Instruction Manual

YEWFLO

Model YF100
Vortex Flowmeter
Fieldbus Communication Protocol

IM 1F2F4-01E

YOKOGAWA
Yokogawa Electric Corporation

IM 1F2F4-01E
1st Edition

CONTENTS

FD No. IM 1F2F4-01E
1st Edition: Dec. 1998 (YK)

1. INTRODUCTION

This manual contains a description of the YF100 Vortex Flowmeter Fieldbus Communication Protocol. The Fieldbus communication protocol is based on the same sensing features as that of the BRAIN communication protocol, which is employed as the measurement principle, and is similar to the BRAIN communication protocol in terms of basic performance and operation. This manual describes only those topics that are required for operation of the Fieldbus communication protocol and that are not contained in the BRAIN communication protocol instruction manual. Refer to each of the following instruction manuals for topics common to the BRAIN communication and Fieldbus communication protocols.

■ Regarding This Manual

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

■ Safety Precautions

- For the protection and safety of the operator and the instrument or the system including the instrument, please be sure to follow the instructions on safety described in this manual when handling this instrument. In case the instrument is handled in contradiction to these instructions, Yokogawa does not guarantee safety.
- For the intrinsically safe equipment and explosionproof equipment, in case the instrument is not restored to its original condition after any repair or modification undertaken by the customer, intrinsically safe construction or explosionproof construction is damaged and may cause dangerous condition. Please contact Yokogawa for any repair or modification required to the instrument.
- The following safety symbol marks are used in this Manual:

WARNING

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

CAUTION

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

CAUTION

This instrument is tested and certified as explosionproof type. Please note that the construction of the instrument, installation, external wiring, maintenance or repair is strictly restricted, and non-observance or negligence of these restriction would result dangerous condition.

IMPORTANT

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

NOTE

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

■ Warranty

The warranty shall cover the period noted on the quotation presented to the purchaser at the time of purchase. Problems occurred during the warranty period shall basically be repaired free of charge.

- In case of problems, the customer should contact the Yokogawa representative from which the instrument was purchased, or the nearest Yokogawa office.
- If a problem arises with this instrument, please inform us of the nature of the problem and the circumstances under which it developed, including the model specification and serial number. Any diagrams, data and other information you can include in your communication will also be helpful.
- Responsible party for repair cost for the problems shall be determined by Yokogawa based on our investigation.

● **The purchaser shall bear the responsibility for repair costs, even during the warranty period, if the malfunction is due to:**

- Improper and/or inadequate maintenance by the purchaser.
- Failure or damage due to improper handling, use or storage which is out of design conditions.
- Use of the product in question in a location not conforming to the standards specified by the Yokogawa, or due to improper maintenance of the installation location.
- Failure or damage due to modification or repair by the party except Yokogawa or who is requested by Yokogawa.
- Malfunction or damage from improper relocation of the product in question after delivery.
- Reason of force majeure such as fires, earthquakes, storms/floods, thunder/lightening, or other natural disasters, or disturbances, riots, warfare, or radioactive contamination.

2. PARTS OF THE AMPLIFIER

Refer to the individual instruction manuals for detailed descriptions of the parts. This section describes the topics applicable to the Fieldbus communication protocol.

(1) The Fieldbus communication type has no local key access.
(2) The Fieldbus communication protocol has a simulation function. A SIMULATE-ENABLE jumper is mounted in the YF100 amplifier to discourage attempts to trigger the simulation function during operation. Refer to Section 6.3, “Simulation Function” for details of the simulation function.

Figure 2.1 Shape of the CPU Assembly

3. ABOUT FIELDBUS

3.1 Outline

Fieldbus is a bi-directional digital communication protocol for field devices. Fieldbus is a dramatic advance in implementation technologies for process control systems and is widely employed by numerous field devices. It is expected to replace the standard 4 to 20 mA analog communication protocol.

YF100 Series Fieldbus communication protocol employs the specification (FOUNDATION™*1 Fieldbus Low Voltage Mode) standardized by the Foundation Fieldbus, and provides interoperability between Yokogawa devices and those produced by other manufacturers. Fieldbus comes with software consisting of AI function block, providing the means to implement a flexible instrumentation system.

For information on other features, engineering, design, construction work, startup and maintenance of Fieldbus, refer to “The Fieldbus Reference Manual” (TI 38K3A01-01E).

3.2 Internal Structure of YF100

The YF100 contains virtual field devices (VFD) that share the following functions.

3.2.1 System/network Management VFD

- Sets node addresses and device tags necessary for communication.
- Controls the execution of function blocks.
- Manages operation parameters and communication resources (Virtual Communication Relationship: VCR).

3.2.2 Function Block VFD

(1) Resource block
- Manages the status of YF100 hardware.
- Automatically informs the host of the detected faults or other problems.

(2) Transducer block
- Converts sensor output to flow signal and delivers to AI function block.

(3) AI function block
- Outputs flow signals.
- Carries out scaling, and damping.

*1: FOUNDATION is a registered trademark of the Foundation Fieldbus.

3.3 Correlation of Each Block

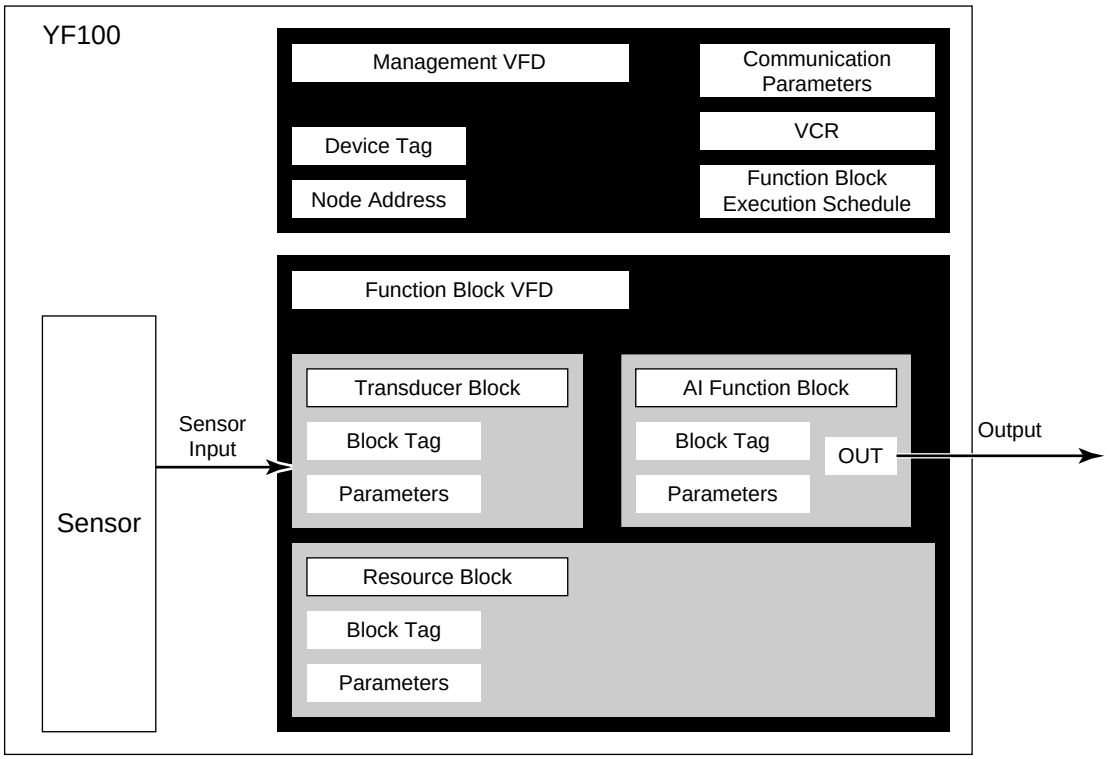


Figure 3.1 Correlation of Each Block

Setting of various parameters, node address, and device tag shown in Figure 3.1 is required before starting operation.

3.4 Wiring System Configuration

The number of devices that can be connected to a single bus and the cable length vary depending on system design. When constructing systems, both the fundamental and overall design, must be carefully considered to allow device performance to be fully exhibited.

4. FOR NOVICE USERS

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 used for laboratories or similar experimental purposes.

4.1 Connection of Equipment

The following equipment is required for use with Fieldbus devices:

- Power supply: Fieldbus requires a dedicated power supply. It is recommended that current capacity should be well over the total value of the maximum current consumed by all devices (including the host). Conventional DC current cannot be used as power supply.
- 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 YF100. Two or more YF100 (devices) or other devices can be connected.
- 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 details of the host are explained in the rest of this material.
- Cable: Used for connecting equipment. Refer to “Guide to Fieldbus” (TI 38K3A01-01E) for details of instrumentation cabling. If the total length of the cable is in a range of 2 to 3 meters for laboratory or other experimental use, the following simplified cable (a twisted pair wire with a cross section of 0.8 mm^2 or more (#18 AWG) and cycle period of within 5 cm (2 inches) may be used. Termination processing depends on the type of device being deployed. For YF100, use an M3.5 screw terminal claw. Some hosts require a connector.

Refer to Yokogawa when making arrangements to purchase the recommended equipment.

Connect the equipment as shown in Figure 4.1. Connect the terminators at both ends of the trunk, with a minimum length of the spur laid for connection.

Be care that the polarity of the terminal is correct.

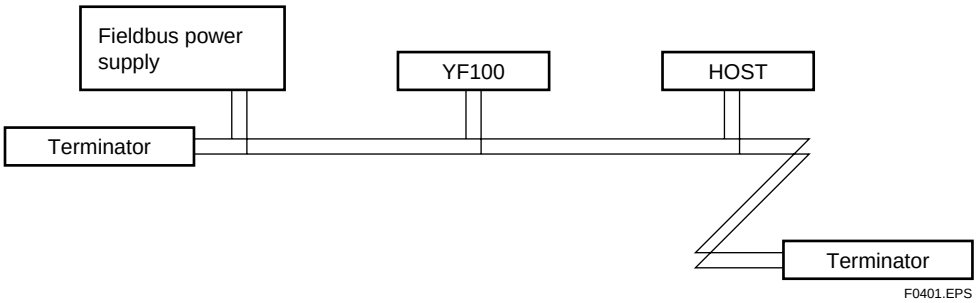


Figure 4.1 Cabling

Note: No CHECK terminal is used for Fieldbus communication YF100. 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. e.g. disconnect the relevant control loop from the bus.

IMPORTANT

Connecting a Fieldbus configuration tool to a loop with its exsisting host may cause communication data scrambles resulting in a functional disorder or a system failure.

4.2 Host Setting

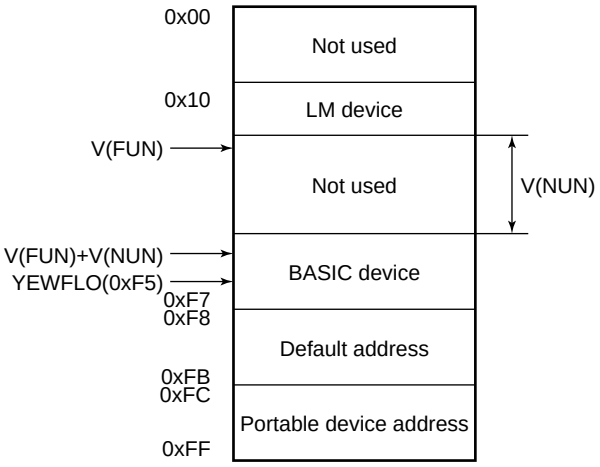
To activate Fieldbus, the following settings are required for the host.

Note: Care must be taken not to turn off the power immediately after setting. If the power is turned off within 30 seconds after setting is made, the modified parameters are not saved and the settings revert back to the original values.

Table 4.1 Operation Parameters

Symbol	Parameter	Description and Settings
V (ST)	Slot-Time	Set 4 or greater value.
V (MID)	Minimum-Inter-PDU-Delay	Set 4 or greater value.
V (MRD)	Maximum-Reply-Delay	Set so that V (MRD) x V (ST) is 12 or greater
V (FUN)	First-Unpolled-Node	Indicate the address next to the address range used by the host. Set hex. 15 or greater.
V (NUN)	Number-of-consecutive-Unpolled-Node	Unused address range. YF100 address is factory-set to hex. F5. Set this address to be within the range of the BASIC device in Figure 4.2.

T0401.EPS



Note 1: LM device: with bus control function (Link Master function)
Note 2: BASIC device: without bus control function

F0402.EPS

Figure 4.2 Available Range of Node Address

4.3 Bus Power ON

Turn on the power of the host and the bus. Where the YF100 is equipped with an LCD indicator, first all segments are lit, then the display begins to operate. If the indicator is not lit or abnormal current flows, check the polarity of the power supply.

Using the host device display function, check that YF100 is in operation on the bus. Unless otherwise specified, the following settings are in effect when shipped from the factory.

Device tag: FI1001
Node address: 245 (hexadecimal F5)
Device ID: 5945430002xxxxxxxx (xxxxxxxx = a total of 8 alphanumeric characters)

If no YF100 is detected, check the available address range and the polarity of the power supply. If two YF100s are connected at a time, only one YF100 will be detected if both YF100s have the same initial address. Separately connect each YF100 and set a different address for each.

4.4 Integration of DD

If the host supports DD (Device Description), the DD of the YF100 needs to be included. Check if the following directory is placed under the directory where the host DD is to be contained.

594543\0002
(Of this directory, 594543 is the manufacturer number of Yokogawa Electric Corporation, and 0002 is the YF100 device number, respectively.)

In the absence of this directory, no DD of YF100 has been included. Create the above directory and copy the DD file (0101.ffo,0101.sym) (option) into the directory.
Once the DD is included in the directory, the name and attribute of all parameters of the YF100 are displayed.

4.5 Reading the Parameters

To read YF100 parameters, select the AI block of the YF100 from the host screen and read the OUT parameter. The current flow is displayed.

(Check that MODE_BLK of the function block resource block is set to AUTO.)

4.6 Continuous Record of Settings

If the host has a function of continuously recording the indications, use this function to list the indications (values). Depending on the host being used, it may be necessary to set the schedule of Publish (the function that transmits the indication on a periodic basis).

4.7 Generation of Alarm

If the host is allowed to receive alarms, generation of an alarm can be attempted from YF100. In this case, set the reception of alarms on the host side. YF100's VCR-7 and link object-3 are factory-set for this purpose. For practical purposes, all alarms are placed in a disabled status; for this reason, it is recommended that you first use one of these alarms on a trial basis.

Since the LO_PRI parameter (index 629) of the AI block is set to "0", try setting this value to "3". Select the Write function from the host in operation, specify an index or variable name, and write "3" to it.

The LO_LIM parameter (index 630) of the AI block determines the limit at which the lower bound alarm for the process value is given. In usual cases, a very small value is set to this limit. Set 10 (meaning 10 kg/min) to the limit. Since the flow is almost 0, a lower bound alarm is raised. Check that the alarm can be received at the host. When the alarm is confirmed, transmission of the alarm is suspended.

The above-mentioned items are a description of the simple procedure to be carried out until YF100 is connected to Fieldbus. In order to take full advantage of the performance and functionality of the device, it is recommended that it be read together with Chapter 5, which describes how to use the YF100.

5. CONFIGURATION

This chapter contains information on how to adapt the function and performance of the YF100 to suit specific applications. Because two or more devices are connected to Fieldbus, settings including the requirements of all devices need to be determined. Practically, the following steps must be taken.

(1) Network design
Determines the devices to be connected to Fieldbus and checks the capacity of the power supply.
(2) Network definition
Determines the tag and node address for all devices.
(3) Definition of combining function blocks
Determines the method for combination between each function block.
(4) Setting tag and address
Sets the device address and node address one by one for each device.
(5) Communication setting
Sets the link between communication parameters and function blocks.
(6) Block setting
Sets the parameters for function blocks.

The following section describes each step of the procedure in the order given. Using a dedicated configuration tool allows the procedure to be significantly simplified. This section describes the procedure to be assigned for a host which has relatively simple functions.

5.1 Network Design

Select the devices to be connected to the Fieldbus network. The following equipment is necessary for operation of Fieldbus.

- Power supply: Fieldbus requires a dedicated power supply. It is recommended that current capacity should be well over the total value of the maximum current consumed by all devices (including the host). Conventional DC current cannot be used as power supply.
- Terminator: Fieldbus requires two terminators. Refer to the supplier for details of terminators that are attached to the host.
- Field devices: Connect the field devices necessary for instrumentation. YF100 has passed the interoperability test conducted by the Foundation Fieldbus. In order to smoothly start Fieldbus, it is recommended that the devices used satisfy the requirements of the above test.
- Host: Used for accessing field devices. A minimum of one device with bus control function is needed.
- Cable: Used for connecting equipment. Refer to “Guide to Fieldbus” for details of instrumentation cabling. Provide a cable sufficiently long to connect all devices. For field branch cabling, use terminal boards or a connection box as required.

First, check the capacity of the power supply. The power supply capacity must be greater than the sum of the maximum current consumed by all devices to be connected to Fieldbus. The maximum current consumed (power supply voltage 9 V to 32 V) for YF100 is 17 mA. The cable must have the spur in a minimum length with terminators installed at both ends of the trunk.

5.2 Network Definition

Before connection of devices with Fieldbus, define the Fieldbus network. Allocate device tags and node address to all devices (excluding such passive devices as terminators).

The device tag is the same as the conventional one used for the device. Up to 32 alphanumeric characters may be used for definition. Use a hyphen as a delimiter as required.

The node address is used to specify devices for communication purposes. Because data is too long for a device tag, the host uses the device tag in place of the node address for communication. A range of 16 to 247 (or hexadecimal 10 to F7) can be set. The device (LM device) with bus control function (Link Master function) is allocated from a smaller address number (16) side, and other devices (BASIC device) without bus control function allocated from a larger address number (247) side respectively. Place YF100 in the range of the BASIC device. Set the range of address to be used to the LM device. Set the following parameters.

Table 5.1 Parameters for Setting Address Range

V (FUN)	First-Unpolled-Node	Indicates the address next to the address range used for the host or other LM device.
V (NUN)	Number-of-consecutive-Unpolled-Node	Unused address range

T0501.EPS

The devices within the address range written as “Unused” in Figure 5.1 cannot participate in Fieldbus. For other address ranges, the range is periodically checked to identify when a new device is mounted. Care must be taken not to allow the address range to become wider, which can lead to exhaustive consumption of Fieldbus communication performance.

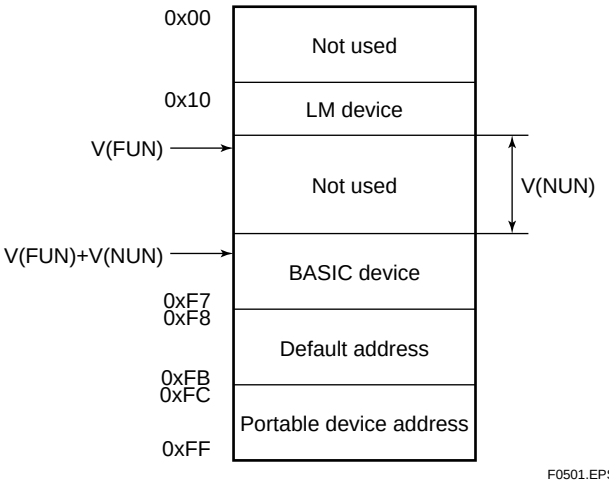


Figure 5.1 Available Range of Node Address

To ensure stable operation of Fieldbus, determine the operation parameters and set them to the LM devices. While the parameters in Table 5.2 are to be set, the worst-case value of all the devices to be connected to the same Fieldbus must be used. Refer to the specification of each device for details. Table 5.2 lists YF100 specification values.

Table 5.2 Operation Parameter Values of the YF100 to be Set to LM Devices

Symbol	Parameters	Description and Settings
V (ST)	Slot-Time	Indicates the time necessary for immediate reply of thje device. Unit of time is in octets (256 μs). Set maximum specification for all devices. For YF100, 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 YF100, 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) xV (ST) is the maximum value of the specification for all devices. For YF100, the setting must be a value of 12 or greater.

T0502.EPS

5.3 Definition of Combining Function Blocks

The input/output parameters for function blocks are combined. For the YF100, the output parameter (OUT) for AI block is subject to combination. They are combined with the input of the control block as necessary. Practically, setting is written to the YF100 link object with reference to “Block setting” in Section 5.6 for details. It is also possible to read values from the host at proper intervals instead of connecting the YF100 block output to other blocks.

The combined blocks need to be executed synchronously with other blocks or the communications schedule. In this case, change the YF100 schedule according to the following table. Enclosed values in the table are factory-settings.

Table 5.3 Execution Schedule of the YF100 Function Blocks

Index	Parameters	Setting (Enclosed is factory-setting)
269 (SM)	MACROCYCLE_DURATION	Cycle (MACROCYCLE) period of control or measurement. Unit is 1/32 ms. (32000 = 1 s)
276 (SM)	FB_START_ENTRY.1	AI block startup time. Elapsed time from the start of MACROCYCLE specified in 1/32 ms. (0 = 0 s)

T0503.EPS

A maximum of 100ms is taken for execution of AI block. For scheduling of communications for combination with the next function block, the execution is so arranged as to start after a lapse of longer than 100ms.

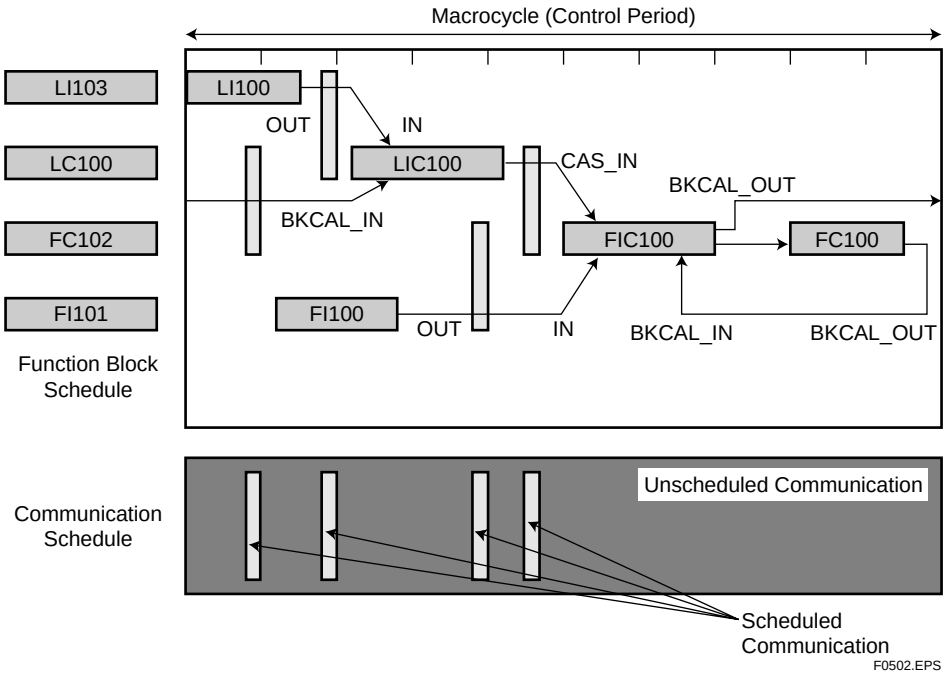


Figure 5.2 Function Block Schedule and Communication Schedule

5.4 Setting of Device Tag and Node Address

This section describes the steps in the procedure to take to set device tags and node addresses to the YF100. There are three states of Fieldbus devices as shown in Figure 5.3, and if the state is other than the lowest SM_OPERATIONAL state, no function block is executed. YF100 must be transferred to this state when an YF100 Device Tag or Node Address is changed.

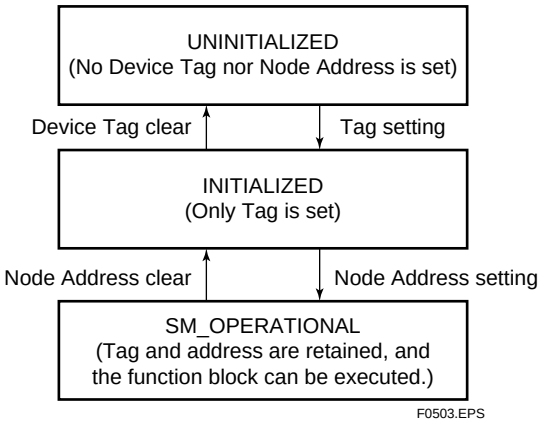


Figure 5.3 Status Transition by Setting Device Tag and Node Address

YF100 has a device tag (FI1001) and node address (245, or hexadecimal F5) that are set upon shipment from the factory (unless otherwise specified). To change only the node address, clear the address once and then set a new node address. To set the device tag, first clear the node address and clear the device tag, then set the device address and node address again.

Devices whose node address was cleared will await the default address (randomly chosen from a range of 248 to 251, or from hexadecimal F8 to FB). At the same time, it is necessary to specify the device ID in order to correctly specify the device. The device ID of the YF100 is 5945430002xxxxxxxx. (The xxxxxxxx at the end of the above device ID is a total of 8 alphanumeric characters.)

5.5 Communication Setting

To set the communication function, it is necessary to change the database residing in SM-VFD.

VCR Setting

Set VCR (Virtual Communication Relationship), which specifies the called party for communication and resources. YF100 has 8 VCRs whose application can be changed, except for the first VCR, which is used for management. Each VCR has the parameters listed in Table 5.4. Parameters must be changed together for each VCR because modification for each parameter may cause inconsistent operation.

Table 5.4 VCR Static Entry

Subindex	Parameter	Description
1	FasArTypeAndRole	Indicates the type and role of communication (VCR) employed. The following 3 types may be used for YF100. 0x32: Server (Responds to requests from host.) 0x44: Source (Transmits alarm or trend.) 0x66: Publisher (Sends AI block output to other blocks.)
2	FasDllLocalAddr	Set the local address. A range of 20 to F7 in hexadecimal.
3	FasDllConfiguredRemoteAddr	Sets the node address of the called party for communication and the address (DLSAP or DLCEP) used to specify VCR in that address. For DLSAP or DLCEP, a range of 20 to F7 in hexadecimal is used. Addresses in Subindex 2 and 3 need to be set to the same contents of the VCR as the called party (local and remote are reversed).
4	FasDllSDAP	Specifies the quality of communication. Usually, one of the following types is set. 0x2B: Server 0x01: Source (Alert) 0x03: Source (Trend) 0x99: Publisher
5	FasDllMaxConfirmDelayOnConnect	To establish connection for communication, a maximum wait time for the called party's response is set in ms. Typical value is 60 seconds (60000).
6	FasDllMaxConfirmDelayOnData	For request of data, a maximum wait time for the called party's response is set in ms. Typical value is 60 seconds (60000).
7	FasDllMaxDlsduSize	Specifies maximum DL Service Data Unit Size (DLSDU). Set 256 for Server and Trend VCR, and 64 for other VCRs.
8	FasDllResidualActiviey Supported	Specifies whether connection is monitored. Set YES (0xff) for Server. This parameter is not used for other communication.
9	FasDllTimelinessClass	Not used for YF100.
10	FasDllPublisherTimeWindowSize	Not used for YF100.
11	FasDllPublisherSynchronizaingDlcep	Not used for YF100.
12	FasDllSubsriberTimeWindowSize	Not used for YF100.

T0504-1.EPS

Subindex	Parameter	Description
13	FasDllSubscriberSynchronizationDlcep	Not used for YF100.
14	FmsVfdId	Sets VFD in YF100 to be used. VfdID of YF100 is 0x1234.
15	FmsMaxOutstandingServiceCalling	Set 0 to Server. It is not used for other applications.
16	FmsMaxOutstandingServiceCalled	Set 1 to Server. It is not used for other applications.
17	FmsFeaturesSupported	Indicates the type of services in the application layer. In the YF100, it is automatically set according to specific applications.

T0504-2.EPS

Eight VCRs are factory-set as shown in the Table 5.5.

Table 5.5 VCR List

Index (SM)	VCR Number	Factory Setting
293	1	For system management (Fixed)
294	2	Server (LocalAddr = 0xF3)
295	3	Server (LocalAddr = 0xF4)
296	4	Server (LocalAddr = 0xF7)
297	5	Trend Source (LocalAddr = 0x07)
298	6	Publisher (LocalAddr = 0x20)
299	7	AI Alert Source (LocalAddr = 0x07)
300	8	Server (LocalAddr = 0xF9)

T0505.EPS

5.6 Block Setting

Set the parameter for function block VFD.

5.6.1 Link Object

Link object combines the data voluntarily sent by the function block with VCR. YF100 has five link objects. A single link object specifies one combination. Each link object has the parameters listed in Table 5.6. Parameters must be changed together for each VCR because the modifications made to each parameter may cause inconsistent operation.

Table 5.6 Link Object Parameters

Subindex	Parameters	Description
1	LocalIndex	Sets the index of function block parameters to be combined; set “0” for Trend and Alert.
2	VcrNumber	Sets the index of VCR to be combined. If set to “0”, this link object is not used.
3	RemoteIndex	Not used in YF100. Set to “0”.
4	ServiceOperation	Set one of the following. Set only one each for link object for Alert or Trend. 0: Undefined 2: Publisher 6: Alert 7: Trend
5	StaleCountLimit	Not used in YF100. Set to “0”.

T0506.EPS

Five link objects are factory-set as shown Table 5.7. Usually, settings may be used as they are and do not need to be changed.

Table 5.7 Factory-Settings of Link Objects

Index	Link Object #	Factory Settings
2000	1	AI.OUT → VCR#6
2001	2	Trend → VCR#5
2002	3	Alert → VCR#7
2003	4	Not used
2004	5	Not used

T0507.EPS

5.6.2 Trend Object

It is possible to set the parameter so that the function block automatically transmits Trend. YF100 has three Trend objects, all of which are used for Trend in analog mode parameters. A single Trend object specifies the trend of one parameter.

Each Trend object has the parameters listed in Table 5.8. The first four parameters are the items to be set. Before writing to a Trend object, it is necessary to release the WRITE_LOCK parameter.

Table 5.8 Parameters for Trend Objects

subindex	Parameters	Description
1	Block Index	Sets the leading index of the function block that takes a trend. If the YF100, 600 is only available.
2	Parameter Relative Index	Sets the index of parameters taking a trend by a value relative to the beginning of the function block. In the YF100, the following three types of trends are possible. 7: PV 8: OUT 19: FIELD_VAL
3	Sample Type	Specifies how trends are taken. Choose one of the following 2 types: 1: Sampled upon execution of a function block. 2: The average value is sampled.
4	Sample Interval	Specifies sampling intervals in units of 1/32 ms. Set the integer multiple of the function block execution cycle.
5	Last Update	The last sampling time.
6 to 21	List of Status	Status part of a sampled parameter.
21 to 37	List of Samples	Data part of a sampled parameter.

T0508.EPS

Three trend objects are factory-set as shown Table 5.9.

Table 5.9 Trend Object are Factory-Set

Index	Trend Object #	Factory Settings
2200	1	AI OUT
2201	2	Not used.
2202	3	Not used.

T0509.EPS

5.6.3 View Object

This is the object to form groups of parameters in a block. One of advantage brought by forming groups of parameters is the reduction of load for data transaction. YF100 has four View Objects for each Resource block, Transducer block and AI1.AI2 function block, and each View Object has the parameters listed in Table 5.10 to 5.12.

Table 5.10 View Object for Resource Block

Relative Index	Parameter Mnemonic	VIEW_1	VIEW_2	VIEW_3	VIEW_4
1	ST_REV	2	2	2	2
2	TAG_DESC				
3	STRATEGY				2
4	ALERT_KEY				1
5	MODE_BLK	4		4	
6	BLOCK_ERR	2		2	
7	RS_STATE	1		1	
8	TEST_RW				
9	DD_RESOURCE				
10	MANUFAC_ID				4
11	DEV_TYPE				2
12	DEV_REV				1
13	DD_REV				1
14	GRANT_DENY		2		
15	HARD_TYPES				2
16	RESTART				
17	FEATURES				2
18	FEATURE_SEL		2		
19	CYCLE_TYPE				1
20	CYCLE_SEL		1		
21	MIN_CYCLE_T				4
22	MEMORY_SIZE				2
23	NV_CYCLE_T		4		
24	FREE_SPACE		4		
25	FREE_TIME	4		4	
26	SHED_RCAS		4		
27	SHED_ROUT		4		
28	FAIL_SAFE	1		1	
29	SET_FSAFE				
30	CLR_FSAFE				
31	MAX_NOTIFY				4
32	LIM_NOTIFY		4		
33	CONFIRM_TIME		4		
34	WRITE_LOCK		1		
35	UPDATE_EVT				
36	BLOCK_ALM				
37	ALARM_SUM	8		8	
38	ACK_OPTION				2
39	WRITE_PRI				1
40	WRITE_ALM				
	Totals (# bytes)	22	32	22	31

T0510.EPS

Table 5.11 View Object for Transducer Block

Relative Index	Parameter Mnemonic	VIEW_1	VIEW_2	VIEW_3	VIEW_4
1	ST_REV	2	2	2	2
2	TAG_DESC				
3	STRATEGY				2
4	ALERT_KEY				1
5	MODE_BLK	4		4	
6	BLOCK_ERR	2		2	
7	UPDATE_EVT				
8	BLOCK_ALM				
9	TRANSDUCER_DIRECTORY				
10	TRANSDUCER_TYPE	2	2	2	2
11	XD_ERROR	1		1	
12	COLLECTION_DIRECTORY				
13	PRIMARY_VALUE_TYPE		2		
14	PRIMARY_VALUE	5		5	
15	PRIMARY_VALUE_RANGE				11
16	CAL_POINT_HI		4		
17	CAL_POINT_LO		4		
18	CAL_MIN_SPAN				4
19	CAL_UNIT				2
20	SENSOR_TYPE				2
21	SENSOR_RANGE				11
22	SENSOR_SN				4
23	SENSOR_CAL_METHOD				
24	SENSOR_CAL_LOC				
25	SENSOR_CAL_DATE				
26	SENSOR_CAL_WHO				
27	LIN_TYPE				1
28	SECONDARY_VALUE			5	
29	SECONDARY_VALUE_UNIT				2
30	SIZE_SELECT		1		
31	FLUID_TYPE		1		
32	K_FACTOR_VALUE		4		
33	K_FACTOR_UNIT		1		
34	VISCOSITY_VALUE				4
35	VORTEX_FREQ_VALUE	4		4	
36	FLOW_VELOCITY_VALUE	4		4	
37	REYNOLDS_NUM_VALUE			4	
38	MIN_DENITY_VALUE		4		
39	DENSITY_UNIT		1		
40	TEMPERATURE_F_VALUE		4		
41	TEMPERATURE_UNIT		1		
42	DENSITY_F_VALUE		4		
43	SPE_ENTHALPY_VALUE		4		
44	ENTHALPY_UNIT		1		
45	TEMPERATURE_N_VALUE		4		

T0511_1.EPS

Relative Index	Parameter Mnemonic	VIEW_1	VIEW_2	VIEW_3	VIEW_4
46	PRESSURE_F_VALUE		4		
47	PRESSURE_N_VALUE		4		
48	DEVIATION		4		
49	NOISE_BALANCE_VALUE				1
50	TRIGGER_LEVEL_VALUE				1
51	AMPLIFIER_GAIN_VALUE				1
52	INSTRUMENTAL_ERR_ADJ				1
53	REYNOLDS_NUM_ADJ				1
54	ADJACENT_PIPE_EFFECT				1
55	EXPANSION_CORRECTION				1
56	HIGH_CUT_FILTER_VALUE				4
57	LOW_CUT_FLOW				4
58	NOISE_JUDGE_CONTROL				1
59	ADJ_FREQUENCY_1_VALUE				
60	ADJ_DATA_1_VALUE				
61	ADJ_FREQUENCY_2_VALUE				
62	ADJ_DATA_2_VALUE				
63	ADJ_FREQUENCY_3_VALUE				
64	ADJ_DATA_3_VALUE				
65	ADJ_FREQUENCY_4_VALUE				
66	ADJ_DATA_4_VALUE				
67	ADJ_FREQUENCY_5_VALUE				
68	ADJ_DATA_5_VALUE				
69	V_F_OUTPUT_SEL				
70	V_F_FREQUENCY_VALUE				
71	MODEL				
72	DISPLAY_MODE				
73	DISPLAY_CYCLE				
74	ALARM_SUM				
	Totals (# bytes)	24	56	33	64

T0511_2.EPS

Table 5.12 View Object for AI Function Block

Relative Index	Parameter Mnemonic	VIEW_1	VIEW_2	VIEW_3	VIEW_4
1	ST_REV	2	2	2	2
2	TAG_DESC				
3	STRATEGY				2
4	ALERT_KEY				1
5	MODE_BLK	4		4	
6	BLOCK_ERR	2		2	
7	PV	5		5	
8	OUT	5		5	
9	SIMULATE				
10	XD_SCALE		11		
11	OUT_SCALE		11		
12	GRANT_DENY		2		
13	IO_OPTS				2
14	STATUS_OPTS				2
15	CHANNEL				2
16	L_TYPE				1
17	LOW_CUT				4
18	PV_FTIME				4
19	FIELD_VAL	5		5	
20	UPDATE_EVT				
21	BLOCK_ALM				
22	ALARM_SUM	8		8	
23	ACK_OPTION				2
24	ALARM_HYS				4
25	HI_HI_PRI				1
26	HI_HI_LIM				4
27	HI_PRI				1
28	HI_LIM				4
29	LO_PRI				1
30	LO_LIM				4
31	LO_LO_PRI				1
32	LO_LO_LIM				4
33	HI_HI_ALM				
34	HI_ALM				
35	LO_ALM				
36	LO_LO_ALM				
37	PULSE_VAL				
38	RESET				
39	TOTAL				
	Totals (# bytes)	31	26	31	46

T0512.EPS

5.6.4 Function Block Parameters

Function block parameters can be read from the host or can be set. For a list of the parameters of blocks held by the YF100, refer to “List of parameters for each block of the YF100” in Appendix 1. The following are a list of important parameters with a guide to how to set them.

MODE_BLK: Indicates the three types of function block modes; Out_Of_Service, Manual, and Auto. In Out_Of_Service mode, the AI block does not operate. The Manual mode does not allow values to be updated. The Auto mode causes the measured value to be updated. Under normal circumstances, set the Auto mode to take effect. The Auto mode is the factory default.

CHANNEL: This is the parameter of the transducer block to be input to the AI block. AI block is assigned flow, respectively. Do not change this setting.

XD_SCALE: Scale of input from the transducer block. The calibrated range is factory set (from 0 point to 100% point). Usually, the unit is set in kg/min. Changing the unit (can be set only in flow unit) also causes the unit within the transducer block to be automatically changed. (The unit is automatically changed according to the unit selected by AI.)

L_TYPE: Specifies the operation function of the AI block. If set to “Direct”, the input delivered to CHANNEL is directly reflected on OUT. If set to “Indirect”, scaling by XD_SCALE and OUT_SCALE is carried out and is reflected on OUT. If set to “Indirect SQRT”, after scaling by XD_SCALE, the square root is extracted and the value scaled by OUT_SCALE is reflected on OUT.
Square root is not utilized for YEWFLO.

PV_FTIME: Sets the time constant of the damping function within AI block (primary delay) in seconds.

OUT_SCALE: Sets the range of output (from 0% to 100%). The unit can also be set with ease.

Alarm Priority: Indicates the priority of the process alarm. If a value of 3 or greater is set, an alarm is transmitted. The factory default is 1. Four types of alarm can be set: HI_PRI, HI_HI_PRI, LO_PRI, and LO_LO_PRI.

Alarm Threshold: Sets the threshold at which a process alarm is generated. The factory default setting is a value that does not generate an alarm. Four types of alarm can be set: HI_LIM, HI_HI_LIM, LO_LIM, and LO_LO_LIM.

6. IN-PROCESS OPERATION

This chapter describes the procedure performed when changing the operation of the function block of the YF100 in process.

6.1 Mode Transition

When the function block mode is changed to Out_Of_Service, the function block pauses and a block alarm is issued.

When the function block mode is changed to Manual, the function block suspends updating of output values. In this case alone, it is possible to write a value to the OUT parameter of the block for output. Note that no parameter status can be changed.

6.2 Generation of Alarm

6.2.1 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 as AL.XX. If two or more alarms are issued, multiple error numbers are displayed in 2-second intervals.

F0601.EPS

Figure 6.1 Error Identified by Built-in Indicator

Table 6.1 List of Error Messages for Built-in Indicators

LCD	Content of Alarms
AL-01	Noise judgement circuit is faulty.
AL-02	Amplifier or hardware failure.
AL-03	EEPROM is faulty.
AL-20	The function block is not scheduled.
AL-21	The resource block is in O/S mode.
AL-22	The transducer block is in O/S mode.
AL-23	AI function block is in O/S mode.
AL-41	Out of flow range.
AL-42	Out of span setting range for maximum and minimum.
AL-61	Out of the range of the built-in indicator display.
AL-62	AI function blocks are in Simulate mode.
AL-63	AI function block is in MAN mode.

T0601.EPS

6.2.2 Alarms and Events

Following alarm or event can be reported by YF100 as an alert if allowed.

Analog Alerts (Generated when a process value exceeds threshold)
- By AI Block Hi-Hi Alarm, Hi Alarm, Low Alarm, Low-Low Alarm

Discrets Alerts (Generated when an abnormal condition is detected)
- By Resource Block Block Alarm, Write Alarm
- By Transducer Block Block Alarm
- By AI Block Block Alarm

Update Alerts (Generated when a important (restorable) parameter is updated)
- By Resource Block Update Event
- By Transducer Block Update Event
- By AI Block Update Event

An alert has following structure:

Table 6.2 Alert Object

Subindex of Analog Alert	Subindex of Discrete Alert	Subindex of Update Alert	Parameter Name	Explanation
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

T0602.EPS

6.3 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 jumper is mounted in the YF100 amplifier as a key for disabling the accidental operation of this behavior. When this jumper is short-circuited with a pin, simulation is enabled. To initiate the same action from a remote terminal, if REMOTE LOOP TEST SWITCH is written to the 9th element (a string of 32 characters) of the TEST_RW parameter (index 308) of the resource block, the resulting action is the same as the one taken when the above jumper is mounted. 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 block consists of the elements listed in Table 6.3 below.

Table 6.3 SIMULATE Parameter

Subindex	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	Simulate En/Disable	Controls the simulation function of this block. 1: Simulation disabled (standard) 2: Simulation started

T0603.EPS

When Simulate En/Disable in Table 6.3 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.

APPENDIX 1. LIST OF PARAMETERS FOR EACH BLOCK OF THE YF100

Note: The Write Mode column contains the modes in which each parameter is write enabled.
O/S: Write enabled in O/S mode.
MAN: Write enabled in Man mode and O/S mode.
AUTO: Write enabled in Auto mode, Man mode, and O/S mode.

A1.1 Resource Block

Offset	Index	Parameter Name	Factory Default	Write Mode	Valid Range	Explanation
0	300	Block Header	TAG:“RS”	Block Tag = O/S		Information on this block such as Block Tag, DD Revision, Execution Time etc.
1	301	ST_REV	–	–		The revision level of the static data associated with the resource block. The revision value is incremented each time a static parameter value in this block is changed.
2	302	TAG_DESC	Null	AUTO		The user description of the intended application of the block.
3	303	STRATEGY	0	AUTO		The strategy field can be used to identify grouping of blocks. This data is not checked or processed by the block.
4	304	ALERT_KEY	0	AUTO	1 to 255	The identification number of the plant unit. This information may be used in the host for sorting alarms, etc.
5	305	MODE_BLK	AUTO	AUTO		The actual, target, permitted, and normal modes of the block.
6	306	BLOCK_ERR	–	–		This parameter reflects the error status associated with the hardware or software components associated with a block. It is a bit string, so that multiple errors may be shown.
7	307	RS_STATE	–	–		State of the resource block state machine.
8	308	TEST_RW	Null	AUTO		Read/write test parameter-used only for conformance testing and simulation.
9	309	DD_RESOURCE	Null	–		String identifying the tag of the resource which contains the Device Description for this resource.
10	310	MANUFAC_ID	0x00594543	–		Manufacturer identification number-used by an interface device to locate the DD file for the resource.
11	311	DEV_TYPE	2	–		Manufacturer’s model number associated with the resource-used by interface devices to locate the DD file for the resource.
12	312	DEV_REV	1	–		Manufacturer revision number associated with the resource-used by an interface device to locate the DD file for the resource.
13	313	DD_REV	1	–		Revision of the DD associated with the resource-used by an interface device to locate the DD file for the resource.
14	314	GRANT_DENY	0	AUTO		Options for controlling access of host computer and local control panels to operating, tuning and alarm parameters of the block.
15	315	HARD_TYPES	Scalar input	–		The types of hardware available as channel numbers.
16	316	RESTART	–	–		Allows a manual restart to be initiated. Several degrees of restart are possible. They are 1: Run, 2: Restart resource, 3: Restart with defaults, and 4: Restart processor.
17	317	FEATURES	Soft write lock supported Report supported	–		Used to show supported resource block options.
18	318	FEATURE_SEL	Soft write lock supported Report supported	AUTO		Used to select resource block options.

TA0101-1.EPS

Offset	Index	Parameter Name	Factory Default	Write Mode	Valid Range	Explanation
19	319	CYCLE_TYPE	Scheduled	–		Identifies the block execution methods available for this resource.
20	320	CYCLE_SEL	Scheduled	AUTO		Used to select the block execution method for this resource.
21	321	MIN_CYCLE_T	3200 (100ms)	–		Time duration of the shortest cycle interval of which the resource is capable.
22	322	MEMORY_SIZE	0	–		Available configuration memory in the empty resource. To be checked before attempting a download.
23	323	NV_CYCLE_T	0	–		Interval between writing copies of NV parameters to non-volatile memory. Zero means never.
24	324	FREE_SPACE	0	–		Percent of memory available for further configuration. YF100 has zero which means a preconfigured resource.
25	325	FREE_TIME	0	–		Percent of the block processing time that is free to process additional blocks. YF100 does not support this.
26	326	SHED_RCAS	–	AUTO		Time duration at which to give up on computer writes to function block RCas locations. YF100 does not support this.
27	327	SHED_ROUT	–	AUTO		Time duration at which to give up on computer writes to function block ROut locations. YF100 does not support this.
28	328	FAULT_STATE	1	–		Condition set by loss of communication to an output block, failure promoted to an output block or a physical contact. When fail-safe condition is set, Then output function blocks will perform their FSAFE actions.
29	329	SET_FSTATE	1	AUTO	1(No Change) 2(Change) only	Allows the fail-safe condition to be manually initiated by selecting Set.
30	330	CLR_FSTATE	1	AUTO	1(No Change) 2(Change) only	Writing a Clear to this parameter will clear the device fail-safe state if the field condition, if any, has cleared.
31	331	MAX_NOTIFY	3	–		Maximum number of unconfirmed notify messages possible.
32	332	LIM_NOTIFY	3	AUTO	0–MAX_NOTIFY	Maximum number of unconfirmed alert notify messages allowed.
33	333	CONFIRM_TIM	5000 (ms)	AUTO		The minimum time between retries of alert reports.
34	334	WRITE_LOCK	Unlocked	AUTO	1(Unlocked) 2(Locked) only	If set, no writes from anywhere are allowed, except to clear WRITE_LOCK. Block inputs will continue to be updated
35	335	UPDATE_EVT	–	–		This alert is generated by any change to the static data.
36	336	BLOCK_ALM	–	–		The block alarm is used for all configuration, hardware, connection failure or system problems in the block. The cause of the alert is entered in the subcode field. The first alert to become active will set the Active status in the Status attribute. As soon as the Unreported status is cleared by the alert reporting task, another block alert may be reported without clearing the Active status, if the subcode has changed.
37	337	ALARM_SUM	Enable	–		The current alert status, unacknowledged states, unreported states, and disabled states of the alarms associated with the function block.
38	338	ACK_OPTION	0	AUTO		
39	339	WRITE_PRI	0	AUTO	0, 1, 3 to 15 only	Priority of the alarm generated by clearing the write lock.
40	340	WRITE_ALM	–	–		This alert is generated if the write lock parameter is cleared.

TA0101-2.EPS

A1.2 AI Function Block

Offset	Index	Parameter Name	Factory Default	Write Mode	Valid Range	Explanation
0	600	Block Header	TAG: “AI”	Block Tag = O/S		Information on this block such as Block Tag, DD Revision, Execution Time etc.
1	601	ST_REV	–	–		The revision level of the static data associated with the function block. The revision value will be incremented each time a static parameter value in the block is changed.
2	602	TAG_DESC	(blank)	AUTO		The user description of the intended application of the block.
3	603	STRATEGY	0	AUTO		The strategy field can be used to identify grouping of blocks. This data is not checked or processed by the block.
4	604	ALERT_KEY	0	AUTO	1 to 255	The identification number of the plant unit. This information may be used in the host for sorting alarms, etc.
5	605	MODE_BLK	AUTO	AUTO		The actual, target, permitted, and normal modes of the block.
6	606	BLOCK_ERR	–	–		This parameter reflects the error status associated with the hardware or software components associated with a block. It is a bit string, so that multiple errors may be shown.
7	607	PV	–	–		Either the primary analog value for use in executing the function, or a process value associated with it. May also be calculated from the READBACK value of an AO block.
8	608	OUT	–	Value = MAN		The primary analog value calculated as a result of executing the function.
9	609	SIMULATE	Disable	AUTO		Allows the transducer analog input or output to the block to be manually supplied when simulate is enabled. When simulation is disabled, the simulate value and status track the actual value and status.
10	610	XD_SCALE	Specified at the time of order	MAN		The high and low scale values, engineering units code, and number of digits to the right of the decimal point used with the value obtained from the transducer for a specified channel.
11	611	OUT_SCALE	Specified at the time of order	MAN		The high and low scale values, engineering units code, and number of digits to the right of the decimal point to be used in displaying the OUT parameter and parameters which have the same scaling as OUT.
12	612	GRANT_DENY	0	AUTO		Options for controlling access of host computers and local control panels to operating, tuning and alarm parameters of the block.
13	613	IO_OPTS	0	O/S		Options which the user may select to alter input and output block processing
14	614	STATUS_OPTS	0	O/S		Options which the user may select in the block processing of status
15	615	CHANNEL	1	O/S	1 only	The number of the logical hardware channel that is connected to this I/O block. This information defines the transducer to be used going to or from the physical world.
16	616	L_TYPE	Specified at the time of order	MAN	1 to 3 only	Determines if the values passed by the transducer block to the AI block may be used directly (Direct) or if the value is in different units and must be converted linearly (Indirect), or with square root (Ind Sqr Root), using the input range defined by the transducer and the associated output range.
17	617	LOW_CUT	0	AUTO	The value > 0	Limit used in square root processing. A value of zero percent of scale is used in block processing if the transducer value falls below this limit, in % of scale. This feature may be used to eliminate noise near zero for a flow sensor.
18	618	PV_FTIME	2sec	AUTO	The value > 0	Time constant of a single exponential filter for the PV, in seconds.

TA0102-1.EPS

Offset	Index	Parameter Name	Factory Default	Write Mode	Valid Range	Explanation
19	619	FIELD_VAL	–	–		Raw value of the field device in percent of thePV range, with a status reflecting the Transducer condition, before signal characterization (L_TYPE) or filtering (PV_FTIME).
20	620	UPDATE_EVT	–	–		This alert is generated by any change to the static data.
21	621	BLOCK_ALM	–	–		The block alarm is used for all configuration, hardware, connection failure or system problems in the block. The cause of the alert is entered in the subcode field. The first alert to become active will set the Active status in the Status attribute. As soon as the Unreported status is cleared by the alert reporting task, another block alert may be reported without clearing the Active status, if the subcode has changed.
22	622	ALARM_SUM	Enable	–		The current alert status, unacknowledged states, unreported states, and disabled states of the alarms associated with the function block.
23	623	ACK_OPTION	0	AUTO		Selection of whether alarms associated with the block will be automatically acknowledged.
24	624	ALARM_HYS	0.5%	AUTO	0 to 50	Amount the PV must return within the alarm limits before the alarm condition clears. Alarm Hysteresis is expressed as a percent of the PV span.
25	625	HI_HI_PRI	0	AUTO	0, 1, 3 to 15	Priority of the high high alarm.
26	626	HI_HI_LIM	+INF	AUTO	Note 1	The setting for high high alarm in engineering units.
27	627	HI_PRI	0	AUTO	0, 1, 3 to 15	Priority of the high alarm.
28	628	HI_LIM	+INF	AUTO	Note 1	The setting for high alarm in engineering units.
29	629	LO_PRI	0	AUTO	0, 1, 3 to 15	Priority of the low alarm.
30	630	LO_LIM	–INF	AUTO	Note 2	The setting for the low alarm in engineering units.
31	631	LO_LO_PRI	0	AUTO	0, 1, 3 to 15	Priority of the low low alarm.
32	632	LO_LO_LIM	–INF	AUTO	Note 2	The setting of the low low alarm in engineering units.
33	633	HI_HI_ALM	–	–		The status for high high alarm and its associated time stamp.
34	634	HI_ALM	–	–		The status for high alarm and its associated time stamp.
35	635	LO_ALM	–	–		The status of the low alarm and its associated time stamp.
36	636	LO_LO_ALM	–	–		The status of the low low alarm and its associated time stamp.
37	637	PULSE_VAL	5 (E+5)	O/S	0 to 13	Set the factor per totalized value count when a totalized flow is necessary.
38	638	RESET	0 (OFF)	AUTO	0 (Off), 1 (Reset) only	Totalized value (display & RAM data) are reset when this function is executed.
39	639	TOTAL	–	–		Totalized value.

TA0102-2.EPS

Note 1: When Min (OUT_SCALE.EU0, OUT_SCALE.EU100) ≤ set value ≤ + INF, it is write-able.
Note 2: When -INF ≤ set value ≤ Max (OUT_SCALE .EU0,OUT_SCALE.EU100), it is write-able.

A1.3 Transducer Block

Offset	Index	Parameter Name	Factory Default	Write Mode	Valid Range	Explanation
0	400	Block Header	TAG: “TB”	Block Tag = O/S		Information on this block such as Block Tag, DD Revision, Execution Time etc.
1	401	ST_REV	–	–		The revision level of the static data associated with the function block. The revision value will be incremented each time a static parameter value in the block is changed.
2	402	TAG_DESC	(blank)	AUTO		The user description of the intended application of the block
3	403	STRATEGY	0	AUTO		The strategy field can be used to identify grouping of blocks. This data is not checked or processed by the block.
4	404	ALERT_KEY	1	AUTO	1 to 255	The identification number of the plant unit. This information may be used in the host for sorting alarms, etc.
5	405	MODE_BLK	AUTO	AUTO		The actual, target, permitted, and normal modes of the block.
6	406	BLOCK_ERR	–	–		This parameter reflects the error status associated with hardware or software components associated with a block. It is a bit string, so that multiple errors may be shown.
7	407	UPDATE_EVT	–	–		This alert is generated by any change to the static data.
8	408	BLOCK_ALM	–	–		The block alarm is used for all configuration, hardware, connection failure or system problems in the block. The cause of the alert is entered in the subcode field. The first alert to become active will set the Active status in the Status attribute.
9	409	TRANSDUCER_ DIRECTORY	–	–		A directory that specifies the number and starting indices of the transducers.
10	410	TRANSDUCER_ TYPE	104: Flow with Calibration	–	104: Flow with Calibration	Identifies transducer.
11	411	XD_ERROR	–	–		The error code in transducer.
12	412	COLLECTION_ DIRECTORY	–	–		A directory that specifies the number, starting indices, and DD Item Ids of the data collections in each transducer within a transducer block.
13	413	PRIMARY_ VALUE_TYPE	100: Mass flow 101: Volumetric flow	O/S	100 to 109	The type of measurement represented by primary value.
14	414	PRIMARY_ VALUE	–	–		The measured value and status available to the function block.
15	415	PRIMARY_ VALUE_RANGE	Range of flow	–		The High and Low range limit values, engineering units code and the number of digits to the right of the decimal point to be used to display the primary value.
16	416	CAL_POINT_HI	Max range	O/S	Note 1	The highest calibrated value.
17	417	CAL_POINT_LO	Min. range	O/S	Note 2	The lowest calibrated value.
18	418	CAL_MIN_SPAN	Flow	–		The minimum calibration span value allowed.
19	419	CAL_UNIT	1349: m^3/h	–	Note 3	The engineering unit for the calibrated values.
20	420	SENSOR_TYPE	Vortex	–	112:Vortex only	The type of sensor.
21	421	SENSOR_ RANGE	Flow range	–		The High and Low range limit values, engineering units code and the number of digits to the right of the decimal point for the sensor.
22	422	SENSOR_SN	Serial No.	–		The sensor serial number.
23	423	SENSOR_CAL_ METHOD	100: Volumetric	O/S	100 to 106	The method of the last sensor calibration.
24	424	SENSOR_CAL_ LOC	–	O/S		The location of the last sensor calibration.
25	425	SENSOR_CAL_ DATE	–	O/S		The date of the last sensor calibration.
26	426	SENSOR_CAL_ WHO	–	O/S		The name of the person responsible for the last sensor calibration.
27	427	LIN_TYPE	1	–	0, 1, 255	
28	428	SECONDARY_ VALUE	–	–		The secondary value (totalized value) of transducer.
29	429	SECONDARY_ VALUE_UNIT	1088: kg	–	Only displayed units are write enabled	The engineering unit of secondary value.
30	430	SIZE_SELECT	25 mm	O/S	0:15 mm to 16:200 mmHPT	The nominal size of combined detector.

TA0103-1.EPS

Offset	Index	Parameter Name	Factory Default	Write Mode	Valid Range	Explanation
31	431	FLUID_TYPE	Steam M	O/S	0:Stream M to 7:Liq M	The type of flow fluid.
32	432	K_FACTOR_ VALUE	68.6	O/S	0 to 32000	The K-factor value (KM) at 15degC for combined detector.
33	433	K_FACTOR_ UNIT	P/L	O/S	0:p/L, 1:p/gal, 2:p/lmpGal	The unit of K-factor.
34	434	VISCOSITY_ VALUE	1	O/S	0 to 32000	The viscosity coefficient of low fluid to output the Reynolds number.
35	435	VORTEX_FREQ _VALUE	–	–		The vortex frequency.
36	436	FLOW_VELOCITY _VALUE	–	–		The flow velocity value.
37	437	REYNOLDS_ NUM_VALUE	–	–		The reynolds number
38	438	MIN_DENSITY_ VALUE	1	O/S	0 to 32000	The minimum density value under operating condition.
39	439	DENSTY_UNIT	Kg/m^3	O/S	1097:kg/m^3 1107:lb/ft^3 1108:lb/gal	The density unit under operating condition.
40	440	TEMPERATURE_ F_VALUE	15	O/S	–500 to 1000	The fluid temperature under operating condition.
41	441	TEMPERATURE_ UNIT	DegC	O/S	1001:degC 1002:degF	The temperature unit
42	442	DENSITY_F_ VALUE	1	O/S	0 to 32000	The density value under operationg condition.
43	443	SPE_ENTHALPY _VALUE	1	O/S	0 to 32000	The value of specific enthalpy.
44	444	ENTHALPY_ UNIT	Kcal/kg	O/S	1515:kcal/kg 1208:kJ/kg 1516:Btu/lb	The unit of specific enthalpy.
45	445	TEMPPERATURE _N_VALUE	15	O/S	–500 to 1000	The fluid temperature under standard condition.
46	446	PRESSURE_F_ VALUE	1.0332	O/S	0 to 32000	The absolute pressure value (kg/cm^2 abs) under operating condition.
47	447	PRESSURE_N VALUE	1.0332	O/S	0 to 32000	The absolute pressure value (kg/cm2 abs) under standard condition.
48	448	DEVIATION	1	O/S	0 to 10	The deviation factor.
49	449	NOISE_BALANCE _VALUE	0	O/S	–5 to 10	The noise balance adjustment.
50	450	TRIGGER_LEVEL _VALUE	0	O/S	–1 to 2	The trigger level adjustment.
51	451	AMPLIFIER_ GAIN_VALUE	0	O/S	Note 4	The flowmeter gain can be adjusted.
52	452	INSTRUMENTAL_ ERR_ADJ	0	O/S	0:Off, 1:On	The parameter to correct the instrumental error.
53	453	REYNOLDS_ NUM_ADJ	0	O/S	0:Off, 1:On	The parameter to correct the reynolds number's shift error.
54	454	ADJACENT_PIPE _EFFECT	0	O/S	0:Off to 6:Flange Sch80	The parameter to correct the measurement errors caused by pipe schedules 10, 40, and 80
55	455	EXPANSION_ CORRECTION	0	O/S	0:Off, 1:On	The parameter to corrects the deviation from the ideal gas law when measuring a compressibility gas by mass flow and standard condition.
56	456	HIGH_CUT_ FILTER_VALUE	0	–	Note 5	The control high cut filter to minimize the effect of high frequency noise.
57	457	LOW_CUT_ FLOW	0.06122	–	0 to XD_SCALE.EU100	The parameter to eliminate noise in the low-frequency (low flow rate) area.
58	458	NOISE_JUDGE_ CONTROL	1	O/S	0:Off, 1:On	The parameter to eliminate pipe vibration effect when flowrate is close to zero.
59	459	ADJ_ FREQUENCY_ 1_VALUE	0	O/S	0 to 32000	The first break-point frequency for the instrumental error adjustment.
60	460	ADJ_DATA_1_ VALUE	0	O/S	–100 to 100	The correcting value (%) at the first break-point frequency for the instrumental error adjustment.
61	461	ADJ_ FREQUENCY_2 _VALUE	0	O/S	0 to 32000	The second break-point frequency for the instrumental error adjustment.

TA0103-2.EPS

Offset	Index	Parameter Name	Factory Default	Write Mode	Valid Range	Explanation
62	462	ADJ_DATA_2_ VALUE	0	O/S	–100 to 100	The correcting value (%) at the second break-point frequnecy for the instrumental error adjustment.
63	463	ADJ_ FREQUENCY_3 _VALUE	0	O/S	0 to 32000	The third break-point frequency for the instrumental error adjustment.
64	464	ADJ_DATA_3_ VALUE	0	O/S	–100 to 100	The correcting value (%) at the third break-point frequnecy for the instrumental error adjustment.
65	465	ADJ_ FREQUENCY_4 _VALUE	0	O/S	0 to 32000	The fourth break-point frequency for the instrumental error adjustment.
66	466	ADJ_DATA_4_ VALUE	0	O/S	–100 to 100	The correcting value (%) at the fourth break-point frequency for the instrumental error adjustment.
67	467	ADJ_ FREQUENCY_5 _VALUE	0	O/S	0 to 32000	The fifth break-point frequency for the instrumental error adjustment.
68	468	ADJ_DATA_5_ VALUE	0	O/S	–100 to 100	The correcting value (%) at the fifth break-point frequency for the instrumental error adjustment.
69	469	V_F_OUTPUT_ SEL	0	–	0:Normal, 1-2:Temp. 3:TP2, 4:Amplitude	The output of V/F circuit frequency (V_F_FREQUENCY_VALUE).
70	472	V_F_ FREQUENCY_ VALUE	–	–		The frequency corresponding to the value which is selected in V_F_OUTPUT_SEL.
71	471	MODEL	YF100*E	–		The model name of flow converter.
72	472	DISPLAY_MODE	1	–	1:Flow unit, 2:%, 3:Total	The display content of the indicator.
73	473	DISPLAY_ CYCLE	1	–	1 to 255	The renewal cycle of the indicator.
74	474	ALARM_SUM	–	–		The current alert status, unacknowledged status, unreported status and disabled status of the alarms associated with the function block.

TA0103-3.EPS

Note 1: When CAL_POINT_LO< set value, set value < SENSOR_RANGE, EU100, it is write-able only.
Note 2: When CAL_POINT_HI > set value, set value < SENSOR_RANGE, EU100, it is write-able only.
Note 3: Only the flow rate unit is write-able (see parameter description)
Note 4: Set to one of 16 steps between -15 to 15 depending on diameter.
Note 5: The center value (0 value) is shifted in 16 steps between -15 to 15 depending on the XD_SCALEEU100 value.
The limit value is used when a value larger than the limit value is set.

APPENDIX 2. APPLICATION, SETTING AND CHANGE OF BASIC PARAMETERS

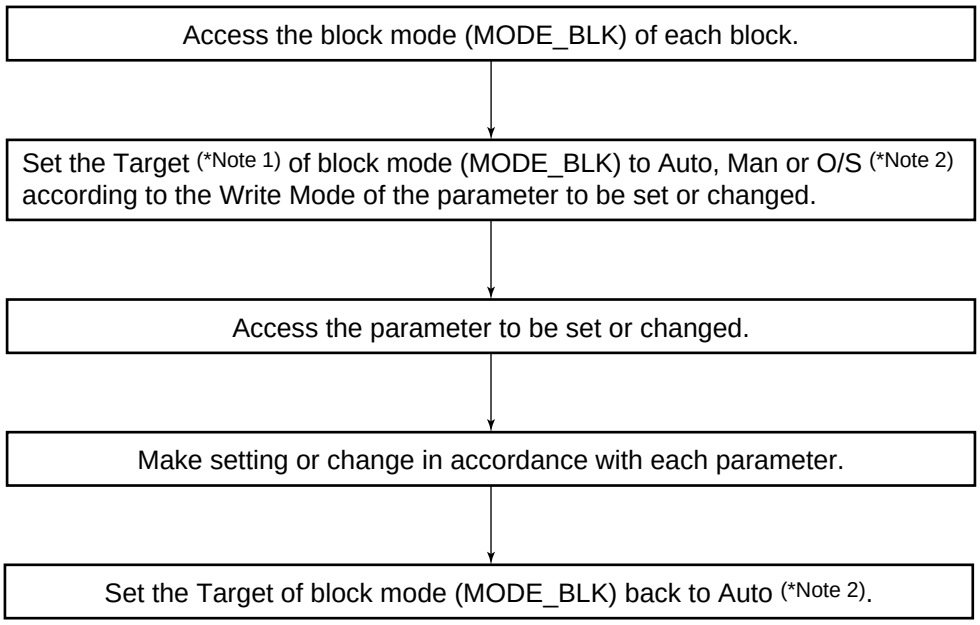
A2.1 Applications and Selection of Basic Parameters

Setting Item (applicable parameters)	Summary
Tag No.	Sets the device tag and each block tag. Up to 32 alphanumeric characters can be set for both tags. Refer to “Tag and address” in Section 5.4.
Calibration (XD_SCALE)	Sets the range of input from the transducer block corresponding to the 0% and 100% points in operation within the AI function block. The calibrated range (0% and 100%) is the factory default setting. Sets the range unit, input value of the 0% point (lower bound of calibration range), input value of the 100% point (upper bound of calibration range), and the 4 data at the decimal point.
Output scale (OUT_SCALE)	Sets the scale of output corresponding to the 0% and 100% points in operation within the AI function block. It is possible to set a unit and scale that differs from the calibration range. Sets the range unit, input value of the 0% point (lower bound of output scale), input value of the 100% point (upper bound of output scale), and the 4 data at the decimal point.
Scale range and unit of built-in indicator (OUT_SCALE)	The range determined with the output scale becomes the scale and unit of the built-in indicator. Note: If a built-in indicator is available, the lower bound and the upper bound of the range (numeric string excluding the decimal point if it is included) may be set in a range from -65535 to 65535. Down to the third decimal position can be set.
Output mode (L_TYPE)	Selects the operation function of the AI function block. It may be chosen from among Direct, Indirect, and IndirectSQRT. Direct: The output of the transducer block is directly output only via filtering without scaling and square root extraction. Indirect: Output processed by proportion at the AI function block. IndirectSQRT: Output processed by square root extraction at the AI function block.
Output signal low cut (LOW_CUT)	If the output falls below the setting of this parameter, the output is set to Zero. It can be set individually with Direct, Indirect, and IndirectSQRT.
Damping time constant (PV_FTIME)	Sets the time constant of the damping (primary delay) function in the AI function block in seconds.
Simulation (SIMULATE)	Performs simulation of the AI function block. The input value and status for the calibration range can also be set. It is recommended that this parameter be used for loop checks and other purposes. Refer to “Simulation Function” in Section 6.3.
LCD display (DISPLAY_MODE, DISPLAY_CYCLE)	Sets the unit to be displayed on the LCD and the display speed. Adjust display speed if a low temperature environment causes a poor LCD display quality.
Calibration range plus real input (CAL_POINT_HI, CAL_POINT_LO)	Sets the range corresponding to the 0% and 100% points while adding the real input. It is possible to set output to correctly match the user’s reference device output.

TA0201.EPS

A2.2 Setting and Change of Basic Parameters

This section describes the procedure taken to set and change the parameters for each block. Obtaining access to each parameter differs depending on the configuration system used. For details, refer to the instruction manual for each configuration system.



FA0201.EPS

NOTE

Do not turn the power OFF immediately after parameter setting. Should the power be turned OFF 30 seconds after setting of parameters, changed parameters are not saved and revert back to their original values.

Note 1: Block mode consists of the following four modes that are controlled by the universal parameter that displays the running condition of each block.
- Target (Target mode): Sets the operating condition of the block.
- Actual (Real mode): Indicates the current operating condition.
- Permit (Allowable mode): Indicates the operating condition that the block is allowed to take.
- Normal (Usual mode): Indicates the operating condition that the block will usually take.

Note 2: The following are the operating conditions which the individual blocks will take.

	AI Function Block	Transducer Block	Resource Block
Automatic (Auto)	Yes	Yes	Yes
Manual (Man)	Yes		
Out of Service (O/S)	Yes	Yes	Yes

TA0202.EPS

Refer to the “List of parameters for each block of the YF100” for details of the Write Mode for each block.

A2.3 Setting the AI Function Block

The AI function block controls operation of output of flow.

(1) Setting the calibration range

Access the XD_SCALE parameter.
Set the upper bound of the input range to EU at 100% on XD_SCALE.
Set the lower bound of the input range to EU at 0% on XD_SCALE.
Set the necessary unit to Units Index.
Set the decimal position of 2 to Decimal Point.

FAP02.EPS

Example:

To measure 0 to 100 kg/min,
Set 100 to EU at 100% on XD_SCALE,
Set 0 to EU at 0% on XD_SCALE, and
Set 1323 to Units Index on XD_SCALE (*Note).

Note 1: Each unit is expressed using a 4-digit numeric code. Refer to the applicable table for each unit and the corresponding 4-digit codes.

(2) Setting the output range

Access the OUT_SCALE parameter.
Set an output value corresponding to the upper bound of the input range to EU at 100% on XD_SCALE.
Set an output value corresponding to the lower bound of the input range to EU at 0% on XD_SCALE.
Set the necessary unit of output to Units Index.
Set the decimal position to Decimal Point.

FA0203.EPS

Example:

To set the output to 0.0 to 100.0%,
Set 100 to EU at 100% on XD_SCALE,
Set 0 to EU at 0% on XD_SCALE,
Set 1324 to Units Index on XD_SCALE , and
Set 2 to Decimal Point on OUT_SCALE.

Restrictions imposed when the device is equipped with a built-in indicator.
For a built-in indicator, the range determined by the output range corresponds to the scale and unit of the indicator. Set the lower bound and upper bound of the range (numeric string excluding decimal point if the decimal point is included) in a range of –65535 to 65535. Down to the third decimal position can be set.

(3) Setting the output mode

Access the L_TYPE parameter.
Set the output mode.

1: Direct		(Sensor output value)
2: Indirect		(Linear output value)
3: IndirectSQRT		(Square root extraction output value)

FA0204.EPS

(4) Setting the output signal Low Cut

Set the low cut value.

Access the LOW_CUT parameter.
Set the value subject to LOW_CUT.

↓

Access the IO_OPTS parameter.
Turn Low cutoff ON.
If Low cutoff is turned OFF, Low cut function is released.

FA0205.EPS

(5) Setting the damping time constant

Access the PV_FTIME parameter.
Set the time subject to damping (in seconds).

FA0206.EPS

(6) Simulation

By optionally setting the input value to the calibration range and status, perform simulation of the AI function block.

Access the Simulate Status parameter.
Set the status code.

↓

Access the Simulate Value parameter.
Set an optional input value.

↓

Access the Simulate En/Disable parameter.
Set whether Simulation is enabled or disabled.
1: Disabled
2: Enabled

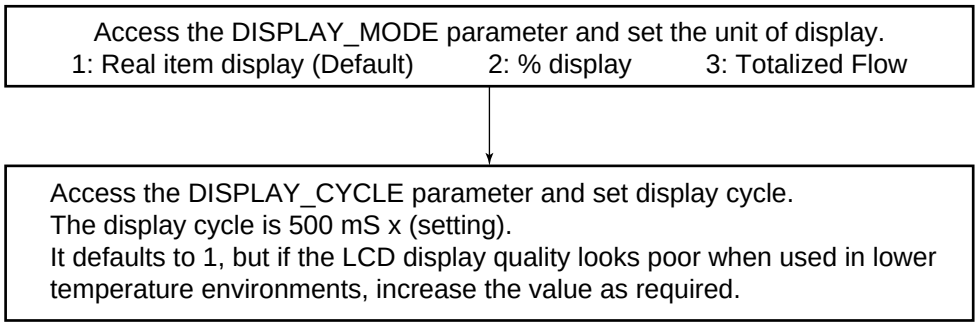
FA0207.EPS

If simulation is enabled, AI block uses Simulate Status and Simulate Value as the input, and if disabled, the AI block uses Transducer Status and Transducer Value as input.

A2.4 Setting the Transducer Block

To access function specifics to the the YF100 of the transducer block, DD (Device Description) for YF100 needs to have been installed in the configuration tool used. For integration of DD, refer to “Integration of DD” in Section 4.4.

Setting the LCD display



FA0208.EPS

APPENDIX 3. OPERATION OF EACH PARAMETER IN THE EVENT OF FAILURE

- Operation of each parameter in the event of failure

Cause	LCD display	TR block BROCK ERR	TR block XD_ ERROR	TR block PV STATUS	TR block SV STATUS
Sensor failure	AL. 01	Input Failure	Mechanical Failure z	Bad: Sensor Failure	Bad: Sensor Failure
Amplifier failure	AL. 02	Device Needs Maintenance Now	I/0 Failure	Bad: Device Failure	Bad: Device Failure
Communication failure	AL. 02	Device Needs Maintenance Now	Electronics Failure	Bad: Device Failure	Bad: Device Failure
EEPROM (FB) failure	AL. 03	–	–	Bad: Non Specific	Bad: Non Specific
Function block unscheduled	AL. 20	–	–	–	–
RS block O/S mode	AL. 21	–	–	Bad: Non Specific	Bad: Non Specific
TR block O/S mode	AL. 22	Out of Service	–	Bad: Out of Service	Bad: Out of Service
AI block O/S mode	AL. 23	–	–	–	–
Abnormal flow	AL. 41	–	–	Uncertain: Sensor Conversion Not Accurate	Uncertain: Subnormal
Abnormal parameter	AL. 42	–	–	Uncertain: Subnormal	Uncertain: Sensor Conversion Not Accurate
Out of LCD display range	AL. 61	–	–	–	–
AI block Simulate mode	AL. 62	–	–	–	–
AI block MAN mode	AL. 63	–	–	–	–

TA0301.EPS