User's Manual

Model EXAxt AV550G Fieldbus Communication Type

EXAxt

IM 11M12D01-61E

vigilantplant.®

YOKOGAWA
Yokogawa Electric Corporation

IM 11M12D01-61E
2nd Edition

Model EXAxt AV550G
Fieldbus Communication Type

IM 11M12D01-61E 2nd Edition

CONTENTS

INTRODUCTION

This manual covers only items that are specific to the FOUNDATION Fieldbus type of the AV550G Averaging Converter and that are not contained in the User's Manual of the AV550G. For details of the operation and performance of the AV550G, refer to IM 11M12D01-01E.

Regarding This Manual

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

FOUNDATION is a registered trademark of Fieldbus FOUNDATION.

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.

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- Use of the product in question in a location not conforming to the standards specified by Yokogawa, or due to improper maintenance of the installation location.
- Failure or damage due to modification or repair by any party except Yokogawa or an approved representative of Yokogawa.
- Malfunction or damage from improper relocation of the product in question after delivery.
- Reason of force majeure such as fires, earthquakes, storms/floods, thunder/lightening, or other natural disasters, or disturbances, riots, warfare, or radioactive contamination.

⚠ WARNING

In wiring, please confirm voltages between the power supply and the instrument before connecting the power cables. And also, please confirm that the cables are not powered before connecting.

Safe Use of This Product

For the safety of the operator and to protect the instrument and the system, please be sure to follow this manual's safety instructions when handling this instrument. If these instructions are not heeded, the protection provided by this instrument may be impaired. In this case, Yokogawa cannot guarantee that the instrument can be safely operated. Please pay special attention to the following points:

(a) Installation

- This instrument may only be installed by an engineer or technician who has an expert knowledge of this device. Operators are not allowed to carry out installation unless they meet this condition.
- When removing the instrument from a hazardous process, avoid contact with the fluid and the interior of the meter.
- All installation work shall comply with local installation requirements and the local electrical code.

(b) Wiring

- The instrument must be installed by an engineer or technician who has an expert knowledge of this instrument. Operators are not permitted to carry out wiring unless they meet this condition.
- Before connecting the power cables, please confirm that there is no current flowing through the cables and that the power supply to the instrument is switched off.

(c) Maintenance

- Please carry out only the maintenance procedures described in this manual. If you require further assistance, please contact the nearest Yokogawa office.
- Care should be taken to prevent the build up of dust or other materials on the display glass and the name plate. To clean these surfaces, use a soft, dry cloth.

(d) Modification

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

- The following safety symbol marks are used in this Manual:

WARNING

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

CAUTION

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

IMPORTANT

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

NOTE

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

After-sales Warranty

- Do not modify the product.
- During the warranty period, for repair under warranty carry or send the product to the local sales representative or service office. Yokogawa will replace or repair any damaged parts and return the product to you.
- Before returning a product for repair under warranty, provide us with the model name and serial number and a description of the problem. Any diagrams or data explaining the problem would also be appreciated.
- If we replace the product with a new one, we won't provide you with a repair report.
- Yokogawa warrants the product for the period stated in the pre-purchase quotation. Yokogawa shall conduct defined warranty service based on its standard. When the customer site is located outside of the service area, a fee for dispatching the maintenance engineer will be charged to the customer.
- In the following cases, customer will be charged repair fee regardless of warranty period.
  - Failure of components which are out of scope of warranty stated in instruction manual.
  - Failure caused by usage of software, hardware or auxiliary equipment, which Yokogawa did not supply.
  - Failure due to improper or insufficient maintenance by user.
  - Failure due to modification, misuse or outside-of-specifications operation which Yokogawa does not authorize.
  - Failure due to power supply (voltage, frequency) being outside specifications or abnormal.

  - Failure caused by any usage out of scope of recommended usage.
  - Any damage from fire, earthquake, storms and floods, lightning, disturbances, riots, warfare, radiation and other natural changes.

- Yokogawa does not warrant conformance with the specific application at the user site. Yokogawa will not bear direct/indirect responsibility for damage due to a specific application.
- Yokogawa will not bear responsibility when the user configures the product into systems or resells the product.
- Maintenance service and supplying repair parts will be covered for five years after the production ends. For repair for this product, please contact the nearest sales office described in this instruction manual.

2. CONTROL CARD FOR FIELDBUS COMMUNICATION

Fieldbus simulation functions on the control card are enabled using the SIMULATE_ENABLE switch.

For details of the simulation functions, see Sec. 6.3 Simulation Functions.

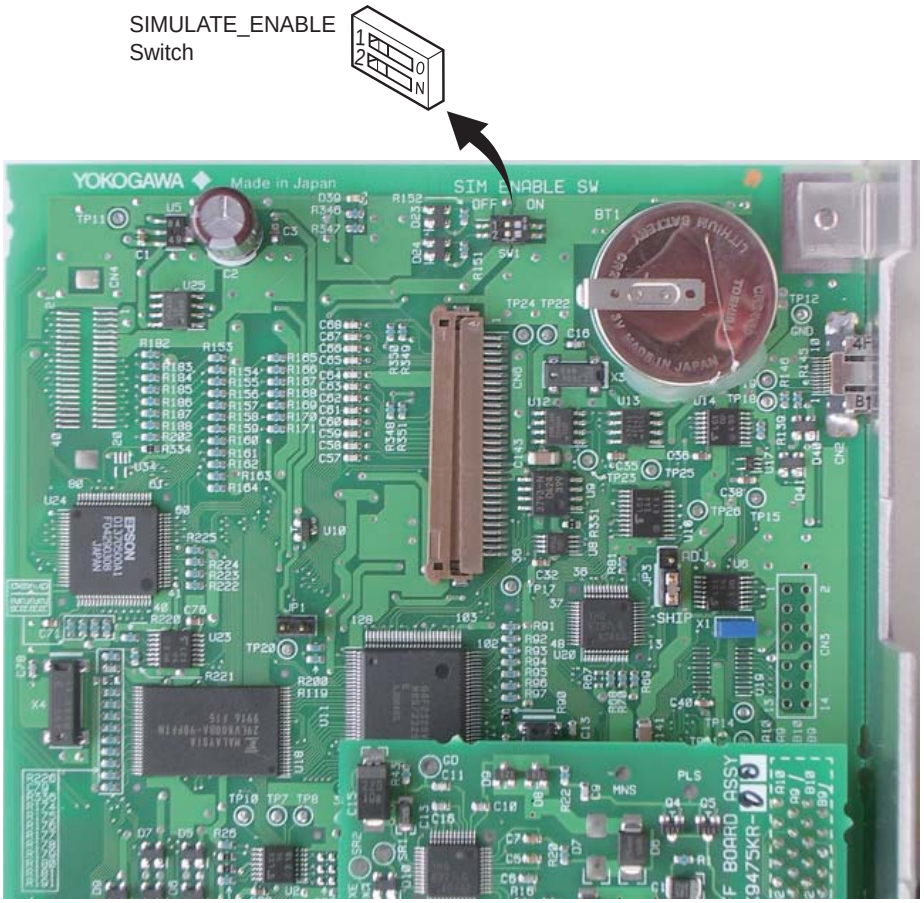

Fig. 2.1 Fieldbus Communications Control Card.

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3. ABOUT FIELDBUS

3.1 Fieldbus Overview

The Fieldbus digital communications protocol supports the requirements of large-scale process control systems that have numerous field devices,and is regarded as a worthy successor to the conventional 4-20mA analog loop.

The AV550G Fieldbus functions are designed to satisfy the Foundation Fieldbus standard in order to ensure compatibility with other makers' Fieldbus products.

The Fieldbus implementation for the AV550G supports three AI, two DI, MAI and MAO blocks.

For an overview of Fieldbus engineering, design, installation, startup and maintenance, refer to Foundation Fieldbus TI 38K03A01-01E.

3.2 Fieldbus Representation of AV550G

The Fieldbus Representation of the AV550G is two Virtual Field Devices (VFD) as follows:

3.2.1 System/Network Management VFD

- Sets node addresses and Physical Device tags (PD Tag) 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 (RS) block

- Manages the status of AV550G hardware.
- Automatically informs the host of any detected faults or other problems.

(2) Transducer (TR) block

- This conditions each oxygen concentration sensor output signal and connects it to an AI function block.
  It also transmits abnormality and alarm signals to DI function blocks.

(3) AI function blocks (three)

- There are three AI blocks (AI1 thru' AI3) which can condition (perform scaling and first-order-lag damping for) three sensor signals.

  AI1 is averaging-value "a" output signal block.

  AI2 is averaging-value "b" output signal block.

  AI3 is averaging-value "c" output signal block.

  * Simulation functions support scaling and first-order-lag damping.

(4) DI function blocks (two)

  DI1 is an alarm output switch, and

  DI2 is an abnormality output switch.

(5) MAI function block

- Each of these corresponds to the oxygen concentration signal output.

(6) MAO function block

- This block can acquire field data; a total of up to eight signals.

3.3 Relationship between Blocks

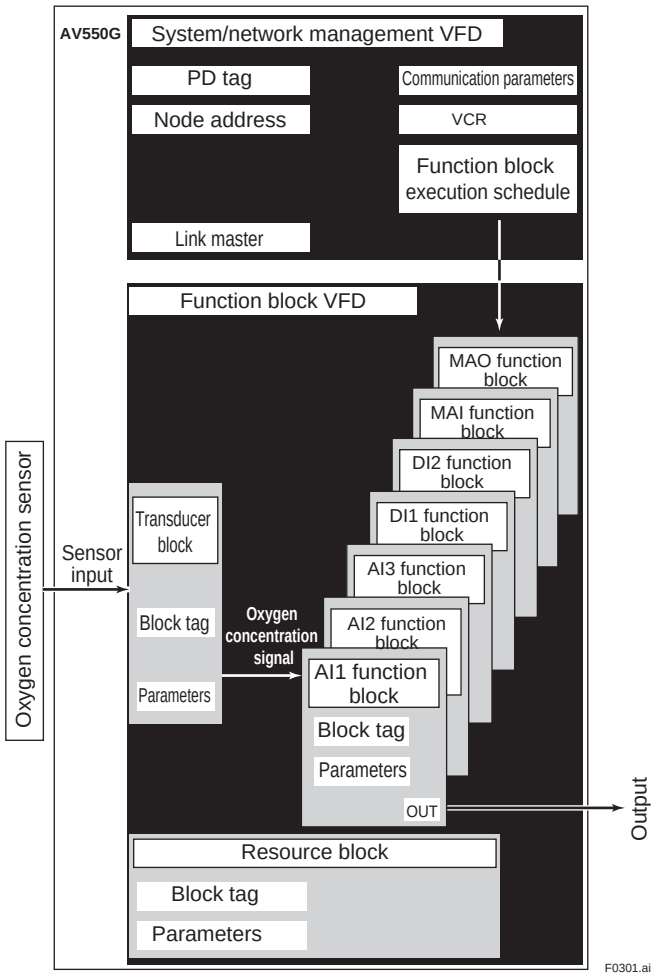


Fig. 3.1 Relationship between blocks

Various parameters, the node address, and the PD tag shown in Figure 3.1 must be set before using the device. Refer to Chapter 4 for the setting procedures.

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 basic and overall design must be carefully considered to achieve optimal performance.

4. GETTING STARTED

Fieldbus is a wholly digital communications protocol, and so differs from the conventional 4 to 20 mA analog loop. It is recommended that new users try the Fieldbus familiarization exercises described in this section. It is expected that these can be done in a laboratory or the like.

4.1 Connection of Devices

The following equipment is required for a Fieldbus laboratory setup:

- **Power supply:**
  Fieldbus requires a special power supply. You cannot use ordinary, unmodified DC power supplies. It is recommended that you choose one with sufficient capacity to supply the maximum current demand of all devices to be connected, including the host.
- **Terminator:**
  Fieldbus requires two terminators. Sometimes these are supplied with the host, so please check with the supplier of the host.
- **Fieldbus devices:**

⚠ CAUTION

Be sure to read Section 5.1.1,"Wiring Precautions" in the User's Manual of the AV550G Zirconia Oxygen Analyzer Averaging Converter.

Connect the Fieldbus version of the AV550G. You can connect several devices, e.g., multiple AV550G converters and other Fieldbus devices.

The Fieldbus function of the AV550G is powered by the bus power supply. (The AV550G itself requires AC power supply. The AV550G's hardware that supports the Fieldbus function is powered by the bus power supply.)

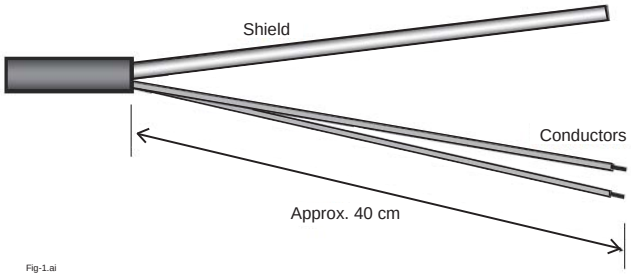
For connection of the AV550G, connect the cable on the positive (+) side of the Fieldbus power supply to terminal 5 on the control card and connect the cable on the negative (-) side to terminal 6. Connect the shield to the cable shield ground terminal on the AV550G

.• **Procedure**

⚠ WARNING

To avoid electrical shock, turn off power before connecting cables.

Strip off approximately 40 cm of the cable sheath and separate the conductors and the shield.



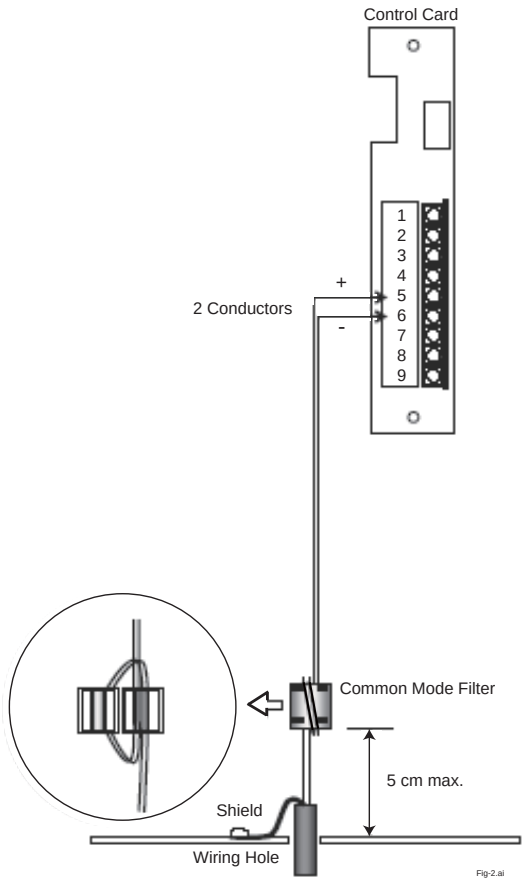
Run the cable through the wiring hole on the AV550G. Fix the cable with a cable gland, if necessary.

Open the common mode filter supplied, and wind one turn of the two conductors on it. The cable length between the common mode filter and the wiring hole should not exceed 5 cm.

Close the common mode filter, taking care not to catch the cable in it, and then lock it.

Connect the cable on the positive (+) side of the Fieldbus power supply to terminal 5 on the control card, and connect the cable on the negative (-) side to terminal 6. Use the M3.5 screw terminals.

Connect the shield to the cable shield ground terminal on the AV550G. The shield length to the terminal should be as short as possible and the excess length should be cut off. Use the M4 screw terminal.



- **Host:**
  This is a PC used to access the Fieldbus devices. In a control system, the host would normally be a DCS or the like, but in a test setup we can use a Fieldbus communications software tool running on a PC for the host. We won't describe the operation of the host software in detail here; refer to its Instruction Manual.

- **Cable:**
  This is used to interconnect the Fieldbus devices. Refer to the Fieldbus Overview TI 38K03A01-01E for a description. In a test setup, a total length of 2-3m is sufficient, and we can use simple cabling (wire with crosssectional area of at least 0.9mm^2 , run as twisted pair with twist interval of not more than 5 cm (2 inches)). The termination will need to match the connected devices. For the AV550G use wire lugs for M3.5 (3.5 mm) screw terminals. Some devices may require special connectors.

Yokogawa can provide information as to recommended suppliers.

Connect the devices as illustrated in Fig. 4.1.
Terminators should be used on both ends of the “trunk”, and any spur runs off the trunk should be as short as possible. Observe correct terminal polarity.

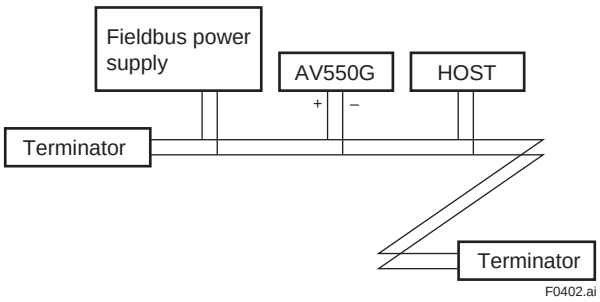


Fig. 4.1 Connecting the devices

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

Do not connect a second Fieldbus master, such as a PC with software for remote setting of Fieldbus device parameters, to an existing DCSattached Fieldbus system. This may confuse the DCS and cause it to diagnose a communications failure. Any test setup should be off line.

4.2 Host Setting

For Fieldbus to operate, you need to set the following parameters in the AV550G host. Take particular care to assign a valid bus address to the AV550G.

IMPORTANT

Do not turn off the AV550G power immediately after finishing parameter setting.
To enhance reliability, two copies of the parameter settings are written to EEPROM. If you do not allow at least 60 seconds for this data to be written before turning off the power then there is the possibility that the old parameter values will be retained unchanged.

Table 4.2 Parameters required for operation

Symbol	Parameter name	Description and Value
V (ST)	Slot-Time	Set a value of 4 or greater
V (MID)	Minimum-Inter-PDU-Delay	Set a value of 4 or greater
V (MRD)	Maximum-Reply-Delay	Set this such that V(MRD) x V(ST) is 12 or greater.
V (FUN)	First-Unpolled-Node	Defines the first address that can be used by host. Set a value of 15 or greater (hex).
V (NUN)	Number-of-consecutive-Unpolled-Node	This sets the number of consecutive unpolled nodes. Factory default setting is F7 (hex). This address determines the number of addresses Reserved for BASIC devices, as shown in Fig. 4.2

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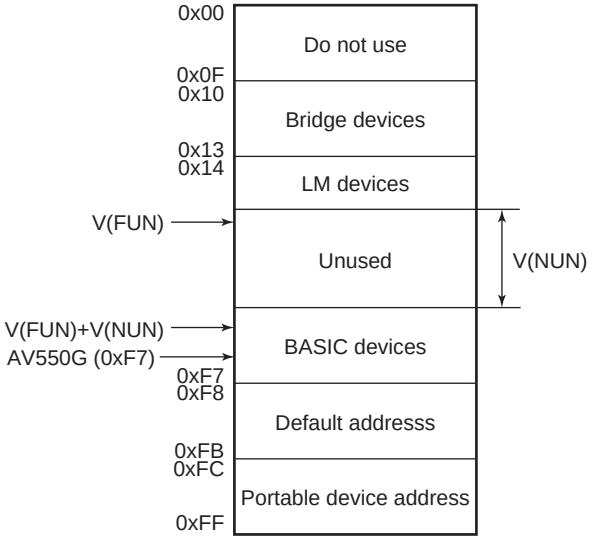

Note 1: LM device: with bus control function (Link Master function)
Note 2: BASIC device: without bus control function

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Figure 4.2 Available Address Range

4.3 Turning on Power to AV550G and Fieldbus

Turn on power to the host, bus and AV550G. If the display of the AV550G does not light up, or if an abnormal current flows from the power supply, check the power supply voltage.
Use the host's display to confirm that the AV550G is operating normally on the bus. Unless advised otherwise, you can assume that the AV550G factory default Fieldbus device settings are as follows:

PD tag: AV550G
Node address: 247 (hexadecimal F7)
Device ID: 5945430401xxxxxxxx (xxxxxx = six alphanumeric characters)

[See explanation of numbers in Sec. 4.4 below. The xxxxxxxx is like a serial no. that is unique to each unit manufactured.]

If the AV550G is not detected on the Fieldbus, check its address setting and also check the available free addresses on the Fieldbus. Unless the PD tag and node address are specified at order time, then the factory defaults above will apply. If two or more AV550G with factory default settings are connected to the Fieldbus, then, since their address settings are the same, only one will be detected. Connect them one at a time and assign them different addresses.

4.4 Installation of DD

If the host supports DD (Device Description), then the DD file of the AV550G needs to be installed. Check if the host has the following directory under its default DD directory.

594543\0401

(Here 594543 is the manufacturer ID of Yokogawa Electric Corp., and 0401 is Yokogawa's device ID number for the AV550G.)

If this directory does not yet exist, then the AV550G DD file has not been installed.
Create the directory, and copy the AV550G DD file (which has a file name like "0m0n.ffo,0m0n.sym" where m and n are numbers) to the directory.
When the DD file is installed, you will be able to display all the parameter names and attributes of the AV550G. You can also use the capability file (CFF) to perform offline configuration.

Both the DD file and the capability file will be available for download from the Yokogawa web site. You can confirm the URL with your Yokogawa rep.
http://www.yokogawa.com/an/download/an-dlfieldbus-001en.htm

 CAUTION

Be sure to use the DD file that matches the AV550G Device Revision no.

4.5 Reading Device Parameters

Try reading AV550G parameters. Select the AI block of the AV550G on the screen of the host, and read a parameter such as OUT (representing the output current). Confirm that the function block resource block MODE_BLOCK is AUTO.

4.6 Continuous Record of Values

If the host can continuously record parameter values, use this function to record some values. Depending on the Host software, you may have to change the update interval of Publish (which periodically sends the updated parameter value to the bus).

4.7 Generating Alarms

If the host is able to receive alarms, then enable alarm capture on the host and generate an alarm from the AV550G to test this. At the time of shipping from the factory, virtual communication relationship VCR-7 of AV550G is set up for this purpose. Default setting is for all alarms to be disabled. Try enabling one alarm as follows: Set the value of link object 3 (index 30002) to (0, 299, 0, 6, 0). Refer to Sec. 5.6.1 Link Objects.

Set the AI block LO_PRI parameter (index 4029) to 0, then try setting this value to 3. From the host, select Write and specify the index or the variable name and write the value 3 to it.

The LO_LIM parameter (index 4030) of the AI block sets the low limit alarm value.
Normally this is set to a very small value. Here we set it to slightly under 100% of XD_SCALE (same units as XD_SCALE) in order to generate an alarm. Since the flow is zero, a low limit alarm is generated. We can confirm if the host receives this alarm. If we Confirm (Acknowledge) this alarm, the alarm stops.

5. CONFIGURATION

This section describes how to customize the functions and tailor the performance of the AV550G to suit specific applications. Because multiple devices are connected to the Fieldbus, it is important to take care to consider the network as a whole to eliminate any design defects that might adversely affect the network as a whole. The design procedure is as follows:

(1) Initial network design

Determine the devices to be connected to the Fieldbus, determine maximum power requirements and ensure that power supply capacity will be sufficient.

(2) Define network constants

Determine/Define unique PD tag and node addresses for all devices.

(3) Define connections (communications) between function blocks

(4) Set any device PD tag and node addresses that need to be changed

(5) Set communication settings for connections between function blocks

Set links between function blocks and communication parameters.

(6) Set function block parameters that should be changed from default values.

These steps are explained below. Special purpose configuration tools can greatly simplify and facilitate setup.

This section covers procedures for setting up basic functions (e.g. for basic Fieldbus devices); procedures for more complex devices such as Link Masters are described in Appendix 5.

5.1 Initial network design

Select the devices to be connected to the Fieldbus network. The following are essential for the operation of Fieldbus.

- **Power supply:**
  Fieldbus requires a special power supply, you cannot use an ordinary DC power supply. The power supply should be capable of supplying more current that the sum of the maximum currents drawn by individual devices, including hosts.
- **Terminator:**
  Fieldbus requires two terminators. Sometimes these are supplied with the host, so please check
- **Fieldbus devices:**
  Connect the field devices that will be used in the Fieldbus system. The AV550G has passed interoperability tests conducted by the Fieldbus Foundation. If you are starting up a new Fieldbus system, we recommend that you use only devices that have passed the interoperability tests, in order to ensure a smooth startup.
- **Host:**
  Hosts can access and control Fieldbus devices. You need at least one “Link Master” host in a Fieldbus system.

- **Fieldbus Cable:**

  Cable is used for interconnecting Fieldbus devices. Refer to Fieldbus Technical Information TI 38K3A01-01E for details. You need enough cable to interconnect all Fieldbus devices. You can use terminal boards or terminal boxes for running side “spurs” off the “main trunk”, however you should ensure that the length of such “spur” runs is as short as possible.

Be sure to check that the capacity of the power supply is more than sufficient to supply the sum of the maximum currents drawn by individual devices, including hosts. The AV550G draws a maximum rated current of 15 mA over the power supply voltage range 9 to 32 V DC..

5.2 Define network constants

Before connecting devices to (an existing) Fieldbus, determine unique PD tag and node addresses for all devices (except for passive devices like terminators).
PD tags are like the instrument tag numbers used in measurement and control systems. You can use up to 32 alphanumeric characters to define the PD tag of each device. You can also use hyphen delimiters in PD tag names.
Node addresses are used for Fieldbus communications between devices, but PD tag names may be used as mnemonic aliases for node addresses. You can assign node addresses in the range (hexadecimal) 10 to F7, which is (decimal) 20 to 247.

Link Master (LM) device addresses should be assigned in sequence starting from the smallest address (0x14), and basic device addresses should be assigned in sequence starting from the largest (0xF7). You must set the address range in the Link Master device, using the following parameters:

Table 5.1 Parameters for setting address range

Symbol	Parameters	Description
V (FUN)	First-Unpolled-Node	First unused address outside the range of LM (host) addresses.
V (NUN)	Number-of-consecutive-Unpolled-Nodes	Range of unused addresses.

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Any devices that are assigned addresses within the “Unused” address range in Figure 5.1 cannot participate in the Fieldbus. The “basic device” address range is periodically scanned to find any devices that have newly joined the Fieldbus.
If there are many unused addresses in this range then Fieldbus performance may be severely degraded (LM devices waiting for nonexistent devices to respond).

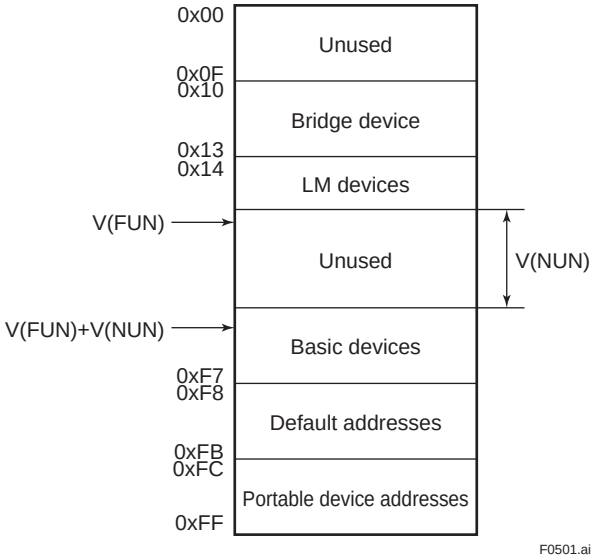

Figure 5.1 Available Range of Node Addresses

For all Link Master (LM) devices, the parameters listed in Table 5.2 are set to ensure stable operation. These parameters determine the time each LM device waits for a response, and are set so as to allow sufficient for the slowest device on the Fieldbus to respond. (The values of these parameters for each connected Fieldbus device is defined in its capability file (CFF). A LM host may check CFF files of connected Fieldbus devices and set these parameters automatically).

Table 5.2 Operation Parameter Values of AV550G to be Set to LM Device

Symbol	Parameter name	Description and value
V (ST)	Slot-Time	Time interval required to send a message, expressed as a multiple of V(SlotTime), the time (256μS) required to send one octet. For the AV550G, the value is 4. Set this to the max. value among connected devices.
V (MID)	Minimum-Inter-PDU-Delay	Min. value of interval between messages, expressed as a multiple of V(SlotTime), the time (256μS) required to send one octet. For the AV550G, the value is 4. Set this to the max. value among connected devices.
V (MRD) x V (ST)	Maximum-Response-Delay x Slot-time	Represents the time a LM should wait for a device to respond. For the AV550G, the value is 12. (Since V(ST) is predefined, the value of this product determines V(MRD)). Set this to the max. value among connected devices.

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5.3 Function Block Link Definitions

The output of one function block may be linked to the input of another.

For the AV550G, the three AI blocks each have (OUT) output parameters, the two DI blocks have (OUT_D) output parameters -- these may be connected to the inputs of control blocks -- and there are also MAI and MAO blocks. The procedure for writing values to the link object settings of the AV550G are described in Sec. 5.6 Block Settings. As an alternative to connecting the outputs of the AV550G block to other blocks, you can have the host read them at suitable intervals.

For connections between blocks to work as expected, you will have to schedule the starting of each block execution cycle and the timing of communications, allowing for execution time of each block. Refer to Table 5.3 for the factory default execution start timings (in brackets) for the AI blocks in the AV550G.

Table 5.3 Function Block execution scheduling for AV550G

Index	Parameters	Setting (& factory default)
269 (SM)	MACROCYCLE_DURATION	Macrocycle is control or measurement cycle repetition interval, unit 1/32 ms, (default 32,000=1 sec).
276 (SM)	FB_START_ENTRY.1	Macrocycle-relative start offset of AI1 block, unit 1/32 ms, (default 0=0 ms).
277 (SM)	FB_START_ENTRY.2	Macrocycle-relative start offset of AI2, unit 1/32 ms, (default 9600=300 ms).
278 (SM)	FB_START_ENTRY.3	Macrocycle-relative start offset of AI3, unit 1/32 ms, (default 19200=600 ms).
279 (SM) to 289 (SM)	FB_START_ENTRY.4 to 14	Not set

T0503.ai

Each AI block takes a maximum of 29 ms to execute, so you can schedule communication of the output value to the input of a connected function block to start after this time has elapsed.

Figure 5.2 illustrates the connection of typical function blocks, and Figure 5.3 shows the corresponding scheduling of their execution.

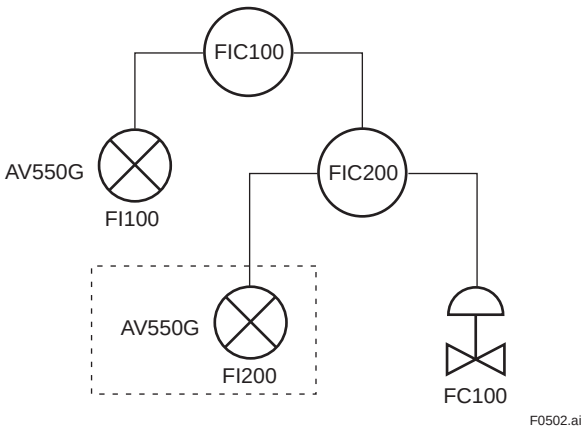

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Figure 5.2 Example of loop with two AV550G function blocks connected to other instruments.

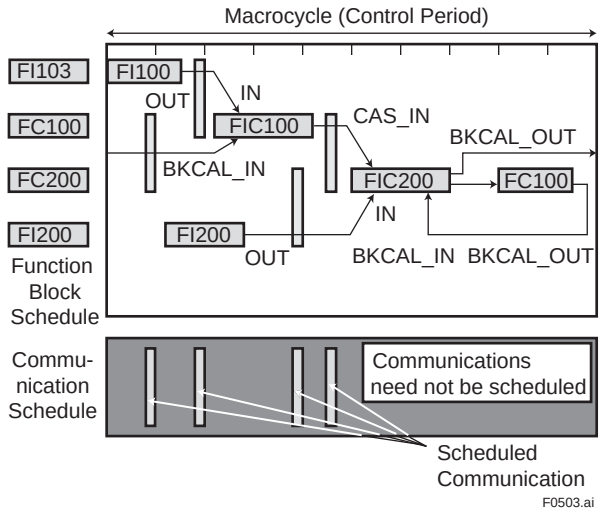

Figure 5.3 Function Block and Communications Scheduling Example.

When the control period (macrocycle) is set to more than 4 seconds, set the following interval to be more than 1% of the control period.

- Interval between “end of block execution” and “start of sending CD from LAS”, (refer to Sec. A6.1).
- Interval between “end of block execution” and “start of next block execution”.

5.4 Setting of Tags and Addresses

This section explains the procedure for setting AV550G PD tags and node addresses. As shown in Fig. 5.4, Fieldbus devices may be in any of three states, but only in SM_OPERATIONAL state (at the bottom) can the function block be executed. If you are changing the PD tags and/or node address of an AV550G, be sure to revert it to this state.

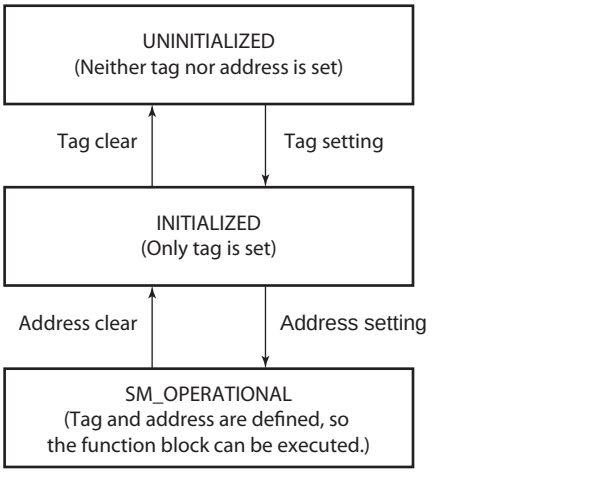

Fig. 5.4 PD-tag and Node-Address related State Transition diagram (figure reference)

Unless specified otherwise at order time, factory default settings for the AV550G are for PD tag setting of “AV550G” and node address of F7 hex (247). To change just the node address setting, you can clear the existing node address then set a new one; but to change the PD tag then you need to clear the node address and PD tag the set the new PD tag and the node address.

A device whose node address has been cleared will select an arbitrary address in the range F8 to FB (248 to 251). To address such a device, you should specify the device ID. For the AV550G, this is 5945430401xxxxxx (six alphanumeric digits after the 5945430401).

5.5 Communication Setting

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

5.5.1 VCR Setting

The VCR (Virtual Communication Relationship) specifies the device and item communicated with, and the type of resources used. Each AV550G supports 33 VCRs; the first is used for management, the other 32 are user-customizable.

The AV550G supports the following four types of VCR:

Server (QUB) VCR
A server responds to requests from, and is used for exchanging data with, a host.
This is called a QUB (Queued User-triggered Bidirectional) VCR.

Source (QUU) VCR
A source multicasts alarms or trends to other devices.
This is called a QUU (Queued Usertriggered Unidirectional) VCR.

Publisher (BNU) VCR
A publisher multicasts outputs of AI blocks, DI blocks, and MAI blocks to other function blocks.
This is called a BNU (Buffered Networktriggered Unidirectional) VCR.

Subscriber (BNU) VCR
A subscriber connects outputs from other function blocks to an MAO block.

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 a contradiction.

Table 5.4 VCR Static Entry

Sub-index	Parameter	Description
1	FasArTypeAndRole	Indicates the type and role of communication (VCR). The following 4 types are used for the AV550G. 0x32: Server (Responds to requests from host.) 0x44: Source (Transmits alarm or trend.) 0x66: Publisher (Sends AI, DI, MAI block output to other blocks.) 0x76: Subscriber (Connects output of other blocks to MAO block.)
2	FasDllLocalAddr	Sets the local DLSAP or DLCEP address to specify a VCR in the AV550G. A range of 20 to F7 in hexadecimal.
3	FasDllConfigured RemoteAddr	Sets the node address of the called party for communication and the address (DLSAP or DLCEP) used to specify VCR at 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) 0x91: Publisher/Subscriber
5	FasDllMaxConfirm DelayOnConnect	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).

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Sub-index	Parameter	Description
6	FasDllMaxConfirm DelayOnData	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	FasDllResidual ActivitySupported	Specifies whether connection is monitored. Set TRUE (0xff) for Server. This parameter is not used for other communication.
9	FasDllTimelinessClass	Not used for the AV550G.
10	FasDllPublisherTime WindowSize	Not used for the AV550G.
11	FasDllPublisher SynchronizaingDlcep	Not used for the AV550G.
12	FasDllSubscriberTime WindowSize	Not used for the AV550G.
13	FasDllSubscriber SynchronizationDlcep	Not used for the AV550G.
14	FmsVfdId	Sets VFD for the AV550G to be used. (0x1: System/network management VFD 0x1234: Function block VFD)
15	FmsMaxOutstanding ServiceCalling	Set 0 to Server. It is not used for other applications.
16	FmsMaxOutstanding ServiceCalled	Set 1 to Server. It is not used for other applications.
17	FmsFeatures Supported	Indicates the type of services in the application layer. In the AV550G, it is automatically set according to specific applications.

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These 33 VCRs are factory-set as shown in 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, Remote Address=0x111)
298	6	Publisher (LocalAddr = 0x20)
299	7	Alert Source (LocalAddr = 0x07, Remote Address=0x110)
300	8	Server (LocalAddr = 0xF9)
301 to 325	9 to 33	Not set

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5.5.2 Function Block Execution Control

According to the instructions given in Section 5.3, set the execution cycle of the function blocks and schedule of execution.

5.6 Block Setting

Set the parameter for function block VFD.

5.6.1 Link Objects

A link object combines the data voluntarily sent by the function block with the VCR. Each AV550G has 40 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

Sub-index	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 the AV550G. 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 3: Subscriber 6: Alert 7: Trend
5	StaleCountLimit	Set the maximum number of consecutive stale input values which may be received before the input status is set to BAD. To avoid the unnecessary mode transition caused when the data is not correctly received by subscriber, set this parameter to “2” or more.

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Link objects are not factory-set. Set link objects as shown in Table 5.7.

Table 5.7 Settings of Link Objects (example)

Index	Link Object #	Settings(example)
30000	1	AI. OUT → VCR#6
30001	2	Trend → VCR#5
30002	3	Alert → VCR#7
30003 to 30039	4 to 40	Not used

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5.6.2 Trend Objects

It is possible to make settings so that a function block automatically transmits trends.
For this, each AV550G has ten trend objects: eight for trends of analog parameters and two for discrete parameters. For each trend object, specify a single parameter, the trend of which is to be transmitted.

Each trend object has the parameters listed in Table 5.8. For the first four parameters, setting is mandatory. Before writing parameter settings to a trend object, parameter WRITE_LOCK of the resource block must be modified to unlock the write-lock.

Table 5.8 Parameters for Trend Objects

Sub-index	Parameters	Description
1	Block Index	Specifies index of head of function block that is creating the trend.
2	Parameter Relative Index	Specifies index of parameter used for trend, relative to head of function block. In the AV550G, 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.

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Ten trend objects are not factory-set.

Table 5.9 Trend Objects

Index	Parameter	Factory Setting
32000 to 32007	TREND_FLT.1 to TREND_FLT.8	Not set.
32008	TREND_DIS.1	Not set (these parameters are used with a DI block).
32009	TREND_DIS.2	

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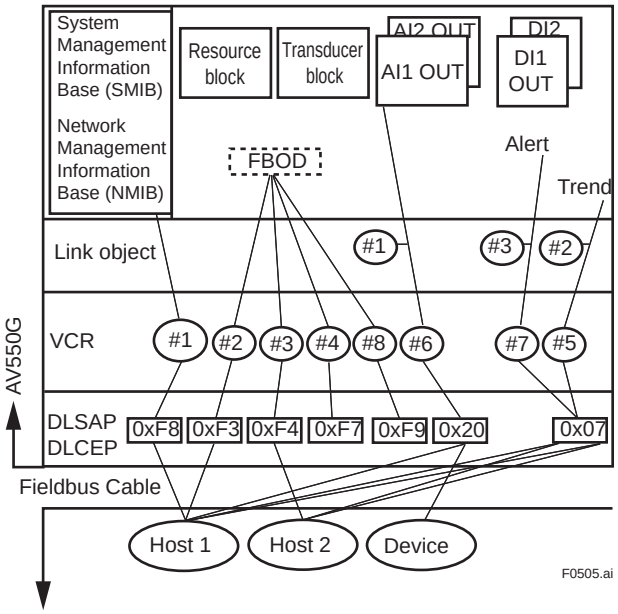

Figure 5.5 Example of Configuration

5.6.3 View Objects

View objects are used to group parameters. This reduces the load of data transactions. Each AV550G supports four view objects for each resource block, transducer block, each of the three AI blocks, two DI blocks, MAI and MAO blocks.

Each view object contains a group of the parameters listed in Tables 5.11 to 5.14.

Table 5.10 Purpose of Each View Object

	Description
VIEW_1	Set of dynamic parameters required by operator for plant operation. (PV, SV, OUT, Mode etc.)
VIEW_2	Set of static parameters which need to be shown to plant operator at once. (Range etc.)
VIEW_3	Set of all the dynamic parameters.
VIEW_4	Set of static parameters for configuration or maintenance.

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Table 5.11 View Objects 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				

Relative Index	Parameter Mnemonic	VIEW 1	VIEW 2	VIEW 3	VIEW 4
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				
41	ITK_VER				
42	SOFT_REV				
43	SOFT_DESC				
44	SIM_ENABLE_MSG				
45	DEVICE_STATUS_1			4	
46	DEVICE_STATUS_2			4	
47	DEVICE_STATUS_3			4	
48	DEVICE_STATUS_4			4	
49	DEVICE_STATUS_5			4	
50	DEVICE_STATUS_6			4	
51	DEVICE_STATUS_7			4	
52	DEVICE_STATUS_8			4	
53	SOFTDWN_PROTECT				1
54	SOFTDWN_FORMAT				1
55	SOFTDWN_COUNT				2
56	SOFTDWN_ACT_AREA			1	
57	SOFTDWN_MOD_REV			16	
58	SOFTDWN_PROTECT			2	
	Total bytes	22	30	73	35

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Table 5.12 View Objects for Transducer Block

Index	Parameter Mnemonic	VIEW1	VIEW2	VIEW3 1 st	VIEW3 2 nd	VIEW3 3 rd	VIEW3 4 th	VIEW3 5 th	VIEW3 6 th	VIEW3 7 th	VIEW3 8 th	VIEW3 9 th	VIEW3 10 th	VIEW4
1	ST_REV	2	2	2	2	2	2	2	2	2	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_1_TYPE		2											
14	PRIMARY_VALUE_1	5		5										
15	PRIMARY_VALUE_1_RANGE													11
16	PRIMARY_VALUE_1_USE_CH			2										
17	PRIMARY_VALUE_2_TYPE		2											
18	PRIMARY_VALUE_2	5		5										
19	PRIMARY_VALUE_2_RANGE													11
20	PRIMARY_VALUE_2_USE_CH			2										
21	PRIMARY_VALUE_3_TYPE		2											
22	PRIMARY_VALUE_3	5		5										
23	PRIMARY_VALUE_3_RANGE													11
24	PRIMARY_VALUE_3_USE_CH			2										
25	ALARM_SW_VALUE_D			2										
26	ERROR_SW_VALUE_D			2										
27	IN_UNIT													2
28	IN_DISPLAY_FORMAT													1
29	USE_IN_NO													1
30	PV1_MIN_VALUE			4										
31	PV1_MAX_VALUE			4										
32	PV1_AVE_VALUE			4										
33	PV1_MIN_DATE			7										
34	PV1_MAX_DATE			7										
35	PV2_MIN_VALUE			4										
36	PV2_MAX_VALUE			4										
37	PV2_AVE_VALUE			4										
38	PV2_MIN_DATE			7										
39	PV2_MAX_DATE			7										
40	PV3_MIN_VALUE				4									
41	PV3_MAX_VALUE				4									
42	PV3_AVE_VALUE				4									
43	PV3_MIN_DATE				7									

* Continued on next page

Index	Parameter Mnemonic	VIEW1	VIEW2	VIEW3 1 st	VIEW3 2 nd	VIEW3 3 rd	VIEW3 4 th	VIEW3 5 th	VIEW3 6 th	VIEW3 7 th	VIEW3 8 th	VIEW3 9 th	VIEW3 10 th	VIEW4
44	PV3_MAX_DATE				7									
45	CH1_CELL_VOLT					4								
46	CH1_HEATER_TEMP					4								
47	CH1_CJ_TEMP					4								
48	CH1_TC_VOLT					4								
49	CH1_CJ_VOLT					4								
50	CH1_CELL_RESISTANCE					4								
51	CH1_CJ_RESISTANCE					4								
52	CH1_ZERO_CAL_COEFF					4								
53	CH1_SPAN_CAL_COEFF					4								
54	CH1_CELL_ROBUSTNESS					1								
55	CH1_HEATER_ON_TIME					4								
56	CH1_RESPONSE_TIME					4								
57	CH1_MIN_VALUE					4								
58	CH1_MAX_VALUE					4								
59	CH1_AVE_VALUE					4								
60	CH1_MIN_DATE					7								
61	CH1_MAX_DATE					7								
62	CH2_CELL_VOLT						4							
63	CH2_HEATER_TEMP						4							
64	CH2_CJ_TEMP						4							
65	CH2_TC_VOLT						4							
66	CH2_CJ_VOLT						4							
67	CH2_CELL_RESISTANCE						4							
68	CH2_CJ_RESISTANCE						4							
69	CH2_ZERO_CAL_COEFF						4							
70	CH2_SPAN_CAL_COEFF						4							
71	CH2_CELL_ROBUSTNESS						1							
72	CH2_HEATER_ON_TIME						4							
73	CH2_RESPONSE_TIME						4							
74	CH2_MIN_VALUE						4							
75	CH2_MAX_VALUE						4							
76	CH2_AVE_VALUE						4							
77	CH2_MIN_DATE						7							
78	CH2_MAX_DATE						7							
79	CH3_CELL_VOLT							4						
80	CH3_HEATER_TEMP							4						
81	CH3_CJ_TEMP							4						
82	CH3_TC_VOLT							4						
83	CH3_CJ_VOLT							4						
84	CH3_CELL_RESISTANCE							4						
85	CH3_CJ_RESISTANCE							4						
86	CH3_ZERO_CAL_COEFF							4						

* Continued on next page

Index	Parameter Mnemonic	VIEW1	VIEW2	VIEW3 1 st	VIEW3 2 nd	VIEW3 3 rd	VIEW3 4 th	VIEW3 5 th	VIEW3 6 th	VIEW3 7 th	VIEW3 8 th	VIEW3 9 th	VIEW3 10 th	VIEW4
87	CH3_SPAN_CAL_COEFF							4						
88	CH3_CELL_ROBUSTNESS							1						
89	CH3_HEATER_ON_TIME							4						
90	CH3_RESPONSE_TIME							4						
91	CH3_MIN_VALUE							4						
92	CH3_MAX_VALUE							4						
93	CH3_AVE_VALUE							4						
94	CH3_MIN_DATE							7						
95	CH3_MAX_DATE							7						
96	CH4_CELL_VOLT								4					
97	CH4_HEATER_TEMP								4					
98	CH4_CJ_TEMP								4					
99	CH4_TC_VOLT								4					
100	CH4_CJ_VOLT								4					
101	CH4_CELL_RESISTANCE								4					
102	CH4_CJ_RESISTANCE								4					
103	CH4_ZERO_CAL_COEFF								4					
104	CH4_SPAN_CAL_COEFF								4					
105	CH4_CELL_ROBUSTNESS								1					
106	CH4_HEATER_ON_TIME								4					
107	CH4_RESPONSE_TIME								4					
108	CH4_MIN_VALUE								4					
109	CH4_MAX_VALUE								4					
110	CH4_AVE_VALUE								4					
111	CH4_MIN_DATE								7					
112	CH4_MAX_DATE								7					
113	CH5_CELL_VOLT									4				
114	CH5_HEATER_TEMP									4				
115	CH5_CJ_TEMP									4				
116	CH5_TC_VOLT									4				
117	CH5_CJ_VOLT									4				
118	CH5_CELL_RESISTANCE									4				
119	CH5_CJ_RESISTANCE									4				
120	CH5_ZERO_CAL_COEFF									4				
121	CH5_SPAN_CAL_COEFF									4				
122	CH5_CELL_ROBUSTNESS									1				
123	CH5_HEATER_ON_TIME									4				
124	CH5_RESPONSE_TIME									4				
125	CH5_MIN_VALUE									4				
126	CH5_MAX_VALUE									4				
127	CH5_AVE_VALUE									4				
128	CH5_MIN_DATE									7				
129	CH5_MAX_DATE									7				

* Continued on next page

Index	Parameter Mnemonic	VIEW1	VIEW2	VIEW3 1 st	VIEW3 2 nd	VIEW3 3 rd	VIEW3 4 th	VIEW3 5 th	VIEW3 6 th	VIEW3 7 th	VIEW3 8 th	VIEW3 9 th	VIEW3 10 th	VIEW4
130	CH6_CELL_VOLT										4			
131	CH6_HEATER_TEMP										4			
132	CH6_CJ_TEMP										4			
133	CH6_TC_VOLT										4			
134	CH6_CJ_VOLT										4			
135	CH6_CELL_RESISTANCE										4			
136	CH6_CJ_RESISTANCE										4			
137	CH6_ZERO_CAL_COEFF										4			
138	CH6_SPAN_CAL_COEFF										4			
139	CH6_CELL_ROBUSTNESS										1			
140	CH6_HEATER_ON_TIME										4			
141	CH6_RESPONSE_TIME										4			
142	CH6_MIN_VALUE										4			
143	CH6_MAX_VALUE										4			
144	CH6_AVE_VALUE										4			
145	CH6_MIN_DATE										7			
146	CH6_MAX_DATE										7			
147	CH7_CELL_VOLT											4		
148	CH7_HEATER_TEMP											4		
149	CH7_CJ_TEMP											4		
150	CH7_TC_VOLT											4		
151	CH7_CJ_VOLT											4		
152	CH7_CELL_RESISTANCE											4		
153	CH7_CJ_RESISTANCE											4		
154	CH7_ZERO_CAL_COEFF											4		
155	CH7_SPAN_CAL_COEFF											4		
156	CH7_CELL_ROBUSTNESS											1		
157	CH7_HEATER_ON_TIME											4		
158	CH7_RESPONSE_TIME											4		
159	CH7_MIN_VALUE											4		
160	CH7_MAX_VALUE											4		
161	CH7_AVE_VALUE											4		
162	CH7_MIN_DATE											7		
163	CH7_MAX_DATE											7		
164	CH8_CELL_VOLT												4	
165	CH8_HEATER_TEMP												4	
166	CH8_CJ_TEMP												4	
167	CH8_TC_VOLT												4	
168	CH8_CJ_VOLT												4	
169	CH8_CELL_RESISTANCE												4	
170	CH8_CJ_RESISTANCE												4	
171	CH8_ZERO_CAL_COEFF												4	
172	CH8_SPAN_CAL_COEFF												4	

* Continued on next page

Index	Parameter Mnemonic	VIEW1	VIEW2	VIEW3 1 st	VIEW3 2 nd	VIEW3 3 rd	VIEW3 4 th	VIEW3 5 th	VIEW3 6 th	VIEW3 7 th	VIEW3 8 th	VIEW3 9 th	VIEW3 10 th	VIEW4
173	CH8_CELL_ROBUSTNESS												1	
174	CH8_HEATER_ON_TIME												4	
175	CH8_RESPONSE_TIME												4	
176	CH8_MIN_VALUE												4	
177	CH8_MAX_VALUE												4	
178	CH8_AVE_VALUE												4	
179	CH8_MIN_DATE												7	
180	CH8_MAX_DATE												7	
181	CH1_SMART_CALIB_DATE					7								
182	CH2_SMART_CALIB_DATE						7							
183	CH3_SMART_CALIB_DATE							7						
184	CH4_SMART_CALIB_DATE								7					
185	CH5_SMART_CALIB_DATE									7				
186	CH6_SMART_CALIB_DATE										7			
187	CH7_SMART_CALIB_DATE											7		
188	CH8_SMART_CALIB_DATE												7	
189	CH1_SEMIAUTO_CAL_START					1								
190	CH2_SEMIAUTO_CAL_START						1							
191	CH3_SEMIAUTO_CAL_START							1						
192	CH4_SEMIAUTO_CAL_START								1					
193	CH5_SEMIAUTO_CAL_START									1				
194	CH6_SEMIAUTO_CAL_START										1			
195	CH7_SEMIAUTO_CAL_START											1		
196	CH8_SEMIAUTO_CAL_START												1	
197	CH1_INDICATION_START					1								
198	CH2_INDICATION_START						1							
199	CH3_INDICATION_START							1						
200	CH4_INDICATION_START								1					
201	CH5_INDICATION_START									1				
202	CH6_INDICATION_START										1			
203	CH7_INDICATION_START											1		
204	CH8_INDICATION_START												1	
205	BLOWBACK_START				1									
206	CAL_GAS_PRESS_DROP_SW				1									
207	PROCESS_GAS_ALARM_SW				1									
208	CH1_DETC					1								
209	CH2_DETC						1							
210	CH3_DETC							1						
211	CH4_DETC								1					
212	CH5_DETC									1				
213	CH6_DETC										1			
214	CH7_DETC											1		
215	CH8_DETC												1	

* Continued on next page

Index	Parameter Mnemonic	VIEW1	VIEW2	VIEW3 1 st	VIEW3 2 nd	VIEW3 3 rd	VIEW3 4 th	VIEW3 5 th	VIEW3 6 th	VIEW3 7 th	VIEW3 8 th	VIEW3 9 th	VIEW3 10 th	VIEW4
216	AV550G_STATUS				2									
217	CH1_STATUS					2								
218	CH2_STATUS						2							
219	CH3_STATUS							2						
220	CH4_STATUS								2					
221	CH5_STATUS									2				
222	CH6_STATUS										2			
223	CH7_STATUS											2		
224	CH8_STATUS												2	
225	IPL_SOFT_REV				4									
226	CONTROL_SOFT_REV				4									
227	CH1_SOFT_REV					4								
228	CH2_SOFT_REV						4							
229	CH3_SOFT_REV							4						
230	CH4_SOFT_REV								4					
231	CH5_SOFT_REV									4				
232	CH6_SOFT_REV										4			
233	CH7_SOFT_REV											4		
234	CH8_SOFT_REV												4	
235	REMOVE_ALARM_CH				1									
236	ALARM_SUM				8									
237	TEST_1				1									
238	TEST_2				2									
239	TEST_3				32									
240	TEST_4													2
241	TEST_5													32
242	TEST_6													2
243	TEST_7													
244	TEST_8													
245	TEST_9													
246	TEST_10													
247	TEST_11													2
248	TEST_12													2
249	TEST_13													
250	TEST_14													1
	Total bytes	26	10	88	85	89	89	89	89	89	89	89	89	85

Table 5.13 View Objects for Each AI Function Block (AI1,AI3)

Relative Index	Parameter Mnemonic	VIEW1	VIEW2	VIEW3	VIEW4
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				
	Total bytes	31	26	31	46

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Table 5.14 View Objects for Each DI Function Block (DI1,DI2)

Relative Index	Parameter Mnemonic	VIEW1	VIEW2	VIEW3	VIEW4
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_D	2		2	
8	OUT_D	2		2	
9	SIMULATE_D				
10	XD_STATE		2		
11	OUT_STATE		2		
12	GRANT_DENY		2		
13	IO_OPTS				2
14	STATUS_OPTS				2
15	CHANNEL				2
16	PV_FTIME				4
17	FIELD_VAL_D	2		2	
18	UPDATE_EVT				
19	BLOCK_ALM				
20	ALARM_SUM	8		8	
21	ACK_OPTION				2
22	DISC_PRI				1
23	DISC_LIM				1
24	DISC_ALM				
	Total bytes	22	8	22	19

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Table 5.15 View Objects for MAI Function Block

Relative Index	Parameter Mnemonic	VIEW1	VIEW2	VIEW3	VIEW4
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	CHANNEL				2
8	OUT_1	5		5	
9	OUT_2	5		5	
10	OUT_3	5		5	
11	OUT_4	5		5	
12	OUT_5	5		5	
13	OUT_6	5		5	
14	OUT_7	5		5	
15	OUT_8	5		5	
16	UPDATE_EVT				
17	BLOCK_ALM				
	Total bytes	48	2	48	7

Table 5.16 View Objects for MAO Function Block

Relative Index	Parameter Mnemonic	VIEW1	VIEW2	VIEW3	VIEW4
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	CHANNEL				2
8	IN_1	5		5	
9	IN_2	5		5	
10	IN_3	5		5	
11	IN_4	5		5	
12	IN_5	5		5	
13	IN_6	5		5	
14	IN_7	5		5	
15	IN_8	5		5	
16	MO_OPTS				2
17	FSTATE_TIME				4
18	FSTATE_VAL1				4
19	FSTATE_VAL2				4
20	FSTATE_VAL3				4
21	FSTATE_VAL4				4
22	FSTATE_VAL5				4
23	FSTATE_VAL6				4
24	FSTATE_VAL7				4
25	FSTATE_VAL8				4
26	FSTATE_STATUS	2		2	
27	UPDATE_EVT				
28	BLOCK_ALM				
	Total bytes	50	2	50	45

Table 5.17 View Indexes for Each Resource

Block	VIEW1	VIEW2	VIEW3	VIEW4
Resource block	40100	40101	40102	40103
Transducer block	40200	40201	40202	40203
AI1 function block	40400	40401	40402	40403
AI2 function bloc	40410	40411	40412	40413
AI3 function block	40420	40421	40422	40423
DI1 function block	40600	40601	40602	40603
DI2 function block	40610	40611	40612	40613
MAI function block	40900	40901	40902	40903
MAO function block	41000	41001	41002	41003

5.6.4 AI Function Block Parameters

Parameters of the three AI function blocks can be read and written from the host. For a list of block parameters in each AV550G, refer to Appendix 1, “List of Parameters for Each Block of AV550G.”

The following describes important parameters and 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: Averaging oxygen concentration Ave-a is connected to AI1, Averaging oxygen concentration Ave-b is connected to AI2, and Averaging oxygen concentration Ave-c is connected to AI3.
Do not change these settings.

XD_SCALE:

Range of input from the transducer block.
Factory defaults are:
“0” (0%), “100.0” (100%) and “%” for the units.
The value of XD_SCALE cannot be set up except the initial factory default value of the AV550G.

OUT_SCALE:

Sets the output range (default is 0% to 100%).

L_TYPE:

Specifies AI1 block output scaling. The factory default “Direct” means no scaling, OUT is the same as the CHANNEL input. If set to “Indirect”, then XD_SCALE is mapped to OUT_SCALE. “Indirect SQRT” is not valid for the AV550G.

PV_FTIME:

Sets the damping (1st order lag) time constant of the AI1 block in seconds.

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 0. 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.

5.6.5 Transducer Block Parameters

The transducer block settings are specific to the AV550G functions. Refer to the list of AV550G block parameters in Appendix 1. Here we explain the more important parameter settings.

(1) Explanation of Parameters

1) PRIMARY_VALUE_1 (Relative Index is 13)

Type of measurement, for the AV550G this is 119 (oxygen).

2) PRIMARY_VALUE_2 (Relative Index is 17)
Type of measurement, for the AV550G this is 119 (oxygen).

3) PRIMARY_VALUE_3 (Relative Index is 21)
Type of measurement, for the AV550G this is 119(oxygen).

4) IN_UNIT (Relative Index is 27)
Specifies the units for MAO block channel input value USE_IN_NO (below).
For the AV550G, the following units are supported (if you want to display data in other units, then you can display the data without a units display): 1001 (degC), 1002 (degF), 1130 (Pa), 1132 (MPa), 1133 (kPa), 1137 (bar), 1138 (mbar), 1141 (psi), 1144 (g/cm2), 1145 (g/cm2), 1149 (mmH2O), 1157 (mmHg), 1342 (%), 1423 (ppm). Factory default: 1342 (%)

5) IN_DISPLAY_FORMAT (Relative Index is 28)
Specifies the decimal point position for MAO block channel input value USE_IN_NO (below). This sets the format for all displays. If input data overflows the maximum, or underflows the minimum, then the high or low limit settings will apply. The four possible display format/ range settings are:

0: Display range [-9999 to 9999]

1: Display range [-999.9 to 999.9]

2: Display range [-99.99 to 99.99]

3: Display range [-9.999 to 9.999]

Factory default range setting: 0

6) USE_IN_NO (Relative Index is 29)
Selects which of the eight channels supported by MAO will be displayed on the AV550G. Factory default channel setting: 1

5.6.6 DI Function Block Parameters

DI function block output 1 corresponds to Transducer block “Alarm”, and output 2 corresponds to Transducer block “Error” switch signals.

MODE_BLK
Three block modes O/S, Auto, and Manual are supported. In O/S (Out of Service) mode the DI function block does not operate. In Manual mode the value is not updated. In Auto mode the measured value is periodically updated. The factory default mode setting for all DI blocks is O/S.

CHANNEL
This is a value from the transducer block that is connected to the DI block input.
For the AV550G, it’s set to 4 or 5.

PV_FTIME
This sets the damping time constant of the DI block.

DISC_PRI
Sets the priority of the block output (OUT_D) discrete alarm. If the value is 3 or greater then alarm output is enabled. The factory default setting is 1.

Table 5.18 Alarm Priority

Value	Descriptions
0	Alert output suppressed, and alarm parameters not updated.
1	Alert output suppressed.
3 to 7	Advisory alarm.
8 to 15	Critical alarm.

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DISC_LIM
Sets the value of the Discrete Alarm corresponding to block output OUT_D.
When the value of OUT_D is the same as this value, an alarm is output.

5.6.7 MAI Function Block Parameters

The MAI function block parameters can be read from the host and set. Here we explain the more important parameters.

MODE_BLK
Three block modes O/S, Auto, and Manual are supported. In O/S (Out of Service) mode the MAI function block does not operate. In Manual mode the value is not updated. In Auto mode the measured value is periodically updated. The factory default mode setting for all MAI blocks is O/S.

CHANNEL
This is a value from the transducer block that is connected to the MAI block input.
For the AV550G, it's set to 6.

5.6.8 MAO Function Block Parameters

MODE_BLK
Four block modes O/S, Auto, Manual, and Local Override are supported. In O/S (Out of Service) mode the MAO function block does not operate. In Manual mode the value is not updated. In Auto mode the measured value is periodically updated. In Local Override mode, can be set in actual. The factory default mode setting for MAO blocks is O/S.

CHANNEL
This is a value from the transducer block that is connected to the MAI block input.
For the AV550G, it's set to 7.

MO_OPTS
Specifies whether FSTATE_VAL is used or not. 2- byte bit array.

Bit	Label	Description
0	Fault state to value 1	In Fault State, write FSTATE_VAL1 to IN_1
1	Fault state to value 2	In Fault State, write FSTATE_VAL2 to IN_2
2	Fault state to value 3	In Fault State, write FSTATE_VAL3 to IN_3
3	Fault state to value 4	In Fault State, write FSTATE_VAL4 to IN_4
4	Fault state to value 5	In Fault State, write FSTATE_VAL5 to IN_5
5	Fault state to value 6	In Fault State, write FSTATE_VAL6 to IN_6
6	Fault state to value 7	In Fault State, write FSTATE_VAL7 to IN_7
7	Fault state to value 8	In Fault State, write FSTATE_VAL8 to IN_8
8	Use fault state to value on restart1	On restart, write FSTATE_VAL1 to IN_1
9	Use fault state to value on restart2	On restart, write FSTATE_VAL2 to IN_2
10	Use fault state to value on restart3	On restart, write FSTATE_VAL3 to IN_3
11	Use fault state to value on restart4	On restart, write FSTATE_VAL4 to IN_4
12	Use fault state to value on restart5	On restart, write FSTATE_VAL5 to IN_5
13	Use fault state to value on restart6	On restart, write FSTATE_VAL6 to IN_6
14	Use fault state to value on restart7	On restart, write FSTATE_VAL7 to IN_7
15	Use fault state to value on restart8	On restart, write FSTATE_VAL8 to IN_8

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FSTATE_TIME
Sets time (seconds) from MAO IN_1 to IN_8 communications fail and Fault State.

FSTATE_VAL1 to FSTATE_VAL8
Sets values to write to IN_1 to IN_8 of MAO block when these inputs are in Fault State.

6. IN-PROCESS OPERATION

This section describes AV550G function block mode transitions and status changes during operation.

6.1 Mode Transition

If the function block mode is changed (from Auto) to O/S (Out_Of_Service), the function block is stopped and a block alarm is generated.

If the function block mode is changed (from Auto) to Manual, the function block stops updating output values. In this case it is possible to write desired output values to the OUT parameter.
However, the status of parameters cannot be changed.

6.2 Generation of Alarm or Error Status

6.2.1 AV550G Alarms

If the AV550G self-diagnostic functions detect an abnormality in the AV550G, a device alarm is generated by the resource block. If an abnormality (block error) or process (value abnormal) alarm is detected, the corresponding block generates an alarm.

6.2.2 Alarms and Events

An AV550G can report the following alarms or events as alerts:

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 Block: Block Alarm
By DI Block: Block Alarm
By MAI Block: Block Alarm
By MAO 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
By DI Block: Update Event
By MAI Block: Update Event
By MAO Block: Update Event

An alert has the following structure:

Table 6.1 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	Mft Type	Alert Name identified by manufacturer specific DD
5	5	5	Message Type	Reason for Alert
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

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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 switch is mounted on the AV550G's CONTROL CARD. This is to prevent the accidental operation of this function. When this is switched on, simulation is enabled. (See Figure 6.1.) To initiate the same action from a remote terminal, if REMOTE LOOP TEST SWITCH is written to SIM_ENABLE_MSG (index 1044) parameter 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 block consists of the elements listed in Table 6.2 below.

Table 6.2 SIMULATE Parameter

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	Simulate En/Disable	Controls the simulation function of this block. 1: Disabled (standard) 2: Active(simulation)

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When Simulate En/Disable in Table 6.3 above is set to “Active”, 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

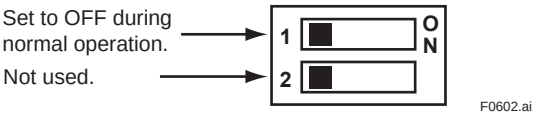

Figure 6.1 SIMULATE_ENABLE Switch Position

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7. DEVICE STATUS

In an AV550G, resource block parameters DEVICE_STATUS_1 through DEVICE_STATUS_4 (with indexes 1045 through 1048) represent alarm and error statuses:

Table 7.1 Contents of DEVICE_STATUS_1 (Index 1045)

Hexadecimal Representation	Reading when DD Is Downloaded	Description
0x02000000	Download fail	Shows that the software downloading state is 0Fail.0
0x01000000	Download incomplete	Shows that the software downloading state is 0Incomplete.0
0x00800000	Simulate enable switch On	Shows that the SIMULATE_ENABLE switch is 0ON.0
0x00400000	RB in O/S mode	Shows that the resource block is in the O/S mode.
0x00080000	AMP module failure 1	Shows that the amplifierís EEPROM is faulty.
0x00008000	Link Obj. 1/17/33 not open	Shows that the VCR specified in Link Object 1 is not open.
0x00004000	Link Obj. 2/18/34 not open	Shows that the VCR specified in Link Object 2 is not open.
0x00002000	Link Obj. 3/19/35 not open	Shows that the VCR specified in Link Object 3 is not open.
0x00001000	Link Obj. 4/20/36 not open	Shows that the VCR specified in Link Object 4 is not open.
0x00000800	Link Obj. 5/21/37 not open	Shows that the VCR specified in Link Object 5 is not open.
0x00000400	Link Obj. 6/22/38 not open	Shows that the VCR specified in Link Object 6 is not open.
0x00000200	Link Obj. 7/23/39 not open	Shows that the VCR specified in Link Object 7 is not open.
0x00000100	Link Obj. 8/24/40 not open	Shows that the VCR specified in Link Object 8 is not open.
0x00000080	Link Obj. 9/25 not open	Shows that the VCR specified in Link Object 9 is not open.
0x00000040	Link Obj. 10/26 not open	Shows that the VCR specified in Link Object 10 is not open.
0x00000020	Link Obj. 11/27 not open	Shows that the VCR specified in Link Object 11 is not open.
0x00000010	Link Obj. 12/28 not open	Shows that the VCR specified in Link Object 12 is not open.
0x00000008	Link Obj. 13/29 not open	Shows that the VCR specified in Link Object 13 is not open.
0x00000004	Link Obj. 14/30 not open	Shows that the VCR specified in Link Object 14 is not open.
0x00000002	Link Obj. 15/31 not open	Shows that the VCR specified in Link Object 15 is not open.
0x00000001	Link Obj. 16/32 not open	Shows that the VCR specified in Link Object 16 is not open.

Table 7.2 Contents of DEVICE_STATUS_2 (Index 1046)

Hexadecimal Representation	Reading when DD Is Downloaded	Description
0x00000002	COM. Circuit failure 1	Shows that the amplifierís communication circuit block is faulty (1).
0x00000001	COM. Circuit failure 2	Shows that the amplifierís communication circuit block is faulty (2).

Table 7.3 Contents of DEVICE_STATUS_3 (Index 1047)

Hexadecimal Representation	Reading when DD Is Downloaded	Description
0x01000000	Transducer Block in O/S mode	Shows that the transducer block is in the O/S mode.
0x00800000	AI Function Block 1 not scheduled	Shows that AI function block 1 is not yet scheduled.
0x00400000	Simulation is enabled in AI Function Block 1	Shows that AI function block 1 is in a SIMULATE state.
0x00200000	AI Function Block 1 in Manual mode	Shows that AI function block 1 is in the Manual mode.
0x00100000	AI Function Block 1 in O/S mode	Shows that AI function block 1 is in the O/S mode.
0x00040000	AI Function Block 2 not scheduled	Shows that AI function block 2 is not yet scheduled.
0x00020000	Simulation is enabled in AI Function Block 2	Shows that AI function block 2 is in a SIMULATE state.
0x00010000	AI Function Block 2 in Manual mode	Shows that AI function block 2 is in the Manual mode.
0x00008000	AI Function Block 2 in O/S mode	Shows that AI function block 2 is in the O/S mode.
0x00002000	AI Function Block 3 not scheduled	Shows that AI function block 3 is not yet scheduled.
0x00001000	Simulation is enabled in AI Function Block 3	Shows that AI function block 3 is in a SIMULATE state.
0x00000800	AI Function Block 3 in Manual mode	Shows that AI function block 3 is in the Manual mode.
0x00000400	AI Function Block 3 in O/S mode	Shows that AI function block 3 is in the O/S mode.
0x00000100	DI Function Block 1 not scheduled	Shows that DI function block 1 is not yet scheduled.
0x00000080	Simulation is enabled in DI Function Block 1	Shows that DI function block 1 is in a SIMULATE state.
0x00000040	DI Function Block 1 in Manual mode	Shows that DI function block 1 is in the Manual mode.
0x00000020	DI Function Block 1 in O/S mode	Shows that DI function block 1 is in the O/S mode.
0x00000008	DI Function Block 2 not scheduled	Shows that DI function block 2 is not yet scheduled.
0x00000004	Simulation is enabled in DI Function Block 2	Shows that DI function block 2 is in a SIMULATE state.
0x00000002	DI Function Block 2 in Manual mode	Shows that DI function block 2 is in the Manual mode.
0x00000001	DI Function Block 2 in O/S mode	Shows that DI function block 2 is in the O/S mode.

Table 7.4 Contents of DEVICE_STATUS_4 (Index 1048)

Hexadecimal Representation	Reading when DD Is Downloaded	Description
0x00000020	MAO Function Block 1 not scheduled	Shows that MAO function block 1 is not yet scheduled.
0x00000010	MAO Function Block 1 in O/S mode	Shows that MAO function block 1 is in the O/S mode.
0x00000004	MAI Function Block 1 not scheduled	Shows that MAI function block 1 is not yet scheduled.
0x00000002	MAI Function Block 1 in Manual mode	Shows that MAI function block 1 is in the Manual mode.
0x00000001	MAI Function Block 1 in O/S mode	Shows that MAI function block 1 is in the O/S mode.

8. GENERAL SPECIFICATIONS

8.1 Standard Specifications

For items other than those described below, refer to GS 11M12D01-01E.

Applicable Models

All the models of AV550G with Fieldbus communication functions (Output code: F).
These models conform to the following EMC standards:
EN61326
AS/NZS2064

Output Signals

Digital communication signal compliant with the FOUNDATION Fieldbus protocol

Physical Layer Type

113 (standard power signaling, bus powered, non I.S.)

Supply Voltage

9 to 32 V DC for general-purpose, flameproof types and Nonincendive.

Condition of Communication Line

Supply voltage: 9 to 32 V DC
Supply current: 15 mA (maximum)

Functional Specifications

The communication specifications conform to the H1 fieldbus specification of the Fieldbus FOUNDATION.

Function blocks
• Three AI function blocks.
• Two DI function blocks.
• One MAI block.
• One MAO block.
Link master functionality (BASIC of factory setting) Software download function

8.2 Model and Suffix Codes

1. Detector

Refer to GS 11M12A01-01E for a detailed explanation of the detector specifications and available accessories.

2. Averaging Converter

Model	Suffix Code	Option Code	Specification
AV550G			Averaging Converter
Base (*1)	-A		4 Channel Base
	-B		8 Channel Base
Number of Channel Card (*2)	-A1		1 Oxygen Channel Card, Common Isolation
	-A2		2 Oxygen Channel Cards, Common Isolation
	-A3		3 Oxygen Channel Cards, Common Isolation
	-A4		4 Oxygen Channel Cards, Common Isolation
	-A5		5 Oxygen Channel Cards, Common Isolation
	-A6		6 Oxygen Channel Cards, Common Isolation
	-A7		7 Oxygen Channel Cards, Common Isolation
	-A8		8 Oxygen Channel Cards, Common Isolation
	-B1		1 Oxygen Channel Card, Individual Isolation
	-B2		2 Oxygen Channel Cards, Individual Isolation
	-B3		3 Oxygen Channel Cards, Individual Isolation
	-B4		4 Oxygen Channel Cards, Individual Isolation
	-B5		5 Oxygen Channel Cards, Individual Isolation
	-B6		6 Oxygen Channel Cards, Individual Isolation
	-B7		7 Oxygen Channel Cards, Individual Isolation
	-B8		8 Oxygen Channel Cards, Individual Isolation
Display	-J		Japanese
	-E		English
	-F		French
	-G		German
Power supply	-1		100 / 115 V AC
	-2		230 V AC (*3)
Communication	-E		HART communication
	-F		FOUNDATION Fieldbus communication (*4)
Options		/SCT	Stainless steel tag plate
		/24	24 Voltage output for Solenoid valve
		/G □□	Cable gland (Numbers in □□) (*5)

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(*1) Select code "-B" (8 Channel Base)when future expansion exceeding 4 channels is expected. By so doing, the expansion can be made economically.

(*2) Common isolation is recommended, when the same instrument receives the analog outputs from each channel card. Individual isolation is recommended to prevent the trouble by mutual interference, when different instrument receives the analog outputs from each channel card.

(*3) When suffix code "-2" (230 V AC) is selected, select code "-A" (4 Channel Base).

(*4) When suffix code "-F" (FOUNDATION Fieldbus communication) is selected, used exclusively for communication.

(*5) Input 01 to 30 in □□ .

Setting When Shipped.

Item	Oxygen concentration (AI)
Tag number* (PD_TAG)	Set to “AV550G” by default unless otherwise specified when ordered.
Output mode (L_TYPE)	“Direct”
Upper and lower calculation range limits and unit (XD_SCALE)	Upper Limit : 100 Lower Limit : 0 Unit : %
Upper and lower output range limits and unit (OUT_SCALE)	
Node address	Set to 0xF7 unless otherwise specified when ordered.

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* The tag number, if specified, will be written to the amplifier memory and inscribed on the stainless steeltag plate.

· A tag number of up to 32 characters of alphanumerics, hyphens (-), and bullets (·) can be written to the amplifier memory.

· A tag number of up to 16 characters of alphanumerics, hyphens (-), and bullets (·) can be inscribed on the stainless steel tag plate (only for models with option code /SCT specified; see GS 11M12D01- 01E).

APPENDIX 1. LIST OF PARAMETERS FOR EACH BLOCK OF AV550G

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

Relative Index	Index	Parameter Name	Factory Default	Write Mode	Explanation
0	1000	Block Header	TAG: “RS”	Block Tag = O/S	Information on this block such as Block Tag, DD Revision, Execution Time etc.
1	1001	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	1002	TAG_DESC	(Spaces)	AUTO	The user description of the intended application of the block.
3	1003	STRATEGY	1	AUTO	The strategy field can be used to identify grouping of blocks. This data is not checked or processed by the
4	1004	ALERT_KEY	1	AUTO	The identification number of the plant unit. This information may be used in the host for sorting alarms, etc.
5	1005	MODE_BLK	—	AUTO	The actual, target, permitted, and normal modes of the block.
6	1006	BLOCK_ERR	0	—	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	1007	RS_STATE	—	—	State of the resource block state machine.
8	1008	TEST_RW	0	AUTO	Read/write test parameter-used only for conformance testing and simulation.
9	1009	DD_RESOURCE	(Spaces)	—	String identifying the tag of the resource which contains the Device Description for this resource.
10	1010	MANUFAC_ID	0x594543	—	Manufacturer identification number-used by an interface device to locate the DD file for the resource.
11	1011	DEV_TYPE	0x401	—	Manufacturer’s model number associated with the resource-used by interface devices to locate the DD file for the resource.
12	1012	DEV_REV	1	—	Manufacturer revision number associated with the resource-used by an interface device to locate the DD file for the resource.
13	1013	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	1014	GRANT_DENY	—	AUTO	Options for controlling access of host computer and local control panels to operating, tuning and alarm parameters of the block.
15	1015	HARD_TYPES	0x0001 (Scalar input)	—	The types of hardware available as channel numbers. bit0: Scalar input bit1: Scalar output bit2: Discrete input bit3: Discrete output

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Relative Index	Index	Parameter Name	Factory Default	Write Mode	Explanation
16	1016	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	1017	FEATURES	0x000e (Soft write lock supported, Fault state supported, Report supported)	—	Used to show supported resource block options.
18	1018	FEATURE_SEL	0x000e (Soft write lock supported, Fault state supported, Report supported)	AUTO	Used to select resource block options.
19	1019	CYCLE_TYPE	0x0001(Scheduled)	—	Identifies the block execution methods available for this resource.
20	1020	CYCLE_SEL	0x0001(Scheduled)	AUTO	Used to select the block execution method for this resource. bit0: Scheduled bit1: Event driven bit2: Manufacturer specified
21	1021	MIN_CYCLE_T	3200	—	Time duration of the shortest cycle interval of which the resource is capable.
22	1022	MEMORY_SIZE	0	—	Available configuration memory in the empty resource. To be checked before attempting a download.
23	1023	NV_CYCLE_T	0	—	Interval between writing copies of NV parameters to non-volatile memory. Zero means never.
24	1024	FREE_SPACE	0	—	Percent of memory available for further configuration. AV550G has zero which means a preconfigured resource.
25	1025	FREE_TIME	0	—	Percent of the block processing time that is free to process additional blocks.
26	1026	SHED_RCAS	640000 (20 s)	AUTO	Time duration at which to give up on computer writes to function block RCas locations.
27	1027	SHED_ROUT	640000 (20 s)	AUTO	Time duration at which to give up on computer writes to function block ROut locations.
28	1028	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	1029	SET_FSTATE	1 (OFF)	AUTO	Allows the fail-safe condition to be manually initiated by selecting Set.
30	1030	CLR_FSTATE	1 (OFF)	AUTO	Writing a Clear to this parameter will clear the device fail-safe state if the field condition, if any, has cleared.
31	1031	MAX_NOTIFY	3	—	Maximum number of unconfirmed notify messages possible.
32	1032	LIM_NOTIFY	3	AUTO	Maximum number of unconfirmed alert notify messages allowed.
33	1033	CONFIRM_TIME	640000 (20 s)	AUTO	The minimum time between retries of alert reports.
34	1034	WRITE_LOCK	Not locked	AUTO	If set, no writes from anywhere are allowed, except to clear WRITE_LOCK. Block inputs will continue to be updated. 1: Not locked, 2: Locked
35	1035	UPDATE_EVT	—	—	This alert is generated by any change to the static data.
36	1036	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.

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Relative Index	Index	Parameter Name	Factory Default	Write Mode	Explanation
37	1037	ALARM_SUM	—	—	The current alert status, unacknowledged states, unreported states, and disabled states of the alarms associated with the function block.
38	1038	ACK_OPTION	0xffff	AUTO	
39	1039	WRITE_PRI	0	AUTO	Priority of the alarm generated by clearing the write lock. 0, 1, 3 to 15
40	1040	WRITE_ALM	—	—	This alert is generated if the write lock parameter is cleared.
41	1041	ITK_VER	4	—	Version number of interoperability test by Fieldbus Foundation applied to AV550G.
42	1042	SOFT_REV	—	—	AV550G software revision number.
43	1043	SOFT_DESC		—	Yokogawa internal use.
44	1044	SIM_ENABLE_MSG	(Spaces)	AUTO	Software switch for simulation function.
45	1045	DEVICE_STATUS_1	—	—	Device status (VCR setting etc.)
46	1046	DEVICE_STATUS_2	—	—	Device status (failure or setting error etc.)
47	1047	DEVICE_STATUS_3	—	—	Device status (function block setting)
48	1048	DEVICE_STATUS_4	—	—	Device status (function block setting)
49	1049	DEVICE_STATUS_5	—	—	Not used for AV550G.
50	1050	DEVICE_STATUS_6	—	—	Not used for AV550G
51	1051	DEVICE_STATUS_7	—	—	Not used for AV550G.
52	1052	DEVICE_STATUS_8	—	—	Not used for AV550G.

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A1.2 AI Function Block

Relative Index	Index AI1	Index AI2	Index AI3	Parameter Name	Factory Default	Write Mode	Explanation
0	4000	4100	4200	Block Header	TAG: AI1, AI2 or AI3	Block Tag = O/S	Information on this block such as Block Tag, DD Revision, Execution Time etc.
1	4001	4101	4201	ST_REV	0	—	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	4002	4102	4202	TAG_DESC	(spaces)	AUTO	The user description of the intended application of the block.
3	4003	4103	4203	STRATEGY	1	AUTO	The strategy field can be used to identify grouping of blocks. This data is not checked or processed by the block.
4	4004	4104	4204	ALERT_KEY	1	AUTO	The identification number of the plant unit. This information may be used in the host for sorting alarms, etc.
5	4005	4105	4205	MODE_BLK	AUTO	AUTO	The actual, target, permitted, and normal modes of the block.
6	4006	4106	4206	BLOCK_ERR	0	—	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	4007	4107	4207	PV	0	—	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	4008	4108	4208	OUT	0	Value = MAN	The primary analog value calculated as a result of executing the function.
9	4009	4109	4209	SIMULATE	Disabled	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. 1=Disabled, 2=Active
10	4010	4110	4210	XD_SCALE		O/S	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	4011	4111	4211	OUT_SCALE		O/S	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	4012	4112	4212	GRANT_DENY	0x00	AUTO	Options for controlling access of host computers and local control panels to operating, tuning and alarm parameters of the block.
13	4013	4113	4213	IO_OPTS	0x0000	O/S	Options which the user may select to alter input and output block processing. bit 6: Low cutoff
14	4014	4114	4214	STATUS_OPTS	0	O/S	Options which the user may select in the block processing of status. bit 3: Propagate Failure Forward, bit 8: Uncertain if Man mode.
15	4015	4115	4215	CHANNEL	1 (AI1) 2 (AI2) 3 (AI3)	O/S	Used to select a transducer block to connect to. In the case of the AV550G, an averaging oxygen concentration a, b and c signals are always set for the AI1, AI2 and AI3 blocks, respectively.
16	4016	4116	4216	L_TYPE	Direct (1)	MAN	Determines if the values passed by the transducer block to the AI block may be used directly (Direct (1)) or if the value is in different units and must be converted linearly (Indirect (2)), or with square root (Ind Sqr Root (3)), using the input range defined by the transducer and the associated output range. "Indirect Square Root" is not used for the AV550G.

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Relative Index	Index AI1	Index AI2	Index AI3	Parameter Name	Factory Default	Write Mode	Explanation
17	4017	4117	4217	LOW_CUT	0.0 (AI1) 0.0 (AI2) 0.0 (AI3)	AUTO	Sets low cut point of output. This low cut value become available by setting "Low cutoff" to "IO_OPTS".
18	4018	4118	4218	PV_FTIME	0sec (AI1) 0sec (AI2) 0sec (AI3)	AUTO	Time constant of a single exponential filter for the PV, in seconds.
19	4019	4119	4219	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), filtering (PV_FTIME), or low cut (LOW_CUT).
20	4020	4120	4220	UPDATE_EVT	—	—	This alert is generated by any change to the static data.
21	4021	4121	4221	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	4022	4122	4222	ALARM_SUM	—	—	The current alert status, unacknowledged states, unreported states, and disabled states of the alarms associated with the function block.
23	4023	4123	4223	ACK_OPTION	0xffff	AUTO	Selection of whether alarms associated with the block will be automatically acknowledged.
24	4024	4124	4224	ALARM_HYS	0.5%	AUTO	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. 0 to 50
25	4025	4125	4225	HI_HI_PRI	0	AUTO	Priority of the high high alarm. 0, 1, 3 to 15
26	4026	4126	4226	HI_HI_LIM	1. #INF	AUTO	The setting for high high alarm in engineering units. (Note 1)
27	4027	4127	4227	HI_PRI	0	AUTO	Priority of the high alarm. 0, 1, 3 to 15
28	4028	4128	4228	HI_LIM	1. #INF	AUTO	The setting for high alarm in engineering units. (Note 1)
29	4029	4129	4229	LO_PRI	0	AUTO	Priority of the low alarm. 0, 1, 3 to 15
30	4030	4130	4230	LO_LIM	-1. #INF	AUTO	The setting for the low alarm in engineering units. (Note 2)
31	4031	4131	4231	LO_LO_PRI	0	AUTO	Priority of the low low alarm. 0, 1, 3 to 15
32	4032	4132	4232	LO_LO_LIM	-1. #INF	AUTO	The setting of the low low alarm in engineering units. (Note 2)
33	4033	4133	4233	HI_HI_ALM	—		The status for high high alarm and its associated time stamp.
34	4034	4134	4234	HI_ALM	—		The status for high alarm and its associated time stamp.
35	4035	4135	4235	LO_ALM	—		The status of the low alarm and its associated time stamp.
36	4036	4136	4236	LO_LO_ALM	—		The status of the low low alarm and its associated time stamp.

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Note 1: An intended set value can be written only if Min(OUT_SCALE.EU0, OUT_SCALE.EU100) ≤ the intended value ≤ +INF.
Note 2: An intended set value cannot be written if –INF ≤ the intended value ≤ Min(OUT_SCALE.EU0, OUT_SCALE.EU100).

A1.3 Transducer Block

Relative Index	Index	Parameter Name	Factory Default	Write Mode	Explanation
0	2000	Block Header	TAG: “TB”	Block Tag = O/S	Information on this block such as Block Tag, DD Revision, and Execution Time.
1	2001	ST_REV	–	–	Represents the revision level of setting parameters associated with the transducer block. Changing the setpoint updates this revision. Used, for example, to check for parameter changes.
2	2002	TAG_DESC	(Spaces)	AUTO	A universal parameter used to store comments on tag contents. 32 characters maximum.
3	2003	STRATEGY	1	AUTO	A universal parameter used specifically when the host system distinguishes one function block from another.
4	2004	ALERT_KEY	1	AUTO	Key information used to identify the place where the alert in question has been issued. Under normal conditions, this parameter is used so that the host system localizes the place to a specific area within the plant targeted by a specific operator and selects only necessary alerts. One of the universal parameters.
5	2005	MODE_BLK	AUTO	AUTO	A universal parameter used to represent the block’s operating condition. This parameter consists of Actual, Target, Permit, and Normal modes.
6	2006	BLOCK_ERR	0	–	Denotes the error status related to the local block. The transducer block of the AV550G deals with the following error factors: p Faulty results of auto-tuning p Amplifier failure p Transducer block in O/S mode
7	2007	UPDATE_EVT	–	–	Shows details on an update event that has occurred.
8	2008	BLOCK_ALM	–	–	Shows details of an error that has occurred within the block.
9	2009	TRANSDUCER_DIRECTORY	1, 2010	–	Stores the indexes of transducers included in the device.
10	2010	TRANSDUCER_TYPE	65535	–	Denotes the device type. The type of AV550G is “Others.”
11	2011	XD_ERROR	0	–	Denotes the highest-priority subcode for an error that occurs to the transducer block, among the following subcodes: 0 = Normal, 20 = Electronics failure, 21 = Mechanical failure, 22 = I/O failure
12	2012	COLLECTION_DIRECTORY	3, 2013, 0x30002, 2017, 0x30006, 2021, 0x3000a	–	Stores the item IDs of DD corresponding to the indexes of important parameters within the transducer block.
13	2013	PRIMARY_VALUE_1_TYPE	119	O/S	Denotes the type of primary 1 quantity. The following setting is allowed for the AV550G. 119 = Oxygen
14	2014	PRIMARY_VALUE_1	–	–	Denotes the oxygen concentration of averaging A.
15	2015	PRIMARY_VALUE_1_RANGE	1342, 100.0, 0.0, 2	–	Denotes the range of averaging A.
16	2016	PRIMARY_VALUE_1_USE_CH	–	–	Denotes the channel used to calculate averaging A.
17	2017	PRIMARY_VALUE_2_TYPE	119	O/S	Denotes the type of primary 2 quantity. The following setting is allowed for the AV550G. 119 = Oxygen
18	2018	PRIMARY_VALUE_2	–	–	Denotes the oxygen concentration of averaging B.
19	2019	PRIMARY_VALUE_2_RANGE	1342, 100.0, 0.0, 2	–	Denotes the range of averaging B.
20	2020	PRIMARY_VALUE_2_USE_CH	–	–	Denotes the channel used to calculate averaging B.
21	2021	PRIMARY_VALUE_3_TYPE	119	O/S	Denotes the type of primary 3 quantity. The following setting is allowed for the AV550G. 119 = Oxygen
22	2022	PRIMARY_VALUE_3	–	–	Denotes the oxygen concentration of averaging C.
23	2023	PRIMARY_VALUE_3_RANGE	1342, 100.0, 0.0, 2	–	Denotes the range of averaging C.
24	2024	PRIMARY_VALUE_3_USE_CH	–	–	Denotes the channel used to calculate averaging C.
25	2025	ALARM_SW_VALUE_D	–	–	Shows that an alarm has been generated in the AV550G.

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26	2026	ERROR_SW_VALUE_D	–	–	Shows that an error has occurred in the AV550G.
27	2027	IN_UNIT	1342	O/S	Denotes the unit of MAO data to be indicated on the AV550G's display.
28	2028	IN_DISPLAY_FORMAT	0	O/S	Denotes the decimal places of MAO data to be indicated on the AV550G's display.
29	2029	USE_IN_NO	1	O/S	Denotes the IN number of MAO data to be indicated on the AV550G's display.
30	2030	PV1_MIN_VALUE	–	–	Denotes the minimum oxygen concentration of averaging A.
31	2031	PV1_MAX_VALUE	–	–	Denotes the maximum oxygen concentration of averaging A.
32	2032	PV1_AVE_VALUE	–	–	Denotes the average oxygen concentration of averaging A.
33	2033	PV1_MIN_DATE	–	–	Denotes the date and time when the minimum oxygen concentration of averaging A was calculated.
34	2034	PV1_MAX_DATE	–	–	Denotes the date and time when the maximum oxygen concentration of averaging A was calculated.
35	2035	PV2_MIN_VALUE	–	–	Denotes the minimum oxygen concentration of averaging B.
36	2036	PV2_MAX_VALUE	–	–	Denotes the maximum oxygen concentration of averaging B.
37	2037	PV2_AVE_VALUE	–	–	Denotes the average oxygen concentration of averaging B.
38	2038	PV2_MIN_DATE	–	–	Denotes the date and time when the minimum oxygen concentration of averaging B was calculated.
39	2039	PV2_MAX_DATE	–	–	Denotes the date and time when the maximum oxygen concentration of averaging B was calculated.
40	2040	PV3_MIN_VALUE	–	–	Denotes the minimum oxygen concentration of averaging C.
41	2041	PV3_MAX_VALUE	–	–	Denotes the maximum oxygen concentration of averaging C.
42	2042	PV3_AVE_VALUE	–	–	Denotes the average oxygen concentration of averaging C.
43	2043	PV3_MIN_DATE	–	–	Denotes the date and time when the minimum oxygen concentration of averaging C was calculated.
44	2044	PV3_MAX_DATE	–	–	Denotes the date and time when the maximum oxygen concentration of averaging C was calculated.
45	2045	CH1_CELL_VOLT	–	–	Denotes the cell electromotive force of the channel-1 detector.
46	2046	CH1_HEATER_TEMP	–	–	Denotes the heater temperature of the channel-1 detector.
47	2047	CH1_CJ_TEMP	–	–	Denotes the cold junction temperature of the channel-1 detector.
48	2048	CH1_TC_VOLT	–	–	Denotes the thermocouple electromotive force of the channel-1 detector.
49	2049	CH1_CJ_VOLT	–	–	Denotes the cold junction voltage of the channel-1 detector.
50	2050	CH1_CELL_RESISTANCE	–	–	Denotes the cell resistance of the channel-1 detector measured during calibration.
51	2051	CH1_CJ_RESISTANCE	–	–	Denotes the cold junction resistance of the channel-1 detector.
52	2052	CH1_ZERO_CAL_COEFF	–	–	Denotes the zero-point correction factor of the channel-1 detector.
53	2053	CH1_SPAN_CAL_COEFF	–	–	Denotes the span-point correction factor of the channel-1 detector.
54	2054	CH1_CELL_ROBUSTNESS	–	–	Denotes the cell service life of the channel-1 detector.
55	2055	CH1_HEATER_ON_TIME	–	–	Denotes the power-on rate of the channel-1 detector's heater.
56	2056	CH1_RESPONSE_TIME	–	–	Denotes the response time of the channel-1 detector measured during calibration.
57	2057	CH1_MIN_VALUE	–	–	Denotes the minimum oxygen concentration of channel 1.
58	2058	CH1_MAX_VALUE	–	–	Denotes the maximum oxygen concentration of channel 1.
59	2059	CH1_AVE_VALUE	–	–	Denotes the average oxygen concentration of channel 1.
60	2060	CH1_MIN_DATE	–	–	Denotes the date and time when the minimum oxygen concentration of channel 1 was calculated.
61	2061	CH1_MAX_DATE	–	–	Denotes the date and time when the maximum oxygen concentration of channel 1 was calculated.
62	2062	CH2_CELL_VOLT	–	–	Denotes the cell electromotive force of the channel-2 detector.
63	2063	CH2_HEATER_TEMP	–	–	Denotes the heater temperature of the channel-2 detector.
64	2064	CH2_CJ_TEMP	–	–	Denotes the cold junction temperature of the channel-2 detector.

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65	2065	CH2_TC_VOLT	–	–	Denotes the thermocouple electromotive force of the channel-2 detector.
66	2066	CH2_CJ_VOLT	–	–	Denotes the cold junction voltage of the channel-2 detector.
67	2067	CH2_CELL_RESISTANCE	–	–	Denotes the cell resistance of the channel-2 detector measured during calibration.
68	2068	CH2_CJ_RESISTANCE	–	–	Denotes the cold junction resistance of the channel-2 detector.
69	2069	CH2_ZERO_CAL_COEFF	–	–	Denotes the zero-point correction factor of the channel-2 detector.
70	2070	CH2_SPAN_CAL_COEFF	–	–	Denotes the span-point correction factor of the channel-2 detector.
71	2071	CH2_CELL_ROBUSTNESS	–	–	Denotes the cell service life of the channel-2 detector.
72	2072	CH2_HEATER_ON_TIME	–	–	Denotes the power-on rate of the channel-2 detector's heater.
73	2073	CH2_RESPONSE_TIME	–	–	Denotes the response time of the channel-2 detector measured during calibration.
74	2074	CH2_MIN_VALUE	–	–	Denotes the minimum oxygen concentration of channel 2.
75	2075	CH2_MAX_VALUE	–	–	Denotes the maximum oxygen concentration of channel 2.
76	2076	CH2_AVE_VALUE	–	–	Denotes the average oxygen concentration of channel 2.
77	2077	CH2_MIN_DATE	–	–	Denotes the date and time when the minimum oxygen concentration of channel 2 was calculated.
78	2078	CH2_MAX_DATE	–	–	Denotes the date and time when the maximum oxygen concentration of channel 2 was calculated.
79	2079	CH3_CELL_VOLT	–	–	Denotes the cell electromotive force of the channel-3 detector.
80	2080	CH3_HEATER_TEMP	–	–	Denotes the heater temperature of the channel-3 detector.
81	2081	CH3_CJ_TEMP	–	–	Denotes the cold junction temperature of the channel-3 detector.
82	2082	CH3_TC_VOLT	–	–	Denotes the thermocouple electromotive force of the channel-3 detector.
83	2083	CH3_CJ_VOLT	–	–	Denotes the cold junction voltage of the channel-3 detector.
84	2084	CH3_CELL_RESISTANCE	–	–	Denotes the cell resistance of the channel-3 detector measured during calibration.
85	2085	CH3_CJ_RESISTANCE	–	–	Denotes the cold junction resistance of the channel-3 detector.
86	2086	CH3_ZERO_CAL_COEFF	–	–	Denotes the zero-point correction factor of the channel-3 detector.
87	2087	CH3_SPAN_CAL_COEFF	–	–	Denotes the span-point correction factor of the channel-3 detector.
88	2088	CH3_CELL_ROBUSTNESS	–	–	Denotes the cell service life of the channel-3 detector.
89	2089	CH3_HEATER_ON_TIME	–	–	Denotes the power-on rate of the channel-3 detector's heater.
90	2090	CH3_RESPONSE_TIME	–	–	Denotes the response time of the channel-3 detector measured during calibration.
91	2091	CH3_MIN_VALUE	–	–	Denotes the minimum oxygen concentration of channel 3.
92	2092	CH3_MAX_VALUE	–	–	Denotes the maximum oxygen concentration of channel 3.
93	2093	CH3_AVE_VALUE	–	–	Denotes the average oxygen concentration of channel 3.
94	2094	CH3_MIN_DATE	–	–	Denotes the date and time when the minimum oxygen concentration of channel 3 was calculated.
95	2095	CH3_MAX_DATE	–	–	Denotes the date and time when the maximum oxygen concentration of channel 3 was calculated.
96	2096	CH4_CELL_VOLT	–	–	Denotes the cell electromotive force of the channel-4 detector.
97	2097	CH4_HEATER_TEMP	–	–	Denotes the heater temperature of the channel-4 detector.
98	2098	CH4_CJ_TEMP	–	–	Denotes the cold junction temperature of the channel-4 detector.
99	2099	CH4_TC_VOLT	–	–	Denotes the thermocouple electromotive force of the channel-4 detector.
100	2100	CH4_CJ_VOLT	–	–	Denotes the cold junction voltage of the channel-4 detector.

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101	2101	CH4_CELL_RESISTANCE	–	–	Denotes the cell resistance of the channel-4 detector measured during calibration.
102	2102	CH4_CJ_RESISTANCE	–	–	Denotes the cold junction resistance of the channel-4 detector.
103	2103	CH4_ZERO_CAL_COEFF	–	–	Denotes the zero-point correction factor of the channel-4 detector.
104	2104	CH4_SPAN_CAL_COEFF	–	–	Denotes the span-point correction factor of the channel-4 detector.
105	2105	CH4_CELL_ROBUSTNESS	–	–	Denotes the cell service life of the channel-4 detector.
106	2106	CH4_HEATER_ON_TIME	–	–	Denotes the power-on rate of the channel-4 detector's heater.
107	2107	CH4_RESPONSE_TIME	–	–	Denotes the response time of the channel-4 detector measured during calibration.
108	2108	CH4_MIN_VALUE	–	–	Denotes the minimum oxygen concentration of channel 4.
109	2109	CH4_MAX_VALUE	–	–	Denotes the maximum oxygen concentration of channel 4.
110	2110	CH4_AVE_VALUE	–	–	Denotes the average oxygen concentration of channel 4.
111	2111	CH4_MIN_DATE	–	–	Denotes the date and time when the minimum oxygen concentration of channel 4 was calculated.
112	2112	CH4_MAX_DATE	–	–	Denotes the date and time when the maximum oxygen concentration of channel 4 was calculated.
113	2113	CH5_CELL_VOLT	–	–	Denotes the cell electromotive force of the channel-5 detector.
114	2114	CH5_HEATER_TEMP	–	–	Denotes the heater temperature of the channel-5 detector.
115	2115	CH5_CJ_TEMP	–	–	Denotes the cold junction temperature of the channel-5 detector.
116	2116	CH5_TC_VOLT	–	–	Denotes the thermocouple electromotive force of the channel-5 detector.
117	2117	CH5_CJ_VOLT	–	–	Denotes the cold junction voltage of the channel-5 detector.
118	2118	CH5_CELL_RESISTANCE	–	–	Denotes the cell resistance of the channel-5 detector measured during calibration.
119	2119	CH5_CJ_RESISTANCE	–	–	Denotes the cold junction resistance of the channel-5 detector.
120	2120	CH5_ZERO_CAL_COEFF	–	–	Denotes the zero-point correction factor of the channel-5 detector.
121	2121	CH5_SPAN_CAL_COEFF	–	–	Denotes the span-point correction factor of the channel-5 detector.
122	2122	CH5_CELL_ROBUSTNESS	–	–	Denotes the cell service life of the channel-5 detector.
123	2123	CH5_HEATER_ON_TIME	–	–	Denotes the power-on rate of the channel-5 detector's heater.
124	2124	CH5_RESPONSE_TIME	–	–	Denotes the response time of the channel-5 detector measured during calibration.
125	2125	CH5_MIN_VALUE	–	–	Denotes the minimum oxygen concentration of channel 5.
126	2126	CH5_MAX_VALUE	–	–	Denotes the maximum oxygen concentration of channel 5.
127	2127	CH5_AVE_VALUE	–	–	Denotes the average oxygen concentration of channel 5.
128	2128	CH5_MIN_DATE	–	–	Denotes the date and time when the minimum oxygen concentration of channel 5 was calculated.
129	2129	CH5_MAX_DATE	–	–	Denotes the date and time when the maximum oxygen concentration of channel 5 was calculated.
130	2130	CH6_CELL_VOLT	–	–	Denotes the cell electromotive force of the channel-6 detector.
131	2131	CH6_HEATER_TEMP	–	–	Denotes the heater temperature of the channel-6 detector.
132	2132	CH6_CJ_TEMP	–	–	Denotes the cold junction temperature of the channel-6 detector.
133	2133	CH6_TC_VOLT	–	–	Denotes the thermocouple electromotive force of the channel-6 detector.
134	2134	CH6_CJ_VOLT	–	–	Denotes the cold junction voltage of the channel-6 detector.
135	2135	CH6_CELL_RESISTANCE	–	–	Denotes the cell resistance of the channel-6 detector measured during calibration.
136	2136	CH6_CJ_RESISTANCE	–	–	Denotes the cold junction resistance of the channel-6 detector.
137	2137	CH6_ZERO_CAL_COEFF	–	–	Denotes the zero-point correction factor of the channel-6 detector.

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138	2138	CH6_SPAN_CAL_COEFF	–	–	Denotes the span-point correction factor of the channel-6 detector.
139	2139	CH6_CELL_ROBUSTNESS	–	–	Denotes the cell service life of the channel-6 detector.
140	2140	CH6_HEATER_ON_TIME	–	–	Denotes the power-on rate of the channel-6 detector's heater.
141	2141	CH6_RESPONSE_TIME	–	–	Denotes the response time of the channel-6 detector measured during calibration.
142	2142	CH6_MIN_VALUE	–	–	Denotes the minimum oxygen concentration of channel 6.
143	2143	CH6_MAX_VALUE	–	–	Denotes the maximum oxygen concentration of channel 6.
144	2144	CH6_AVE_VALUE	–	–	Denotes the average oxygen concentration of channel 6.
145	2145	CH6_MIN_DATE	–	–	Denotes the date and time when the minimum oxygen concentration of channel 6 was calculated.
146	2146	CH6_MAX_DATE	–	–	Denotes the date and time when the maximum oxygen concentration of channel 6 was calculated.
147	2147	CH7_CELL_VOLT	–	–	Denotes the cell electromotive force of the channel-7 detector.
148	2148	CH7_HEATER_TEMP	–	–	Denotes the heater temperature of the channel-7 detector.
149	2149	CH7_CJ_TEMP	–	–	Denotes the cold junction temperature of the channel-7 detector.
150	2150	CH7_TC_VOLT	–	–	Denotes the thermocouple electromotive force of the channel-7 detector.
151	2151	CH7_CJ_VOLT	–	–	Denotes the cold junction voltage of the channel-7 detector.
152	2152	CH7_CELL_RESISTANCE	–	–	Denotes the cell resistance of the channel-7 detector measured during calibration.
153	2153	CH7_CJ_RESISTANCE	–	–	Denotes the cold junction resistance of the channel-7 detector.
154	2154	CH7_ZERO_CAL_COEFF	–	–	Denotes the zero-point correction factor of the channel-7 detector.
155	2155	CH7_SPAN_CAL_COEFF	–	–	Denotes the span-point correction factor of the channel-7 detector.
155	2156	CH7_CELL_ROBUSTNESS	–	–	Denotes the cell service life of the channel-7 detector.
157	2157	CH7_HEATER_ON_TIME	–	–	Denotes the power-on rate of the channel-7 detector's heater.
158	2158	CH7_RESPONSE_TIME	–	–	Denotes the response time of the channel-7 detector measured during calibration.
159	2159	CH7_MIN_VALUE	–	–	Denotes the minimum oxygen concentration of channel 7.
160	2160	CH7_MAX_VALUE	–	–	Denotes the maximum oxygen concentration of channel 7.
161	2161	CH7_AVE_VALUE	–	–	Denotes the average oxygen concentration of channel 7.
162	2162	CH7_MIN_DATE	–	–	Denotes the date and time when the minimum oxygen concentration of channel 7 was calculated.
163	2163	CH7_MAX_DATE	–	–	Denotes the date and time when the maximum oxygen concentration of channel 7 was calculated.
164	2164	CH8_CELL_VOLT	–	–	Denotes the cell electromotive force of the channel-8 detector.
165	2165	CH8_HEATER_TEMP	–	–	Denotes the heater temperature of the channel-8 detector.
166	2166	CH8_CJ_TEMP	–	–	Denotes the cold junction temperature of the channel-8 detector.
167	2167	CH8_TC_VOLT	–	–	Denotes the thermocouple electromotive force of the channel-8 detector.
168	2168	CH8_CJ_VOLT	–	–	Denotes the cold junction voltage of the channel-8 detector.
169	2169	CH8_CELL_RESISTANCE	–	–	Denotes the cell resistance of the channel-8 detector measured during calibration.
170	2170	CH8_CJ_RESISTANCE	–	–	Denotes the cold junction resistance of the channel-8 detector.
171	2171	CH8_ZERO_CAL_COEFF	–	–	Denotes the zero-point correction factor of the channel-8 detector.
172	2172	CH8_SPAN_CAL_COEFF	–	–	Denotes the span-point correction factor of the channel-8 detector.
173	2173	CH8_CELL_ROBUSTNESS	–	–	Denotes the cell service life of the channel-8 detector.
174	2174	CH8_HEATER_ON_TIME	–	–	Denotes the power-on rate of the channel-8 detector's heater.
175	2175	CH8_RESPONSE_TIME	–	–	Denotes the response time of the channel-8 detector measured during calibration.

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176	2176	CH8_MIN_VALUE	–	–	Denotes the minimum oxygen concentration of channel 8.
177	2177	CH8_MAX_VALUE	–	–	Denotes the maximum oxygen concentration of channel 8.
178	2178	CH8_AVE_VALUE	–	–	Denotes the average oxygen concentration of channel 8.
179	2179	CH8_MIN_DATE	–	–	Denotes the date and time when the minimum oxygen concentration of channel 8 was calculated.
180	2180	CH8_MAX_DATE	–	–	Denotes the date and time when the maximum oxygen concentration of channel 8 was calculated.
181	2181	CH1_SMART_CALIB_DATE	–	–	Denotes the recommended date of channel 1's next calibration.
182	2182	CH2_SMART_CALIB_DATE	–	–	Denotes the recommended date of channel 2's next calibration.
183	2183	CH3_SMART_CALIB_DATE	–	–	Denotes the recommended date of channel 3's next calibration.
184	2184	CH4_SMART_CALIB_DATE	–	–	Denotes the recommended date of channel 4's next calibration.
185	2185	CH5_SMART_CALIB_DATE	–	–	Denotes the recommended date of channel 5's next calibration.
186	2186	CH6_SMART_CALIB_DATE	–	–	Denotes the recommended date of channel 6's next calibration.
187	2187	CH7_SMART_CALIB_DATE	–	–	Denotes the recommended date of channel 7's next calibration.
188	2188	CH8_SMART_CALIB_DATE	–	–	Denotes the recommended date of channel 8's next calibration.
189	2189	CH1_SEMIAUTO_CAL_START	1 (stop)	AUTO	Determines whether to start or stop semi-auto calibrating channel 1.
190	2190	CH2_SEMIAUTO_CAL_START	1 (stop)	AUTO	Determines whether to start or stop semi-auto calibrating channel 2.
191	2191	CH3_SEMIAUTO_CAL_START	1 (stop)	AUTO	Determines whether to start or stop semi-auto calibrating channel 3.
192	2192	CH4_SEMIAUTO_CAL_START	1 (stop)	AUTO	Determines whether to start or stop semi-auto calibrating channel 4.
193	2193	CH5_SEMIAUTO_CAL_START	1 (stop)	AUTO	Determines whether to start or stop semi-auto calibrating channel 5.
194	2194	CH6_SEMIAUTO_CAL_START	1 (stop)	AUTO	Determines whether to start or stop semi-auto calibrating channel 6.
195	2195	CH7_SEMIAUTO_CAL_START	1 (stop)	AUTO	Determines whether to start or stop semi-auto calibrating channel 7.
196	2196	CH8_SEMIAUTO_CAL_START	1 (stop)	AUTO	Determines whether to start or stop semi-auto calibrating channel 8.
197	2197	CH1_INDICATION_START	1 (stop)	AUTO	Determines whether to start or stop semi-auto checking the indication of channel 1.
198	2198	CH2_INDICATION_START	1 (stop)	AUTO	Determines whether to start or stop semi-auto checking the indication of channel 2.
199	2199	CH3_INDICATION_START	1 (stop)	AUTO	Determines whether to start or stop semi-auto checking the indication of channel 3.
200	2200	CH4_INDICATION_START	1 (stop)	AUTO	Determines whether to start or stop semi-auto checking the indication of channel 4.
201	2201	CH5_INDICATION_START	1 (stop)	AUTO	Determines whether to start or stop semi-auto checking the indication of channel 5.
202	2202	CH6_INDICATION_START	1 (stop)	AUTO	Determines whether to start or stop semi-auto checking the indication of channel 6.
203	2203	CH7_INDICATION_START	1 (stop)	AUTO	Determines whether to start or stop semi-auto checking the indication of channel 7.
204	2204	CH8_INDICATION_START	1 (stop)	AUTO	Determines whether to start or stop semi-auto checking the indication of channel 8.
205	2205	BLOWBACK_START	1 (stop)	AUTO	Determines whether to start or stop blowing back.
206	2206	CAL_GAS_PRESS_DROP_SW	1 (off)	AUTO	Sets the on or off state for a drop in the calibration gas pressure.
207	2207	PROCESS_GAS_ALARM_SW	1 (off)	AUTO	Sets the on or off state for process gas alarms.

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208	2208	CH1_DETC	–	–	Denotes the type of the channel-1 detector.
209	2209	CH2_DETC	–	–	Denotes the type of the channel-2 detector.
210	2210	CH3_DETC	–	–	Denotes the type of the channel-3 detector.
211	2211	CH4_DETC	–	–	Denotes the type of the channel-4 detector.
212	2212	CH5_DETC	–	–	Denotes the type of the channel-5 detector.
213	2213	CH6_DETC	–	–	Denotes the type of the channel-6 detector.
214	2214	CH7_DETC	–	–	Denotes the type of the channel-7 detector.
215	2215	CH8_DETC	–	–	Denotes the type of the channel-8 detector.
216	2216	AV550G_STATUS	–	–	Denotes the alarm/failure status of the control card.
217	2217	CH1_STATUS	–	–	Denotes the alarm/failure status of channel 1.
218	2218	CH2_STATUS	–	–	Denotes the alarm/failure status of channel 2.
219	2219	CH3_STATUS	–	–	Denotes the alarm/failure status of channel 3.
220	2220	CH4_STATUS	–	–	Denotes the alarm/failure status of channel 4.
221	2221	CH5_STATUS	–	–	Denotes the alarm/failure status of channel 5.
222	2222	CH6_STATUS	–	–	Denotes the alarm/failure status of channel 6.
223	2223	CH7_STATUS	–	–	Denotes the alarm/failure status of channel 7.
224	2224	CH8_STATUS	–	–	Denotes the alarm/failure status of channel 8.
225	2225	IPL_SOFT_REV	–	–	Denotes the software revision of the IPL.
226	2226	CONTROL_SOFT_REV	–	–	Denotes the software revision of the control card.
227	2227	CH1_SOFT_REV	–	–	Denotes the software revision of channel 1.
228	2228	CH2_SOFT_REV	–	–	Denotes the software revision of channel 2.
229	2229	CH3_SOFT_REV	–	–	Denotes the software revision of channel 3.
230	2230	CH4_SOFT_REV	–	–	Denotes the software revision of channel 4.
231	2231	CH5_SOFT_REV	–	–	Denotes the software revision of channel 5.
232	2232	CH6_SOFT_REV	–	–	Denotes the software revision of channel 6.
233	2233	CH7_SOFT_REV	–	–	Denotes the software revision of channel 7.
234	2234	CH8_SOFT_REV	–	–	Denotes the software revision of channel 8.
235	2235	REMOVE_ALARM_CH	1	–	Shows that channels in an oxygen concentration alarm status are excluded from averaging processing.
236	2236	ALARM_SUM	0	O/S, AUTO	Denotes the block-wide alarm status. Can only be set to “Disable.”
237	2237	TEST_1	–	–	A parameter for internal use only. No access allowed.
238	2238	TEST_2	–	–	A parameter for internal use only. No access allowed.
239	2239	TEST_3	–	–	A parameter for internal use only. No access allowed.
240	2240	TEST_4	–	–	A parameter for internal use only. No access allowed.
241	2241	TEST_5	–	–	A parameter for internal use only. No access allowed.
242	2242	TEST_6	–	–	A parameter for internal use only. No access allowed.
243	2243	TEST_7	–	–	A parameter for internal use only. No access allowed.
244	2244	TEST_8	–	–	A parameter for internal use only. No access allowed.
245	2245	TEST_9	–	–	A parameter for internal use only. No access allowed.
246	2246	TEST_10	–	–	A parameter for internal use only. No access allowed.
247	2247	TEST_11	–	–	A parameter for internal use only. No access allowed.
248	2248	TEST_12	–	–	A parameter for internal use only. No access allowed.
249	2249	TEST_13	–	–	A parameter for internal use only. No access allowed.
250	2250	TEST_14	–	–	A parameter for internal use only. No access allowed.

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A1.4 DI Function Block

Relative Index	Index DI1	Index DI2	Parameter Name	Factory Default	Write Mode	Explanation
0	6000	6100	Block Header		Block Tag = O/S	Information on this block such as the block tag, DD revision, and execution time
1	6001	6101	ST_REV	0	—	The revision level of the static data of the DI block. The value of this parameter is incremented each time a static parameter value is changed.
2	6002	6102	TAG_DESC	(spaces)	AUTO	The user description of the intended application of the block
3	6003	6103	STRATEGY	1	AUTO	Used by an upper-level system to identify grouping of the block. Not checked or processed by the block.
4	6004	6104	ALERT_KEY	1	AUTO	The identification number of the plant unit. This information may be used in the host for sorting alarms.
5	6005	6105	MODE_BLK	O/S	AUTO	The actual, target, permitted, and normal modes of the block
6	6006	6106	BLOCK_ERR	—	—	Indicates the error statuses related to the block itself.
7	6007	6107	PV_D	—	—	The primary discrete value (or process value) for execution of the block's functions.
8	6008	6108	OUT_D	—	MAN	Indicates the value and status of block's output.
9	6009	6109	SIMULATE_D	Disabled	AUTO	Allows use of values manually set instead of the limit switch input from the transducer block. When Disable is set for this value, the block reflects the actual input value and status. 1 = Disabled, 2 = Active
10	6010	6110	XD_STATE	0	—	Not used in a AV550G.
11	6011	6111	OUT_STATE	0	—	Not used in a AV550G.
12	6012	6112	GRANT_DENY	0	AUTO	Option to control access from the host computer and local control panel to tuning and alarm parameters. Before write access to a parameter, set the GRANT bit in this parameter to have the operation right to be granted. Then after write access, check the DENY bit in this parameter. If the write access is complete successfully, it is not ON.
13	6013	6113	IO_OPTS	0	O/S	Sets the block input/output options.
14	6014	6114	STATUS_OPTS	0	O/S	Defines block actions depending on block status conditions. For DI blocks of a AV550G, only bit 0 (Invert: on/off state inversion) is effective.
15	6015	6115	CHANNEL	4 (DI1) 5 (DI2)	O/S	The channel number of the transducer block's logical hardware channel connected to this block. This parameter is always fixed for the DI block of the AV550G.
16	6016	6116	PV_FTIME	0 s	AUTO	Sets the time constant of damping for PV_D.
17	6017	6117	FIELD_VAL_D	—	—	The status of the limit switch signal transferred from the transducer block
18	6018	6118	UPDATE_EVT	—	—	Shows the contents of an update event (a change to the setpoint) upon occurrence.
19	6019	6119	BLOCK_ALM	—	—	Shows the contents of a block alarm upon occurrence.
20	6020	6120	ALARM_SUM	0	AUTO	Indicates the current alarm statuses.
21	6021	6121	ACK_OPTION	0xffff (Unack)	AUTO	Selects whether alarms associated with the block will be automatically acknowledged.
22	6022	6122	DISC_PRI	0	AUTO	Sets the alarm priority level.
23	6023	6123	DISC_LIM	0	AUTO	Indicates the status of the input for the discrete alarm.
24	6024	6124	DISC_ALM	—	—	Indicates the status related to the discrete alarm.

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A1.5 MAI Function Block

Relative Index	Index	Parameter Name	Factory Default	Write Mode	Explanation
0	9000	Block Header	TAG: “MAI1”	Block Tag = O/S	Information on this block such as Block Tag, DD Revision, and Execution.
1	9001	ST_REV	–	–	Represents the revision level of setting parameters associated with the MAI block. Changing the setpoint updates this revision. Used, for example, to check for parameter changes.
2	9002	TAG_DESC	(Spaces)	AUTO	A universal parameter used to store comments on tag contents. 32 characters maximum.
3	9003	STRATEGY	1	AUTO	A universal parameter used specifically when the host system distinguishes one function block from another.
4	9004	ALERT_KEY	1	AUTO	Key information used to identify the place where the alert in question has been issued. Under normal conditions, this parameter is used so that the host system localizes the place to a specific area within the plant targeted by a specific operator and selects only necessary alerts. One of the universal parameters.
5	9005	MODE_BLK	AUTO	AUTO	A universal parameter used to represent the block’s operating status. This parameter consists of Actual, Target, Permit, and Normal modes.
6	9006	BLOCK_ERR	0	–	Denotes the error status related to the local block.
7	9007	CHANNEL	6	O/S	Used to set the channel number of the hardware to be coupled with the transducer block. This parameter is fixed to 6 for the AV550G.
8	9008	OUT_1	–	MAN	Denotes the output value and status.
9	9009	OUT_2	–	MAN	Denotes the output value and status.
10	9010	OUT_3	–	MAN	Denotes the output value and status.
11	9011	OUT_4	–	MAN	Denotes the output value and status.
12	9012	OUT_5	–	MAN	Denotes the output value and status.
13	9013	OUT_6	–	MAN	Denotes the output value and status.
14	9014	OUT_7	–	MAN	Denotes the output value and status.
15	9015	OUT_8	–	MAN	Denotes the output value and status.
16	9016	UPDATE_EVT	–	–	Shows details on an update event that has occurred.
17	9017	BLOCK_ALM	–	–	Shows details of an error that has occurred within the block.

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A1.6 MAO Function Block

Relative Index	Index	Parameter Name	Factory Default	Write Mode	Explanation
0	10000	Block Header	TAG: “MAO1”	Block Tag = O/S	Information on this block such as Block Tag, DD Revision, and Execution.
1	10001	ST_REV	–	–	Represents the revision level of setting parameters associated with the MAO block. Changing the setpoint updates this revision. Used, for example, to check for parameter changes.
2	10002	TAG_DESC	(Spaces)	AUTO	A universal parameter used to store comments on tag contents. 32 characters maximum.
3	10003	STRATEGY	1	AUTO	A universal parameter used specifically when the host system distinguishes one function block from another.
4	10004	ALERT_KEY	1	AUTO	Key information used to identify the place where the alert in question has been issued. Under normal conditions, this parameter is used so that the host system localizes the place to a specific area within the plant targeted by a specific operator and selects only necessary alerts. One of the universal parameters.
5	10005	MODE_BLK	AUTO	AUTO	A universal parameter used to represent the block’s operating status. This parameter consists of Actual, Target, Permit, and Normal modes.
6	10006	BLOCK_ERR	0	–	Denotes the error status related to the local block.
7	10007	CHANNEL	7	O/S	Used to set the channel number of the hardware to be coupled with the transducer block. This parameter is fixed to 7 for the AV550G.
8	10008	IN_1	–	MAN	Denotes the input value and status.
9	10009	IN_2	–	MAN	Denotes the input value and status.
10	10010	IN_3	–	MAN	Denotes the input value and status.
11	10011	IN_4	–	MAN	Denotes the input value and status.
12	10012	IN_5	–	MAN	Denotes the input value and status.
13	10013	IN_6	–	MAN	Denotes the input value and status.
14	10014	IN_7	–	MAN	Denotes the input value and status.
15	10015	IN_8	–	MAN	Denotes the input value and status.
16	10016	MO_OPTS	0	AUTO	Sets the method for processing the values of IN_1 to IN_8.
17	10017	FSTATE_TIME	0	AUTO	Denotes the time taken from when any of IN_1 to IN_8 fails to when the block falls into a fault state (unit: sec).
18	10018	FSTATE_VAL1	0	AUTO	A value to be stored as the value of IN_1 when IN_1 falls into a fault state.
19	10019	FSTATE_VAL2	0	AUTO	A value to be stored as the value of IN_1 when IN_2 falls into a fault state.
20	10020	FSTATE_VAL3	0	AUTO	A value to be stored as the value of IN_1 when IN_3 falls into a fault state.
21	10021	FSTATE_VAL4	0	AUTO	A value to be stored as the value of IN_1 when IN_4 falls into a fault state.
22	10022	FSTATE_VAL5	0	AUTO	A value to be stored as the value of IN_1 when IN_5 falls into a fault state.
23	10023	FSTATE_VAL6	0	AUTO	A value to be stored as the value of IN_1 when IN_6 falls into a fault state.
24	10024	FSTATE_VAL7	0	AUTO	A value to be stored as the value of IN_1 when IN_7 falls into a fault state.
25	10025	FSTATE_VAL8	0	AUTO	A value to be stored as the value of IN_1 when IN_8 falls into a fault state.
26	10026	FSTATE_STATUS	0	–	Shows whether any of IN_1 to IN_8 is in a fault state.
27	10027	UPDATE_EVT	–	–	Shows details on an update event that has occurred.
28	10028	BLOCK_ALM	–	–	Shows details of an error that has occurred within the block.

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APPENDIX 2. APPLICATION, SETTING AND CHANGE OF BASIC PARAMETERS

A2.1 Applications and Selection of Basic Parameters

Setting Item (applicable parameters)	Summary
Tag numbers (PD-TAG)	Set the physical device (PD) tag and block tags. Up to 32 alphanumeric characters can be set for each of these tags. Refer to Section 5.4, “Setting of Tags and Addresses.”
Calibration range setup (XD_SCALE of AI block)	Sets the range of input from the transducer block corresponding to the 0% and 100% points in operation within the AI function block. The maximum oxygen concentration scale value shown on an order sheet (WS 1F6A0-01E) is the factory default setting. Set four data: the unit of the range, the input value at the 0% point, the input value at the 100% point, and the decimal point position.
Output scale setup (OUT_SCALE of AI block)	Set 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 differ from the measurement range. Set four data: the unit of the scale, the output value at the 0% point (i.e., the lower output scale limit), the output value at the 100% point (i.e., the upper output scale limit), and the decimal point position.
Output mode setup (L_TYPE of AI block)	Select the calculation function of each AI function block from the following: • Direct: The output of the transducer block is directly output only via filtering without scaling and square root extraction (in the range set in XD_SCALE). • Indirect: Proportional scaling is applied to the input to the AI function block, and the result is output (in the range set in OUT_SCALE). • IndirectSQRT: Square root extraction is applied to the input to the AI function block and the result is output (in the range set in OUT_SCALE). This setting is not used for a AV550G.
Simulation setup (SIMULATE of AI/DI block)	Simulation of each AI/DI block can be performed in such a way that the value and status of the input to the block can be set arbitrarily. Use this function for loop checks or the like. Refer to Section 6.3, “Simulation Function. ”

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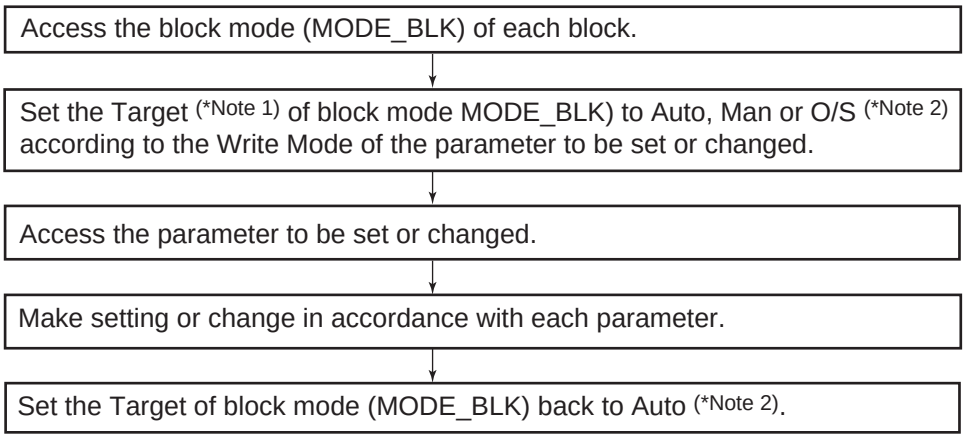
A2.2 Setting and Change of Basic Parameters

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



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IMPORTANT

Do not turn the power OFF immediately after parameter setting. When the parameters are saved to the EEPROM, the redundant processing is executed for the improvement of reliability. If the power is turned OFF within 60 seconds after setting of parameters, changed parameters are not saved and may return 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: Sets the operating condition of the block.
Actual: Indicates the current operating condition.
Permit: Indicates the operating condition that the block is allowed to take.
Normal: Indicates the operating condition that the block will usually take.

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

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

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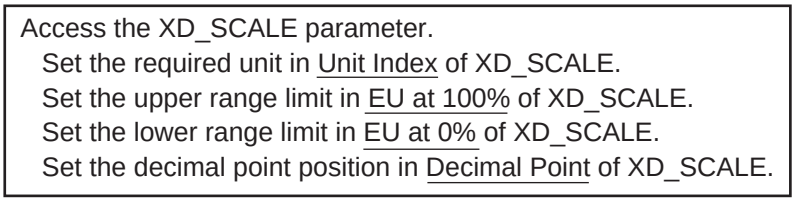
Note: Refer to Appendix 1, “List of parameters for each block of the AV550G” for details of the Write Mode for each block.

A2.3 Setting the AI Function Blocks

Each AV550G contains three AI function blocks having independent parameters. Set up the parameters of each AI block you use, individually as necessary.

The AI block performs the averaging oxygen concentration output calculation.

(1)-1. Setting the calibration range



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Example:
To measure 0 to 100%,
Set (1342)*1 in Units Index of XD_SCALE,
Set 100 in EU at 100% of XD_SCALE, and
Set 0 in EU at 0% of XD_SCALE.

(1)-2. Setting the output scale

Access the OUT_SCALE parameter.
Set the required unit in Unit Index of OUT_SCALE.
Set the output value corresponding to the upper range limit in EU at 100% of OUT_SCALE.
Set the output value corresponding to the lower range limit in EU at 0% of OUT_SCALE.
Set the decimal point position in Decimal Point of OUT_SCALE.

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Example:
To set the output range to 0.00 to 100.00%,
Set (1342)*1 in Units Index of OUT_SCALE,
Set 100 in EU at 100% of OUT_SCALE,
Set 0 in EU at 0% of OUT_SCALE,
and Set 2 in Decimal Point of OUT_SCALE.

*1: Each unit is expressed using a 4-digit numeric code. Refer to Section 5.6.4, “AI Function Block Parameters.”

(2) 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)*1

*1: IndirectSQRT is not used for the AV550G.

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(3) Simulation

Perform simulation of each AI function block by setting the desired value and status of the input to the block.

REMOTE LOOP TEST SWITCH is written to SIM_ENABLE_MSG (index 1044) parameter of the resource block.

↓

Access the En/Disable element of the SIMULATE parameter to enable simulation.
1: Disabled
2: Active

↓

Access the SIMULATE Status element of SIMULATE and set the desired status code.

↓

Access the SIMULATE Value element of SIMULATE and set the desired input value.

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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. Refer to Section 6.3, “Simulation Function.”

A2.4 Setting the DI Function Blocks

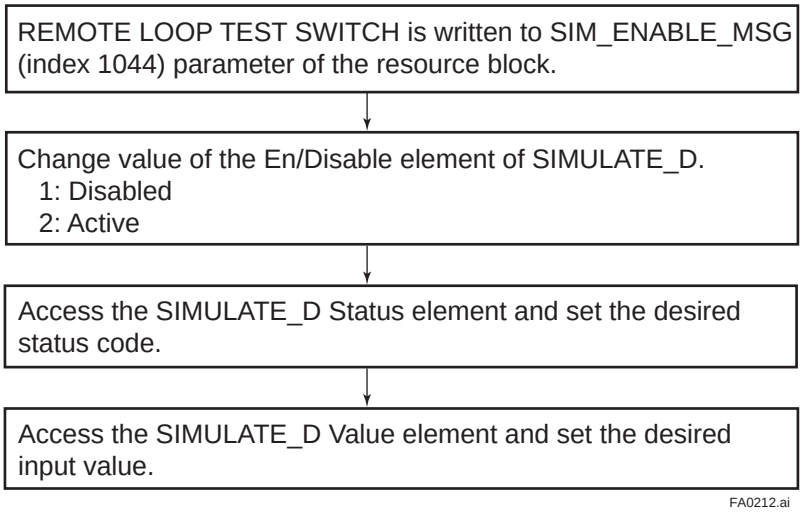
DI function blocks output switch signals received from the transducer block.

Two DI blocks (DI1 and DI2) in each AV550G have independent parameters. Set up the parameters of each AI block you use, individually as necessary. The following shows the DI setting procedure as an example.

(1) Setting the channel
The CHANNEL parameter of the DI block, which specifies the switch number of the transducer’s switch to be input to DI (DI1: 4, DI2: 5) for a AV550G.

(2) Setting the damping time constant
Access the PV_FTIME parameter and set the damping time constant (in units of seconds).

(3) Simulation
Perform simulation of each AI function block by setting the desired value and status of the input to the block. Access the SIMULATE_D parameter and change the values of its elements as follows.



The DI block uses SIMULATE_D Status and SIMULATE_D Value in the SIMULATE_D parameter as its input status and value when simulation is active, or uses Transducer Status and Transducer Value in SIMULATE_D as its input status and value when simulation is disabled. Refer to Section 6.3, “Simulation.”

APPENDIX 3. SETTING OF AV550G-SPECIFIC COMMANDS

Byaccessing the parameters of the transducer block, it is possible to execute commands specificto the AV550G.

A3.1 AV550G-specific Commands

Command	Summary
Start Calibration (CHx_SEMIAUTO_CAL_START, where x is the channel number)	Instructs the AV550G to perform manual calibration on its individual channel cards.
Start Indication Checking (CHx_INDICATION_START, where x is the channel number)	Instructs the AV550G to perform indication checking on its individual channel cards.
Start Blow Back (BLOWBACK_START)	Instructs the AV550G to perform a blow back.
Calibration Gas Pressure Drop (CAL_GAS_PRESS_DROP_SW)	Informs the AV550G of a drop in the calibration gas pressure.
Process Gas Alarm (PROCESS_GAS_ALARM_SW)	Informs the AV550G that a process gas alarm has been generated.

A3.2 Setting of AV550G-specific Commands

(1) Start Calibration Command

Access the CHx_SEMIAUTO_CAL_START (x = 1 to 8) parameter.
Setting the parameter to 2 (START) allows manual calibration to be performed.

For example, set CH1_SEMIAUTO_CAL_START (189) to 2, to perform manual calibration on the channel-1 card. (189 is a relative index.)

NOTE

This function does not operate unless the calibration mode of the AV550G is set to Semi-Auto or Auto. For details, refer to the AV550G's user's manual.

(2) Start Indication Checking Command

Access the CHx_INDICATION_START (x = 1 to 8) parameter.
Setting the parameter to 2 (START) allows indication checking to be performed.

For example, set CH1_INDICATION_START (197) to 2, to perform indication checking on the channel-1 card. (197 is a relative index.)

NOTE

This function does not operate unless the indication check mode of the AV550G is set to Semi-Auto or Auto.
For details, refer to the AV550G's user's manual.

(3) Start Blow Back Command

Access the BLOWBACK_START parameter. Setting the parameter to 2 (START) allows a blowback to be performed.

For example, set BLOWBACK_START (205) to 2, to perform a blow back on the AV550G.
(205 is a relative index.)

NOTE

This function does not operate unless the blowback mode of the AV550G is set to Semi-Auto or Auto. For details, refer to the AB550G's user's manual.

(4) Calibration Gas Pressure Drop Alarm

Access the CAL_GAS_PRESS_DROP_SW parameter.

1: No alarm issued (OFF)
2: Alarm in effect (ON)

For example, set CAL_GAS_PRESS_DROP_SW (206) to 2, to inform the AV550G of a drop in the calibration gas pressure.

(5) Process Gas Alarm

Access the PROCESS_GAS_ALARM_SW parameter.

1: No alarm issued (OFF)
2: Alarm in effect (ON)

For example, set PROCESS_GAS_ALARM_SW (207) to 2, to inform the AV550G of a process gas alarm.

APPENDIX 4. FUNCTION DIAGRAMS OF FUNCTION BLOCKS

A4.1 AI Function Block

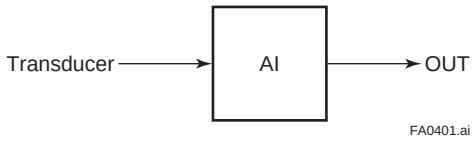


Figure A4-1. Input/Output of AI Block

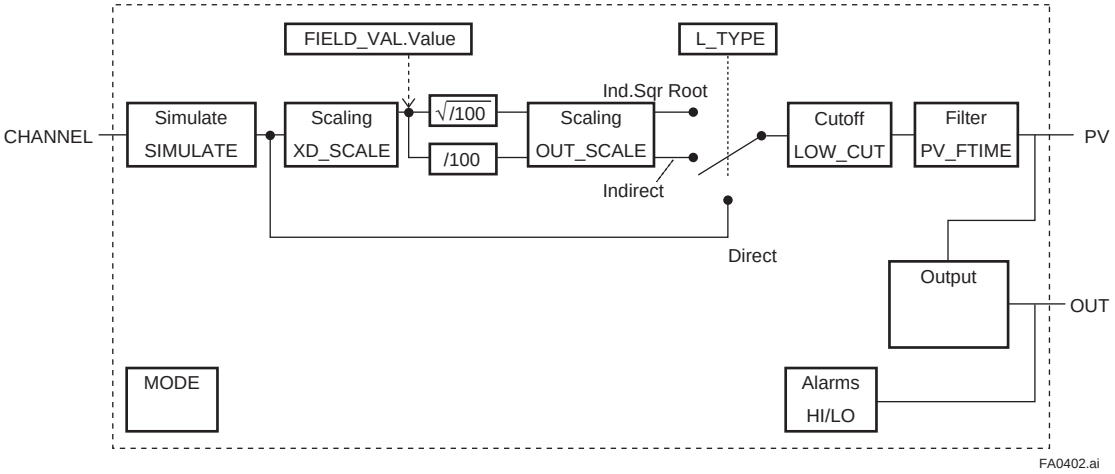


Figure A4-2. Function Diagram of AI Block

A4.2 DI Function Block

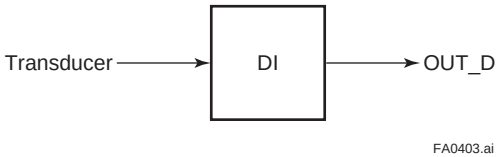


Figure A4-3. Input/Output of DI Block

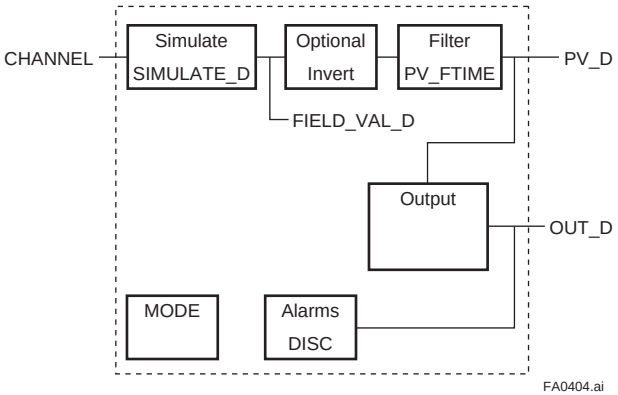


Figure A4-4. Function Diagram of DI Block

A4.3 MAI Function Block

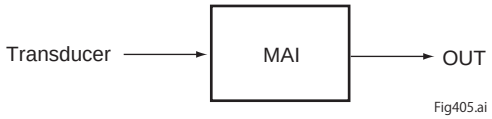


Figure A4-5. Input/Output of MAI Block

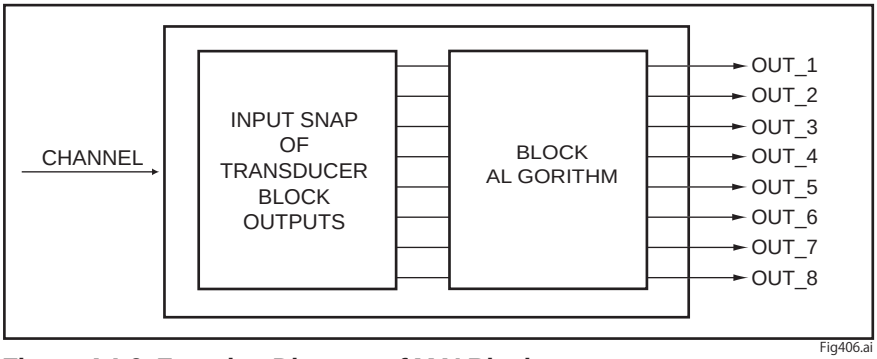


Figure A4-6. Function Diagram of MAI Block

A4.4 MAO Function Block

Figure A4-7. Input/Output of MAO Block

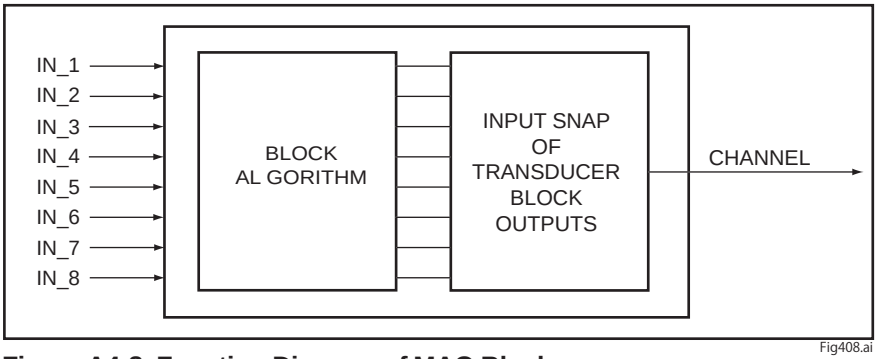


Figure A4-8. Function Diagram of MAO Block

APPENDIX 5. LINK MASTER FUNCTIONS

A5.1 Link Active Scheduler

A link active scheduler (LAS) is a deterministic, centralized bus scheduler that can control communications on an H1 fieldbus segment. There is only one LAS on an H1 fieldbus segment.

A AV550G supports the following LAS functions.

- PN transmission: Identifies a fieldbus device newly connected to the same fieldbus segment. PN is short for Probe Node.
- PT transmission: Passes a token governing the right to transmit, to a fieldbus device on the same segment. PT is short for Pass Token.
- CD transmission: Carry out a scheduled transmission to a fieldbus device on the same segment. CD is short for Compel Data.
- Time synchronization: Periodically transmits the time data to all fieldbus devices on the segment and returns the time data in response to a request from a device.
- Live list equalization: Sends the live list data to link masters on the same segment.
- LAS transfer: Transfers the right to be the LAS on the segment to another link master.

A5.2 Link Master

A link master (LM) is any device containing a link active scheduler. There must be at least one LM on a segment. When the LAS on a segment has failed, another LM on the same segment starts working as the LAS.

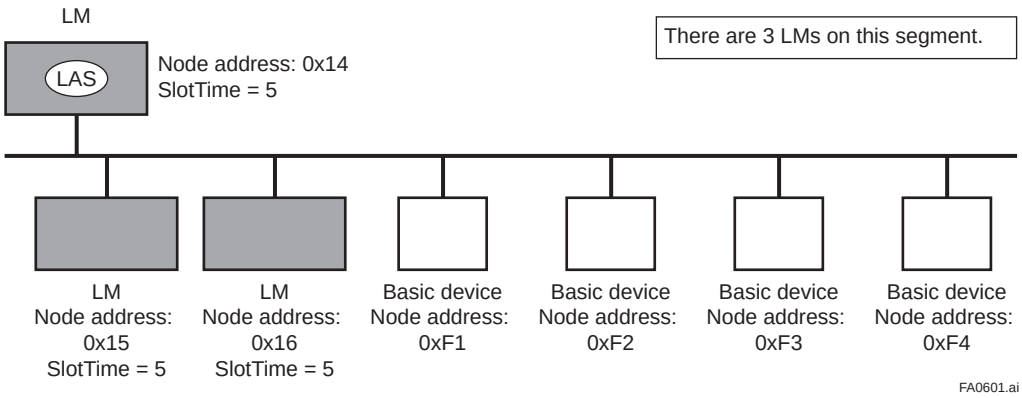


Figure A5-1. Example of Fieldbus configuration-3 LMs on Same Segment

A5.3 Transfer of LAS

There are two procedures for an LM to become the LAS:

- If the LM whose value of [V(ST)3V(TN)] is the smallest on a segment, with the exception of the current LAS, judges that there is no LAS on the segment, in such a case as when the segment has started up or when the current LAS has failed, the LM declares itself as the LAS, then becomes the LAS. (With this procedure, an LM backs up the LAS as shown in the following figure.)
- The LM whose value of [V(ST)3V(TN)] is the smallest on a segment, with the exception of the current LAS, requests the LAS on the same segment to transfer the right of being the LAS, then becomes the LAS.

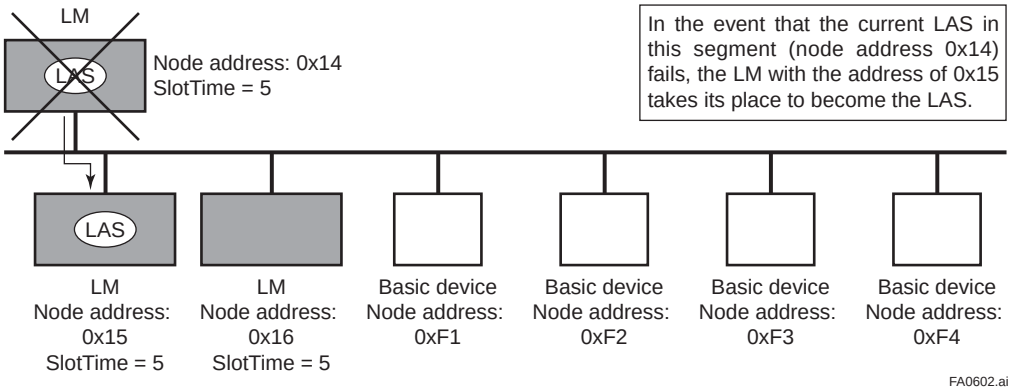


Figure A5-2. Backup of LAS

To set up a AV550G as a device that is capable of backing up the LAS, follow the procedure below.

NOTE: When changing the settings in a AV550G, add the AV550G to the segment in which an LAS is running. After making changes to the settings, do not turn off the power to the AV550G for at least 60 seconds.

(1) Set the node address of the AV550G. In general, use an address from 0x14 to [V(FUN) – 1].

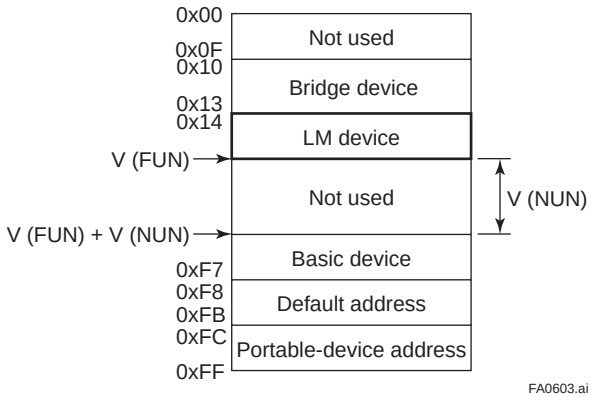


Figure A5-3. Node Address Ranges

(2) In the LAS settings of the AV550V, set the values of V(ST), V(MRD), and V(MID) to the same as the respective lowest capability values in all the devices within the segment. An example is shown bellow.

DlmeBasicInfo (AV550G Index 361 (SM))

Sub-index	Element	AV550G	Device 1	Device 2	Device 3	Description
1	SlotTime	4	8	10	20	Capability value for V(ST)
3	MaxResponse Delay	3	6	3	5	Capability value for V(MRD)
6	MinInterPdu Delay	4	8	12	10	Capability value for V(MID)

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In this case, set SlotTime, MaxResponseTime,and MinInterPduDelay as forrows:

ConfiguredLinkSettingsRecord (AV550G Index 369 (SM))

Subindex	Element	Setting (Default)	Description
1	SlotTime	20 (4095)	V (ST)
3	MaxResponseDelay	6 (5)	V (MRD)
6	MinInterPduDelay	12 (12)	V (MID)

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(3) In the LAS settings of the AV550G, set the values of V(FUN) and V(NUN) so that they include the node addresses of all nodes within the same segment. (See also Figure A5-3.)

ConfiguredLinkSettingsRecord
(AV550G Index 369 (SM))

Subindex	Element	Default Value	Description
4	FirstUnpolledNodeId	0x25	V (FUN)
7	NumConsecUnpolledNodeId	0xBA	V (NUN)

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A5.4 LM Functions

No.	Function	Description
1	LM initialization	When a fieldbus segment starts, the LM with the smallest [V(ST) × V(TN)] value within the segment becomes the LAS. At all times, each LM is checking whether or not a carrier is on the segment.
2	Startup of other nodes (PN and Node Activation SPDU transmissions)	Transmits a PN (Probe Node) message, and Node Activation SPDU message to devices which return a new PR (Probe Response) message.
3	PT transmission (including final bit monitoring)	Passes a PT (Pass Token) message to devices included in the live list sequentially, and monitors the RT (Return Token) and final bit returned in reply to the PT.
4	CD transmission	Transmits a CD (Compel Data) message at the scheduled times.
5	Time synchronization	Supports periodic TD (Time Distribution) transmissions and transmissions of a reply to a CT (Compel Time).
6	Domain download server	Sets the schedule data. The schedule data can be equalized only when the Domain Download command is carried out from outside the LM in question. (The version of the schedule is usually monitored, but no action takes place, even when it changes.)
7	Live list equalization	Transmits SPDU messages to LMs to equalize live lists.
8	LAS transfer	Transfers the right of being the LAS to another LM.
9	Reading/writing of NMIB for LM	See Section A5.5.
10	Round Trip Delay Reply (RR) Reply to DLPDU	Not yet supported in the current version.
11	Long address	Not yet supported in the current version.

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A5.5 LM Parameters

A5.5.1 LM Parameter List

The tables below show LM parameters of a AV550G.

Meanings of **Access** column entries: RW = read/write possible; R = read only

Index (SM)	Parameter Name	Sub-parameter Name (Sub Index)	Default Factory Setting	Access	Remarks
362	DLME_LINK_MASTER_CAPABILITIES_VARIABLE		0x04	RW	
363	DLME_LINK_MASTER_INFO_RECORD	0		RW	
		1 MaxSchedulingOverhead	0		
		2 DefMinTokenDelegTime	100		
		3 DefTokenHoldTime	300		
		4 TargetTokenRotTime	4096		
		5 LinkMaintTokHoldTime	400		
		6 TimeDistributionPeriod	5000		
		7 MaximumInactivityToClaimLasDelay	8		
		8 LasDatabaseStatusSpduDistributionPeriod	6000		
364	PRIMARY_LINK_MASTER_FLAG_VARIABLE		–	RW	LAS: True = 0xFF; non-LAS: False = 0x00
365	LIVE_LIST_STATUS_ARRAY_VARIABLE		–	R	
366	MAX_TOKEN_HOLD_TIME_ARRAY	0	0x0000×16, 0x012c×16	RW	
		1 Element1	0x012c×5, 0x0000×27		
		2 Element2	0x0000×32		
		3 Element3	0x0000×32		
		4 Element4	0x0000×32		
		5 Element5	0x0000×32		
		6 Element6	0x0000×31, 0x012c		
		7 Element7	0x012c×32		
		8 Element8	0x02		
367	BOOT_OPERAT_FUNCTIONAL_CLASS		0x01	RW	0x01 (basic device); 0x02 (LM)
368	CURRENT_LINK_SETTING_RECORD	0		R	Settings for LAS
		1 SlotTime			
		2 PerDlpduPhlOverhead			
		3 MaxResponseDelay			
		4 FirstUnpolledNodeId			
		5 ThisLink			
		6 MinInterPduDelay			
		7 NumConseeUnpolledNodeId			
		8 PreambleExtension			
		9 PostTransGapExtension			
		10 MaxInterChanSignalSkew			
		11 TimeSyncClass	4095		
369	CONFIGURED_LINK_SETTING_RECORD	0	4	RW	
		1 SlotTime	5		
		2 PerDlpduPhlOverhead	37		
		3 MaxResponseDelay	0		
		4 FirstUnpolledNodeId	12		
		5 ThisLink	186		
		6 MinInterPduDelay	2		
		7 NumConseeUnpolledNodeId	1		
		8 PreambleExtension	0		
		9 PostTransGapExtension	4		
		10 MaxInterChanSignalSkew			
		11 TimeSyncClass			

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Index (SM)	Parameter Name	Sub-parameter Name (Sub Index)	Default Factory Setting	Access	Remarks
370	PLME_BASIC_ CHARACTERISTICS	0		R	
		1 ChannelStatisticsSupported	0x00		
		2 MediumAndDataRatesSupported	0x4900000000000000		
		3 IecVersion	1 (0x1)		
		4 NumOfChannels	1 (0x1)		
		5 PowerMode	0 (0x0)		
371	CHANNEL_STATES	0		R	
		1 channel-1	0 (0x0)		
		2 channel-2	128 (0x80)		
		3 channel-3	128 (0x80)		
		4 channel-4	128 (0x80)		
		5 channel-5	128 (0x80)		
		6 channel-6	128 (0x80)		
		7 channel-7	128 (0x80)		
		8 channel-8	128 (0x80)		
372	PLME_BASIC_INFO	0		R	
		1 InterfaceMode	0 (0x0)		
		2 LoopBackMode	0 (0x0)		
		3 XmitEnabled	1 (0x1)		
		4 RcvEnabled	1 (0x1)		
		5 PreferredReceiveChannel	1 (0x1)		
		6 MediaTypeSelected	73 (0x49)		
		7 ReceiveSelect	1 (0x1)		
373	LINK_SCHEDULE_ACTIVATION_VARIABLE			RW	
374	LINK_SCHEDULE_LIST_ CHARACTERISTICS_ RECORD	0		R	
		1 NumOfSchedules	0		
		2 NumOfSubSchedulesPerSchedule	1		
		3 ActiveScheduleVersion	0		
		4 ActiveSheduleOdIndex	0		
		5 ActiveScheduleStartingTime	0		
375	DLME_SCHEDULE_ DESCRIPTOR.1	0		R	
		1 Version	0		
		2 MacrocycleDuration	0		
		3 TimeResolution	0		
376	DLME_SCHEDULE_ DESCRIPTOR.2	0		R	
		1 Version	0		
		2 MacrocycleDuration	0		
		3 TimeResolution	0		
377	DOMAIN.1				Read/write impossible. Get-OD possible.
378	DOMAIN.2				Read/write impossible. Get-OD possible.

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A5.5.2 Descriptions for LM Parameters

The following describes LM parameters of a AV550G transmitter.

NOTE: Do not turn off the power to the AV550G for 60 seconds after making a change to its parameter settings.

(1) DlmeLinkMasterCapabilitiesVariable

Bit Position	Meaning	Description	Value
B3: 0x04	LAS Schedule in Non-volatile Memory	Whether the LAS schedule can (= 1) or cannot (= 0) be saved to the non-volatile memory	1
B2: 0x02	Last Values Record Supported	Whether to support (= 1) or not to support (= 0) LastValuesRecord.	0
B1: 0x01	Link Master Statistics Record Supported	Whether to support (= 1) or not to support (= 0) DlmeLinkMasterStatisticsRecord.	0

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(2) DlmeLinkMasterInfoRecord

Sub-index	Element	Size [bytes]	Description
1	MaxSchedulingOverhead	1	V(MSO)
2	DefMinTokenDelegTime	2	V(DMDT)
3	DefTokenHoldTime	2	V(DTHT)
4	TargetTokenRotTime	2	V(TTRT)
5	LinkMaintTokHoldTime	2	V(LTHT)
6	TimeDistributionPeriod	4	V(TDP)
7	MaximumInactivityToClaimLasDelay	2	V(MICD)
8	LasDatabaseStatusSpduDistributionPeriod	2	V(LDDP)

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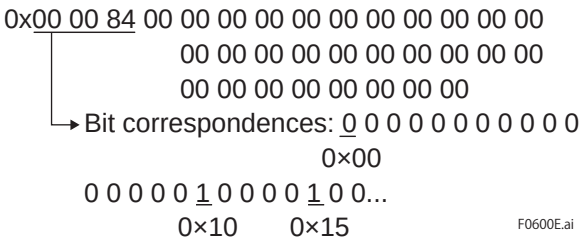
(3) PrimaryLinkMasterFlagVariable

Explicitly declares the LAS. Writing “true” (0xFF) to this parameter in a device causes that device to attempt to become the LAS. However, a request of writing “true” to this parameter in a device is rejected if the value of the same parameter in any other device that has a smaller node address within the same segment is true.

(4) LiveListStatusArrayVariable

A 32-byte variable, in which each bit represents the status of whether a device on the same segment is live or not. The leading bit corresponds to the device address 0x00, and final bit to 0xFF. The value of LiveListStatusArrayVariable in the case where devices having the addresses 0x10 and 0x15 in the fieldbus segment is shown below.



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(5) MaxTokenHoldTimeArray

An 8- by 64-byte array variable, in which each set of 2 bytes represents the delegation time (set as an octet time) assigned to a device. The delegation time denotes a time period that is given to a device by means of a PT message sent from the LAS within each token circulation cycle.

The leading 2 bytes correspond to the device address 0x00, and the final 2 bytes to the device address 0xFF. Specify the subindex to access this parameter.

(6) BootOperatFunctionalClass

Writing 1 to this parameter in a device and restarting the device causes the device to start as a basic device. On the contrary, writing 2 to this parameter and restarting the device causes the device to start as an LM.

(7) CurrentLinkSettingRecord and ConfiguredLinkSettingsRecord

CurrentLinkSettingRecord indicates the bus parameter settings currently used. ConfiguredLinkSettingsRecord indicates the bus parameter settings to be used when the device becomes the LAS. Thus, when a device is the LAS, its CurrentLinkSettingRecord and ConfiguredLinkSettingsRecord have the same values.

Sub-index	Element	Size [bytes]	Descrip-tion
1	SlotTime	2	V(ST)
2	PerDlpduPhlOverhead	1	V(PhLO)
3	MaxResponseDelay	1	V(MRD)
4	FirstUnpolledNodeId	1	V(FUN)
5	ThisLink	2	V(TL)
6	MinInterPduDelay	1	V(MID)
7	NumConsecUnpolledNodeId	1	V(NUN)
8	PreambleExtension	1	V(PhPE)
9	PostTransGapExtension	1	V(PhGE)
10	MaxInterChanSignalSkew	1	V(PhIS)
11	TimeSyncClass	1	V(TSC)

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(8) DlmeBasicInfo

Sub-index	Element	Size [bytes]	Description
1	SlotTime	2	Indicates the capability value for V(ST) of the device.
2	PerDlpduPhlOverhead	1	V(PhLO)
3	MaxResponseDelay	1	Indicates the capability value for V(MRD) of the device.
4	ThisNode	1	V(TN), node address
5	ThisLink	2	V(TL), link-id
6	MinInterPduDelay	1	Indicates the capability value for V(MID) of the device.
7	TimeSyncClass	1	Indicates the capability value for V(TSC) of the device.
8	PreambleExtension	1	V(PhPE)
9	PostTransGapExtension	1	V(PhGE)
10	MaxInterChanSignalSkew	1	V(PhIS)

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(9) PlmeBasicCharacteristics

Sub-index	Element	Size [bytes]	Value	Description
1	Channel Statistics Supported	1	0	Statistics data are not supported.
2	Medium AndData Rates Supported	8	0x4900000000000000	Wire medium, voltage mode,and 31.25 kbps are supported.
3	IceVersion	2	0x0403	IEC 4.3 is supported.
4	NumOf Channels	1	1	
5	Power Mode	1	0	0: Bus-powered; 1: Self-powered

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(10) ChannelStates

Sub-index	Element	Size [bytes]	Value	Description
1	Channel 1	1	0x00	In Use, No Bad since last read, No Silent since last read, No Jabber since last read, Tx Good, Rx Good
2	Channel 2	1	0x80	Unused
3	Channel 3	1	0x80	Unused
4	Channel 4	1	0x80	Unused
5	Channel 5	1	0x80	Unused
6	Channel 6	1	0x80	Unused
7	Channel 7	1	0x80	Unused
8	Channel 8	1	0x80	Unused

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(11) PlmeBasicInfo

Sub-index	Element	Size [bytes]	Value	Description
1	InterfaceMode	1	0	0: Half duplex; 1: Full duplex
2	LoopBackMode	1	0	0: Disabled; 1: MAU; 2: MDS
3	XmitEnabled	1	0x01	Channel 1 is enabled.
4	RcvEnebled	1	0x01	Channel 1 is enabled.
5	PreferredReceive Channel	1	0x01	Channel 1 is used for reception.
6	MediaType Selected	1	0x49	Wire medium, voltage mode, and 31.25 kbps are selected.
7	ReceiveSelect	1	0x01	Channel 1 is used for reception.

TA0612.ai

(12) LinkScheduleActivationVariable

Writing the version number of an LAS schedule, which has already been downloaded to the domain, to this parameter causes the corresponding schedule to be executed. On the other hand, writing 0 to this parameter stops execution of the active schedule.

(13) LinkScheduleListCharacteristicsRecord

Sub-index	Element	Size [bytes]	Description
1	NumOf Schedules	1	Indicates the total number of LAS schedules that have been downloaded to the domain.
2	NumOfSub SchedulesPer Schedule	1	Indicates the maximum number of sub-schedules an LAS schedule can contain. (This is fixed to 1 in the Yokogawa communication stacks.)
3	ActiveSchedule Version	2	Indicates the version number of the schedule currently executed.
4	ActiveSchedule OdIndex	2	Indicates the index number of the domain that stores the schedule currently executed.
5	ActiveSchedule StaringTime	6	Indicates the time when the current schedule began being executed.

TA0613.ai

(14) DlmeScheduleDescriptor

This parameter exists for the same number as the total number of domains, and each describes the LAS schedule downloaded to the corresponding domain. For the domain to which a schedule has not yet been downloaded, the values in this parameter are all zeros.

Sub-index	Element	Size [bytes]	Description
1	Version	2	Indicates the version number of the LAS schedule downloaded to the corresponding domain.
2	Macrocycle Duration	4	Indicates the macro cycle of the LAS schedule downloaded to the corresponding domain.
3	TimeResolution	2	Indicates the time resolution that is required to execute the LAS schedule downloaded to the corresponding domain.

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(15) Domain

Read/write: impossible; get-OD: possible Carrying out the GenericDomainDownload command from a host writes an LAS schedule to the domain.

A5.6 FAQs

Q1. When the LAS stops, a AV550G does not back it up by becoming the LAS. Why?

A1-1. Is that AV550G running as an LM? Check that the value of BootOperatFunctionalClass (index 367) is 2 (indicating that it is an LM).

A1-2. Check the values of V(ST) and V(TN) in all LMs on the segment and confirm that the following condition is met:

AV550G		Other LMs
V(ST) 3 V(TN)	<	V(ST) 3 V(TN)

Q2. How can I make a AV550G become the LAS?

A2-1. Check that the version numbers of the active schedules in the current LAS and the AV550G are the same by reading:

LinkScheduleListCharacteristicsRecord (index 374 for a AV550G)
- ActiveScheduleVersion (subindex 3)

A2-2. Make the AV550G declare itself as and become the LAS by writing:

- 0x00 (false) to PrimaryLinkMasterFlagVariable in the current LAS; and
- 0xFF (true) to PrimaryLinkMasterFlagVariable (index 364) in the AV550G.

Q3. On a segment where a AV550G works as the LAS, another device cannot be connected. Why?

A3-1. Check the following bus parameters that indicate the bus parameter as being the LAS for the AV550G and the capabilities of being the LAS for the device that cannot be connected:

- V(ST), V(MID), and V(MRD) of AV550G: ConfiguredLinkSettingsRecord (index 369)
- V(ST), V(MID), and V(MRD) of problematic device: DlmeBasicInfo

Then, confirm that the following conditions are met:

AV550G		Problematic Device
V(ST)	>	V(ST)
V(MID)	>	V(MID)
V(MRD)	>	V(MRD)

A3-2. Check that the node address of the problematic device does not lie within either 0x00 to 0x10 or the range of unused (unpolled) node addresses determined by the AV550G's LM parameter settings, which is 0x00 to 0x10 or V(FUN) to V(FUN) + V(NUM).
(Refer to Section 5.2, "Network Definition.")

APPENDIX 6. SOFTWARE DOWNLOAD

A6.1 Benefits of Software Download

This function enables you to download software to field devices via a FOUNDATION Fieldbus to update theirv software. Typical uses are to add new features such as function blocks and diagnostics to existing devices, and to optimize existing field devices for your plant.

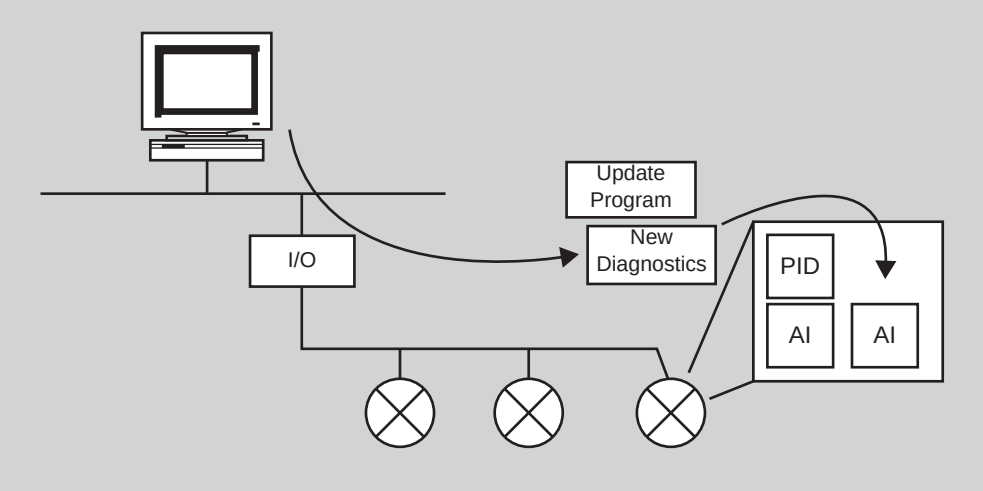

Figure 6-1. Concept of Software Downloading

A6.2 Specifications

Steady-state current: Max. 15 mA
Current during FlashROM blanking time: Max. 15 mA
Fieldbus Foundation download class: Class 1

NOTE

Class 1 devices can continue the specified measurement and/or control actions even while software is being downloaded to them. Upon completion of a download, however, the devices will be reset internally to make the new, downloaded software take effect, and this will temporarily halt fieldbus communication and function block executions.

A6.3 Preparations for Software Downloading

For software downloading, you need to prepare the following:

- Software download tool
- Software binary file for each of the target field devices

For the software download tool, use only the specific program. For details, see the User's Manual of download tool. For information about updates of software binary files for field devices and how to obtain them, visit the following web site.

http://www.yokogawa.com/an/download/an-dlfieldbus- 001en.htm

CAUTION

Avoid linking the software download tool to a fieldbus segment, as this may adversely affect the plant operation.

NOTE

The download tool can not execute downloading during other system connects to the system/ network management VFD of the device.

A6.4 Flow of Software Download

The flowchart below outlines the software download procedure. Although the time taken for the entire procedure varies depending on the size of the field bus device's software, it will take about 20 minutes for a one-to-one connection between a fieldbus device and download tool, and longer when multiple field devices are connected to the fieldbus.

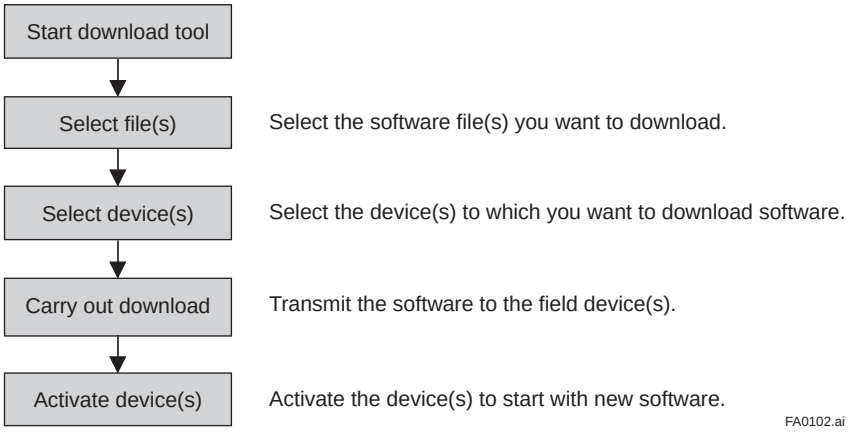

Figure 6-2. Flow of Software Download Procedure

CAUTION

Carrying out a software download leaves the PD tag, node address, and transducer block calibration parameters that are retained in the nonvolatile memory inside the target device, but may reset other parameters to the defaults (except a minor update that does not change the number of parameters). Hence, where necessary, save the parameters using an engineering tool, parameter setting utility, or the like before carrying out a software download, and then reconfigure the field device(s) after the download. For details, see Section A1.6.

CAUTION

The current dissipation of the target field device increases transitorily immediately after a download due to erasing of the FlashROM's contents. Use a fieldbus power supply which has sufficient capacity to cover such increases in feed current.

CAUTION

Upon completion of the activation, the target fieldbus device performs resetting internally, which temporarily halts fieldbus communication and function block executions. Be especially careful about a valve positioner; the output air pressure will fall to the minimum level (i.e., zero).

CAUTION

Do not turn off the power to a field device or disconnect the download tool during a download or activation. The device may fail as a result.

NOTE

Be careful about the noise on the fieldbus link. If the fieldbus is noisy, the downloading may take a very long time or fail.

A6.5 Download Files

Download files have the following filenames (with the filename extension of ".ffd"). Take care to choose the correct download file for the target field device:

"594543" + device family + "_" + device type + "_" + domain name + "_" + software name + "_" + software revision + ".ffd"

For example, the name of the download file for a AV550G may have the following name:

5945430401_0401_AV550G_ORIGINAL_R101.ffd

Refer to A1.11(3) DOMAIN_HEADER about each keyword of the file name.

The device type is "0401" for a AV550G (with software download capability).

The software name is "ORIGINAL" or "UPDATE."
The former indicates an original file and the latter an update file. Whenever performing a download to update the device revision, obtain the original file. In general, an addition to the parameters or blocks requires a device revision update.

A6.6 Steps after Activating a Field Device

When the communication with a field device has recovered after activating the device, check using the download tool that the software revision of the field device has been updated accordingly. The value of SOFT_REV of the resource block indicates the software revision.

The PD tag, node address, and transducer block calibration parameters that are retained in the nonvolatile memory inside the target device will remain unchanged after a software download. However, after a software update which causes an addition to the block parameters or blocks, or to the system/network management VFD parameters, some parameters may be reset to the defaults, thus requiring parameter setup and engineering again. For details, see the table below.

Also note that a change in the number of parameters or blocks requires the DD and capabilities files corresponding to the new software revision.

Table 6-1. Actions after Software Update

Contents of Software Update	Action
Does not change the number of parameters.	Re-setup of parameters not needed.
Adds a block parameter.	Setup of the added parameter needed.
Adds a block.	Reengineering and setup of the added block's parameters needed.
Changes the number of system/network management VFD parameters.	Reengineering needed.

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A6.7 Troubleshooting

For error messages appearing in the download tool, see also the User's Manual of download tool.

Table 6- 2. Actions after Software Update

Symptom	Cause	Remedy
An error occurs before starting a download, disabling the download.	The selected download file is not for the selected field device.	Check SOFTDWN_ERROR in the resource block and obtain the correct file.
An error occurs after starting a download, disabling the download.	You attempted to update the device revision by downloading a file which is not an original file.	Check SOFTDWN_ERROR in the resource block and obtain the original file.
	The voltage on the fieldbus segment falls below the specified limit (9 volts).	Check the capacity of the field bus power supply used and the voltage at the terminal.
	There was an error in a checksum or the number of transmission bytes.	Check SOFTDWN_ERROR in the resource block and obtain the correct file.
	The download tool does not allow download with same software revision.	Check the setting of the download tool.
The download takes far longer than expected or fails frequently.	The fieldbus segment is noisy.	Check the noise on the fieldbus segment.
An error occurs after activation.	Transient error caused by the internal resetting of the field device	Check whether communication with the field device has recovered after a while.
The new software does not take effect after the activation.	The file of the current revision was downloaded.	Obtain the correct file.
	Failure of the memory in field device, etc.	Check SOFTDWN_ERROR in the resource block, and re-try downloading. If fails, place a service call.

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A6.8 Resource Block's Parameters Relating to Software Download

Table 6.3.1 Additional Parameters of Resource Block

Relative Index	Index	Parameter Name	Default (Factory Set)	Write Mode	Description
53	1053	SOFTDWN_PROTECT	0x01	AUTO	Defines whether to accept software downloads. 0x01: Unprotected 0x02: Protected
54	1054	SOFTDWN_FORMAT	0x01	AUTO	Selects the software download method. 0x01: FF Standard
55	1055	SOFTDWN_COUNT	0	—	Indicates the number of times the internal FlashROM was erased.
56	1056	SOFTDWN_ACT_AREA	0	—	Indicates the ROM number of the currently working FlashROM. 0: FlashROM #0 working 1: FlashROM #1 working
57	1057	SOFTDWN_MOD_REV	1, 0, 0, 0, 0, 0, 0, 0, 0	—	Indicates the software module revision.
58	1058	SOFTDWN_ERROR	0	—	Indicates the error during a software download. See Table 4.

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Table 6.3.2 Additional Contents of “DEVICE_STATUS_1”. (Index 1045)

Hexadecimal	Display through DD	Description
0x02000000	DOWNLOAD_FAIL	Software download is failed.
0x01000000	DOWNLOAD_INCOMPLET	Software download is failed.

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Table 6.4. Error Codes of Errors during Download

Error Code	Detail
0	No error
32768	Unsupported header version
32769	Abnormal header size
32770	Abnormal manufacturer ID
32771	Abnormal device family
32772	Abnormal device revision
32773	Abnormal vendor specification version
32774	Abnormal number of modules
32775	Abnormal number of bytes in module 1
32776	Abnormal number of bytes in module 2
32777	Device error in module 1
32778	Checksum error in module 1
32779	Checksum error in file
32780	Unused
32781	Write-prohibited area in FlashROM
32782	Verification error during FlashROM writing
32783	Polling error during FlashROM erasing
32784	Polling time-out during FlashROM erasing
32785	Polling error during FlashROM writing
32786	Polling time-out during FlashROM writing
32787	FlashROM driver undefined number error
32788	File endcode error
32789	File type error (UPDATE, ORIGINAL)
32790	FlashROM driver undefined number error
32791	On-start state error (other than DWNLD_NOT_READY)
32792	Start segment error in module 1
32793	Binary file error
32794	Binary file error
32795	Device error in module 2
32796	Detection of EEPROM state other than backup after activation
32797	Checksum error in module 2
32798	Not in DWNLD_READY state when receiving GenericDomainInitiate
32799	Not in DWNLD_OK state when receiving GenericDomainTerminate
32800	Not in DOWNLOADING state when receiving GenericDomainSegment
32801	Firmware error
32802	Abnormal number of change in EEPROM
32803	Abnormal change address in EEPROM
32804	Control number error
32805	Abnormal length of change data for EEPROM
36863	Unused

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A6.9 View Objects Altered by Software Download

(1) 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				
41	ITK_VER				
42	SOFT_REV				
43	SOFT_DESC				
44	SIM_ENABLE_MSG				
45	DEVICE_STATUS_1			4	
46	DEVICE_STATUS_2			4	
47	DEVICE_STATUS_3			4	
48	DEVICE_STATUS_4			4	
49	DEVICE_STATUS_5			4	
50	DEVICE_STATUS_6			4	
51	DEVICE_STATUS_7			4	
52	DEVICE_STATUS_8			4	

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Relative Index	Parameter Mnemonic	VIEW 1	VIEW 2	VIEW 3	VIEW 4
53	SOFTDWN_PROTECT				1
54	SOFTDWN_FORMAT				1
55	SOFTDWN_COUNT				2
56	SOFTDWN_ACT_AREA			1	
57	SOFTDWN_MOD_REV			16	
58	SOFTDWN_PROTECT			2	
	Total bytes	22	30	73	35

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A6.10 System/Network Management VFD Parameters Relating to Software Download

Table 6.5. System/Network Management VFD Parameters

Write Mode: R/W = read/write; R = read only

Index (SM)	Parameter Name	Sub Index	Sub-parameter Name	Default (Factory Set)	Write Mode	Remarks
400	DWNLD_PROPERTY	0			R	
		1	Download Class	1		
		2	Write Rsp Returned For ACTIVATE	1		
		3	Write Rsp Returned For PREPARE	1		
		4	Reserved	0		
		5	ReadyForDwnld Delay Secs	200		
		6	Activation Delay Secs	60		
410	DOMAIN_DESCRIPTOR	0			R/W	Read/write-permitted only for sub-index 1
		1	Command	3		
		2	State	1		
		3	Error Code	0		
		4	Download Domain Index	440		
		5	Download Domain Header Index	420		
		6	Activated Domain Header Index	430		
		7	Domain Name	(Device name)		
420	DOMAIN_HEADER.1	0				
		1	Header Version Number	0		
		2	Header Size	0		
		3	Manufacturer ID			
		4	Device Family			
		5	Device Type			
		6	Device Revision	0		
		7	DD Revision	0		
		8	Software Revision			
		9	Software Name			
		10	Domain Name			
430	DOMAIN_HEADER.2	0				
		1	Header Version Number	1		
		2	Header Size	44		
		3	Manufacturer ID	0x594543		
		4	Device Family	(DEV_TYPE of RB)		
		5	Device Type	(DEV_TYPE of RB)		
		6	Device Revision	(DEV_REV of RB)		
		7	DD Revision	(DD_REV of RB)		
		8	Software Revision	(SOFT_REV of RB)		
		9	Software Name	ORIGINAL		
		10	Domain Name	(Device name)		
440	DOMAIN					Read/write: prohibited Get-OD: permitted

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A6.11 Comments on System/Network Management VFD Parameters Relating to Software Download

IMPORTANT

Do not turn off the power to a field device immediately after changing parameter settings. Data writing actions to the EEPROM are made redundant to ensure reliability. If the power is turned off within 60 seconds after setup, the parameters may revert to the previous settings.

(1) DWNLD_PROPERTY

Sub Index	Element	Size (Bytes)	Description
1	Download Class	1	Indicates the download class. 1: Class 1
2	Write Rsp Returned For ACTIVATE	1	Indicates whether a write response is returned to the ACTIVATE command. 1: Write Response Returned
3	Write Rsp Returned For PREPARE	1	Indicates whether a write response is returned to the PREPARE command. 1: Write Response Returned
4	Reserved	1	(Reserved)
5	ReadyForDwnld Delay Secs	2	Indicates the maximum delay after receipt of the PREPARE_FOR_DWNLD command to proceed to transition from DWNLD_NOT_READY to DWNLD_READY.
6	Activation Delay Secs	2	Indicates the maximum delay after receipt of the ACTIVATE command to proceed to transition from DWNLD_OK to DWNLD_NOT_READY.

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(2) DOMAIN_DESCRIPTOR

Sub Index	Element	Size (Bytes)	Description
1	Command	1	Reads/writes software download commands. 1: PREPARE_FOR_DWNLD (instruction of download preparation) 2: ACTIVATE (activation instruction) 3: CANCEL_DWNLD (instruction of download cancellation)
2	State	1	Indicates the current download status. 1: DWNLD_NOT_READY (download not ready) 2: DWNLD_PREPARING (download under preparation) 3: DWNLD_READY (ready for download) 4: DWNLD_OK (download complete) 5: DOWNLOADING (download underway) 6: CHECKSUM_FAIL (not used in this product) 7: FMS_DOWNLOAD_FAIL (failure during download) 8: DWNLD_INCOMPLETE (download error detected at restart) 9: VCR_FAIL (not used in this product) 10: OTHER (download error other than 6 and 7 detected)
3	Error Code	2	Indicates the error during a download and activation. 0: success, configuration retained (download successfully completed) 32768 - 65535: Download error (See Table 4 for error codes.)
4	Download Domain Index	4	Indicates the index number of the domain for software downloading.
5	Download Domain Header Index	4	Indicates the index number of the domain header to which the download is performing.
6	Activated Domain Header Index	4	Indicates the index numbers of the domain header currently running.
7	Domain Name	8	Indicates the domain name. With this product, Domain Name indicates the field device name.

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(3) DOMAIN_HEADER

Sub Index	Element	Size (Bytes)	Description
1	Header Version Number	2	Indicates the version number of the header.
2	Header Size	2	Indicates the header size.
3	Manufacturer ID	6	Indicates the value of resource block's MANUFAC_ID (manufacturer ID) as character string data.
4	Device Family	4	Indicates the device family. With this product, Device Family indicates the value of resource block's DEV_TYPE as character string data.
5	Device Type	4	Indicates the value of resource block's DEV_TYPE as character string
6	Device Revision	1	Indicates the value of resource block's DEV_REV.
7	DD Revision	1	Indicates the value of resource block's DD_REV.
8	Software Revision	8	Indicates the value of resource block's SOFT_REV.
9	Software Name	8	Indicates the attribute of the binary file. With this product, Software Name indicates either of the following: "ORIGINAL" followed by one space: Original file "UPDATE" followed by two spaces: Update file
10	Domain Name	8	Indicates the domain name. With this product, Domain Name indicates the field device name.

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APPENDIX 7. DD Menu Structure

Resource Block DD Menu Structure

Resource block (Top menu)

- Block Info
  - TAG_DESC
  - STRATEGY
  - ALERT_KEY
- Mode Block
  - MODE_BLK.TARGET
  - MODE_BLK.ACTUAL
  - MODE_BLK.PERMITTED
  - MODE_BLK.NORMAL
- Configuration
  - Mode Block
    - MODE_BLK.TARGET
    - MODE_BLK.ACTUAL
    - MODE_BLK.PERMITTED
    - MODE_BLK.NORMAL
  - CONFIRM_TIME
  - WRITE_LOCK
  - Feature Info
    - FEATURES
    - FEATURE_SEL
  - Cycle Info
    - CYCLE_TYPE
    - CYCLE_SEL
    - MIN_CYCLE_T
  - Notify Info
    - MAX_NOTIFY
    - LIM_NOTIFY
  - Shedding
    - SHED_RCAS
    - SHED_ROUT
- Diagnostics/Alerts
  - BLOCK_ERR
  - RS_STATE
  - FAULT_STATE
  - SET_FSTATE
  - CLR_FSTATE
  - Device Status
    - DEVICE_STATUS_1
    - DEVICE_STATUS_2
    - DEVICE_STATUS_3
    - DEVICE_STATUS_4
    - DEVICE_STATUS_5
    - DEVICE_STATUS_6
    - DEVICE_STATUS_7
    - DEVICE_STATUS_8
  - Alert Parameters
    - BLOCK_ALM
      - BLOCK_ALM.UNACKNOWLEDGED
      - BLOCK_ALM.ALARM_STATE
      - BLOCK_ALM.TIME_STAMP
      - BLOCK_ALM.SUB_CODE
      - BLOCK_ALM.VALUE
    - ALARM_SUM
      - ALARM_SUM.CURRENT
      - ALARM_SUM.UNACKNOWLEDGED
      - ALARM_SUM.UNREPORTED
      - ALARM_SUM.DISABLED
    - ACK_OPTION
    - WRITE_PRI
    - WRITE_ALE
      - WRITE_ALM.UNACKNOWLEDGED
      - WRITE_ALM.ALARM_STATE
      - WRITE_ALM.TIME_STAMP
      - WRITE_ALM.SUB_CODE
      - WRITE_ALM.VALUE
    - UPDATE_EVT
      - UPDATE_EVT.UNACKNOWLEDGED
      - UPDATE_EVT.UPDATE_STATE
      - UPDATE_EVT.TIME_STAMP
      - UPDATE_EVT.STATIC_REVISION
      - UPDATE_EVT.RELATIVE_INDEX
- Others
  - RESTART
  - GRANT_DENY
    - GRANT_DENY.GRANT
    - GRANT_DENY.DENY
  - SIM_ENABLE_MSG
  - Hardware Info
    - HARD_TYPES
    - MEMORY_SIZE
    - NV_CYCLE_T
    - FREE_SPACE
    - FREE_TIME
  - Identification
    - MANUFAC_ID
    - DEV_TYPE
    - DEV_REV
    - DD_REV
  - Other Info
    - ITK_VER
    - SOFT_REV
    - SOFT_DESC
- Query Device
  - Standard parameters
  - Enhanced parameters

* Parameters not covered by category

- Block Header
- ST_REV
- DD_RESOURCE
- TEST_RW

AI FB DD Menu structure

AI FB (Top menu)

- Block Info
  - TAG_DESC
  - STRATEGY
  - ALERT_KEY
- Mode Block
  - MODE_BLK.TARGET
  - MODE_BLK.ACTUAL
  - MODE_BLK.PERMITTED
  - MODE_BLK.NORMAL
- Dynamic Variables
  - FIELD_VAL
    - FIELD_VAL.Status
    - FIELD_VAL.Value
  - Process Value
    - PV.Status
    - PV.Value
  - OUT
    - OUT.Status
    - OUT.Value
  - TOTAL
- Configuration
  - Mode Block
    - MODE_BLK.TARGET
    - MODE_BLK.ACTUAL
    - MODE_BLK.PERMITTED
    - MODE_BLK.NORMAL
  - CHANNEL
  - XD_SCALE
    - XD_SCALE.EU100
    - XD_SCALE.EU0
    - XD_SCALE.UNITS INDEX
    - XD_SCALE.DECIMAL POINT
  - OUT_SCALE
    - OUT_SCALE.EU100
    - OUT_SCALE.EU0
    - OUT_SCALE.UNITS INDEX
    - OUT_SCALE.DECIMAL POINT
  - PV_FTIME
  - Options
    - L_TYPE
    - LOW_CUT
    - IO_OPTS
    - STATUS_OPTS
  - Total Setup
    - TOTAL_START
    - TOTAL_RATE_VAL
    - TOTAL_RESET
- Diagnostics/Alerts
  - BLOCK_ERR
  - Alert Parameters
    - BLOCK_ALM
      - BLOCK_ALM.UNACKNOWLEDGED
      - BLOCK_ALM.ALARM_STATE
      - BLOCK_ALM.TIME_STAMP
      - BLOCK_ALM.SUB_CODE
      - BLOCK_ALM.VALUE
    - ALARM_SUM
      - ALARM_SUM.CURRENT
      - ALARM_SUM.UNACKNOWLEDGED
      - ALARM_SUM.UNREPORTED
      - ALARM_SUM.DISABLED
    - ACK_OPTION
    - ALARM_HYS
    - Hi Hi Alarm
      - HI_HI_PRI
      - HI_HI_LIM
      - HI_HI_ALM
        - HI_HI_ALM.UNACKNOWLEDGED
        - HI_HI_ALM.ALARM_STATE
        - HI_HI_ALM.TIME_STAMP
        - HI_HI_ALM.SUB_CODE
        - HI_HI_ALM.VALUE
    - Hi Alarm
      - HI_PRI
      - HI_LIM
      - HI_ALM
        - HI_ALM.UNACKNOWLEDGED
        - HI_ALM.ALARM_STATE
        - HI_ALM.TIME_STAMP
        - HI_ALM.SUB_CODE
        - HI_ALM.VALUE
    - Lo Alarm
      - LO_PRI
      - LO_LIM
      - LO_ALM
        - LO_ALM.UNACKNOWLEDGED
        - LO_ALM.ALARM_STATE
        - LO_ALM.TIME_STAMP
        - LO_ALM.SUB_CODE
        - LO_ALM.VALUE
    - Lo Lo Alarm
      - LO_LO_PRI
      - LO_LO_LIM
      - LO_LO_ALM
        - LO_LO_ALM.UNACKNOWLEDGED
        - LO_LO_ALM.ALARM_STATE
        - LO_LO_ALM.TIME_STAMP
        - LO_LO_ALM.SUB_CODE
        - LO_LO_ALM.VALUE
    - UPDATE_EVT
      - UPDATE_EVT.UNACKNOWLEDGED
      - UPDATE_EVT.UPDATE_STATE
      - UPDATE_EVT.TIME_STAMP
      - UPDATE_EVT.STATIC_REVISION
      - UPDATE_EVT.RELATIVE_INDEX
- Others
  - SIMULATE
  - GRANT_DENY
    - GRANT_DENY.GRANT
    - GRANT_DENY.DENY
- Query Device
  - Standard parameters

* Parameters not covered by category

- Block Header
- ST_REV

DI FB DD Menu structure

DI FB (Top menu)
- Block Info
  - TAG_DESC
  - STRATEGY
  - ALERT_KEY
- Mode Block
  - MODE_BLK.TARGET
  - MODE_BLK.ACTUAL
  - MODE_BLK.PERMITTED
  - MODE_BLK.NORMAL
- Dynamic Variables
  - FIELD_VAL_D
    - *.Status
    - *.Value
  - PV_D
    - *.Status
    - *.Value
  - OUT_D
    - *.Status
    - *.Value
- Configuration
  - Mode Block
    - MODE_BLK.TARGET
    - MODE_BLK.ACTUAL
    - MODE_BLK.PERMITTED
    - MODE_BLK.NORMAL
  - CHANNEL
  - PV_FTIME
  - IO_OPTS
  - STATUS_OPTS
- Diagnostics/Alerts
  - BLOCK_ERR
  - Alert Parameters
    - BLOCK_ALM
      - BLOCK_ALM.UNACKNOWLEDGED
      - BLOCK_ALM.ALARM_STATE
      - BLOCK_ALM.TIME_STAMP
      - BLOCK_ALM.SUB_CODE
      - BLOCK_ALM.VALUE
    - ALARM_SUM
      - ALARM_SUM.CURRENT
      - ALARM_SUM.UNACKNOWLEDGED
      - ALARM_SUM.UNREPORTED
      - ALARM_SUM.DISABLED
    - ACK_OPTION
    - DISC_PRI
    - DISC_LIM
    - DISC_ALM
      - *.UNACKNOWLEDGED
      - *.ALARM_STATE
      - *BLOCK_ALM.TIME_STAMP
      - *.SUB_CODE
      - *.VALUE
    - UPDATE_EVT
      - UPDATE_EVT.UNACKNOWLEDGED
      - UPDATE_EVT.UPDATE_STATE
      - UPDATE_EVT.TIME_STAMP
      - UPDATE_EVT.STATIC_REVISION
      - UPDATE_EVT.RELATIVE_INDEX
- Others
  - SIMULATE_D
  - GRANT_DENY
    - GRANT_DENY.GRANT
    - GRANT_DENY.DENY
- Query Device
  - Standard parameters

* Parameters not covered by category
- Block Header
- ST_REV
- XD_STATE
- OUT_STATE

MAI FB DD Menu structure

MAI FB (Top menu)

- Block Info
  - TAG_DESC
  - STRATEGY
  - ALERT_KEY
- Mode Block
  - MODE_BLK.TARGET
  - MODE_BLK.ACTUAL
  - MODE_BLK.PERMITTED
  - MODE_BLK.NORMAL
- Dynamic variables
  - OUT_1
    - OUT_1.STATUS
    - OUT_1.VALUE
  - OUT_2
    - OUT_2.STATUS
    - OUT_2.VALUE
  - OUT_3
    - OUT_3.STATUS
    - OUT_3.VALUE
  - OUT_4
    - OUT_4.STATUS
    - OUT_4.VALUE
  - OUT_5
    - OUT_5.STATUS
    - OUT_5.VALUE
  - OUT_6
    - OUT_6.STATUS
    - OUT_6.VALUE
  - OUT_7
    - OUT_7.STATUS
    - OUT_7.VALUE
  - OUT_8
    - OUT_8.STATUS
    - OUT_8.VALUE
- Configuration
  - Mode Block
    - MODE_BLK.TARGET
    - MODE_BLK.ACTUAL
    - MODE_BLK.PERMITTED
    - MODE_BLK.NORMAL
  - CHANNEL
- Diagnostics/Alerts
  - BLOCK_ERR
  - Alert Parameters
    - BLOCK_ALM
      - BLOCK_ALM.UNACKNOWLEDGED
      - BLOCK_ALM.ALARM_STATE
      - BLOCK_ALM.TIME_STAMP
      - BLOCK_ALM.SUB_CODE
      - BLOCK_ALM.VALUE
    - UPDATE_EVT
      - UPDATE_EVT.UNACKNOWLEDGED
      - UPDATE_EVT.UPDATE_STATE
      - UPDATE_EVT.TIME_STAMP
      - UPDATE_EVT.STATIC_REVISION
      - UPDATE_EVT.RELATIVE_INDEX
- Query Device
  - Standard parameters

* Parameters not covered by category
- Block Header
- ST_REV

MAO FB DD Menu structure

MAO FB (Top menu)

- Block Info
  - TAG_DESC
  - STRATEGY
  - ALERT_KEY
- Mode Block
  - MODE_BLK.TARGET
  - MODE_BLK.ACTUAL
  - MODE_BLK.PERMITTED
  - MODE_BLK.NORMAL
- Dynamic variables
  - IN_1
    - IN_1.STATUS
    - IN_1.VALUE
  - IN_2
    - IN_2.STATUS
    - IN_2.VALUE
  - IN_3
    - IN_3.STATUS
    - IN_3.VALUE
  - IN_4
    - IN_4.STATUS
    - IN_4.VALUE
  - IN_5
    - IN_5.STATUS
    - IN_5.VALUE
  - IN_6
    - IN_6.STATUS
    - IN_6.VALUE
  - IN_7
    - IN_7.STATUS
    - IN_7.VALUE
  - IN_8
    - IN_8.STATUS
    - IN_8.VALUE
- Configuration
  - Mode Block
    - MODE_BLK.TARGET
    - MODE_BLK.ACTUAL
    - MODE_BLK.PERMITTED
    - MODE_BLK.NORMAL
  - CHANNEL
  - Options
    - MO_OPTS
  - Failsafe
    - FSTATE_TIME
    - FSTATE_VAL1
    - FSTATE_VAL2
    - FSTATE_VAL3
    - FSTATE_VAL4
    - FSTATE_VAL5
    - FSTATE_VAL6
    - FSTATE_VAL7
    - FSTATE_VAL8
- Diagnostics/Alerts
  - BLOCK_ERR
  - FSTATE_STATUS
  - Alert Parameters
    - BLOCK_ALM
      - BLOCK_ALM.UNACKNOWLEDGED
      - BLOCK_ALM.ALARM_STATE
      - BLOCK_ALM.TIME_STAMP
      - BLOCK_ALM.SUB_CODE
      - BLOCK_ALM.VALUE
    - UPDATE_EVT
      - UPDATE_EVT.UNACKNOWLEDGED
      - UPDATE_EVT.UPDATE_STATE
      - UPDATE_EVT.TIME_STAMP
      - UPDATE_EVT.STATIC_REVISION
      - UPDATE_EVT.RELATIVE_INDEX
- Query Device
  - Standard parameters

* Parameters not covered by category
  - Block Header
  - ST_REV

AV550G TB DD Munu structure

- Block Info
  - TAG_DESC
  - STRATEGY
  - ALERT_KEY
  - TRANSDUCER_DIRECTORY
  - TRANSDUCER_TYPE
- Mode Block
  - MODE_BLK.TARGET
  - MODE_BLK.ACTUAL
  - MODE_BLK.PERMITTED
  - MODE_BLK.NORMAL
- Dynamic Variables
  - PRIMARY_VALUE_1
    - PRIMARY_VALUE_1.STATUS
    - PRIMARY_VALUE_1.VALUE
  - PRIMARY_VALUE_2
    - PRIMARY_VALUE_2.STATUS
    - PRIMARY_VALUE_2.VALUE
  - PRIMARY_VALUE_3
    - PRIMARY_VALUE_3.STATUS
    - PRIMARY_VALUE_3.VALUE
  - ALARM_SW_VALUE_D
    - ALARM_SW_VALUE_D.STATUS
    - ALARM_SW_VALUE_D.VALUE
  - ERROR_SW_VALUE_D
    - ERROR_SW_VALUE_D.STATUS
    - ERROR_SW_VALUE_D.VALUE
  - Primary_Value_1_info
    - PV1_MIN_VALUE
    - PV1_MAX_VALUE
    - PV1_AVE_VALUE
    - PV1_MIN_DATE
    - PV1_MAX_DATE
  - Primary_Value_2_info
    - PV2_MIN_VALUE
    - PV2_MAX_VALUE
    - PV2_AVE_VALUE
    - PV2_MIN_DATE
    - PV2_MAX_DATE
  - Primary_Value_3_info
    - PV3_MIN_VALUE
    - PV3_MAX_VALUE
    - PV3_AVE_VALUE
    - PV3_MIN_DATE
    - PV3_MAX_DATE
- Configuration/Calibration
  - Mode Block
    - MODE_BLK.TARGET
    - MODE_BLK.ACTUAL
    - MODE_BLK.PERMITTED
    - MODE_BLK.NORMAL
  - General
    - PRIMARY_VALUE_1_TYPE
    - PRIMARY_VALUE_2_TYPE
    - PRIMARY_VALUE_3_TYPE
    - PRIMARY_VALUE_1_RANGE
      - PRIMARY_VALUE_1_RANGE.EU100
      - PRIMARY_VALUE_1_RANGE.EU0
      - PRIMARY_VALUE_1_RANGE.UNITS INDEX
      - PRIMARY_VALUE_1_RANGE.DECIMAL POINT
    - PRIMARY_VALUE_2_RANGE
      - PRIMARY_VALUE_2_RANGE.EU100
      - PRIMARY_VALUE_2_RANGE.EU0
      - PRIMARY_VALUE_2_RANGE.UNITS INDEX
      - PRIMARY_VALUE_2_RANGE.DECIMAL POINT
    - PRIMARY_VALUE_3_RANGE
      - PRIMARY_VALUE_3_RANGE.EU100
      - PRIMARY_VALUE_3_RANGE.EU0
      - PRIMARY_VALUE_3_RANGE.UNITS INDEX
      - PRIMARY_VALUE_3_RANGE.DECIMAL POINT
    - PRIMARY_VALUE_1_USE_CH
    - PRIMARY_VALUE_2_USE_CH
    - PRIMARY_VALUE_3_USE_CH
  - Display Setup
    - USE_IN_NO
    - IN_UNIT
    - IN_DISPLAY_FORMAT
  - Command
    - Semiauto Calib
      - CH1_SEMIAUTO_CAL_START
      - CH2_SEMIAUTO_CAL_START
      - CH3_SEMIAUTO_CAL_START
      - CH4_SEMIAUTO_CAL_START
      - CH5_SEMIAUTO_CAL_START
      - CH6_SEMIAUTO_CAL_START
      - CH7_SEMIAUTO_CAL_START
      - CH8_SEMIAUTO_CAL_START
    - Indication
      - CH1_INDICATION_START
      - CH2_INDICATION_START
      - CH3_INDICATION_START
      - CH4_INDICATION_START
      - CH5_INDICATION_START
      - CH6_INDICATION_START
      - CH7_INDICATION_START
      - CH8_INDICATION_START
    - BLOWBACK_START
    - CAL_GAS_PRESS_DROP_SW
    - PROCESS_GAS_ALARM_SW
  - Sensor info
    - REMOVE_ALARM_CH
    - Detctor
      - CH1_DETC
      - CH2_DETC
      - CH3_DETC
      - CH4_DETC
      - CH5_DETC
      - CH6_DETC
      - CH7_DETC
      - CH8_DETC
    - Calib Date
      - CH1_SMART_CALIB_DATE
      - CH2_SMART_CALIB_DATE
      - CH3_SMART_CALIB_DATE
      - CH4_SMART_CALIB_DATE
      - CH5_SMART_CALIB_DATE
      - CH6_SMART_CALIB_DATE
      - CH7_SMART_CALIB_DATE
      - CH8_SMART_CALIB_DATE

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- Soft Revision
  - IPL_SOFT_REV
  - CONTROL_SOFT_REV
  - CH1_SOFT_REV
  - CH2_SOFT_REV
  - CH3_SOFT_REV
  - CH4_SOFT_REV
  - CH5_SOFT_REV
  - CH6_SOFT_REV
  - CH7_SOFT_REV
  - CH8_SOFT_REV
- Diagnostics/Alerts
  - BLOCK_ERR
  - XD_ERROR
  - Block Alm
    - BLOCK_ALM.UNACKNOWLEDGED
    - BLOCK_ALM.ALARM_STATE
    - BLOCK_ALM.TIME_STAMP
    - BLOCK_ALM.SUB_CODE
    - BLOCK_ALM.VALUE
  - Alarm Sum
    - ALARM_SUM.CURRENT
    - ALARM_SUM.UNACKNOWLEDGED
    - ALARM_SUM.UNREPORTED
    - ALARM_SUM.DISABLED
  - Update Evt
    - UPDATE_EVT.UNACKNOWLEDGED
    - UPDATE_EVT.UPDATE_STATE
    - UPDATE_EVT.TIME_STAMP
    - UPDATE_EVT.STATIC_REVISION
    - UPDATE_EVT.RELATIVE_INDEX
  - Sensor Status
    - AV550G_STAUS
    - CH1_STAUS
    - CH2_STAUS
    - CH3_STAUS
    - CH4_STAUS
    - CH5_STAUS
    - CH6_STAUS
    - CH7_STAUS
    - CH8_STAUS
  - Measurd Values
    - Ch1_other_value
      - CH1_CELL_VOLT
      - CH1_HEATER_TEMP
      - CH1_CJ_TEMP
      - CH1_TC_VOLT
      - CH1_CJ_VOLT
      - CH1_CELL_RESISTANCE
      - CH1_CJ_RESISTANCE
      - CH1_ZERO_CAL_COEFF
      - CH1_SPAN_CAL_COEFF
      - CH1_CELL_ROBUSTNESS
      - CH1_HEATER_ON_TIME
      - CH1_RESPONSE_TIME
      - CH1_MIN_VALUE
      - CH1_MAX_VALUE
      - CH1_AVE_VALE
      - CH1_MIN_DATE
      - CH1_MAX_DATE
    - Ch2_other_value
      - CH2_CELL_VOLT
      - CH2_HEATER_TEMP
      - CH2_CJ_TEMP
      - CH2_TC_VOLT
      - CH2_CJ_VOLT
      - CH2_CELL_RESISTANCE
      - CH2_CJ_RESISTANCE
      - CH2_ZERO_CAL_COEFF
      - CH2_SPAN_CAL_COEFF
      - CH2_CELL_ROBUSTNESS
      - CH2_HEATER_ON_TIME
      - CH2_RESPONSE_TIME
      - CH2_MIN_VALUE
      - CH2_MAX_VALUE
      - CH2_AVE_VALE
      - CH2_MIN_DATE
      - CH2_MAX_DATE
    - Ch3_other_value
      - CH3_CELL_VOLT
      - CH3_HEATER_TEMP
      - CH3_CJ_TEMP
      - CH3_TC_VOLT
      - CH3_CJ_VOLT
      - CH3_CELL_RESISTANCE
      - CH3_CJ_RESISTANCE
      - CH3_ZERO_CAL_COEFF
      - CH3_SPAN_CAL_COEFF
      - CH3_CELL_ROBUSTNESS
      - CH3_HEATER_ON_TIME
      - CH3_RESPONSE_TIME
      - CH3_MIN_VALUE
      - CH3_MAX_VALUE
      - CH3_AVE_VALE
      - CH3_MIN_DATE
      - CH3_MAX_DATE
    - Ch4_other_value
      - CH4_CELL_VOLT
      - CH4_HEATER_TEMP
      - CH4_CJ_TEMP
      - CH4_TC_VOLT
      - CH4_CJ_VOLT
      - CH4_CELL_RESISTANCE
      - CH4_CJ_RESISTANCE
      - CH4_ZERO_CAL_COEFF
      - CH4_SPAN_CAL_COEFF
      - CH4_CELL_ROBUSTNESS
      - CH4_HEATER_ON_TIME
      - CH4_RESPONSE_TIME
      - CH4_MIN_VALUE
      - CH4_MAX_VALUE
      - CH4_AVE_VALE
      - CH4_MIN_DATE
      - CH4_MAX_DATE

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- Ch5_other_value
  - CH5_CELL_VOLT
  - CH5_HEATER_TEMP
  - CH5_CJ_TEMP
  - CH5_TC_VOLT
  - CH5_CJ_VOLT
  - CH5_CELL_RESISTANCE
  - CH5_CJ_RESISTANCE
  - CH5_ZERO_CAL_COEFF
  - CH5_SPAN_CAL_COEFF
  - CH5_CELL_ROBUSTNESS
  - CH5_HEATER_ON_TIME
  - CH5_RESPONSE_TIME
  - CH5_MIN_VALUE
  - CH5_MAX_VALUE
  - CH5_AVE_VALE
  - CH5_MIN_DATE
  - CH5_MAX_DATE
- Ch6_other_value
  - CH6_CELL_VOLT
  - CH6_HEATER_TEMP
  - CH6_CJ_TEMP
  - CH6_TC_VOLT
  - CH6_CJ_VOLT
  - CH6_CELL_RESISTANCE
  - CH6_CJ_RESISTANCE
  - CH6_ZERO_CAL_COEFF
  - CH6_SPAN_CAL_COEFF
  - CH6_CELL_ROBUSTNESS
  - CH6_HEATER_ON_TIME
  - CH6_RESPONSE_TIME
  - CH6_MIN_VALUE
  - CH6_MAX_VALUE
  - CH6_AVE_VALE
  - CH6_MIN_DATE
  - CH6_MAX_DATE
- Ch7_other_value
  - CH7_CELL_VOLT
  - CH7_HEATER_TEMP
  - CH7_CJ_TEMP
  - CH7_TC_VOLT
  - CH7_CJ_VOLT
  - CH7_CELL_RESISTANCE
  - CH7_CJ_RESISTANCE
  - CH7_ZERO_CAL_COEFF
  - CH7_SPAN_CAL_COEFF
  - CH7_CELL_ROBUSTNESS
  - CH7_HEATER_ON_TIME
  - CH7_RESPONSE_TIME
  - CH7_MIN_VALUE
  - CH7_MAX_VALUE
  - CH7_AVE_VALE
  - CH7_MIN_DATE
  - CH7_MAX_DATE
- Ch8_other_value
  - CH8_CELL_VOLT
  - CH8_HEATER_TEMP
  - CH8_CJ_TEMP
  - CH8_TC_VOLT
  - CH8_CJ_VOLT
  - CH8_CELL_RESISTANCE
  - CH8_CJ_RESISTANCE
  - CH8_ZERO_CAL_COEFF
  - CH8_SPAN_CAL_COEFF
  - CH8_CELL_ROBUSTNESS
  - CH8_HEATER_ON_TIME
  - CH8_RESPONSE_TIME
  - CH8_MIN_VALUE
  - CH8_MAX_VALUE
  - CH8_AVE_VALE
  - CH8_MIN_DATE
  - CH8_MAX_DATE
- Query Device
  - TB Profile Parameters
  - TB Original Parameters(part1)
  - TB Original Parameters(part2)
  - TB Original Parameters(part3)
  - TB Original Parameters(part4)

* Parameters not covered by category.
  - Block Header
  - ST_REV
  - COLLECTION DIRECTORY
  - Factory Parameters

  Mote that the others except Block Header and Factory Parameters are supported by Query Device.

* Details of Method are provided separately.

◆ Operational Precaution

This document supplements information regarding Operational Precaution.

Operate the product carefully based on the following note.

Display on the FieldMate (*)

When the AV550G is in communication with FieldMate, the DTM will run normally, but the information displayed in the FieldMate window will differ somewhat from that indicated on pages A- 46 and A-47 of the IM 11M12D01-61E manual.

(*) FieldMate is a communication tool for HART and Fieldbus.

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