User's Manual

AXF Series Magnetic Flowmeter Installation Manual
FOUNDATION Fieldbus Communication Type and PROFIBUS PA Communication Type

ADMAG AXF™

IM 01E20A01-02EN

vigilantplant®

Integral Flowmeter (AXF□□□G, AXF□□□C, AXF□□□H)

Remote Flowtube (AXF□□□G, AXF□□□C, AXF□□□H, AXF□□□W)

Remote Converter (AXFA14G, AXFA14C)

Note: "□□□" means any of the following.
002, 005, 010, 015, 025, 032, 040, 050, 065, 080, 100, 125, 150, 200, 250, 300, 350, 400

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This manual outlines the basic guidelines for installation procedures of the ADMAG AXF Series FOUNDATION fieldbus type and PROFIBUS PA type. For the items which are not covered in this manual, see the user's manuals in the following table.
Note: Refer to IM 01E20A01-01EN, in addition to this manual.

Document No.	Title
IM 01E20F02-01E	ADMAG AXF Series FOUNDATION Fieldbus Communication Type Magnetic Flowmeter
IM 01E20F12-01E	AXF PROFIBUS PA Communication Type Magnetic Flowmeter

YOKOGAWA
Yokogawa Electric Corporation

IM 01E20A01-02EN
1st Edition

1. FOUNDATION Fieldbus Communication Type

Fieldbus is fully dependent upon digital communication protocol and differs in operation from conventional 4 to 20 mA transmission and the BRAIN communication protocol. It is recommended that novice users use field devices in accordance with the procedures described in this section. The procedures assume that field devices will be set up on a bench or in an instrument shop.

1.1 Connection of Devices

The following are required for use with fieldbus devices:

- **Power supply:**

  Fieldbus requires a dedicated power supply. It is recommended that current capacity be well over the total value of the maximum current consumed by all devices (including the host). Conventional DC current cannot be used as is.

- **Terminator:**

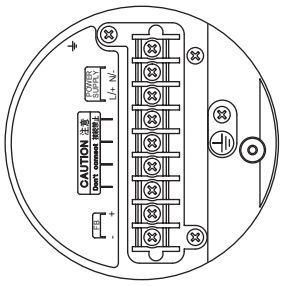
  Fieldbus requires two terminators. Refer to the supplier for details of terminators that are attached to the host.

- **Field devices:**

  Connect fieldbus communication type AXF (Refer to Figure 1.1.1). Two or more AXF devices or other devices can be connected.

Integral Flowmeter AXF

Terminal configuration



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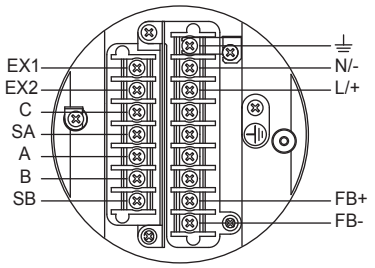
Terminal wiring

Terminal Symbols	Description
⏚	Functional grounding
N/– L/+	Power supply
FB+ FB–	Fieldbus communication signal
⏚	Protective grounding (Outside of the terminal)

Remote Converter AXFA14

Terminal configuration



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Terminal wiring

Terminal Symbols	Description
EX1 EX2	Excitation current Output
C SA A B SB	Flow singal input
⏚	Functional grounding
N/– L/+	Power supply
FB+ FB–	Fieldbus communication signal
⏚	Protective grounding (Outside of the terminal)

Figure 1.1.1 Terminal Connection

CAUTION

Do not connect to these terminals which are marked "CAUTION Don't connect".

- **Host:**

  Used for accessing field devices. A dedicated host (such as DCS) is used for an instrumentation line while dedicated communication tools are used for experimental purposes. For operation of the host, refer to the instruction manual for each host. No other details on the host are given in this manual.

- **Cable:**

  Used for connecting devices. Refer to "Fieldbus Technical Information" (TI 38K03A01-01E) for details of instrumentation cabling. For laboratory or other experimental use, a twisted pair cable two to three meters in length with a cross section of 0.9 mm^2 or more and a cycle period of within 5 cm (2 inches) may be used. Termination processing depends on the type of device being deployed. For AXF, use an M4 screw terminal claw. Some hosts require a connector.

Refer to Yokogawa when making arrangements to purchase the recommended equipment.
Connect the devices as shown in Figure 1.1.2. Connect the terminators at both ends of the trunk, with a minimum length of the spur laid for connection.

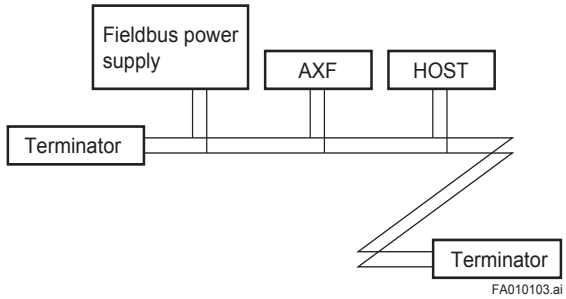


Figure 1.1.2 Cabling

NOTE

No CHECK terminal is used for fieldbus communication AXF. Do not connect the field indicator and check meter.

Before using a fieldbus configuration tool other than the existing host, confirm it does not affect the loop functionality in which all devices are already installed in operation. Disconnect the relevant control loop from the bus if necessary.

IMPORTANT

Connecting a fieldbus configuration tool to a loop with its existing host may cause communication data scrambling resulting in a functional disorder or a system failure.

1.2 Host Setting

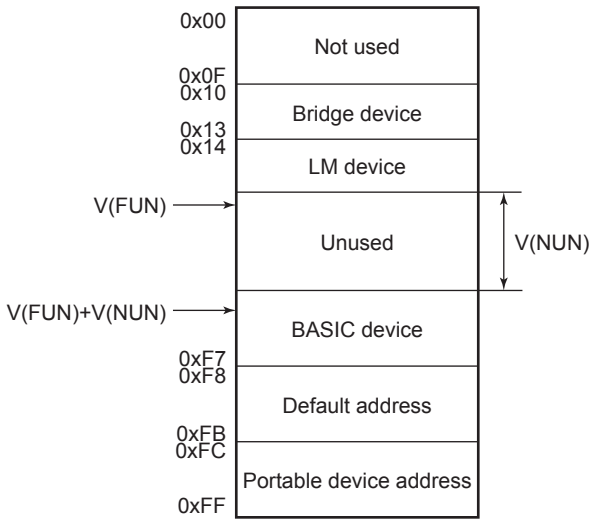
To activate fieldbus, the following settings are required for the host.

IMPORTANT

Do not turn off the power immediately after setting. When the parameters are saved to the EEPROM, the redundant processing is executed for an improvement of reliability. If the power is turned off within 60 seconds after setting is made, the modified parameters are not saved and the settings may return to the original values.

Table 1.2 Operation Parameters

Symbol	Parameter	Description and Settings
V (ST)	Slot-Time	Indicates the time necessary for immediate reply of the device. Unit of time is in octets (256 µs). Set maximum specification for all devices. For AXF, set a value of 4 or greater.
V (MID)	Minimum-Inter-PDU-Delay	Minimum value of communication data intervals. Unit of time is in octets (256 µs). Set the maximum specification for all devices. For AXF, set a value of 4 or greater.
V (MRD)	Maximum-Reply-Delay	The worst case time elapsed until a reply is recorded. The unit is Slot-time; set the value so that V (MRD) ×V (ST) is the maximum value of the specification for all devices. For AXF, the setting must be a value of 12 or greater.
V (FUN)	First-Unpolled-Node	Indicate the address next to the address range used by the host. Set 0×15 or greater.
V (NUN)	Number-of-consecutive-Unpolled-Node	Unused address range.



Note 1: Bridge device: A linking device which brings data from one or more H1 networks.
Note 2: LM device: with bus control function (Link Master function)
Note 3: BASIC device: without bus control function

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Figure 1.2 Available Address Range

1.3 Bus Power ON

Turn on the power of the host and the bus and also the power for the AXF. Where the AXF is equipped with an LCD indicator, first all segments are lit, then the display begins to operate.
Using the host device display function, check that the AXF is in operation on the bus.
The device information, including PD tag, Node address, and Device ID, is described on the sheet attached to the AXF. The device information is given in duplicate on this sheet (Refer to Figure 1.3).

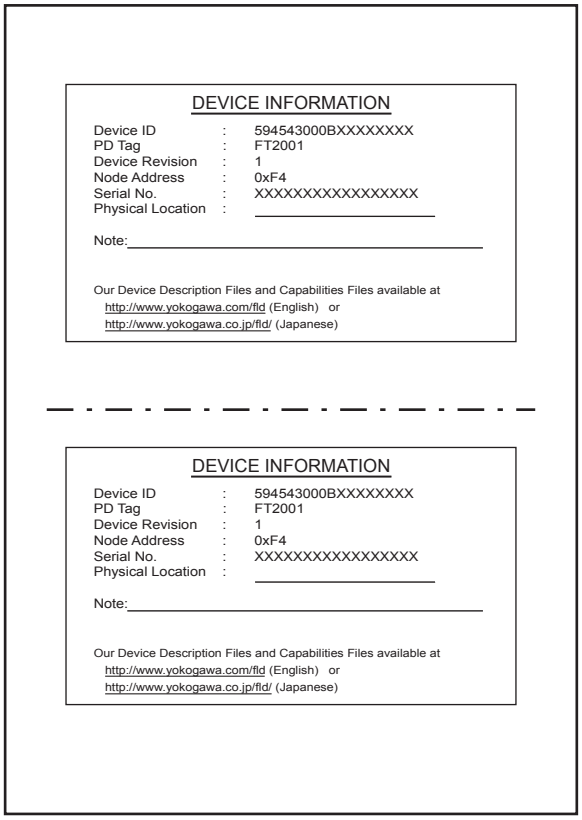

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Figure 1.3 Device Information Sheet Attached to AXF

If no AXF is detected, check the available address range. If the node address and PD tag are not specified when ordering, default value is factory set. If two or more AXFs are connected at a time with default value, only one AXF will be detected from the host as AXFs have the same initial address. Separately connect each AXF and set a different address for each.

1.4 Integration of DD

If the host supports DD (Device Description), the DD of the AXF needs to be installed. Check if host has the following directory under its default DD directory.

594543\000B
(594543 is the manufacturer number of Yokogawa Electric Corporation, and 000B is the AXF device number, respectively.)

If this directory is not found, the DD of the AXF has not been included. Create the above directory and copy the DD file (0m0n.ffo, 0m0n.sym) (m, n is a numeral) into the directory. '0m' in the file name shows the device revision, and '0n' shows the DD revision.

Once the DD is installed in the directory, the name and attribute of all parameters of the AXF are displayed.
Off-line configuration is possible by using capabilities files.
AXF has two capabilities levels, "1" and "2".
Select "Capabilities level = 1" when the AXF doesn't have LC1(PID function) option.
Select "Capabilities level = 2" when the AXF has LC1(PID function) option.
The capabilities level defines the kind and the number of function blocks that can be used.
The table below shows the relation.

Table 1.4 The capability level and function blocks that can be used

Capabilities Level	AI	DI	IT	AR	PID
1	1	2	2	1	0
2	1	2	2	1	1

If you do not have the DD or capabilities files, you can download them from our web page:
http://www.yokogawa.com/fld/

1.5 Generation of Alarm

1.5.1 Indication of Alarm

When the self-diagnostics function indicates that a device is faulty, an alarm (device alarm) is issued from the resource block. When an error (block error) is detected in each function block or an error in the process value (process alarm) is detected, an alarm is issued from each block. If an LCD indicator is installed, the error number is displayed. If two or more alarms are issued, multiple error numbers are displayed.
For details of ALARM, refer to Table 1.5.1.

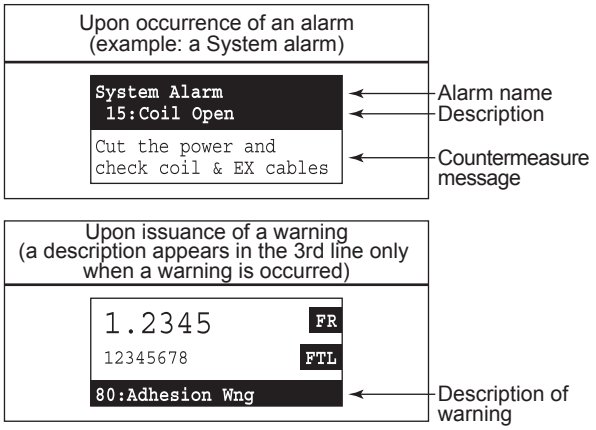


Figure 1.5.1 Error Identification on Indicator

Following tables summarize the value of AXF parameters and LCD display indicates an Alarm.

Table 1.5.1 Alarm Summary

Category	Alarm	XD_ ERROR (Value)	BLOCK_ ERROR	Primary Value	Primary Value Status
System Alarms	10:uP Fault	200	Other	Hold	BAD:Device Failure
	11:EEPROM Fault	199	Other	Hold	BAD:Device Failure
	12:A/D (H) Fault	198	Other	Hold	BAD:Device Failure
	13:A/D (L) Fault	197	Other	Hold	BAD:Device Failure
	14:A/D (Z) Fault	196	Other	Hold	BAD:Device Failure
	15:Coil Open	195	Other	Hold	BAD:Sensor Failure
	16:EEPROM Dflt	194	Other	Hold	BAD:Device Failure
	100:Comm uP Fault	190	Other	Variable	BAD:Device Failure
	101:Comm EEPROM Fault	189	Other	Variable	BAD:Device Failure
	102:IT1 Not Saved				-
	103:IT2 Not Saved				-
	104:Comm Error1	188	Other	Variable	BAD:Device Failure
	105:Comm Error2	187	Other	Variable	BAD:Device Failure
	106:DL Incomplete				-
	107:Download Fail				-
	108:Not Ready				-
Process Alarms	30:Sig Overflow	170	Other	Hold	BAD:Sensor Failure
	31:Empty Pipe	169	Other	Hold	BAD:Sensor Failure
	33:Adhesion Alm	167	Other	Hold	BAD:Sensor Failure
	110:AI Lo Lo Alm				-
	111:AI Hi Hi Alm				-
	112:PID Lo Lo Alm				-
	113:PID Hi Hi Alm				-
O/S Mode Alarms	40:RS O/S Mode				BAD:Non-specific
	41:TB O/S Mode		Out of Service		BAD:Out of Service
	42:AI FB O/S Mode				-
	43:IT1 FB O/S Mode				-
	44:IT2 FB O/S Mode				-
	45:DI1 FB O/S Mode				-
	46:DI2 FB O/S Mode				-
	47:AR FB O/S Mode				-
	48:PID FB O/S Mode				-

Category	Alarm	XD_ ERROR (Value)	BLOCK_ ERROR	Primary Value	Primary Value Status
Setting Alarms	50:Span > 10m/s	160	Other	Hold	BAD: Configuration Error
	51:Span < 0.1m/s	159	Other	Hold	BAD: Configuration Error
	57:Dens Set Err	157	Other	Hold	BAD: Configuration Error
	71:Meas Mod Set	156	Other	Hold	BAD: Configuration Error
	72:Size Set Err	155	Other	Hold	BAD: Configuration Error
	73:Adh Set Err	154	Other	Hold	BAD: Configuration Error
	120:IT1 Clock Per Err				-
	121:IT2 Clock Per Err				-
	122:AR Range Set Err				-
Warning	80:Adhesion Wng	150	Other		Uncertain: Sensor Conversion not Accurate
	82:Auto Zero Wng	148	Other		Uncertain: Sensor Conversion not Accurate
	84:Disp Over Wng				-
	85:Flow Vel Over	147	Other		Uncertain: Engineering Unit Range Violation
	130:AI Non-Schedule				-
	131:IT1 Non-Schedule				-
	132:IT2 Non-Schedule				-
	133:DI1 Non-Schedule				-
	134:DI2 Non-Schedule				-
	135:AR Non-Schedule				-
	136:PID Non-Schedule				-
	140:Sim. Jmpr On				-
	141:AI Sim. Enabled				-
	142:DI1 Sim. Enabled				-
	143:DI2 Sim. Enabled				-
	150:AI FB Man Mode				-
	151:IT1 FB Man Mode				-
	152:IT2 FB Man Mode				-
	153:DI1 FB Man Mode				-
	154:DI2 FB Man Mode				-
	155:AR FB Man Mode				-
	156:PID FB Man Mode				-
	160:PID FB Bypass Mode				-

1.5.2 Alarms and Events

The following alarms or events can be reported by the AXF if Link object and VCR static entry are set.

Analog Alerts (Generated when a process value exceeds threshold)
By AI Block Hi-Hi Alarm, Hi Alarm, Low Alarm, Low-Low Alarm
Discrete Alerts (Generated when an abnormal condition is detected)
By Resource Block Block Alarm, Write Alarm
By Transducer Block Block Alarm
By AI, DI, IT, AR and PID Blocks Block Alarm
Update Alerts (Generated when an important (restorable) parameter is updated)
By Resource Block Update Event
By Transducer Block Update Event
By AI, DI, IT, AR and PID Blocks Update Event

An alert has following structure:

Table 1.5.2 Alert Object

Subindex			Parameter Name	Explanation
Analog Alert	Discrete Alert	Update Alert		
1	1	1	Block Index	Index of block from which alert is generated
2	2	2	Alert Key	Alert Key copied from the block
3	3	3	Standard Type	Type of the alert
4	4	4	Mfr Type	Alert Name identified by manufacturer specific DD
5	5	5	Message Type	Reason of alert notification
6	6	6	Priority	Priority of the alarm
7	7	7	Time Stamp	Time when this alert is first detected
8	8		Subcode	Enumerated cause of this alert
9	9		Value	Value of referenced data
10	10		Relative Index	Relative index of referenced data
		8	Static Revision	Value of static revision (ST_REV) of the block
11	11	9	Unit Index	Unit code of referenced data

1.6 Simulation Function

The simulation function simulates the input of a function block and lets it operate as if the data was received from the transducer block. It is possible to conduct testing for the downstream function blocks or alarm processes.
A SIMULATE_ENABLE switch is mounted in the AXF amplifier. This is to prevent the accidental operation of this function. When this is switched on, simulation is enabled. (See Figure 1.6.) To initiate the same action from a remote terminal, if REMOTE LOOP TEST SWITCH is written to the SIM_ENABLE_MSG parameter (index 1044) of the resource block, the resulting action is the same as is taken when the above switch is on. Note that this parameter value is lost when the power is turned OFF. In simulation enabled status, an alarm is generated from the resource block, and other device alarms will be masked; for this reason the simulation must be disabled immediately after using this function.
The SIMULATE parameter of AI and DI block consists of the elements listed in Table 1.6 below.

Table 1.6 Simulate Parameter (SIMULATE/SIMULATE_D)

Sub-index	Parameters	Description
1	Simulate Status	Sets the data status to be simulated.
2	Simulate Value	Sets the value of the data to be simulated.
3	Transducer Status	Displays the data status from the transducer block. It cannot be changed.
4	Transducer Value	Displays the data value from the transducer block. It cannot be changed.
5	Enable Disable	Controls the simulation function of this block. 1: Disable (standard) 2: Active

When Simulate “Enable Disable” in Table 1.6 above is set to 2, the applicable function block uses the simulation value set in this parameter instead of the data from the transducer block. This setting can be used for propagation of the status to the trailing blocks, generation of a process alarm, and as an operation test for trailing blocks.

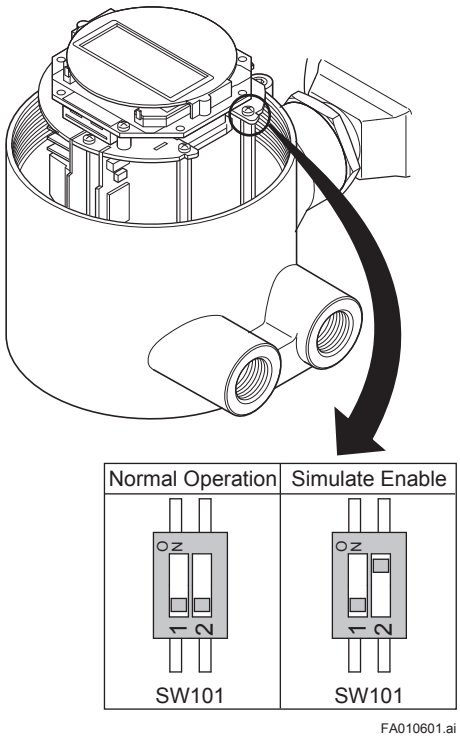


Figure 1.6 SIMULATE_ENABLE Switch Position

IMPORTANT

- Removing and installing cover are necessary for the setting SIMULATE_ENABLE switch. Perform removing and installing cover as described in following Section of user's manual.
  Refer to Subsection 5.4.2 of IM 01E20D01-01E, or refer to Subsection 10.1.2 of IM 01E20C02-01E.
- To preserve the safety, do not touch the electrical circuit and cable except the SIMULATE_ENABLE switch.

2. PROFIBUS PA Communication Type

PROFIBUS PA is fully dependent upon digital communication protocol and differs in operation from conventional 4 to 20 mA transmission and the BRAIN communication protocol.

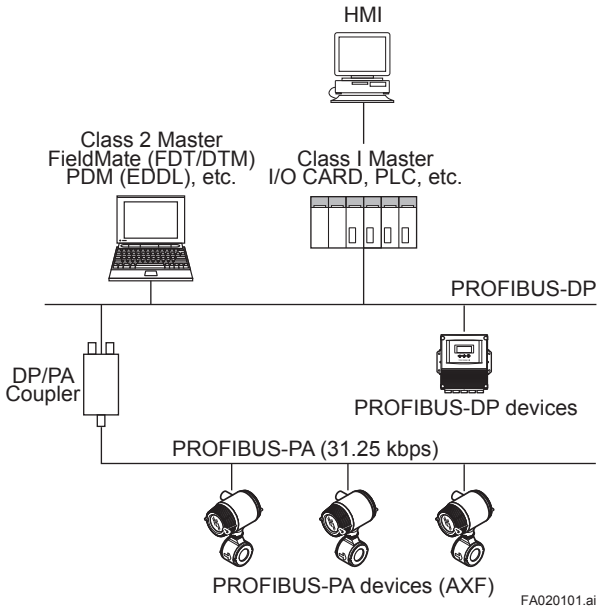


Figure 2.1.1 PROFIBUS System Construction

2.1 Connection of Devices

The following are required for use with PROFIBUS PA devices:

- **Power supply:**

  PROFIBUS PA requires a dedicated power supply. It is recommended that current capacity be well over the total value of the maximum current consumed by all devices. Power is supplied by a DP/PA coupler.

- **Terminators:**

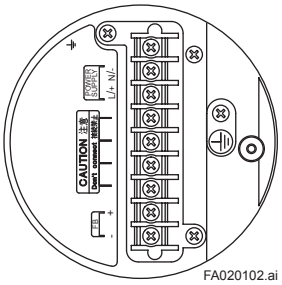
  PROFIBUS PA requires two terminators. A terminator shall be located at each end of the trunk cable.

- **Field devices:**

  Connect PROFIBUS PA communication type AXF (Refer to Figure 2.1.2). Two or more AXF devices or other devices can be connected.

Integral Flowmeter AXF

Terminal configuration

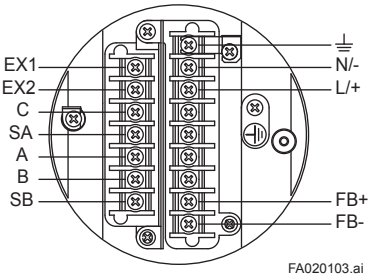


Terminal wiring

Terminal Symbols	Description
⏚	Functional grounding
N/– L/+	Power supply
FB+ FB–	PROFIBUS PA communication signal
⏚	Protective grounding (Outside of the terminal)

Remote Converter AXFA14

Terminal configuration



Terminal wiring

Terminal Symbols	Description
EX1 EX2	Excitation current Output
C SA A B SB	Flow singal input
⏚	Functional grounding
N/– L/+	Power supply
FB+ FB–	PROFIBUS PA communication signal
⏚	Protective grounding (Outside of the terminal)

Figure 2.1.2 Terminal Connection

CAUTION

Do not connect to these terminals which are marked "CAUTION Don't connect".

- **DP/PA Couplers:**

  PROFIBUS PA requires DP/PA couplers which convert the RS-485 signals to the IEC 61158-2 signal level and power the field devices via the PROFIBUS PA.

- **Cable:**

  Refer to Figure 2.1.1.

Table 2.1 PROFIBUS PA Cables and Transmissible Length

Type of cable	Cable specifications	Max. length of cable (reference value)
Type A: Individually-shielded twisted pair cable	#18AWG (0.82 mm^2)	1,900 m
Type B: Overall-shielded twisted pair cable	#22AWG (0.32 mm^2)	1,200 m
Type C: Unshielded twisted pair cable	#26AWG (0.13 mm^2)	400 m
Type D: Overall-shielded non-twisted cable	#16AWG (1.25 mm^2)	200 m

Note: Yokogawa recommends the use of Type A.
Usage of Type B and D is restricted.
Yokogawa does not recommend the use of Type C.

Before using a PROFIBUS PA configuration tool other than the existing class 1 and class 2 Masters, confirm it does not affect the loop functionality in which all devices are already installed in operation. Disconnect the relevant control loop from the bus if necessary.

IMPORTANT

- It is mandatory to turn on the power supply of the AXF before turning on the power supply for the PROFIBUS line.
- Connecting a PROFIBUS PA configuration tool to a loop with its existing class 1 and class 2 Masters may cause communication data scrambling resulting in a functional disorder or a system failure.

2.2 Master Settings

To activate PROFIBUS PA, the following bus parameters must be set for the master.

IMPORTANT

Do not turn off the power immediately after setting. When the parameters are saved to the EEPROM, the redundant processing is executed for an improvement of reliability. If the power is turned off within 60 seconds after setting is made, the modified parameters are not saved and the settings may return to the original values.

Table 2.2 Bus Parameters

Symbol	Parameter	Description and Settings
Transmission rate	Transmission Rate	The transmission rate of PROFIBUS PA matches that of the segment coupler. e.g P+F: 93.75 kbps, Siemens: 45.45 kbps
TSL	Slot Time	The maximum time a master station must wait for the complete reception of the first octet of a response (11 bits). e.g: 4095
min TSDR	Min. Station Delay Timer	Sets the minimum time at which a slave can send the first bit of a response back.
max TSDR	Max. Station Delay Time	Sets the maximum time at which a slave can send the first bit of a response back.
TQUI	Quiet Time	Controls the time at which the bus electronics or software of the sender is set to receive mode after a message is sent.
TSET	Setup Time	Sets the maximum allowable time for parameter setting and response by the slave.
HSA	Highest Station Address	Sets the highest station address in the network.
G	Gap update factor	Sets the number of token cycles after which the master will search for a new master.
max. retry limit	Max Retry Limit	Sets the number of retries that are performed after a receiver does not respond to a message.

2.3 Integration of GSD

A PROFIBUS PA system requires a GSD file containing device parameters such as the supported transmission rate, input data, output data, data format and data length.
The following GSD files are available for the AXF.

Table 2.3 GSD files

Profile Ident-Number	0x9740
Profile GSD file	PA139740.GSD (AIx1, TOTx1)
Device Specific Ident-Number	0x4590
Device Specific GSD file	YEC_4590.GSD

Download GSD for AXF from the following website.
http://www.yokogawa.com/fld/doc/profibus/

IMPORTANT

Do not change contents in the GSD file from the factory default. The AXF may be given a serious problem in its operation if do so.

2.4 Bus and AXF Power ON

Address setting Switch

A setup of bus address is possible by the change with a parameter, or the hardware slide switch.
The set address which is done by hardware is higher priority than by software.
Following description is how to set the bus address using by hardware slide switch.
Refer to Section 5.3 of IM 01E20F12-01E when the bus address is set by software.
The AXF must turn off the power supply when the bus address is changed by hardware slide switch.

The device information, including Tag Desc., Bus address, and Ident Number, is described on the sheet attached to the AXF. The device information is given in duplicate on this sheet.
Confirm the bus address written in the device information.
The default bus address is set as 126 (hexadecimal 7E) at the factory unless otherwise specified when ordered.

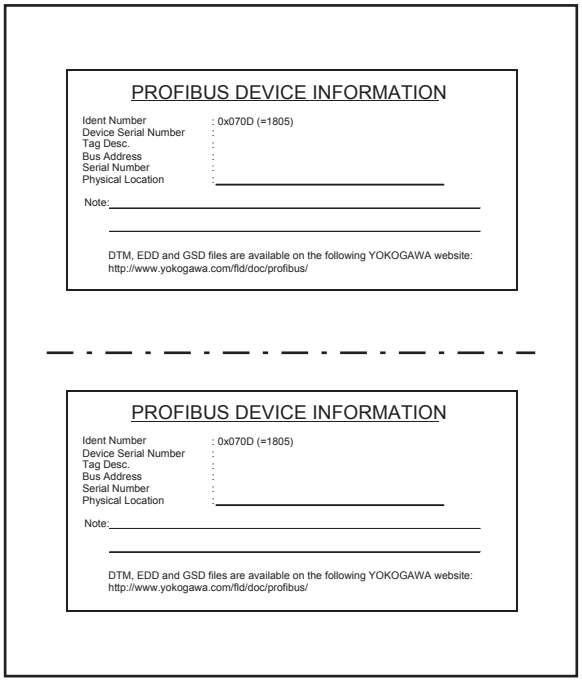


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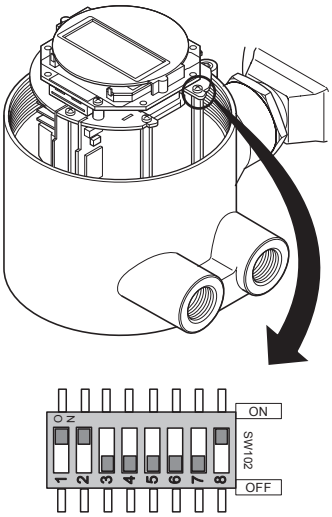
Figure 2.4.1 Device Information Sheet Attached to AXF

Confirm that the AXF is turned off before opening the front cover.
The bus address switch is located as shown in Figure 2.4.1.
The No. 8 switch of SW102 is turned ON first. Other seven switches of No. 1 to No. 7 on the SW102 are for setting address. No. 1 switch of SW102 is allocated for bit0 of address, and No. 7 switch of SW102 is allocated for bit6 of address. The setting condition of the SW102 as shown in Figure 2.4.2 is 3 as the set bus address number as an example.

If two or more AXFs are connected on the same bus, each AXF must be set as different bus address.
The front cover must be closed after finish the work of the bus address setting.



ADDRESS

MSB							LSB
8	7	6	5	4	3	2	1
ON	OFF	OFF	OFF	OFF	OFF	ON	ON

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Figure 2.4.2 Address Switch

WARNING

When opening the cover, wait for more than 10 minutes after turning off the power. Furthermore, opening of the cover must also be carried out by the trained personnel having knowledge of safety standard.

IMPORTANT

To preserve the safety, do not touch the electrical circuit and the cables except the Bus address switch.

Bus and AXF Power ON

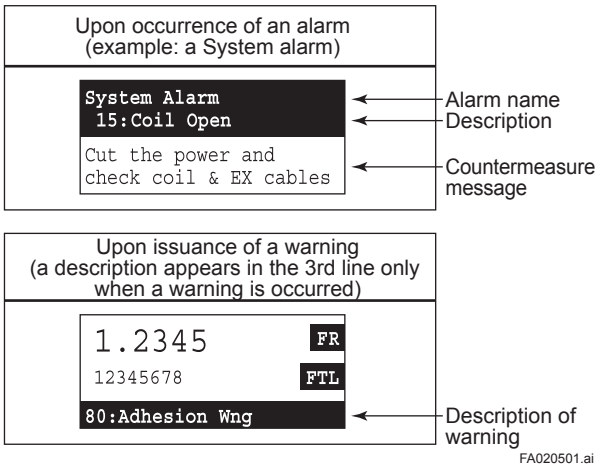
Firstly, turn on the power of the host, and then, the bus and also the power for the AXF. Where the AXF is equipped with the LCD indicator, first all segments are lit, then the display begins to operate.
Using the host device display function, check that the AXF is in operation on the bus.

If no AXF is detected, check the available address range. If the Bus address and Tag Desc. are not specified when ordering, default value is factory set. If two or more AXFs are connected at the same time with default value, only one AXF will be detected from the host as AXFs have the same initial address. Separately connect each AXF and set a different address for each.

2.5 Generation of Alarm

2.5.1 Indication of Alarm

When the self-diagnostics function indicates that a device is faulty, a diagnostic message (DIAGNOSIS or DIAGNOSIS_EXTENSION) is issued from the physical block. When a diagnostic message is detected in each function block or a diagnostic message in the process value (process alarm) is detected, a diagnostic message is issued from each block. If a LCD indicator is installed, the error number is displayed. If two or more alarms are issued, multiple error messages are displayed.
When an alarm has been occurred, the corresponding alarm name, description, and suitable countermeasure will be displayed on the display unit. The normal Display Mode and Alarm Mode may be displayed alternatively. When a warning has been issued, the corresponding content will be shown in the third line in the Display Mode.



FA020501.ai

Figure 2.5 Error Identification on Indicator

2.5.2 Alarms and Warnings

The alarm and warning lists in each function block are shown in Table 2.5.1 to Table 2.5.3.

Table 2.5.1 Status of each parameter in failure mode (1/2)

Category	Alarm	AI Block			TOT Block			DI Block		
		FSAFE_TYPE = 0	FSAFE_TYPE = 1	FSAFE_TYPE = 2	FAIL_TOT = 0	FAIL_TOT = 1	FAIL_TOT = 2	FSAFE_TYPE = 0	FSAFE_TYPE = 1	FSAFE_TYPE = 2
System Alarms	10:uP Fault	Uncertain; Substitude Value, ok	Uncertain; Last Usage Value, ok	Bad; Device Failure, Const.	Uncertain Non Specific, ok	Uncertain; Last Usable Value, Const.	Uncertain Non Specific, ok	Uncertain; Substitude Value, ok	Uncertain; Last Usage Value, ok	Bad; Device Failure, Const.
	11:EEPROM Fault									
	12:A/D(H) Fault									
	13:A/D(L) Fault									
	14:A/D(Z) Fault									
	15:Coil Open			Bad; Sensor Failure, Const.						Bad; Sensor Failure, Const.
	16:EEPROM Dflt			Bad; Device Failure, Const.						Bad; Device Failure, Const.
	100:Comm uP Faul			Bad; Device Failure, ok						Bad; Device Failure, ok
	101:Comm EEPROM Fault									
	102:Total1 Not Saved	–	–	–				–	–	–
	103:Total2 Not Saved	–	–	–				–	–	–
	104:Total3 Not Saved	–	–	–				–	–	–
	105:Comm Error1	Uncertain; Substitude Value, ok	Uncertain; Last Usage Value, ok	Bad; Device Failure, ok	Uncertain Non Specific, ok	Uncertain; Last Usable Value, Const.	Uncertain Non Specific, ok	Uncertain; Substitude Value, ok	Uncertain; Last Usage Value, ok	Bad; Device Failure, ok
	106:Comm Error2									
	107:DL Incomplete	–	–	–	–	–	–	–	–	–
	108:Download Fail	–	–	–	–	–	–	–	–	–
Process Alarms	30:Sig Overflow	Uncertain; Substitude Value, ok	Uncertain; Last Usage Value, ok	Bad; Sensor Failure, Const.	Uncertain Non Specific, ok	Uncertain; Last Usable Value, Const.	Uncertain Non Specific, ok	Uncertain; Substitude Value, ok	Uncertain; Last Usage Value, ok	Bad; Sensor Failure, Const.
	31:Empty Pipe									
	32:HH/LL Alm									
	33:Adhesion Alm	Uncertain; Substitude Value, ok	Uncertain; Last Usage Value, ok	Bad; Sensor Failure, Const.	Uncertain Non Specific, ok	Uncertain; Last Usable Value, Const.	Uncertain Non Specific, ok	Uncertain; Substitude Value, ok	Uncertain; Last Usage Value, ok	Bad; Sensor Failure, Const.
	34:Insulation Alm									
	110:AI Lo Lo Alm	Good; Active Critical Alarm, Low limt.	Good; Active Critical Alarm, Low limt.	Good; Active Critical Alarm, Low limt.	–	–	–	–	–	–
	111:AI Hi Hi Alm	Good; Active Critical Alarm, High limt.	Good; Active Critical Alarm, High limt.	Good; Active Critical Alarm, High limt.	–	–	–	–	–	–
	AI Lo Alm	Good; Active Advisory Alarm, Low limt.	Good; Active Advisory Alarm, Low limt.	Good; Active Advisory Alarm, Low limt.	–	–	–	–	–	–
	AI Hi Alm	Good; Active Advisory Alarm, High limt.	Good; Active Advisory Alarm, High limt.	Good; Active Advisory Alarm, High limt.	–	–	–	–	–	–
	Total1 Lo Lo Alm	–	–	–	TOT1: Good; Active Critical Alarm, Low limt. TOT2: -- TOT3: --	TOT1: Good; Active Critical Alarm, Low limt. TOT2: -- TOT3: --	TOT1: Good; Active Critical Alarm, Low limt. TOT2: -- TOT3: --	–	–	–
	Total1 Hi Hi Alm	–	–	–	TOT1: Good; Active Critical Alarm, High limt. TOT2: -- TOT3: --	TOT1: Good; Active Critical Alarm, High limt. TOT2: -- TOT3: --	TOT1: Good; Active Critical Alarm, High limt. TOT2: -- TOT3: --	–	–	–
	Total1 Lo Alm	–	–	–	TOT1: Good; Active Advisory Alarm,Low limt. TOT2: -- TOT3: --	TOT1: Good; Active Advisory Alarm,Low limt. TOT2: -- TOT3: --	TOT1: Good; Active Advisory Alarm,Low limt. TOT2: -- TOT3: --	–	–	–
	Total1 Hi Alm	–	–	–	TOT1: Good; Active Advisory Alarm,High limt. TOT2: -- TOT3: --	TOT1: Good; Active Advisory Alarm,High limt. TOT2: -- TOT3: --	TOT1: Good; Active Advisory Alarm,High limt. TOT2: -- TOT3: --	–	–	–
	Total2 Lo Lo Alm	–	–	–	TOT1: -- TOT2: Good; Active Critical Alarm, Low limt. TOT3: --	TOT1: -- TOT2: Good; Active Critical Alarm, Low limt. TOT3: --	TOT1: -- TOT2: Good; Active Critical Alarm, Low limt. TOT3: --	–	–	–
	Total2 Hi Hi Alm	–	–	–	TOT1: -- TOT2: Good; Active Critical Alarm, High limt. TOT3: --	TOT1: -- TOT2: Good; Active Critical Alarm, High limt. TOT3: --	TOT1: -- TOT2: Good; Active Critical Alarm, High limt. TOT3: --	–	–	–
	Total2 Lo Alm	–	–	–	TOT1: -- TOT2: Good; Active Advisory Alarm,Low limt. TOT3: --	TOT1: -- TOT2: Good; Active Advisory Alarm,Low limt. TOT3: --	TOT1: -- TOT2: Good; Active Advisory Alarm,Low limt. TOT3: --	–	–	–

Table 2.5.2 Status of each parameter in failure mode (2/2)

Category	Alarm	AI Block			TOT Block			DI Block		
		FSAFE_TYPE = 0	FSAFE_TYPE = 1	FSAFE_TYPE = 2	FAIL_TOT = 0	FAIL_TOT = 1	FAIL_TOT = 2	FSAFE_TYPE = 0	FSAFE_TYPE = 1	FSAFE_TYPE = 2
Process Alarms	Total2 Hi Alm	–	–	–	TOT1: -- TOT2: Good; Active Advisory Alarm,High limt. TOT3: --	TOT1: -- TOT2: Good; Active Advisory Alarm,High limt. TOT3: --	TOT1: -- TOT2: Good; Active Advisory Alarm,High limt. TOT3: --	–	–	–
	Total3 Lo Lo Alm	–	–	–	TOT1: -- TOT2: -- TOT3: Good; Active Critical Alarm, Low limt.	TOT1: -- TOT2: -- TOT3: Good; Active Critical Alarm, Low limt.	TOT1: -- TOT2: -- TOT3: Good; Active Critical Alarm, Low limt.	–	–	–
	Total3 Hi Hi Alm	–	–	–	TOT1: -- TOT2: -- TOT3: Good; Active Critical Alarm, High limt.	TOT1: -- TOT2: -- TOT3: Good; Active Critical Alarm, High limt.	TOT1: -- TOT2: -- TOT3: Good; Active Critical Alarm, High limt.	–	–	–
	Total3 Lo Alm	–	–	–	TOT1: -- TOT2: -- TOT3: Good; Active Advisory Alarm,Low limt.	TOT1: -- TOT2: -- TOT3: Good; Active Advisory Alarm,Low limt.	TOT1: -- TOT2: -- TOT3: Good; Active Advisory Alarm,Low limt.	–	–	–
	Total3 Hi Alm	–	–	–	TOT1: -- TOT2: -- TOT3: Good; Active Advisory Alarm,High limt.	TOT1: -- TOT2: -- TOT3: Good; Active Advisory Alarm,High limt.	TOT1: -- TOT2: -- TOT3: Good; Active Advisory Alarm,High limt.	–	–	–
O/S Mode Alarms	40:PB O/S Mode	Bad; Out of Service, Const.	Bad; Out of Service, Const.	Bad; Out of Service, Const.	Bad; Out of Service, Const.	Bad; Out of Service, Const.	Bad; Out of Service, Const.	Bad; Out of Service, Const.	Bad; Out of Service, Const.	Bad; Out of Service, Const.
	41:TB O/S Mode	Uncertain; Substitute Value, ok	Uncertain; Substitute Value, ok	Uncertain; Substitute Value, ok	Uncertain Non Specific, ok	Uncertain Non Specific, ok	Uncertain Non Specific, ok	Uncertain; Substitute Value, ok	Uncertain; Substitute Value, ok	Uncertain; Substitute Value, ok
	42:AI FB O/S Mode	Bad; Out of Service, Const.	Bad; Out of Service, Const.	Bad; Out of Service, Const.	–	–	–	–	–	–
	43:Total1 FB O/S Mode	–	–	–	TOT1: Bad; Out of Service, Const. TOT2: – TOT3: –	TOT1: Bad; Out of Service, Const. TOT2: – TOT3: –	TOT1: Bad; Out of Service, Const. TOT2: – TOT3: –	–	–	–
	44:Total2 FB O/S Mode	–	–	–	TOT1: – TOT2: Bad; Out of Service, Const. TOT3: –	TOT1: – TOT2: Bad; Out of Service, Const. TOT3: –	TOT1: – TOT2: Bad; Out of Service, Const. TOT3: –	–	–	–
	45:Total3 FB O/S Mode	–	–	–	TOT1: – TOT2: – TOT3: Bad; Out of Service, Const.	TOT1: – TOT2: – TOT3: Bad; Out of Service, Const.	TOT1: – TOT2: – TOT3: Bad; Out of Service, Const.	–	–	–
	46:DI1 FB O/S Mode	–	–	–	–	–	–	DI1: Bad; Out of Service, Const. DI2:	DI1: Bad; Out of Service, Const. DI2:	DI1: Bad; Out of Service, Const. DI2:
	47:DI2 FB O/S Mode	–	–	–	–	–	–	DI1: – DI2: Bad; Out of Service, Const.	DI1: – DI2: Bad; Out of Service, Const.	DI1: – DI2: Bad; Out of Service, Const.
Setting Alarms	50:Span > 10m/s	Uncertain; Substitute Value, ok	Uncertain; Last Usage Value, ok	Bad; Non specific, Const.	Uncertain Non Specific, ok	Uncertain; Last Usable Value, Const.	Uncertain Non Specific, ok	Uncertain; Substitute Value, ok	Uncertain; Last Usage Value, ok	Bad; Non specific, Const.
	51:Span < 0.1m/s ok									
	56:H/L HH/LL Set									
	57:Dens Set Err	Uncertain; Substitute Value, ok	Uncertain; Last Usage Value, ok	Bad; Non specific, Const.	Uncertain Non Specific, ok	Uncertain; Last Usable Value, Const.	Uncertain Non Specific, ok	Uncertain; Substitute Value, ok	Uncertain; Last Usage Value, ok	Bad; Non specific, Const.
	71:Meas Mod Set									
	72:Size Set Err									
	73:Adh Set Err									
	120:Total1 Unit Set Err	–	–	–	TOT1:Bad; Configuration Error, ok TOT2: – TOT3: –	TOT1:Bad; Configuration Error, ok TOT2: – TOT3: –	TOT1:Bad; Configuration Error, ok TOT2: – TOT3: –	–	–	–
	121:Total2 Unit Set Err	–	–	–	TOT1: – TOT2:Bad; Configuration Error, ok TOT3: –	TOT1: – TOT2:Bad; Configuration Error, ok TOT3: –	TOT1: – TOT2:Bad; Configuration Error, ok TOT3: –	–	–	–
	122:Total3 Unit Set Err	–	–	–	TOT1: – TOT2: – TOT3:Bad; Configuration Error, ok	TOT1: – TOT2: – TOT3:Bad; Configuration Error, ok	TOT1: – TOT2: – TOT3:Bad; Configuration Error, ok	–	–	–

Table 2.5.3 Status of each parameter in warning mode

Category	Warning	AI Block			TOT Block			DI Block		
		FSAFE_TYPE = 0	FSAFE_TYPE = 1	FSAFE_TYPE = 2	FAIL_TOT = 0	FAIL_TOT = 1	FAIL_TOT = 2	FSAFE_TYPE = 0	FSAFE_TYPE = 1	FSAFE_TYPE = 2
Warning	80:Adhesion Wng 81:Insu-Brk Wng	Good (NC); Maintenance required, ok	Good (NC); Maintenance required, ok	Good (NC); Maintenance required, ok	Good (NC); Maintenance required, ok	Good (NC); Maintenance required, ok	Good (NC); Maintenance required, ok	Good (NC); Maintenance required, ok	Good (NC); Maintenance required, ok	Good (NC); Maintenance required, ok
	82:Auto Zero Wng	Uncertain; Non specific, ok	Uncertain; Non specific, ok	Uncertain; Non specific, ok	Uncertain; Non specific, ok	Uncertain; Non specific, ok	Uncertain; Non specific, ok	Uncertain; Non specific, ok	Uncertain; Non specific, ok	Uncertain; Non specific, ok
	84:Disp Over Wng	–	–	–	–	–	–	–	–	–
	85:FLow Vel Over	Uncertain; Non specific, Low/High limt.	Uncertain; Non specific, Low/High limt.	Uncertain; Non specific, Low/High limt.	Uncertain; Non specific, Low/High limt.	Uncertain; Non specific, Low/High limt.	Uncertain; Non specific, Low/High limt.	Uncertain; Non specific, Low/High limt.	Uncertain; Non specific, Low/High limt.	Uncertain; Non specific, Low/High limt.
	90:Display Sw	–	–	–	–	–	–	–	–	–
	140:Sim. Jmpr On	–	–	–	–	–	–	–	–	–
	141:PB Sim. enabled (Note1)	–	–	–	–	–	–	–	–	–
	142:TB VF Sim. enabled (Note1)	–	–	–	–	–	–	–	–	–
	143:AI Sim. enabled (Note1)	Depend on SIMULATE.Status	Depend on SIMULATE.Status	Depend on SIMULATE.Status	–	–	–	–	–	–
	144:Total1 Sim. enabled (Note1)	–	–	–	TOT1: Depend on SIMULATE. Status TOT2: – TOT3: –	TOT1: Depend on SIMULATE. Status TOT2: – TOT3: –	TOT1: Depend on SIMULATE. Status TOT2: – TOT3: –	–	–	–
	145:Total2 Sim. enabled (Note1)	–	–	–	TOT1: – TOT2: Depend on SIMULATE. Status TOT3: –	TOT1: – TOT2: Depend on SIMULATE. Status TOT3: –	TOT1: – TOT2: Depend on SIMULATE. Status TOT3: –	–	–	–
	146:Total3 Sim. enabled (Note1)	–	–	–	TOT1: – TOT2: – TOT3: Depend on SIMULATE. Status	TOT1: – TOT2: – TOT3: Depend on SIMULATE. Status	TOT1: – TOT2: – TOT3: Depend on SIMULATE. Status	–	–	–
	147:DI1 Sim. enabled (Note1)	–	–	–	–	–	–	DI1: Depend on SIMULATE. Status DI2: –	DI1: Depend on SIMULATE. Status DI2: –	DI1: Depend on SIMULATE. Status DI2: –
	148:DI2 Sim. enabled (Note1)	–	–	–	–	–	–	DI1: – DI2: Depend on SIMULATE. Status	DI1: – DI2: Depend on SIMULATE. Status	DI1: – DI2: Depend on SIMULATE. Status
	150:AI FB Man Mode	–	–	–	–	–	–	–	–	–
	151:Total1 FB Man Mode	–	–	–	–	–	–	–	–	–
	152:Total2 FB Man Mode	–	–	–	–	–	–	–	–	–
	153:Total3 FB Man Mode	–	–	–	–	–	–	–	–	–
	154:DI1 FB Man Mode	–	–	–	–	–	–	–	–	–
	155:DI2 FB Man Mode	–	–	–	–	–	–	–	–	–

Note1: Make it the condition that the hardware simulation jumper is ON.

2.6 Simulation Function

The AXF has a simulation function and it is possible to conduct testing for the downstream function blocks or alarm processes. Following description is how to use and how to set parameters in this function.
A SIMULATE_ENABLE switch is mounted in the AXF amplifier (See Figure 2.6). This is to prevent the accidental operation of this function. When the No 2 switch is ON, simulation function is enabled.
The [Target Mode] in each function block must be also changed from [AUTO] to [O/S] before setting the simulation parameters.
The simulation parameters in each function block including alarm set as diagnosis in the AI block are described below.
The SIMULATE_ENABLE switch (No 2 switch) and the [Target Mode] in each function block must be returned "OFF" / "AUTO" when the simulation operation was finished.

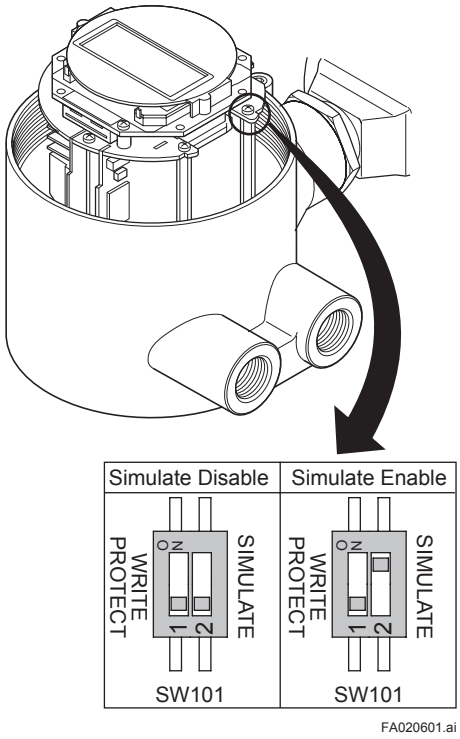


Figure 2.6 SIMULATE_ENABLE Switch Position

WARNING

When opening the cover, wait for more than 10 minutes after turning off the power. Furthermore, opening of the cover must also be carried out by the trained personnel having knowledge of safety standard.

IMPORTANT

- To preserve the safety, do not touch the electrical circuit and cable except the SIMULATE_ENABLE switch.
- Removing and installing cover are necessary for the setting SIMULATE_ENABLE switch. Perform removing and installing cover as described in following Section of user's manual.
  Refer to Subsection 5.4.2 of IM 01E20D01-01E, or refer to Subsection 10.1.2 of IM 01E20C02-01E.

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