Function	2.3
	Output limit (saturation point), check or set	Output Limit	2.9
	Damping time constant, check or set	Damping	2.8
	Units of pressure, check or change	Pressure Unit	2.5
	Zero adjustment, execute	Apply value	3.2
	Zero adjustment, execute (when current input value is not 0 %)	Set LRV (Actual)	3.3
	Output behavior in case of error, check	Fail Safe Direction	3.4
	Loop test, execute	Loop Test	3.1
	Alarm settings, check or change	Alarm Settings	2.10
	Contact output setting, check or change	Contact Output ON/OFF	2.11
	Indicator, set	Display	2.4
Maintenance	Calibrate	Correct Input	4.2
	Calibration default settings, restore	Restore factory setting	4.3
	Self-diagnosis messages, check	Diagnostic Status	4.4
	Self-diagnosis log, check	Status Records	4.5

2-2. Tag Number Configuration

This section explains how to input or change the tag No. In the menu tree in the left pane, select Device → Basic Setup → Tag.
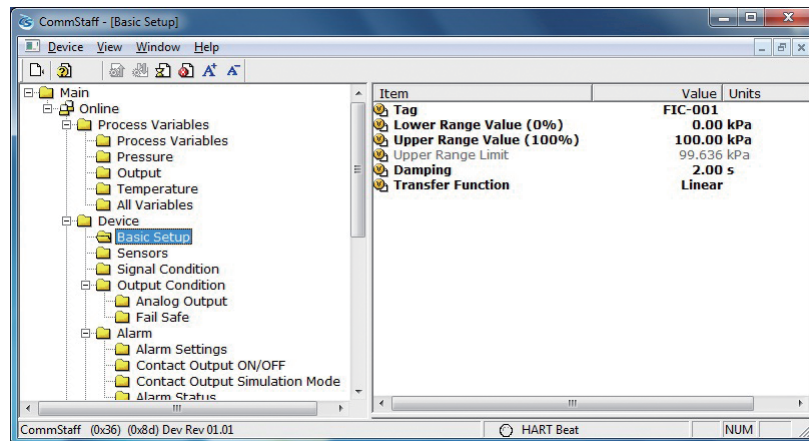
Double-clicking Tag displays the settings screen. On this screen, set the Tag and click the Set button. Tag is highlighted in yellow. Click the Send button to send the new Tag to the transmitter.
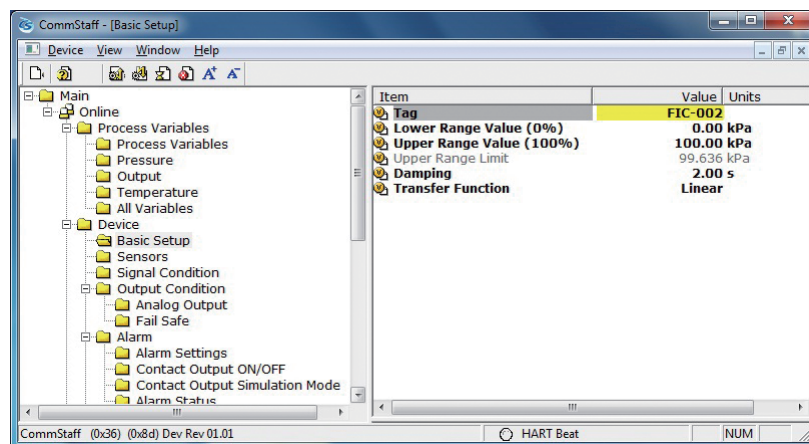
2-3.　Output Format Configuration

This section explains how to switch between linear and square root output. This menu is useful for when communicating with a differential pressure transmitter.

Select Device → Basic Setup → Transfer Function.
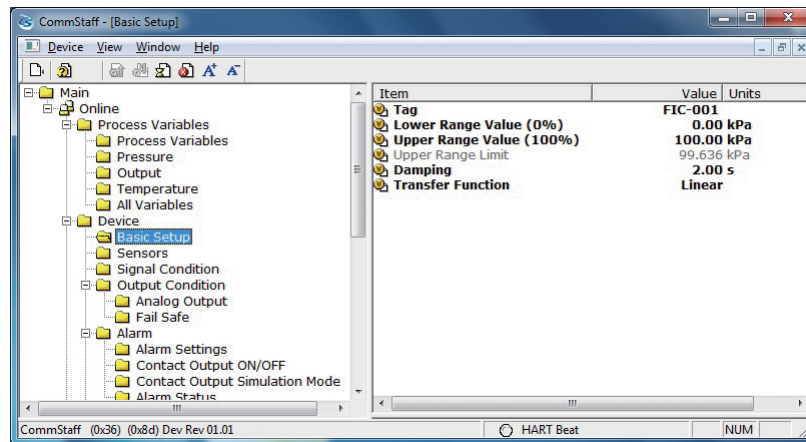
Linear:　　Linear output
Sq root:　　Square root output

2-4. Indicator Display Format

This section explains how to configure the display format of the indicator and the upper and lower limits for engineering units.

Select Device → Display.
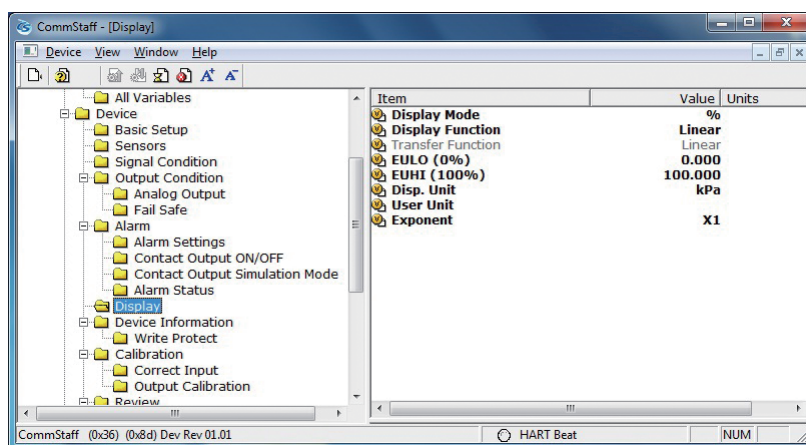
Some parameters are enabled while others are disabled, depending on the Display Mode settings.

In the following table, enabled parameters are indicated with the ○ symbol and disabled parameters with the — symbol.

Display Mode	%	Pressure	Scale
Display Function	○	—	○
Transfer Function	As in reference information	As in reference information	As in reference information
EULO (0%)	—	—	○
EUHI (100%)	—	—	○
Disp. Unit	—	—	○
User Unit	—	—	— (Jap. vers.: SI units) ○ (Eng. vers.: SI & non-SI)
Exponent	—	—	○

2-4-1. Display format

This function is enabled if Transfer Function is set to Linear.

Configuration	Description
Linear	Indicates that both output and display are linear.
Square root	Indicates output is linear and display is square root.

2-4-2. EULO/EUHI (upper and lower limits for engineering units)

This is enabled when Display Mode is set to Scale.

EULO and EUHI values are the upper and lower limits for engineering units (scale readings) displayed on the indicator. They are displayed in the range of -19999 to +19999.

EULO: Value displayed when output is 0%.
EUHI: Value displayed when output is 100%.

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2-4-3. Disp. Unit

This is enabled when Display Mode is set to Scale.

Disp. Unit is displayed on the indicator.

Values shown in the table below may be selected.

(Japanese version: SI)

kPa	MPa	Pa	hPa	kPaG
MPaG	kPa abs	MPa abs	Pa abs	hPa abs
g/cm3	kg/m3	m3	l	kl
ml/h	l/h	kl/h	t/h	m3/h
km3/h	l/min	kl/min	m3/min	kl/d
m3/d	t/d	kg/h	mm	m
%	t	kg	none	

(English version: non-SI)

user define unit	mmH2O	mmAq	mH2O	inH2O
ftH2O	kPa	MPa	Pa	hPa
kPaG	MPaG	kPa abs	MPa abs	Pa abs
hPa abs	bar	mbar	barG	mbarG
mmHg	inHg	mmHg abs	inHg abs	gf/cm2
kgf/cm2	g/cm2	kg/cm2	kgf/cm2G	kgf/cm2 abs
atm	Torr	psi	g/cm3	kg/m3
m3	l	kl	ml/h	l/h
kl/h	Skl/h	Sm3/h	t/h	m3/h
km3/h	Nm3/h	kNm3/h	l/min	kl/min
m3/min	Nml/min	Nl/min	Nm3/min	kl/d
m3/d	t/d	Nm3/d	kg/h	gal/min
gal/h	mm	m	%	t
kg	none			

2-4-4. User Unit

Non-SI units are available in the English version only.

This is enabled when Display Mode is set to Scale.

Available when Disp. Unit is set to User define unit.

Any desired display unit can be set.

2-4-5. Exponent

This is enabled when Display Mode is set to Scale.

By setting Exponent, "x10," "x100," or "x1000" can be shown on the display. If "x1" is set, it is not shown on the display.

2-5.   Selecting a Unit of Pressure

This function allows you to select the measurement units for pressure used by the transmitter.

Select Device → Sensors → Pressure Unit.
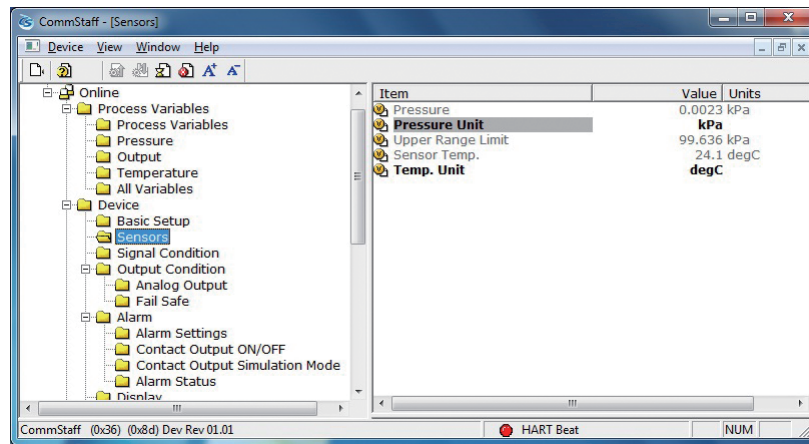
Units for pressure can be selected from the following.

(Jap. vers.: SI units)

kPa	MPa	Pa	hPa

(Eng. vers.: SI & non-SI)

mmH2O	mH2O	inH2O	kPa	MPa
Pa	hPa	bar	mbar	mmHg
inHg	g/cm2	kg/cm2	atm	Torr
psi				

2-6.   Measurement Range Configuration

This section explains how to configure the measurement range of the transmitter.
Select Device → Basic Setup.
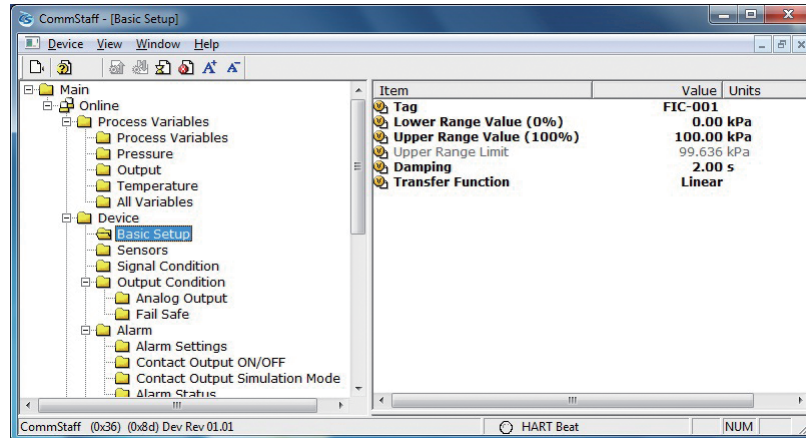
Lower Range Value (0%):   Value at which 4 mA is output

Upper Range Value (100%):   Value at which 20 mA is output

Note: In SFC and CommPad, when the LRV (Lower Range Value (0%)) is changed, the URV (Upper Range Value (100%)) also changes by the same amount in order to keep SPAN unchanged. In CommStaff, when Lower Range Value (0%) is changed, Upper Range Value (100%) does not change.

2-7.   Function for Adjusting the Temperature of a Sealed Liquid

This function is valid only when a GTX_ _R or JTE model is connected. If a model other than GTX_ _R or JTE is connected, the menu is not displayed.

For remote seal pressure transmitters, this is Azbil Corporation's original correction function for minimizing the size of zero point shifts caused by density change in a sealed liquid. Specifically, a temperature sensor on the transmitter measures the ambient temperature, and on this basis the density is corrected.

For this function to be enabled, the height between flanges of the tank on which the transmitter is mounted must be specified.

Select Device → Signal Condition → Height.
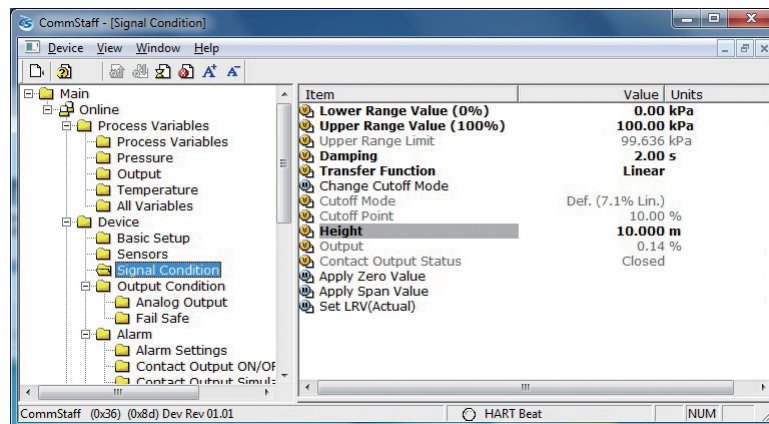
Input the height difference between the flanges in meters. If this function is not enabled, "0.00 m" is displayed.

2-8.   Damping Time Constant Configuration

This section explains how to configure the damping time constant.

Select Device → Basic Setup → Damp.
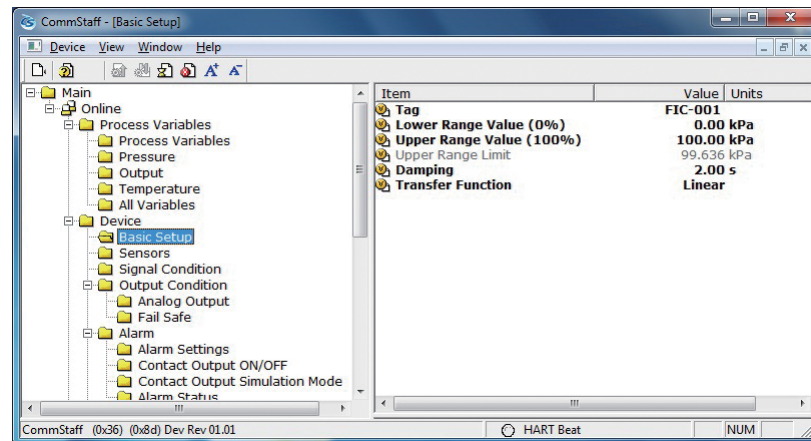
If SFN communication is used, set a value in the range of 0 to 32 seconds.

The following values can be input. If a value other than the following is input, the closest value is automatically selected.

Unit: sec.

0.0
0.16
0.32
0.48
1.00
2.00
4.00
8.00
16.0
32.0

If HART communication is used, set a value in the range of 0 to 120 seconds.

2-9. Output Limit (Output Saturation Point) Configuration

Output limit is enabled only when Burnout is upward or downward. It is disabled if a non-burnout transmitter is used.

The output limit configuration is for specifying the saturation point for output current under normal conditions.

Select Device → Output Condition → Analog Output.
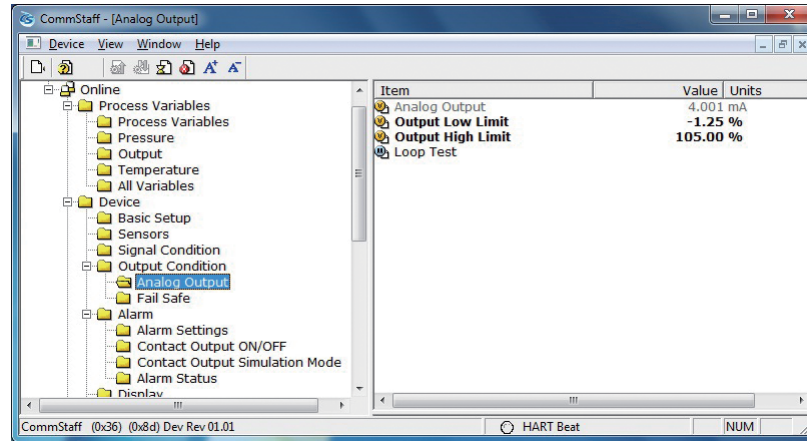
The following are the ranges of possible values.

Lo Limit: -2.50 to 49.99 %
Hi Limit: 50.00 to 110.00 %

2-10. Alarm Settings

There are two types of alarm: Output Alarm for detecting output values and Sensor Temp. Alarm for detecting sensor temperatures. For models that support contact output, alarm results can be generated as contact outputs.

Select Device → Alarm → Alarm Setting.
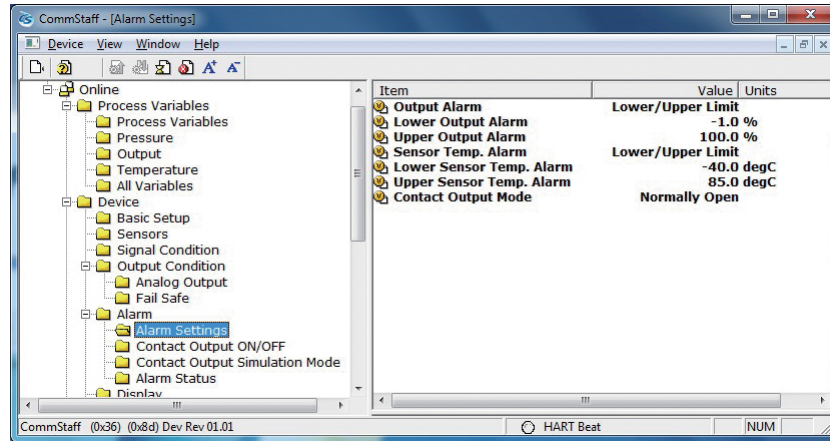
The following are the four Output Alarm settings.

No Alarm	No alarm detection
Lower Limit	Only Lower Output Alarm detection.
Upper Limit	Only Upper Output Alarm detection.
Lower/Upper Limit	Both Lower Output Alarm and Upper Output Alarm detection.

The following are the four Sensor Temp. Alarm settings.

No Alarm	No alarm detection
Lower Limit	Only Lower Output Alarm detection.
Upper Limit	Only Upper Output Alarm detection.
Lower/Upper Limit	Both Lower Output Alarm and Upper Output Alarm detection.

On models with a contact output function, contact output mode can be set.

There are 2 types of Contact Output Mode, as shown below.

Normally Open	Contacts are normally open.
Normally Closed	Contacts are normally closed.

2-11. Contact Output Settings

Contact Output can be set to ON or OFF.

ON: Contact output is valid. OFF: Invalid.

Chapter 3. Preparations and Starting Operation

This chapter explains how to prepare for transmitter operation, and provides general instructions to follow when starting transmitter operation.

3-1. Confirmation of Output Signals (Loop Test)

By putting the transmitter in constant current mode, you can keep current outputs constant in the range of 4 - 20 mA. This section explains how to configure the constant current mode and how to return to normal output mode.

Select Device → Output Condition → Analog Output → Loop Test.

CAUTION: If this operation is performed while the transmitter process is under automatic control, outputs may fluctuate, making transmitter operation dangerous. Before performing this operation, make sure that you switch the process control loop to manual control.
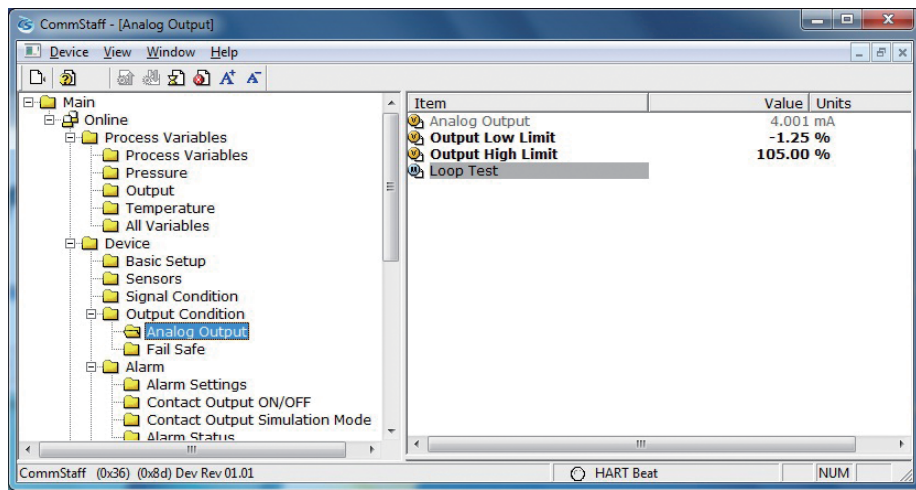
Double-clicking Loop Test displays the following screen.
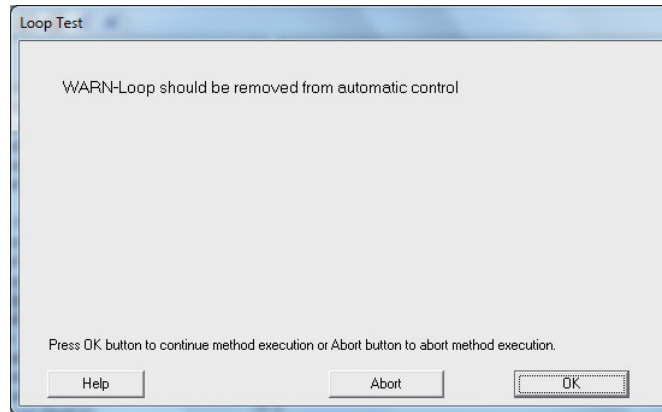
Click OK if there are no problems. The screen changes to the following.
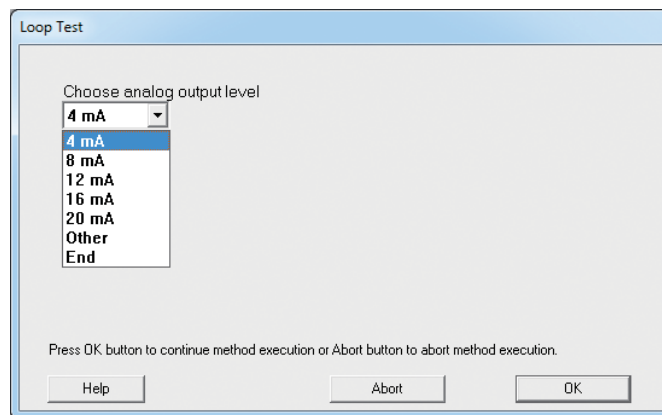
- SFN communication

  Select 4 mA and click OK. Output signals will be fixed at 4 mA (0%).

  Select 8 mA and click OK. Output signals will be fixed at 8 mA (25%).

  Select 12 mA and click OK. Output signals will be fixed at 12 mA (50%).

  Select 16 mA and click OK. Output signals will be fixed at 16 mA (75%).

  Select 20 mA and click OK. Output signals will be fixed at 20 mA (100%).

  To input a different value, select Other and Click OK.

  If you select End and click OK, a message is displayed notifying you that normal output mode will resume.

- HART communication

  Select 4 mA and click OK. Output signals will be fixed at 4 mA (0%).

  Select 20 mA and click OK. Output signals will be fixed at 20 mA (100%).

  To input a different value, select Other and Click OK.

  If you select End and click OK, a message is displayed notifying you that normal output mode will resume.

3-2. Range Configuration (Zero and Span Adjustments) according to Input Pressure

The range can be configured so that the current pressure input into the transmitter becomes 4 mA (0%) or 20 mA (100%).

CAUTION: If this operation is performed while the transmitter process is under automatic control, outputs may fluctuate, making transmitter operation dangerous. Before performing this operation, make sure that you switch the process control loop to manual control.

3-2-1. Zero adjustment

The following describes how the range can be set Zero adjustment to input pressure.
Select Device → Signal Condition → Apply Zero Values.
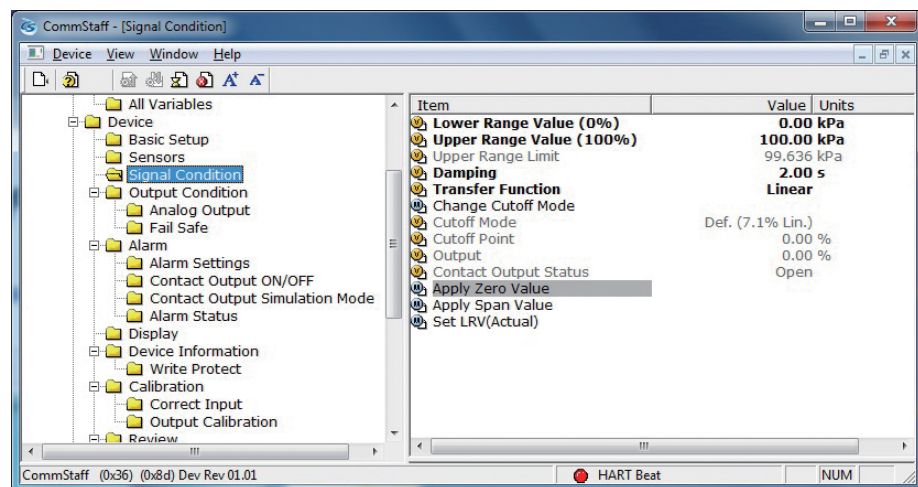
Double-clicking Apply Zero Value displays the following warning. If there are no problems, click OK.
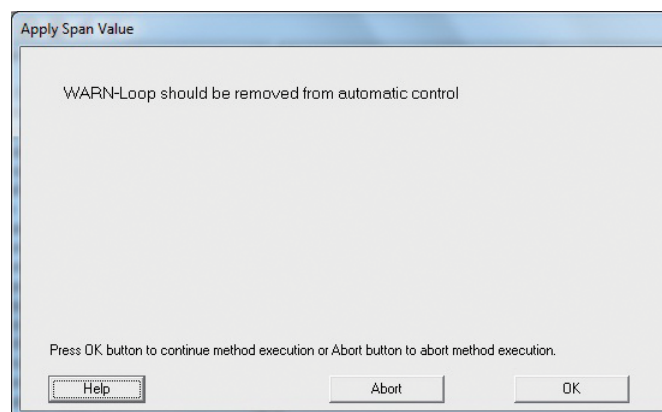
Input the pressure that corresponds to 4 mA and click OK.
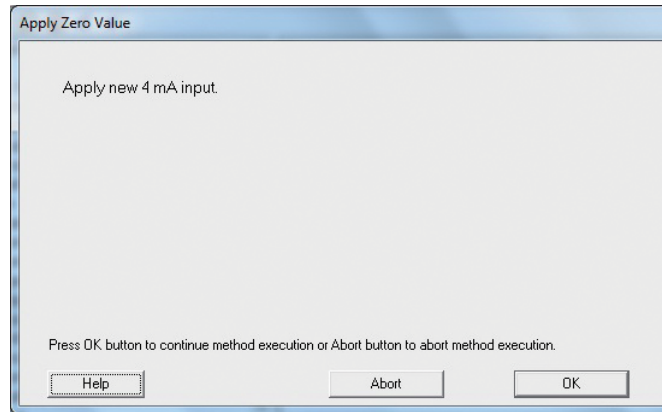
After the input pressure stabilizes, click OK.
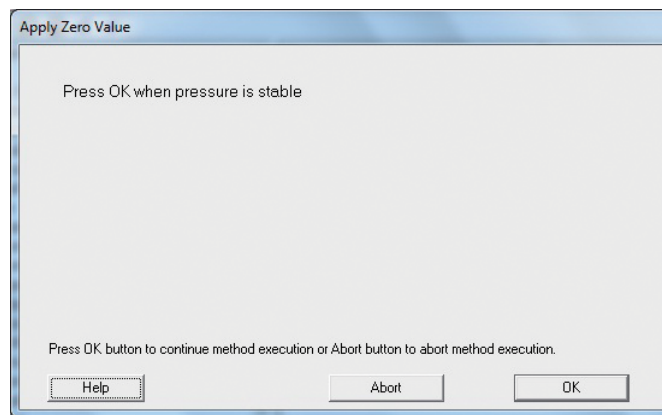
The current input pressure is displayed.
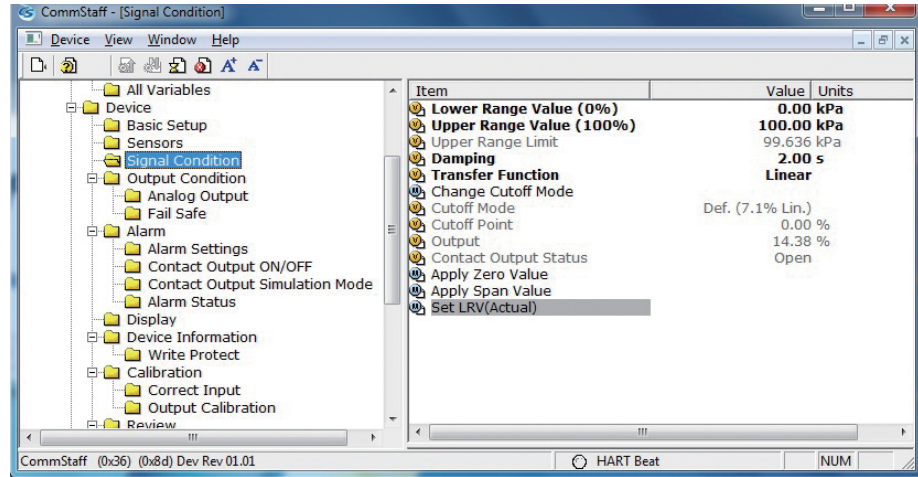If there are no problems, select "Set as 4 mA value" and click OK.
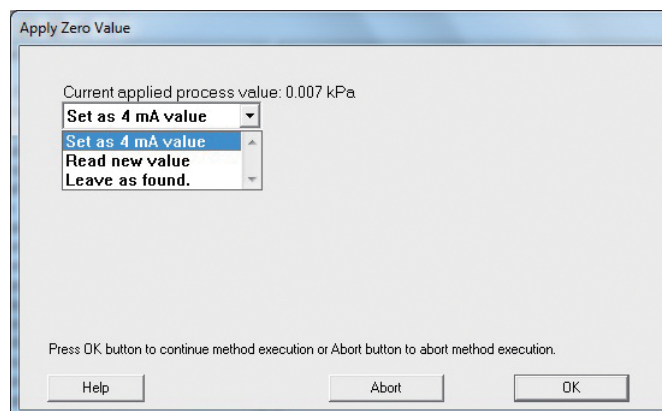
To reread the input pressure, select "Read new value" and click OK.
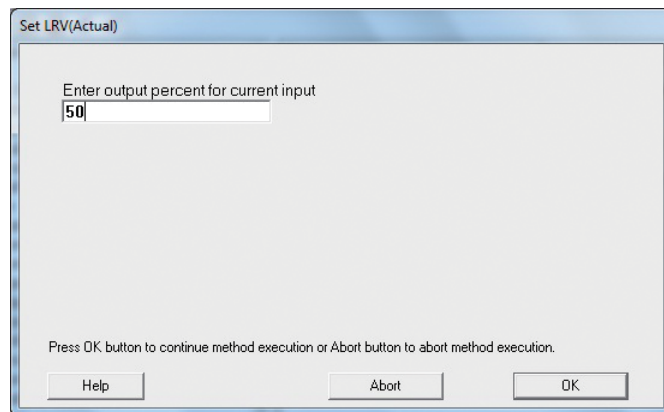To end the adjustment process, select "Leave as found" and click OK.

3-2-2. Span adjustment

The following describes how the range can be set Span adjustment to input pressure.
Select Device → Signal Condition → Apply Span Values.
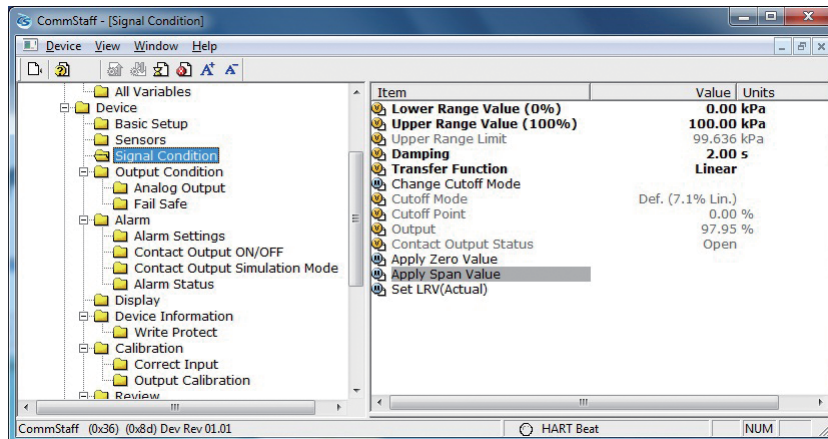
Double-clicking Apply Span Value displays the following warning. If there are no problems, click OK.
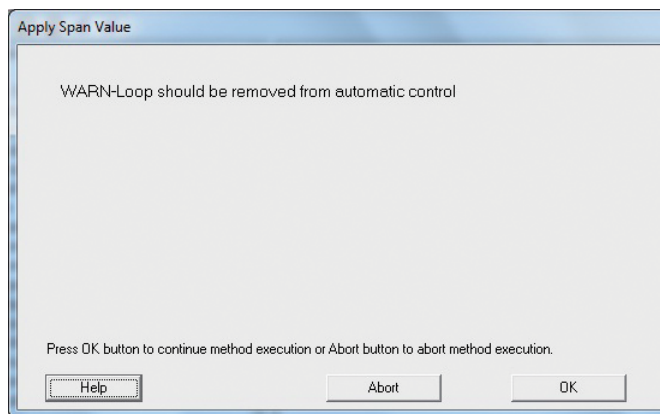
Input the pressure that corresponds to 20 mA and click OK.
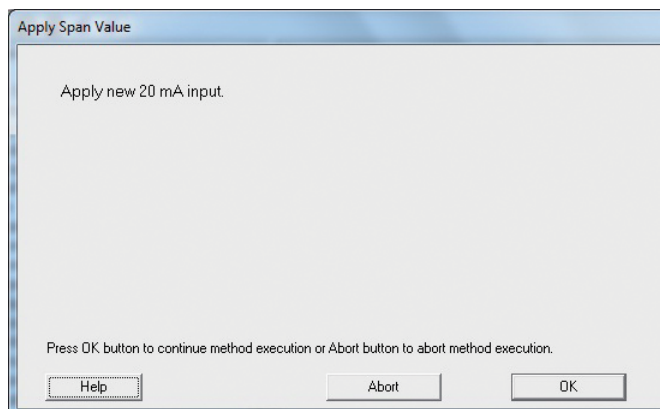
After the input pressure stabilizes, click OK.
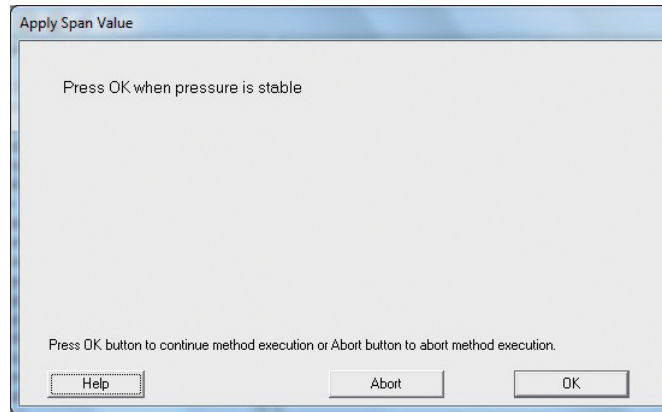
The current input pressure is displayed.
If there are no problems, select "Set as 20 mA value" and click OK.
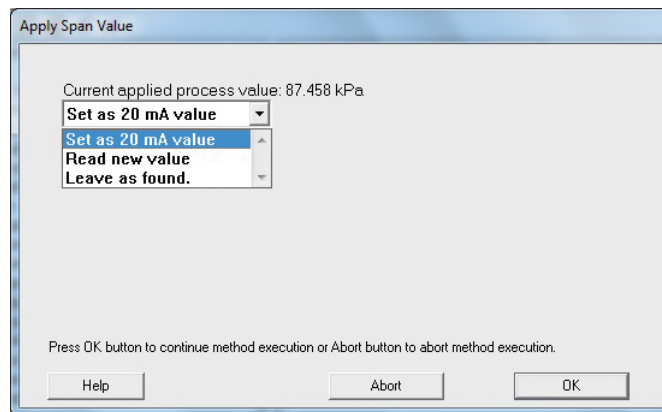
To reread the input pressure, select "Read new value" and click OK.
To end the adjustment process, select "Leave as found" and click OK.

3-3. Zero Point Adjustment according to the Actual Level

This section explains how to adjust the zero point according to the actual level.
Perform this adjustment process when you want to set the present tank level to a specific value, for example, 50%.

Select Device → Signal Condition → Set LRV (Actual).

After two confirmation messages appear, the following screen is displayed.
Enter the output value in percent that you want to assign, and click OK.

The new LRV and URV are displayed.
If there are no problems, select "Set new LRV, URV" and click OK.
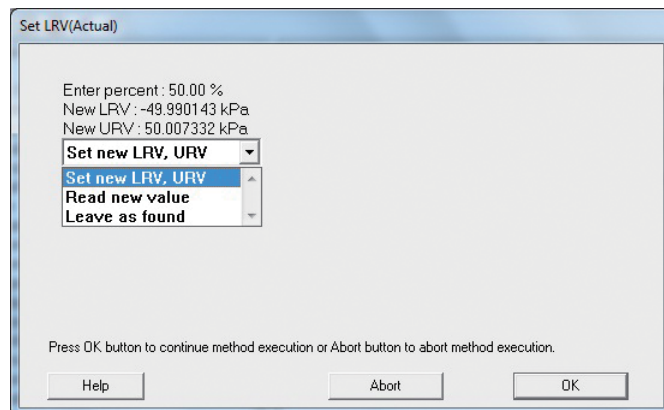
To reread the input pressure, select "Read new value" and click OK.
To end the adjustment process, select "Leave as found" and click OK.

3-4. Confirmation of Output Direction in Abnormal Operating Conditions

This section explains how to check the output direction in abnormal operating conditions.
Select Device → Output Condition → Fall Safe.
Fail Safe Direction is the output direction under abnormal operating conditions.
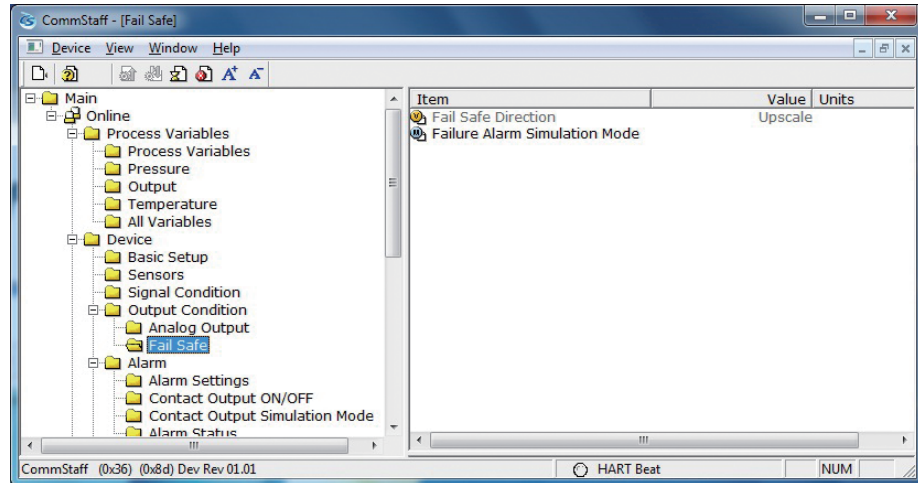
Failure Alarm Simulation Mode allows you to perform a simulation of output current in abnormal operating conditions.
Double-clicking will display first the confirmation screen and then the following screen.
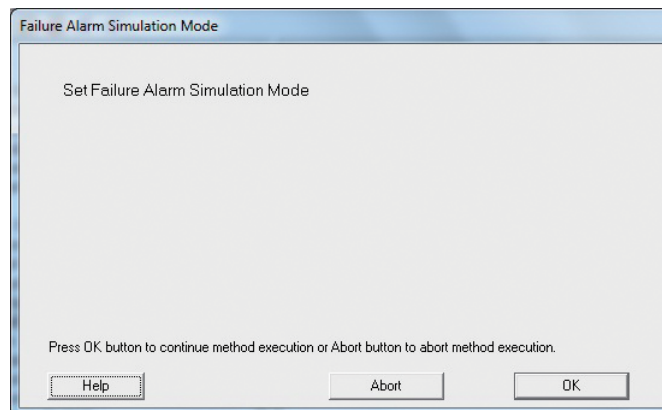
Click OK, and the output current will change to the same output as the output in abnormal operating conditions.

To end this process, select "End Simulation Mode" and click OK.
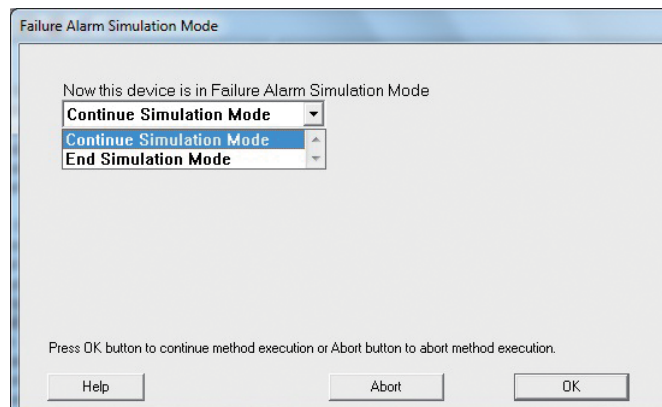
* Failure Alarm Simulation Mode becomes invalid with the DE output.
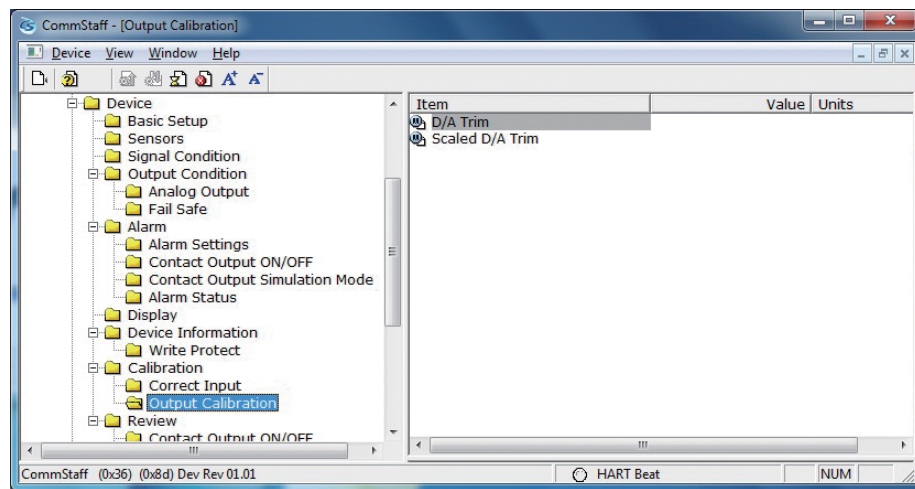
Chapter 4. Maintenance

This chapter explains how to calibrate the analog signals of the transmitter, how to calibrate the measurement range, and how to reset a calibrated value to the default value. It also explains how to check the transmitter's self-diagnostic messages.

4-1. Calibration of Analog Outputs

By connecting to an ammeter and comparing measured values, you can calibrate the 0% and 100% analog outputs.
Select Device → Calibration → Output Calibration → D/A Trim.

CAUTION: If this operation is performed while the transmitter process is under automatic control, outputs may fluctuate, making transmitter operation dangerous. Before performing this operation, make sure that you switch the process control loop to manual control.

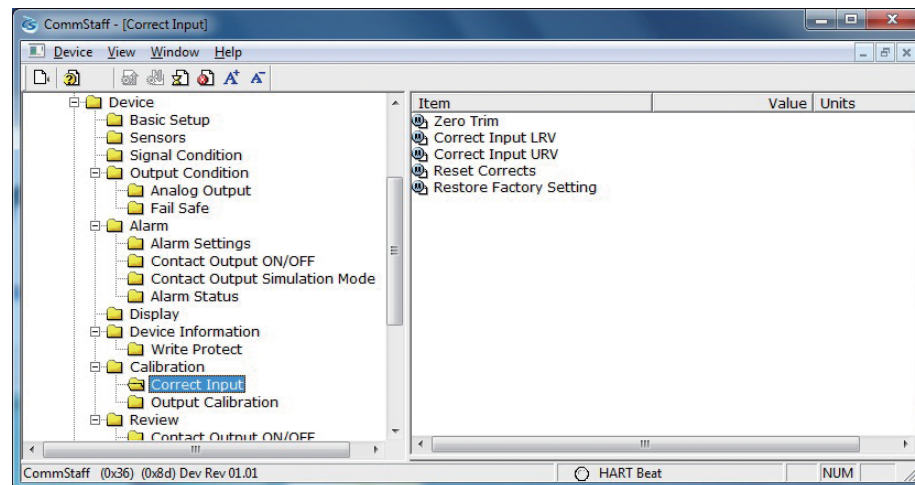| Step	Operation and indication
1	Double-click D/A Trim. WARN - Loop should be removed from automatic control A warning that the loop should be switched from automatic control to manual mode is displayed. After switching to manual mode, click OK. "Connect reference meter" is displayed. Connect the loop to an ammeter (mA) or voltmeter. (It is recommended that an ammeter or voltmeter with an accuracy of 0.03% or better be used.)
2	The following messages are displayed in the order given. Setting fld dev output to 4mA (about to set transmitter output to 4 mA) Click OK if there are no problems. Enter meter value (input the ammeter reading). Input the reading of the ammeter and click OK. This allows the adjustment command to be sent to the transmitter. Fld dev output 4.000mA equal to reference meter? (is the transmitter output equal to the reading on the connected ammeter?) If the transmitter output is not equal to the reading of the ammeter, select No and click OK. This allows the adjustment process to continue.
3	Next do the 20 mA calibration. The following messages are displayed in the order given. Setting fld dev output to 20mA (about to set transmitter output to 20 mA) Click OK if there are no problems. Enter meter value (input the ammeter reading) Input the reading of the ammeter and click OK. This allows the adjustment command to be sent to the transmitter. Fld dev output 20.000mA equal to reference meter? (is the transmitter output equal to a reading of the connected ammeter?) If the transmitter output is not equal to the reading of the ammeter, select No and click OK. This allows the adjustment process to continue. Finally, a message is displayed notifying you that this will return operation to normal measurement mode and that the 20 mA calibration process is complete.

4-2. Measurement Range Calibration according to Actual Pressure

For the AT9000 series Electric differential pressure and pressure transmitters, the measurement range must be calibrated at two points, namely the Lower Range Value (input value at 0% output) and Upper Range Value (input value at 100% output).

This calibration is done when calibrating actual pressures using a standard pressure transmitter. For further details, refer to Chapter 5, "Maintenance" in AT9000 Advanced Transmitter model GTX (CM2-GTX100-2001) or AT9000 SuperAce (CM2-ATS100-2001) .

CAUTION: If this operation is performed while the transmitter process is under automatic control, outputs may fluctuate, making transmitter operation dangerous. Before performing this operation, make sure that you switch the process control loop to manual control.

Select Device → Calibration → Correct Input.

- To calibrate the LRV (Lower Range Value) value, double-click Correct Input LRV. To calibrate the URV (Upper Range Value) value, double-click Correct Input URV.

- A warning that the loop should be switched from automatic control to manual mode is displayed (WARN - Loop should be removed from automatic control). After switching to manual mode, click OK.

- "Apply LRV pressure" or "Apply URV pressure" is displayed. If the value of the standard pressure generator is equal to LRV (0%) or URV (100%), click OK.

- "Press OK when pressure is stable" is displayed. After confirming that input pressure has stabilized, click OK.

- The "Note - Loop may be returned to automatic control" message is displayed to notify you that you can now switch back to automatic control. Click OK.

4-3.   Calibrated Value Reset

The calibrated zero span value can be reset to the factory-set value.

Select Device → Calibration → Correct Input.
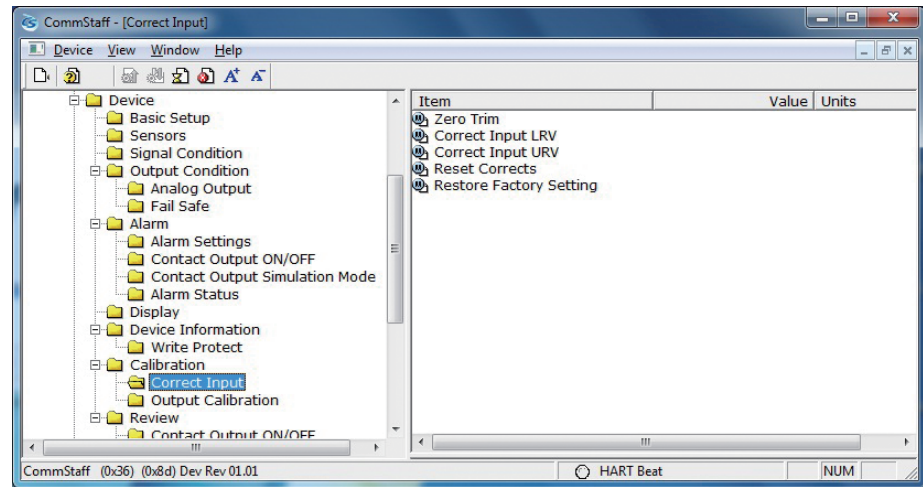
CAUTION: If this operation is performed while the transmitter process is under automatic control, outputs may fluctuate, making transmitter operation dangerous. Before performing this operation, make sure that you switch the process control loop to manual control.

- Double-click Reset Corrects. The "WARN - Loop should be removed from automatic control" message is displayed, warning that the loop should be switched from automatic control to manual mode. After switching to manual mode, click OK.

- The "About to Reset corrects" message is displayed to notify you that calibrated values will be reset. Click OK.

- After the calibrated values are reset, "Reset Corrects OK" is displayed. Click OK.

- The "Note - Loop may be returned to automatic control" message is displayed to notify you that you can now switch the loop back to automatic control. Click OK.
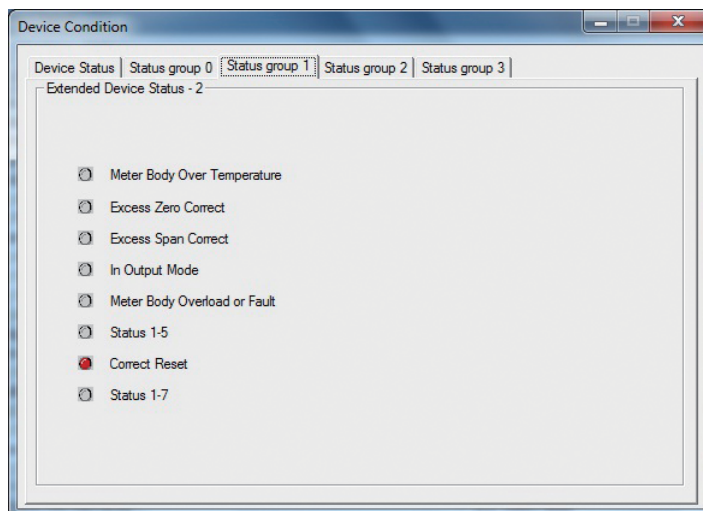
4-4. Checking Self-diagnostic Messages

You can check self-diagnostic messages by clicking the Status icon or "Device status" in the "Display" menu.
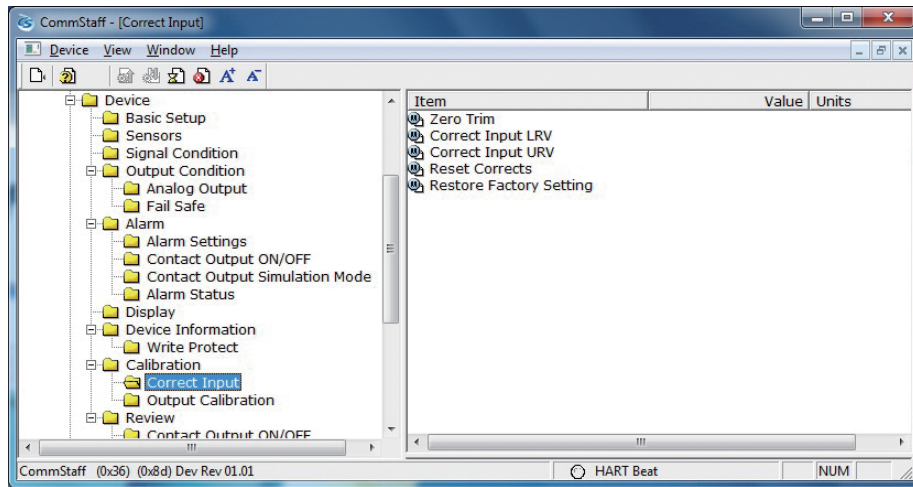
For example, the button to the left of CORRECTS RESET turns red after the calibrated values are reset.

There are 4 status groups. The self-diagnosis details are shown for each group.

The following gives details of the information on self-diagnosis.

|	Status message	Meaning	Required action	Display of Indicator
Internal data inconsistency	Invalid database	Indicates that the settings stored in EEPROM are not correct at the time the power is turned on. However, after the data is reset correctly the error status will be cleared.	Try communicating again. Verify configuration data and recalibrate the device.	Err.09 CONFIG
Critical failure	Analog/Digital Conversion Fault	Input signals for the A/D converter or its peripheral circuits are abnormal.	Contact appropriate personnel.	Err.01 A-D CNV
	Sensor Characteristic Data Fault	There is an error in the characteristic data for the sensor.	Contact appropriate personnel.	Err.02 PROM
	Suspect Input	Sensor operation failure.	Contact appropriate personnel.	Err.03 INPUT
	CPU Fault	CPU (MPU:Micro processing Unit) operation failure	Contact appropriate personnel.	Err.04 CPU
	NVM Fault	EEPROM failure	Contact appropriate personnel.	Err.05 NVM
	RAM Fault	RAM failure	Contact appropriate personnel.	Err.06 RAM
	ROM Fault	ROM failure	Contact appropriate personnel.	Err.07 ROM
	Output Circuit Fault	which the power voltage supplied to the transmitter dips for 1 second or more. Also, if the supply voltage has been abnormal for about 3 minutes, this alarm is displayed.	Contact appropriate personnel.	Err.08 OUTPUT
Non-critical status	Meter Body Over Temperature	Meterbody temperature is too high. The temperature of sensor in the meterbodyexceeds 125 degree C.	Reinstall the device to decrease the temperature to within specifications.	AL.20 M/B.TEMP
	Excess Zero Correct	The zero correction factor is outside the acceptable limits for accurate operation.	Check the input and be sure it matches the calibrated range value.	AL.21 ZERO.CAL
	Excess Span Correct	The span correction factor is outside the acceptable limits for accurate operation.	Check the input and be sure it matches the calibrated range value.	AL.22 SPAN.CAL
	In Output Mode	The device is operating in output mode (Loop test).	Go to the output mode menu to exit the output mode.	Output % OUTMODE
	Meter Body Overload or Meter Body Fault	- The input pressure is more than two times The upper range limit for The device. - Device error.	Check the PV value and replace the device with a larger range model if necessary.	AL.24 OVRLOAD
	Correct Reset	Calibration data is cleared.	Calibrate the lower and upper range values.	AL.26 NO.CALIB
	External Zero/Span Adjustment Fault	External zero/span adjustment error. When external zero/span adjustment is available, this alarm is displayed if the zero or span adjustment switch is turned on for 45 seconds or more, or if both switches are turned on at the same time.	Contact appropriate personnel.	AL.AL.28 SWITCH28
	Contact Output Simulation Mode	The device is operating contact output simulation mode.	To exit contact output simulation mode, go to the alarm/contact output menu.	[Blank] DO.SIM
	Output Alarm Detected	The output is going over upper/lower limit of output alarm.	Check the output.	AL.51 OUT%.AL
	Sensor Temp. Alarm Detected	The sensor temperature is going over upper/lower limit of sensor temp. alarm.	Check the sensor temperature.	AL.52 TEMP.AL

With the AT9000, values can be checked or configured by viewing data in the EDD menu format.

EDD can present data related to self-diagnoses in an easy-to-understand manner.

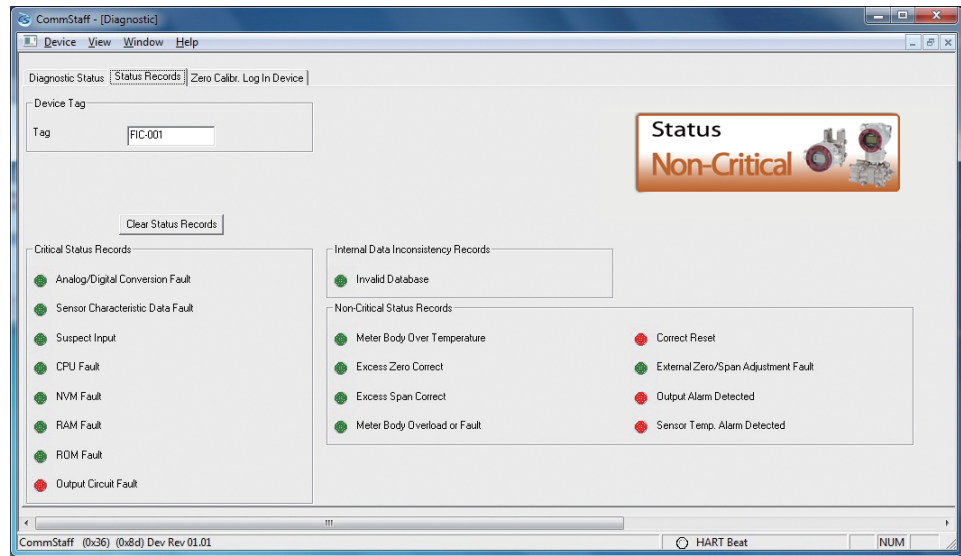Click View on the menu bar and select Diagnostic from the menu.
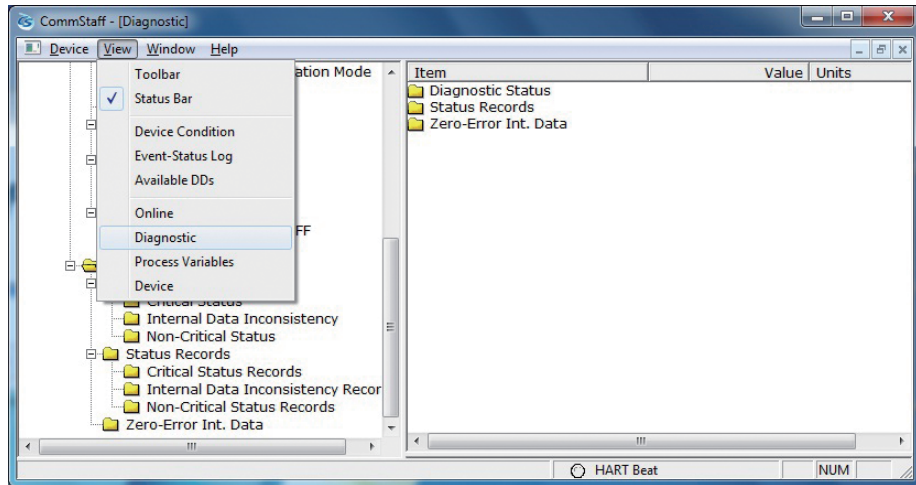
Diagnostic results are displayed in the EDD menu format.
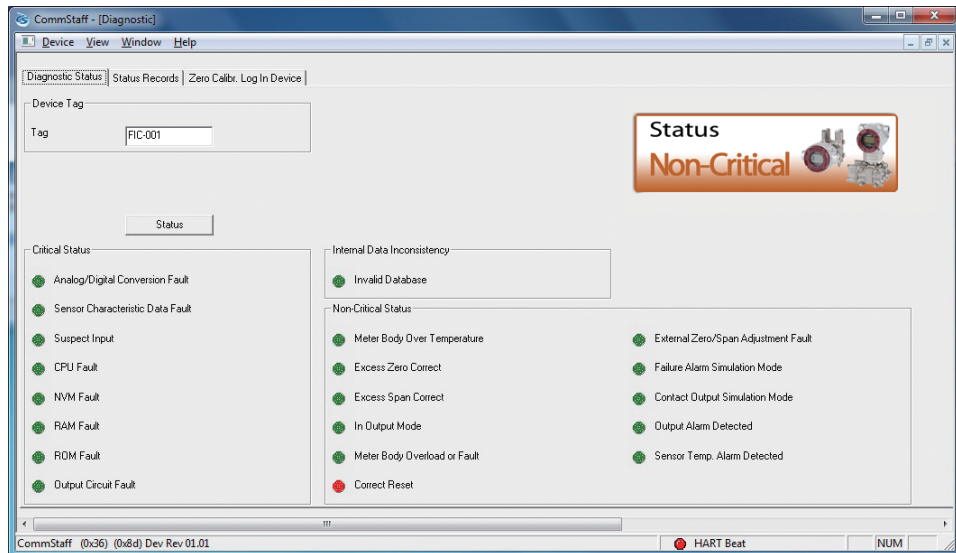
4-5. Checking the Error Log

It is convenient to check the error log in the EDD menu format.

Select (click) the "Status Record" tab as shown in the following screen.

4-6. Checking Internal Data on Zero Calibrations

It is also convenient to check the internal data on zero calibrations in the EDD menu format as shown in the following screen.

Select (click) the "Zero Calibr. Log in Device" tab as shown below.

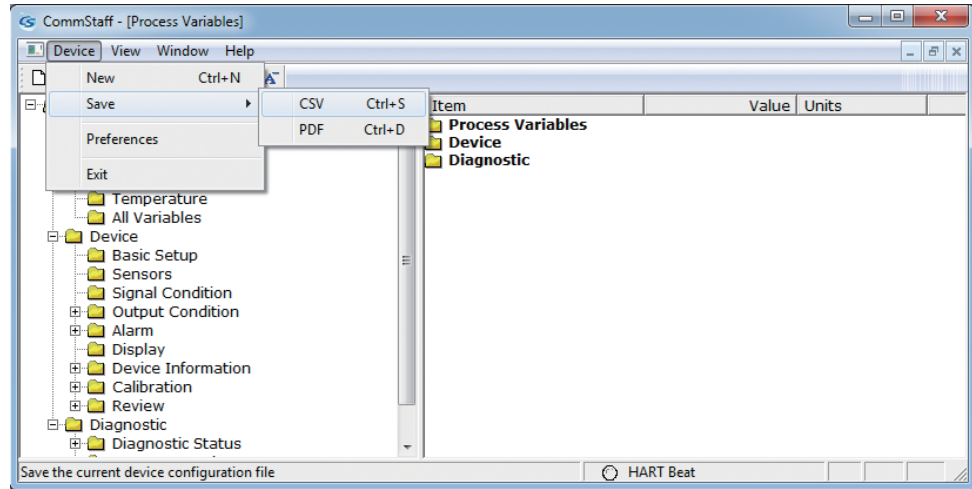You can check for internal data on the past five zero calibrations.
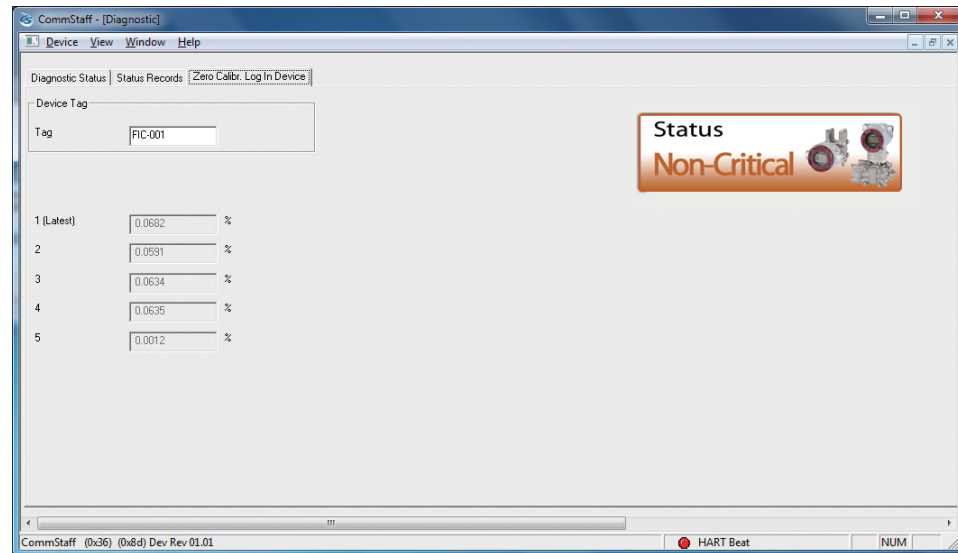
4.7 Storage of Device Data

You can store device data from the menu bar.

Device (D) → Storage (S) → CVS or PDF

4.8 Confirmation of Diagnostic Log

You can make sure the diagnostic log from stored device data.

If device data is stored, the diagnostic log is shown as follows.

Example: [Status group0 0xC3]

This code denotes the following status.

* Status group_ 0x_ _
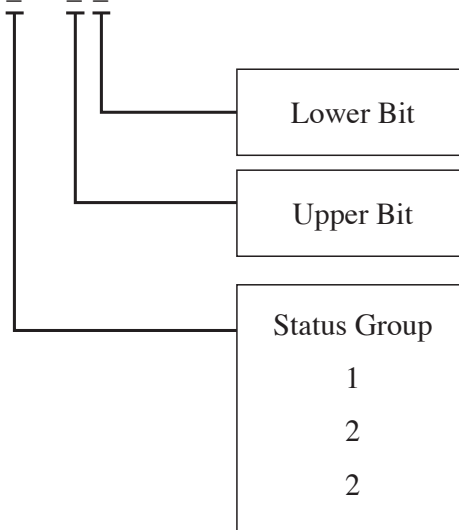
"Status Group 0 0xC3" of the diagnostic result is as follows. The codes "C" and "3" are in accordance with the following tables.

Upper bit C: ROM Fault and Output Circuit Fault

Lower bit 3: Analog/Digital Conversion Fault and Sensor Characteristic Data Fault

If "Status Group 0 0x00" is shown, the item of the group is normal.

Upper Bit of Status group 0

1	NVM Fault			
2	RAM Fault			
3	NVM Fault	RAM Fault		
4	ROM Fault			
5	NVM Fault	ROM Fault		
6	RAM Fault	ROM Fault		
7	NVM Fault	RAM Fault	ROM Fault	
8	Output Circuit Fault			
9	NVM Fault	Output Circuit Fault		
A	RAM Fault	Output Circuit Fault		
B	NVM Fault	RAM Fault	Output Circuit Fault	
C	ROM Fault	Output Circuit Fault		
D	NVM Fault	ROM Fault	Output Circuit Fault	
E	RAM Fault	ROM Fault	Output Circuit Fault	
F	NVM Fault	RAM Fault	ROM Fault	Output Circuit Fault

Lower Bit of Status group 0

1	Analog/Digital Conversion Fault			
2	Sensor Characteristic Data Fault			
3	Analog/Digital Conversion Fault	Sensor Characteristic Data Fault		
4	Suspect Input			
5	Analog/Digital Conversion Fault	Suspect Input		
6	Sensor Characteristic Data Fault	Suspect Input		
7	Analog/Digital Conversion Fault	Sensor Characteristic Data Fault	Suspect Input	
8	CPU Fault			
9	Analog/Digital Conversion Fault	CPU Fault		
A	Sensor Characteristic Data Fault	CPU Fault		
B	Analog/Digital Conversion Fault	Sensor Characteristic Data Fault	CPU Fault	
C	Suspect Input	CPU Fault		
D	Analog/Digital Conversion Fault	Suspect Input	CPU Fault	CPU Fault
E	Sensor Characteristic Data Fault	Suspect Input		
F	Analog/Digital Conversion Fault	Sensor Characteristic Data Fault		

Upper Bit of Status group 1

1	Meter Body Overload or Fault			
4	Correct Reset			
5	Meter Body Overload or Fault	Correct Reset		

Lower Bit of Status group 1

1	Meter Body Over Temperature			
2	Excess Zero Correct			
3	Meter Body Over Temperature	Excess Zero Correct		
4	Excess Span Correct			
5	Meter Body Over Temperature	Excess Span Correct		
6	Excess Zero Correct	Excess Span Correct		
7	Meter Body Over Temperature	Excess Zero Correct	Excess Span Correct	
8	In Output Mode			
9	Meter Body Over Temperature	In Output Mode		
A	Excess Zero Correct	In Output Mode		
B	Meter Body Over Temperature	Excess Zero Correct	In Output Mode	
C	Excess Span Correct	In Output Mode		
D	Meter Body Over Temperature	Excess Span Correct	In Output Mode	
E	Excess Zero Correct	Excess Span Correct	In Output Mode	
F	Meter Body Over Temperature	Excess Zero Correct	Excess Span Correct	In Output Mode

Upper Bit of Status group 2

1	Failure Alarm Simulation Mode			
2	Contact Output Simulation Mode			
3	Failure Alarm Simulation Mode	Contact Output Simulation Mode		
4	Output Alarm Detected			
5	Failure Alarm Simulation Mode	Output Alarm Detected		
6	Contact Output Simulation Mode	Output Alarm Detected		
7	Failure Alarm Simulation Mode	Contact Output Simulation Mode	Output Alarm Detected	
8	Sensor Temp. Alarm Detected			
9	Failure Alarm Simulation Mode	Sensor Temp. Alarm Detected		
A	Contact Output Simulation Mode	Sensor Temp. Alarm Detected		
B	Failure Alarm Simulation Mode	Contact Output Simulation Mode	Sensor Temp. Alarm Detected	
C	Output Alarm Detected	Sensor Temp. Alarm Detected		
D	Failure Alarm Simulation Mode	Output Alarm Detected	Sensor Temp. Alarm Detected	
E	Contact Output Simulation Mode	Output Alarm Detected	Sensor Temp. Alarm Detected	
F	Failure Alarm Simulation Mode	Contact Output Simulation Mode	Output Alarm Detected	Sensor Temp. Alarm Detected

Upper Bit of Status group 3

1	External Zero/Span Adjustment Fault			

Lower Bit of Status group 3

0	"0"			

Lower Bit of Status group 3

1	Invalid Database			

Diagnostic Message and Measure

	Diagnostic Message	Description	Measure	Display of Indicator
Internal data inconsistency	Invalid Database	Configuration data of the device or calibration data is broken	Push quit button and communicate again. Reconfigure device data and calibrate the device again.	Err.09CONFIG
Critical failure	Analog/Digital Conversion Fault	Breakdown of A/D Converter	Contact Azbil group due to an abnormal condition of the sensor or the printed wiring board.	Err.01A-D CNV
	Sensor Characteristic Data Fault	Abnormal condition of sensor characteristic data	Contact Azbil group due to an abnormal condition of the sensor characteristic data.	Err.02PROM
	Suspect Input	Abnormal condition of input data	Contact Azbil group due to an abnormal condition of the sensor or the printed wiring board.	Err.03INPUT
	CPU Fault	Abnormal condition of CPU	Contact Azbil group due to an abnormal condition of the printed wiring board.	Err.04CPU
	NVM Fault	Abnormal condition of R/W of NVM		Err.05NVM
	RAM Fault	Abnormal condition of R/W of RAM		Err.06RAM
	ROM Fault	Abnormal condition of R/W of ROM		Err.07ROM
	Output Circuit Fault	Abnormal condition of the output circuit		Err.08OUTPUT

	Diagnostic Message	Description	Measure	Display of Indicator
Non-critical status	Meter Body Over Temperature	The meter body temperature is too high.	Configure the meter body temperature to be within the specification, or make sure whether the process liquid temperature is normal.	AL.20M/B TEMP
	Excess Zero Correct	The Zero Correct is too high.	Make sure whether there is no difference between the input	AL.21ZERO. CAL
	Excess Span Correct	The Span Correct is too high.		AL.22SPAN. CAL
	In Output Mode	The device operates in the output mode.	Cancel the output mode.	OUTPUT%OUTMODE
	Meter Body Overload or Fault	- The input pressure exceeds twice as wide as the configurable range. - Breakdown of the device	- Make sure whether the input pressure is within the specification. - If the input pressure is very high, decrease the input pressure or change the device with a wider range.	AL.24OVRLOAD
	Correct Reset	The correct value is erased.	Perform recovery of the initial correct value, or calibrate the lower limit and the upper limit of the range.	AL.26NO.CALIB
Non-critical status	External Zero/Span Adjustment Fault	The external zero adjustment switch is broken.	Contact Azbil group due to an abnormal condition of the external zero adjustment switch or the printed wiring board.	AL.28SWITCH
	Output Alarm Detected	The output value exceeds the lower limit or the upper limit of the Output Alarm.	Make sure the output value.	AL.51OUT%. AL.
	Sensor Temp. Alarm Detected	The sensor temperature exceeds the lower limit or the upper limit of the Sensor Temp. Alarm.	Make sure the sensor temperature.	AL.52TEMP. AL

Terms and Conditions

We would like to express our appreciation for your purchase and use of Azbil Corporation's products. You are required to acknowledge and agree upon the following terms and conditions for your purchase of Azbil Corporation's products (system products, field instruments, control valves, and control products), unless otherwise stated in any separate document, including, without limitation, estimation sheets, written agreements, catalogs, specifications and instruction manuals.

1. **Warranty period and warranty scope**
   1.1 **Warranty period**
   Azbil Corporation's products shall be warranted for one (1) year from the date of your purchase of the said products or the delivery of the said products to a place designated by you.
   1.2 **Warranty scope**
   In the event that Azbil Corporation's product has any failure attributable to azbil during the aforementioned warranty period, Azbil Corporation shall, without charge, deliver a replacement for the said product to the place where you purchased, or repair the said product and deliver it to the aforementioned place. Notwithstanding the foregoing, any failure falling under one of the following shall not be covered under this warranty:
   (1) Failure caused by your improper use of azbil product (noncompliance with conditions, environment of use, precautions, etc. set forth in catalogs, specifications, instruction manuals, etc.);
   (2) Failure caused for other reasons than Azbil Corporation's product;
   (3) Failure caused by any modification or repair made by any person other than Azbil Corporation or Azbil Corporation's subcontractors;
   (4) Failure caused by your use of Azbil Corporation's product in a manner not conforming to the intended usage of that product;
   (5) Failure that the state-of-the-art at the time of Azbil Corporation's shipment did not allow Azbil Corporation to predict; or
   (6) Failure that arose from any reason not attributable to Azbil Corporation, including, without limitation, acts of God, disasters, and actions taken by a third party.
   Please note that the term "warranty" as used herein refers to equipment-only-warranty, and Azbil Corporation shall not be liable for any damages, including direct, indirect, special, incidental or consequential damages in connection with or arising out of Azbil Corporation's products.

2. **Ascertainment of suitability**
   You are required to ascertain the suitability of Azbil Corporation's product in case of your use of the same with your machinery, equipment, etc. (hereinafter referred to as "Equipment") on your own responsibility, taking the following matters into consideration:
   (1) Regulations and standards or laws that your Equipment is to comply with.
   (2) Examples of application described in any documents provided by Azbil Corporation are for your reference purpose only, and you are required to check the functions and safety of your Equipment prior to your use.
   (3) Measures to be taken to secure the required level of the reliability and safety of your Equipment in your use
   Although azbil is constantly making efforts to improve the quality and reliability of Azbil Corporation's products, there exists a possibility that parts and machinery may break down.
   You are required to provide your Equipment with safety design such as fool-proof design, [*1] and fail-safe design[*2] (anti-flame propagation design, etc.), whereby preventing any occurrence of physical injuries, fires, significant damage, and so forth. Furthermore, fault avoidance, [*3] fault tolerance,[*4] or the like should be incorporated so that the said Equipment can satisfy the level of reliability and safety required for your use.

   *1. A design that is safe even if the user makes an error.
   *2. A design that is safe even if the device fails.
   *3. Avoidance of device failure by using highly reliable components, etc.
   *4. The use of redundancy.

3. **Precautions and restrictions on application**
   Azbil Corporation's products other than those explicitly specified as applicable (e.g. azbil Limit Switch For Nuclear Energy) shall not be used in a nuclear energy controlled area (radiation controlled area).
   Any Azbil Corporation's products shall not be used for/with medical equipment.
   The products are for industrial use. Do not allow general consumers to install or use any Azbil Corporation's product.
   However, azbil products can be incorporated into products used by general consumers. If you intend to use a product for that purpose, please contact one of our sales representatives.
   In addition,
   you are required to conduct a consultation with our sales representative and understand detail specifications, cautions for operation, and so forth by reference to catalogs, specifications, instruction manual, etc. in case that you intend to use azbil product for any purposes specified in (1) through (6) below.
   Moreover, you are required to provide your Equipment with fool-proof design, fail-safe design, anti-flame propagation design, fault avoidance, fault tolerance, and other kinds of protection/safety circuit design on your own responsibility to ensure reliability and safety, whereby preventing problems caused by failure or nonconformity.
   (1) For use under such conditions or in such environments as not stated in technical documents, including catalogs, specification, and instruction manuals

(2) For use of specific purposes, such as:
* Nuclear energy/radiation related facilities
  [For use outside nuclear energy controlled areas] [For use of Azbil Corporation's Limit Switch For Nuclear Energy]
* Machinery or equipment for space/sea bottom
* Transportation equipment
  [Railway, aircraft, vessels, vehicle equipment, etc.]
* Antidisaster/crime-prevention equipment
* Burning appliances
* Electrothermal equipment
* Amusement facilities
* Facilities/applications associated directly with billing
(3) Supply systems such as electricity/gas/water supply systems, large-scale communication systems, and traffic/air traffic control systems requiring high reliability
(4) Facilities that are to comply with regulations of governmental/public agencies or specific industries
(5) Machinery or equipment that may affect human lives, human bodies or properties
(6) Other machinery or equipment equivalent to those set forth in items (1) to (5) above which require high reliability and safety

4. Precautions against long-term use

Use of Azbil Corporation's products, including switches, which contain electronic components, over a prolonged period may degrade insulation or increase contact-resistance and may result in heat generation or any other similar problem causing such product or switch to develop safety hazards such as smoking, ignition, and electrification.
Although acceleration of the above situation varies depending on the conditions or environment of use of the products, you are required not to use any Azbil Corporation's products for a period exceeding ten (10) years unless otherwise stated in specifications or instruction manuals.

5. Recommendation for renewal

Mechanical components, such as relays and switches, used for Azbil Corporation's products will reach the end of their life due to wear by repetitious open/close operations.
In addition, electronic components such as electrolytic capacitors will reach the end of their life due to aged deterioration based on the conditions or environment in which such electronic components are used.
Although acceleration of the above situation varies depending on the conditions or environment of use, the number of open/close operations of relays, etc.
as prescribed in specifications or instruction manuals, or depending on the design margin of your machine or equipment, you are required to renew any Azbil Corporation's products every 5 to 10 years unless otherwise specified in specifications or instruction manuals.
System products, field instruments (sensors such as pressure/flow/level sensors, regulating valves, etc.) will reach the end of their life due to aged deterioration of parts.
For those parts that will reach the end of their life due to aged deterioration, recommended replacement cycles are prescribed. You are required to replace parts based on such recommended replacement cycles.

6. Other precautions

Prior to your use of Azbil Corporation's products, you are required to understand and comply with specifications (e.g., conditions and environment of use), precautions, warnings/cautions/notices as set forth in the technical documents prepared for individual Azbil Corporation's products, such as catalogs, specifications, and instruction manuals to ensure the quality, reliability, and safety of those products.

7. Changes to specifications

Please note that the descriptions contained in any documents provided by azbil are subject to change without notice for improvement or for any other reason.
For inquires or information on specifications as you may need to check, please contact our branch offices or sales offices, or your local sales agents.

8. Discontinuance of the supply of products/parts

Please note that the production of any Azbil Corporation's product may be discontinued without notice.
For repairable products, we will, in principle, undertake repairs for five (5) years after the discontinuance of those products. In some cases, however, we cannot undertake such repairs for reasons, such as the absence of repair parts.
For system products, field instruments, we may not be able to undertake parts replacement for similar reasons.

9. Scope of services

Prices of Azbil Corporation's products do not include any charges for services such as engineer dispatch service.
Accordingly, a separate fee will be charged in any of the following cases:
(1) Installation, adjustment, guidance, and attendance at a test run
(2) Maintenance, inspection, adjustment, and repair
(3) Technical guidance and technical education
(4) Special test or special inspection of a product under the conditions specified by you
Please note that we cannot provide any services as set forth above in a nuclear energy controlled area (radiation controlled area) or at a place where the level of exposure to radiation is equivalent to that in a nuclear energy controlled area.

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