Fe *e-Front runners*

MICREX-SX *series*
SPH
USER'S MANUAL

High-speed Multi-range Analog Module

8Ch Voltage Input	**<Type: NP1AXH8V-MR>**
8Ch Current Input	**<Type: NP1AXH8I-MR>**
8Ch Voltage Output	**<Type: NP1AYH8V-MR>**
8Ch Current Output	**<Type: NP1AYH8I-MR>**
4Ch Voltage Output	**<Type: NP1AYH4V-MR>**
4Ch Current Output	**<Type: NP1AYH4I-MR>**
6Ch Input/Output	**<Type: NP1AWH6-MR>**

Preface

This user's manual describes the system configuration, specifications and operating method of the following modules for MICREX-SX series:

- ◆ Multi-range analog 8ch voltage input module (type: NP1AXH8V-MR)
- ◆ Multi-range analog 8ch current input module (type: NP1AXH8I-MR)
- ◆ Multi-range analog 8ch voltage output module (type: NP1AYH8V-MR)
- ◆ Multi-range analog 8ch current output module (type: NP1AYH8I-MR)
- ◆ Multi-range analog 4ch voltage output module (type: NP1AYH4V-MR)
- ◆ Multi-range analog 4ch current output module (type: NP1AYH4I-MR)
- ◆ Multi-range analog 6ch input/output module (type: NP1AWH6-MR)

Read this manual carefully to ensure correct operation. When using modules or peripheral devices, be sure to read the corresponding user's manuals listed below:

<SX-Programmer Expert (D300win)>

Title	Manual No.	Contents
User's Manual Instruction, MICREX-SX series	FEH200	Explains the memory, language and system definitions of the MICREX-SX series.
User's Manual Hardware, MICREX-SX series SPH	FEH201	Explains the system configuration, the specifications and operations of modules in the MICREX-SX series.
User's Manual D300win <Reference>, MICREX-SX series	FEH257	Explains the methods for installing, the functions and the operations of D300winV3.
User's Manual D300win <LD/FBD Editor>, MICREX-SX series	FEH257-1	Explains the operations of LD/FBD added to D300winV3.

<SX-Programmer Standard (Standard loader)>

Title	Manual No.	Contents
User's Manual Instruction, MICREX-SX series	FEH588	Explains the memory, language and system definitions of the MICREX-SX series.
User's Manual Hardware, MICREX-SX series SPH	FEH201	Explains the system configuration, the specifications and operations of modules in the MICREX-SX series.
User's Manual SX-Programmer Standard <Reference>, MICREX-SX series	FEH590	Explains the functions and the operations of SX-Programmer Standard.

* This manual is structured such that you can consult it, whether you use SX-Programmer Expert (D300win) or SX-programmer standard (Standard loader).

* In addition to the above manuals, the following Fuji Electric FA Components & Systems Co., Ltd. site offers various manuals and technical documents associated with MICREX-SX.
     URL   http://www.fujielectric.co.jp/fcs/eng/

Notes

1. This manual may not be reproduced in whole or part in any form without prior written approval by the manufacturer.
2. The contents of this manual (including specifications) are subject to change without prior notice.
3. If you find any ambiguous or incorrect descriptions in this manual, please write them down (along with the manual No. shown on the cover) and contact FUJI.

Safety Precautions

Be sure to read the "Safety Precautions" thoroughly before using the module.
Here, the safety precautions items are classified into "Warning" and "Caution".

⚠️ **Warning** : Incorrect handling of the device may result in death or serious injury.

⚠️ **Caution** : Incorrect handling of the device may result in minor injury or physical damage.

Even some items indicated by "Caution" may result in a serious accident.
Both safety instruction categories provide important information. Be sure to strictly observe these instructions.
The items to be cared most are shown below:

⚠️ Warning
❑ Never touch any part of charged circuits as terminals and exposed metal portion while the power is turned ON. It may result in an electric shock to the operator. ❑ Turn OFF the power before mounting, dismounting, wiring, maintaining or checking, otherwise, electric shock, erratic operation or troubles might occur. ❑ Place the emergency stop circuit, interlock circuit or the like for safety outside the PLC. A failure of PLC might break or cause problems to the machine. ❑ Do not connect in reverse polarity, charge (except rechargeable ones), disassemble, heat, deform, throw in a fire or short-circuit the batteries, otherwise, they might burst or take fire. ❑ If batteries have any deformation, spilled fluids, or other abnormality, do not use them. The use of such batteries might cause explosion or firing.

Safety Precautions

⚠ Caution
❑ Do not use one found damaged or deformed when unpacked, otherwise, fire, failure or erratic operation might be caused.
❑ Do not shock the product by dropping or tipping it over, otherwise, it might be damaged or troubled.
❑ Follow the directions of the operating instructions and manual when mounting the product. If mounting is improper, the product might drop or develop problems or erratic operations.
❑ Use the rated voltage and current mentioned in the operating instructions and manual. Use beyond the rated values might cause fire, erratic operation or failure.
❑ Operate (keep) in the environment specified in the operating instructions and manual. High temperature, high humidity, condensation, dust, corrosive gases, oil, organic solvents, excessive vibration or shock might cause electric shock, fire, erratic operation or failure.
❑ Select a wire size to suit the applied voltage and carrying current. Tighten the wire terminals to the specified torque. Inappropriate wiring or tightening might cause fire, malfunction or failure, or might cause the product to drop from its mounting.
❑ Contaminants, wiring chips, iron powder or other foreign matter must not enter the device when installing it, otherwise, fire, accident, erratic operation or failure might occur.
❑ Remove the dust-cover seals of modules or units after wiring, otherwise, fire, accident, erratic operation or failure might occur.
❑ Connect the ground terminal to the ground, otherwise, electric shock or erratic operation might occur.
❑ Periodically make sure the terminal screws and mounting screws are securely tightened. Operation at a loosened status might cause fire or erratic operation.
❑ Put the furnished connector covers on unused connectors, otherwise, erratic operation or failure might occur.
❑ Put the furnished terminal covers on the terminal blocks, otherwise, electric shock or fire might occur.
❑ Sufficiently make sure of safety before program change, forced output, starting, stopping or anything else during a run. Wrong operation might break or cause problems to the machine
❑ Engage the loader connector in a correct orientation, otherwise, an erratic operation might occur.
❑ Before touching the PLC, discharge any static electricity that may have been collected on your body. To discharge it, touch a grounded metallic object. Static electricity might cause erratic operation or failure.
❑ Be sure to install the electrical wiring correctly and securely, observing the directions of the operating instructions and manual. Wrong or loose wiring might cause fire, accident or failure.
❑ When disengaging the plug from the outlet, do not pull the cord, otherwise, break of cable might cause fire or failure.
❑ Do not attempt to change system configurations (such as installing or removing I/O modules) while the power is ON, otherwise, erratic operation or failure might occur.
❑ Do not attempt to repair the module by yourself, but contact your Fuji Electric agent. When replacing the batteries, correctly and securely connect the battery connectors, otherwise, fire, accident or failure might occur.
❑ Do not remodel or disassemble the product, otherwise, failure might occur.
❑ Follow the regulations of industrial wastes when the device is to be discarded.
❑ The modules covered in these operating instructions have not been designed or manufactured for use in equipment or systems which, in the event of failure, can lead to loss of human life.
❑ If you intend to use the modules covered in these operating instructions for special applications, such as for nuclear energy control, aerospace, medical or transportation, please consult your Fuji Electric agent.
❑ Be sure to provide protective measures when using the module covered in these operating instructions in equipment which, in the event of failure, can lead to loss of human life or other grade results.
❑ External power supply (such as 24 V DC power supply) which is connected to DC I/O should be strongly isolated from AC power supply. (Use of EN60950 conforming power supply is recommended.) Otherwise, accident or failure might be caused.

Revisions

Printed on	*Manual No.	Revision contents
Sep. 2002	FEH206	First edition
Jun. 2004	FEH206a	• Operations when using SX-Programmer Standard were added.
Apr. 2006	FEH206b	• Specifications of Analog Input/Output Module (type: NP1AWH6-MR) were added.
May 2007	FEH206c	• Some errors in writing were corrected. • Expository writing was reviewed. (The expressions were revised.)

Contents

Contents

Section 1 General

1-1 List of Modules

Analog modules listed below are described in this manual.

Type	Analog voltage input 0 to 5V, 1 to 5V, 0 to 10V, -10 to 10V	Analog current input 4 to 20mA, 0 to 20mA, -20 to 20mA	Analog voltage output 0 to 5V, 1 to 5V, 0 to 10V, -10 to 10V	Analog current output 0 to 20mA, 4 to 20mA
NP1AXH8V-MR	8 channels	-	-	-
NP1AXH8I-MR	-	8 channels	-	-
NP1AYH8VMR	-	-	8 channels	-
NP1AYH8I-MR	-	-	-	8 channels
NP1AYH4V-MR	-	-	4 channels	-
NP1AYH4I-MR	-	-	-	4 channels
NP1AWH6-MR	4 channels		2 channels	

1-2 Supported Versions of Program Loader

Type	D300winV2 NP4H-SEDBV2	SX-Programmer Expert D300winV3 NP4H-SEDBV3	SX-Programmer Standard NP4H-SWN
NP1AXH8V-MR	V2.2.0.0 or later	V3.0.0.0 or later	V2.0.0.0 or later
NP1AXH8I-MR			
NP1AYH8VMR			
NP1AYH8I-MR			
NP1AYH4V-MR			
NP1AYH4I-MR			
NP1AWH6-MR	-	V3.3.3.0 or later	V2.2.3.0 or later

Section 2 Specifications

2-1 General Specifications

Item		Specification
Physical environmental conditions	Operating ambient temperature	0 to + 55 °C
	Storage (transportation) temperature	-20 to 70 °C
	Relative humidity	20 to 95%RH, no condensation
	Pollution degree	2 (no condensation)
	Corrosion immunity	Free from corrosive gases. Not stained with organic solvents
	Corrosive gas	Free from corrosive gases.
	Operating altitude	2000 m or less above sea level Transport condition: 70 kPa (equivalent to 3000 m above sea level) or more
Mechanical service conditions	Vibration	Half amplitude: 0.15 mm, Constant acceleration: 19.6 m/s^2 2 hours in each of X, Y and Z directions, total 6 hours
	Shock	Peak acceleration: 147 m/s^2(3 cycles in each direction)
Electrical service conditions	Noise immunity	Rise time 1 ns, pulse width 1 μs, 1.5 V (noise simulator)
	Electrostatic discharge	Contact discharge: ±6 kV, Aerial discharge: ±8 kV
	Radioelectromagnetic field	10 V/m (80 MHz to 1,000 MHz)
Isolation method		Between external terminal and internal logic circuit: photocoupler (signal), isolated power supply (DC/DC converter) Between channels: Not insulated
Dielectric strength		500 V AC, 1 minute (between external wires connected together and ground)
Insulation resistance		10 MΩ or more with 500 V DC megger (between external wires connected together and ground)
Internal current consumption	Analog input	NP1AXH8V-MR: 24 V DC, max. 200 mA (supplied from the power module) NP1AXH8I-MR: 24 V DC, max. 200 mA (supplied from the power module)
	Analog output	NP1AYH8V-MR: 24 V DC, max. 240 mA (supplied from the power module) NP1AYH8I-MR: 24 V DC, max. 300 mA (supplied from the power module) NP1AYH4V-MR: 24 V DC, max. 200 mA (supplied from the power module) NP1AYH4I-MR: 24 V DC, max. 200 mA (supplied from the power module)
	Analog input/output	NP1AWH6-MR: 24V DC, max. 200mA (supplied from the power module)
Installation conditions	Structure	Panel built in type, IP30
	Cooling method	Natural air cooled
Mass	Analog input	NP1AXH8V-MR: approx. 240 g NP1AXH8I-MR: approx. 240 g
	Analog output	NP1AYH8V-MR: approx. 240 g NP1AYH8I-MR: approx. 240 g NP1AYH4V-MR: approx. 240 g NP1AYH4I-MR: approx. 240 g
	Analog input/output	NP1AWH6-MR: approx. 240g
Outside dimensions		W35*H105*D111 mm (protrusion 21 mm)

Section 2 Specifications

2-2 Performance Specifications

2-2-1 8ch voltage input module

Item	Specification			
Type	NP1AXH8V-MR			
No. of input points	8			
Analog input range	0 to 5 V	1 to 5 V	0 to 10 V	-10 to 10 V
Input impedance	1 MΩ			
Maximum allowable input	±15 V			
Maximum resolution	1.25 mV	1.25 mV	1.25 mV	1.25 mV
Digital output value (INT type)	0 to 16000			-8000 to 8000
Measurement accuracy	Ambient temperature 18 to 28°C: ±0.1% (of full scale) Ambient temperature 0 to 55°C: ±0.2% (of full scale) (See note 1.)			
Sampling time	0.27 ms x (Number of conversion enabled channels + 1)			
Input filtering time	Max. approx. 100 µs (hard filter)			
Input delay time	Max. 2.5 ms/8 points + takt time (ms)			
External connecting method	Detachable terminal block: M3 screw, 20 poles For the signal assignment of terminals, refer to "Section 5 Wiring".			
Cable to use	Be sure to use shielded twisted pair cable.			
Treatment of unused input	To basically be short-circuited			
No. of occupied slots	1 (one)			
No. of occupied words	Input: 8 words, output: 4 words (fixed)			

Note: For the range of 1 to 5 V, ±0.3% (of full scale) when ambient temperature is 0 to 55°C.

2-2-2 8ch current input module

Item	Specification		
Type	NP1AXH8I-MR		
No. of input points	8		
Analog input range	4 to 20 mA	0 to 20 mA	-20 to 20 mA
Input impedance	250 Ω		
Maximum allowable input	±30 mA		
Maximum resolution	2.5 µA		
Digital output value (INT type)	0 to 16000		
Measurement accuracy	Ambient temperature 18 to 28°C: ±0.1% (of full scale) Ambient temperature 0 to 55°C: ±0.4% (of full scale)		
Sampling time	0.27 ms x (Number of conversion enabled channels + 1)		
Input filtering time	Max. approx. 100 µs (hard filter: time constant of primary delay)		
Input response time	Max. 2.5 ms/8 points + takt time		
External connecting method	Detachable terminal block: M3 screw, 20 poles For the signal assignment of terminals, refer to "Section 5 Wiring".		
Cable to use	Be sure to use shielded twisted pair cable.		
Treatment of unused input	To basically be short-circuited		
No. of occupied slots	1 (one)		
No. of occupied words	Input: 8 words, output: 4 words (fixed)		

Section 2 Specifications

2-2 Performance Specifications

2-2-3 8ch voltage output module

Item	Specification			
Type	NP1AYH8V-MR			
No. of output points	8			
Analog output range	0 to 5 V	1 to 5 V	0 to 10 V	-10 to 10 V
External load resistance	Min. 500Ω	Min. 500Ω	Min. 1kΩ	Min. 1kΩ
Maximum resolution	1.25 mV	1.25 mV	1.25 mV	1.25 mV
Digital input value (INT type)	0 to 16000			-8000 to 8000
Measurement accuracy	Ambient temperature 18 to 28°C: ±0.1% (of full scale) Ambient temperature 0 to 55°C: ±0.2% (of full scale) (See note 1.)			
Output response time	Max. 2.0 ms + takt time (ms) Max. 1.0 ms + takt time (ms) when output is disabled for channels 5 to 8			
Load short-circuit protection	Provided. (See note 2.)			
External connecting method	Detachable terminal block: M3 screw, 20 poles For the signal assignment of terminals, refer to "Section 5 Wiring".			
Cable to use	Be sure to use shielded twisted pair cable.			
Treatment of unused output	To basically be opened			
No. of occupied slots	1 (one)			
No. of occupied words	Input: 4 words, output: 8 words (fixed)			

Note 1: For the range of 1 to 5 V, ±0.3% (of full scale) when ambient temperature is 0 to 55°C.
Note 2: Short-circuit protection for arbitrary one channel. The occurrence of short-circuit on multiple channels in an environment where ambient temperature is higher than 30°C may have a bad influence on internal electronic component of the module.

2-2-4 8ch current output module

Item	Specification	
Type	NP1AYH8I-MR	
No. of output points	8	
Analog output range	0 to 20 mA	4 to 20 mA
External load resistance	Max. 600Ω	
Maximum resolution	2.5 μA	
Digital input value (INT type)	0 to 16000	
Measurement accuracy	Ambient temperature 18 to 28°C: ±0.1% (of full scale) Ambient temperature 0 to 55°C: ±0.4% (of full scale)	
Output response time	Max. 2.0 ms + takt time (ms) Max. 1.0 ms + takt time (ms) when output is disabled for channels 5 to 8	
External connecting method	Detachable terminal block: M3 screw, 20 poles For the signal assignment of terminals, refer to "Section 5 Wiring".	
Cable to use	Be sure to use shielded twisted pair cable.	
Treatment of unused output	To basically be short-circuited	
No. of occupied slots	1 (one)	
No. of occupied words	Input: 4 words, output: 8 words (fixed)	

Section 2 Specifications

2-2 Performance Specifications

2-2-5 4ch voltage output module

Item	Specification			
Type	NP1AYH4V-MR			
No. of output points	4			
Analog output range	0 to 5 V	1 to 5 V	0 to 10 V	-10 to 10 V
External load resistance	Min. 500Ω	Min. 50Ω	Min. 1kΩ	Min. 1kΩ
Maximum resolution	1.25 mV	1.25 mV	1.25 mV	1.25 mV
Digital input value (INT type)	0 to 16000			-8000 to 8000
Measurement accuracy	Ambient temperature 18 to 28°C: ±0.1% (of full scale) Ambient temperature 0 to 55°C: ±0.2% (of full scale) (See note 1.)			
Output response time	Max. 1.0 ms + takt time (ms)			
Load short-circuit protection	Provided. (See note 2.)			
External connecting method	Detachable terminal block: M3 screw, 10 poles For the signal assignment of terminals, refer to "Section 5 Wiring".			
Cable to use	Be sure to use shielded twisted pair cable.			
Treatment of unused output	To basically be opened			
No. of occupied slots	1 (one)			
No. of occupied words	Input: 4 words, output: 4 words (fixed)			

Note 1: For the range of 1 to 5 V, ± 0.3% (of full scale) when ambient temperature is 0 to 55°C.
Note 2: Short-circuit protection for arbitrary one channel. The occurrence of short-circuit on multiple channels in an environment where ambient temperature is higher than 30°C may have a bad influence on internal electronic component of the module.

2-2-6 4ch current output module

Item	Specification	
Type	NP1AYH4I-MR	
No. of output points	4	
Analog output range	0 to 20 mA	4 to 20 mA
External load resistance	Max. 600Ω	
Maximum resolution	2.5 μA	
Digital input value (INT type)	0 to 16000	
Measurement accuracy	Ambient temperature 18 to 28°C: ±0.1% (of full scale) Ambient temperature 0 to 55°C: ±0.4% (of full scale)	
Output response time	Max. 1.0 ms + takt time (ms)	
External connecting method	Detachable terminal block: M3 screw, 10 poles For the signal assignment of terminals, refer to "Section 5 Wiring".	
Cable to use	Be sure to use shielded twisted pair cable.	
Treatment of unused output	To basically be short-circuited	
No. of occupied slots	1 (one)	
No. of occupied words	Input: 4 words, output: 4 words (fixed)	

Section 2 Specifications

2-2 Performance Specifications

2-2-7 6ch input/output module

Item	Specification	
Type	NP1AWH6-MR	
Analog input — No. of input points	4	
Analog input range	0 to 5V, 1 to 5V, 0 to 10V, -10 to 10V	0 to 20mA, 4 to 20mA, -20 to 20mA
Input impedance	1 MΩ	250 Ω
Maximum allowable input	±15 V	±30 mA
Maximum resolution	0.625 mV	2.5 µA
Digital output value (INT type)	0 to 16000, -8000 to 8000	
Sampling time	0.25 ms x (Number of conversion enabled channels + 1)	
Input filtering time	Max. approx. 47 µs (hard filter: time constant of primary delay)	
Input delay time	Max. 1.0 ms/4 channels + takt time (ms)	
Analog output — No. of output points	2	
Analog output range	0 to 5V, 1 to 5V, 0 to 10V, -10 to 10V	0 to 20mA, 4 to 20mA
External load resistance	Min. 2 kΩ	Max. 500 Ω
Maximum resolution	0.625 mV	2.5 µA
Digital input value (INT type)	0 to 16000, -8000 to 8000	
Output response time	Max. 0.5 ms + takt time (ms)	
Load short-circuit protection	Provided (voltage output) (See note 1.)	
Measurement accuracy	Ambient temperature 18 to 28°C: ±0.1% (of full scale) Ambient temperature 0 to 55°C: ±0.2% (of full scale) (See note 2.)	
External connecting method	Detachable terminal block: M3 screw, 10 poles For the signal assignment of terminals, refer to "Section 5 Wiring".	
Cable to use	Be sure to use shielded twisted pair cable.	
Treatment of unused input	Input: To basically be short-circuited (between V+ and COM) Output: To basically be opened	
No. of occupied slots	1 (one)	
No. of occupied words	Input: 4 words, Output: 4 words (fixed)	

Note 1: Short-circuit protection for arbitrary one channel. The occurrence of short-circuit on multiple channels in an environment where ambient temperature is higher than 30°C may have a bad influence on internal electronic component of the module.

Note 2: For the range of 4 to 20 mA and 0 to 20 mA, ±0.3% (of full scale) when ambient temperature is 0 to 55°C.

Section 2 Specifications

2-3 Conversion Characteristics

2-3-1 Conversion characteristics of analog voltage input

Output range	Digital input range	
0 to 5 V	0 to 16000	0 to 10000
1 to 5 V	0 to 16000	0 to 10000
0 to 10 V	0 to 16000	0 to 10000
-10 to 10 V	-8000 to 8000	0 to 10000

1) Characteristic curve for the input range of 0 to 5 V
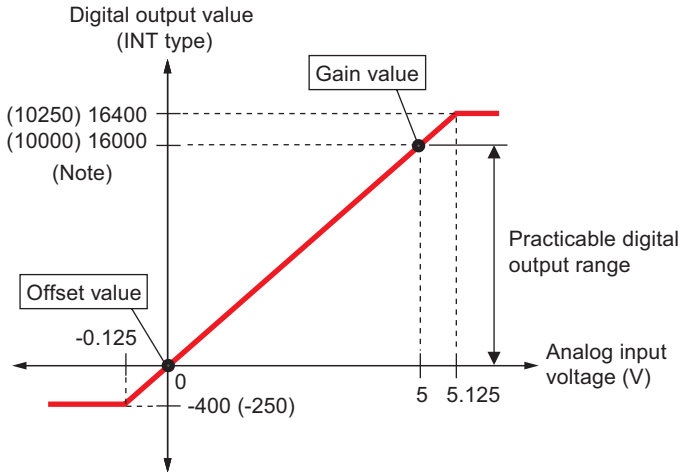
2) Characteristic curve for the input range of 1 to 5 V
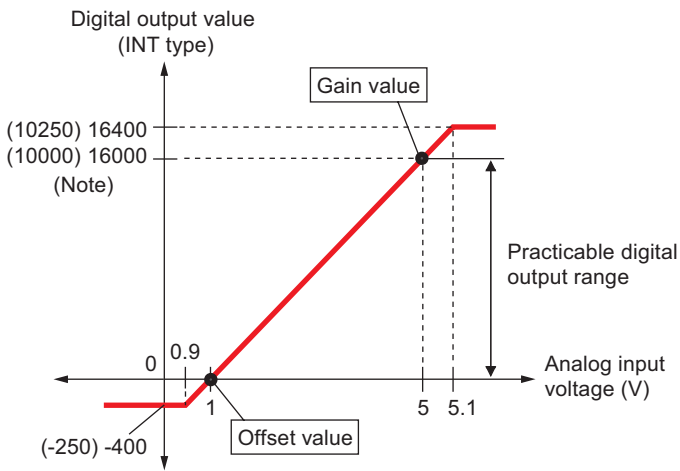
<NP1AWH6-MR only>

Note: Parenthesized figures mean the values when the unit of digital output value is % in Fixed Range Operation mode (excl. NP1AWH6-MR). In software Set Range Operation mode, scaling is necessary to express output values by the %.

Section 2 Specifications

2-3 Conversion Characteristics

3) Characteristic curve for the input range of 0 to 10 V

4) Characteristic curve for the input range of -10 to 10 V

Note: Parenthesized figures mean the values when the unit of digital output value is % in Fixed Range Operation mode (excl. NP1AWH6-MR). In software Set Range Operation mode, scaling is necessary to express output values by the %.

Section 2 Specifications

2-3 Conversion Characteristics

2-3-2 Conversion characteristics of analog current input

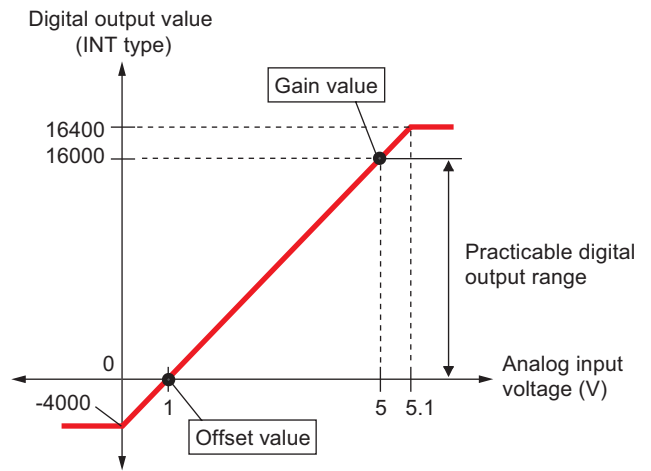| Input range	Digital output range	
4 to 20 mA	0 to 16000	0 to 10000
0 to 20 mA	0 to 16000	0 to 10000
-20 to 20 mA	-8000 to 8000	0 to 10000

1) Characteristic curve for the input range of 4 to 20 mA
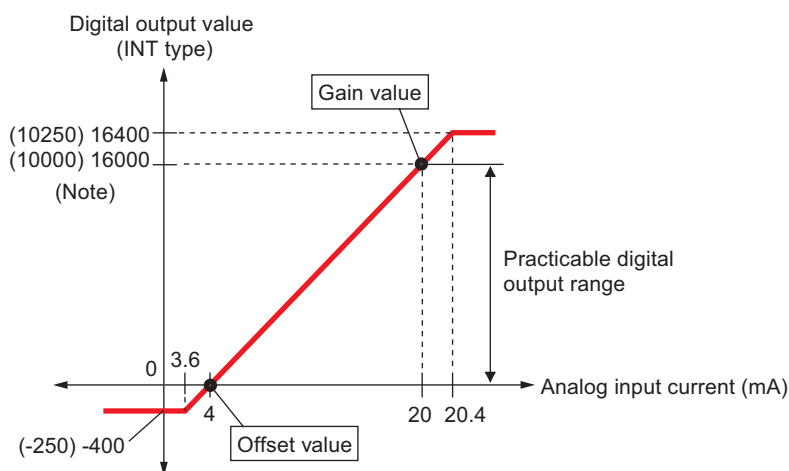
2) Characteristic curve for the input range of 0 to 20 mA
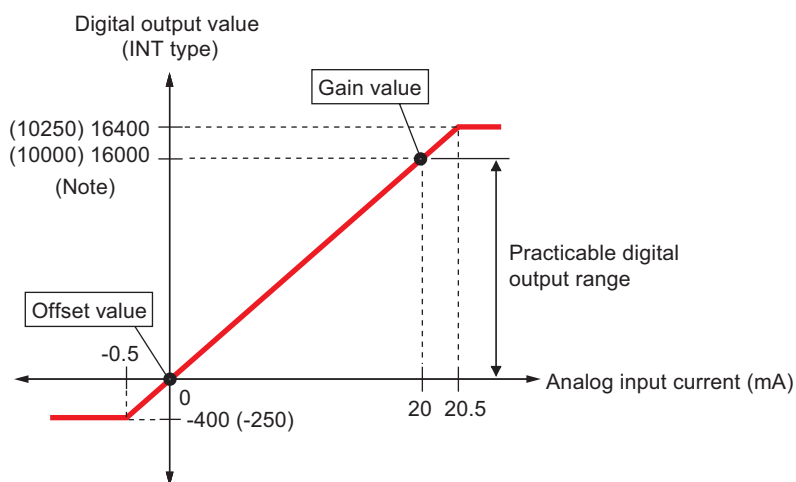
Note: Parenthesized figures mean the values when the unit of digital output value is % in Fixed Range Operation mode (excl. NP1AWH6-MR). In software Set Range Operation mode, scaling is necessary to express output values by the %.

Section 2 Specifications

2-3 Conversion Characteristics

3) Characteristic curve for the input range of -20 to 20 mA
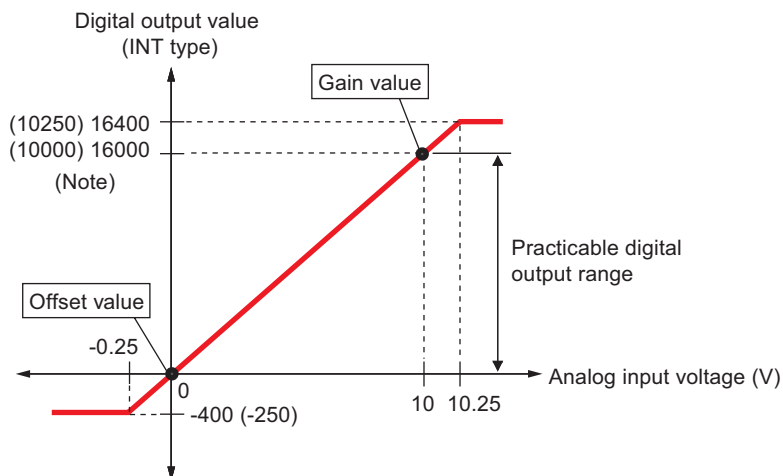

Note: Parenthesized figures mean the values when the unit of digital output value is % in Fixed Range Operation mode (excl. NP1AWH6-MR). In software Set Range Operation mode, scaling is necessary to express output values by the %.
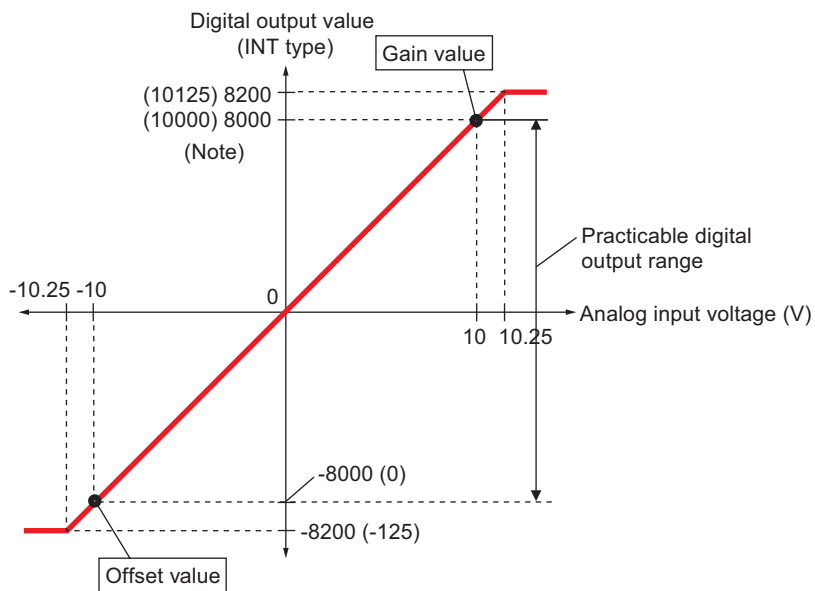
Section 2 Specifications

2-3 Conversion Characteristics

2-3-3 Conversion characteristics of analog voltag output

Output range	Digital input range	
0 to 5 V	0 to 16000	0 to 10000
1 to 5 V	0 to 16000	0 to 10000
0 to 10 V	0 to 16000	0 to 10000
-10 to 10 V	-8000 to 8000	-

1) Characteristic curve for the output range of 0 to 5 V

2) Characteristic curve for the output range of 1 to 5 V
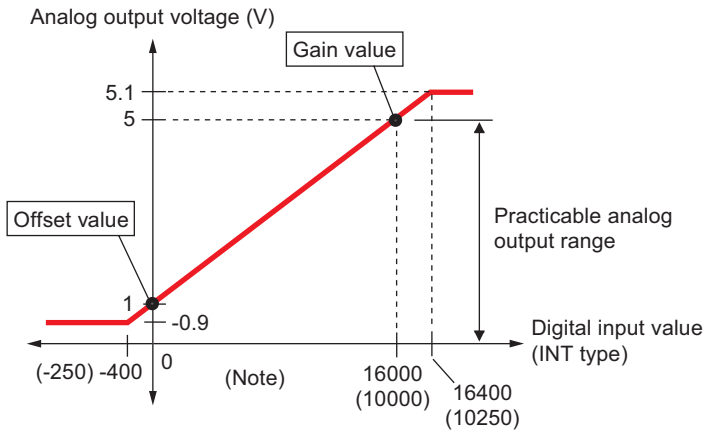
Note 1: Parenthesized figures mean the values when the unit of digital input value is % in Fixed Range Operation mode (excl. NP1AWH6-MR). In Software Set Range Operation mode, scaling is necessary to express input values by the %.

Note 2: If parameter mode is activated in Software Set Range Operation mode, analog output value becomes equal to the offset value.

Section 2 Specifications

2-3 Conversion Characteristics

3) Characteristic curve for the output range of 0 to 10 V

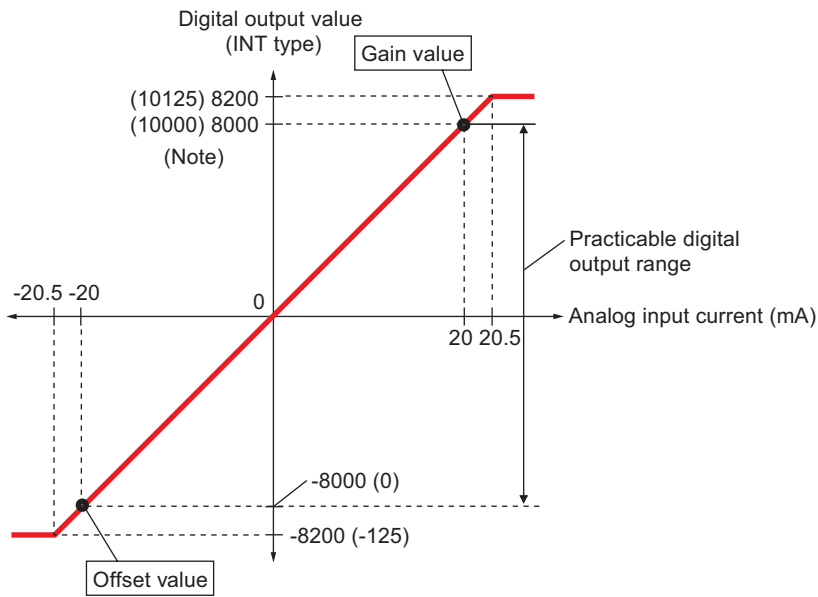**4) Characteristic curve for the output range of -10 to 10 V**
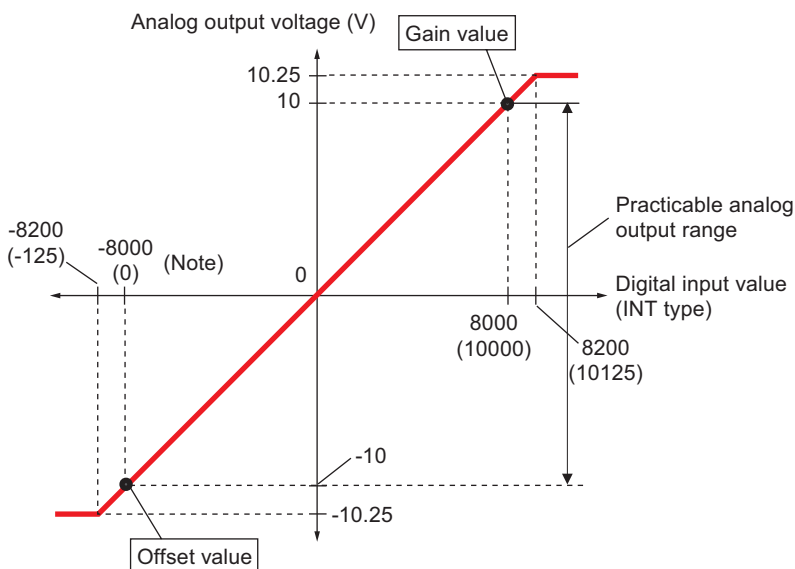
Note 1: Parenthesized figures mean the values when the unit of digital input value is % in Fixed Range Operation mode (excl. NP1AWH6-MR). In Software Set Range Operation mode, scaling is necessary to express input values by the %.

Note 2: For the range of -10 to 10 V, the unit of % cannot be selected by switch setting.

Note 3: If parameter mode is activated in Software Set Range Operation mode, analog output value becomes equal to the offset value, except that 0 V is output for the range of -10 to 10 V.

Section 2 Specifications

2-3 Conversion Characteristics

2-3-4 Conversion characteristics of analog current output

Output range	Digital input range	
4 to 20 mA	0 to 16000	0 to 10000
0 to 20 mA	0 to 16000	0 to 10000

1) Characteristic curve for the output range of 4 to 20 mA
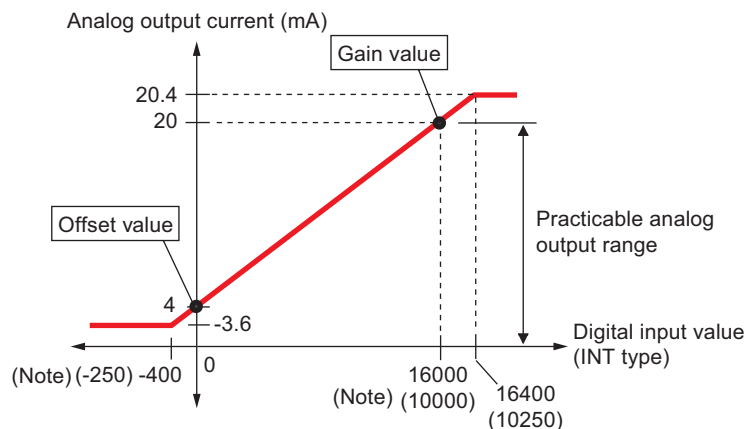
2) Characteristic curve for the output range of 0 to 20 mA

Note 1: Parenthesized figures mean the values when the unit of digital input value is % in Fixed Range Operation mode (excl. NP1AWH6-MR). In Software Set Range Operation mode, scaling is necessary to express input values by the %.
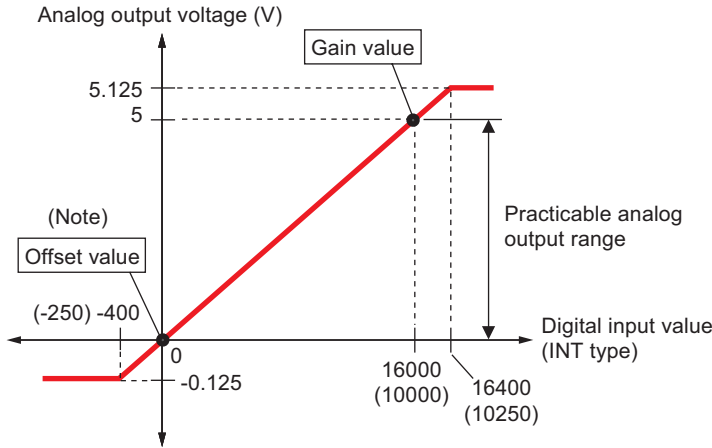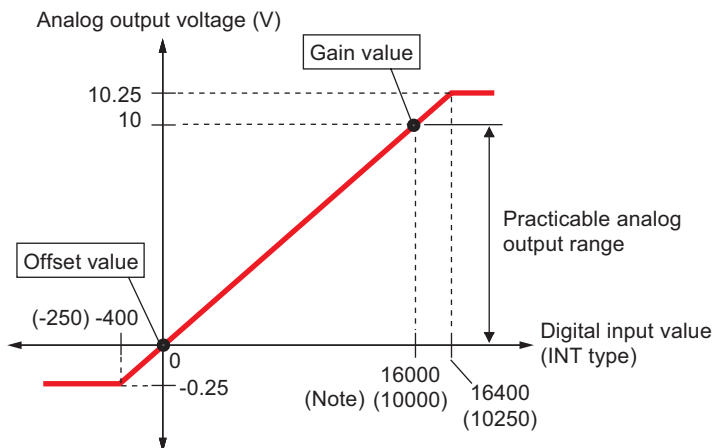
Note 2: If parameter mode is activated in Software Set Range Operation mode, analog output value becomes equal to the offset value.

2-12

Section 2 Specifications

2-4 Functional Specifications

2-4-1 Analog input module functions

(1) Switch batch setting function

With the operation setting switches provided on the module rear panel, it is possible to set the following items for all the channels in a batch:

- Operation range and the unit for digital conversion
- Moving average execution times (can be selected from 1, 2, 4 and 8 times).

When the unit of digital output value is set to %, the module operates, regarding
   Lower limit value of range as 0.00%,
   Upper limit value of range as 100.00%, and
   Digital output range as -2.50% to 102.5%.

Note 1: If the Switch Batch Setting function is enabled after scaling values or other parameters have been changed from the parameter setting window, the changed parameters are not reflected on operation and the parameters return to the default values.

Note 2: When the switch is set to an invalid value, the status code of "30005" is returned to all the channels.

Note 3: The setting of the switch cannot be checked from application program. Be sure to check the switch setting before the system is started or before maintenance or replacement is performed.

⇨ **For how to set the switch, refer to "2-5 Names and Functions".**

(2) Individual channel operation range setting function

When the operation setting switch on the module rear panel is set to "Software Set Range", operation range can be set for individual channel by application program.

(3) Individual channel moving average execution times setting function

When the operation setting switch on the module rear panel is set to "Software Set Range", moving average execution times can be set for individual channel by application program. Default is once (sampling operation). Averaging execution times can be selected from 1, 2, 4 and 8.

Note: The "Average" switch on the module rear panel is disabled.

(4) Individual channel conversion enable/disable setting function

When the operation setting switch on the module rear panel is set to "Software Set Range", enable/disable of A/D conversion can be set for individual channel by application program. Default is "enable conversion".
Sampling time can be reduced by disabling A/D conversion for unused channels. For conversion disabled channels, digital output value is fixed to 0 (zero).

(5) Individual channel gain/offset value fine adjustment function

When the operation setting switch on the module rear panel is set to "Software Set Range", gain and offset values can finely be adjusted for individual channel by application program.

* For the detailed specifications and setting, refer to "4-1-2 (6)".

(6) Scaling function

When the operation setting switch on the module rear panel is set to "Software Set Range", the scale for A/D conversion can be set for individual channel by application program.

* For the detailed specifications and setting, refer to "4-1-2 (6)".

Section 2 Specifications

2-4 Functional Specifications

2-4-2 Analog output module functions

(1) Switch batch setting function

With the operation setting switches provided on the module rear panel, it is possible to set operation range and the unit for digital input value for all the channels in a batch.

When the unit of digital input value is set to %, the module operates, regarding
> **Lower limit value of range as 0.00%,**
> **Upper limit value of range as 100.00%**
> **Digital output range as 2.50% to 102.5%.**

Note 1: If the Switch Batch Setting function is enabled after scaling values or other parameter have been changed from the parameter setting window, the changed parameters are not reflected on operation and the parameters return to the default values.

Note 2: When the switch is set to an invalid value, bit 11 of offset address +0 is set ON.

Note 3: The setting of the switch cannot be checked from application program. Be sure to check the switch setting before the system is started or before maintenance or replacement is performed.

⇨ **For how to set the switch, refer to "2-5 Names and Functions".**

(2) Individual channel operation range setting function

When the operation setting switch on the module rear panel is set to "Software Set Range", operation range can be set for individual channel by application program.

(3) Output enable/disable setting function (analog 8ch output modules only)

When the operation setting switch on the module rear panel is set to "Software Set Range", "enable output for all channels" or "enable output for CH1 to CH4, disable output for CH5 to CH8" can be set by application program.
When "enable output for CH1 to CH4, disable output for CH5 to CH8" is set, sampling time is halved, and the output disabled channels output 0 V or 0 mA.

Note: Because the accuracy of output value is not guaranteed for output disabled channels, these channels may output slightly offset values.

(4) Individual channel gain/offset value fine adjustment function

When the operation setting switch on the module rear panel is set to "Software Set Range", gain and offset values can finely be adjusted for individual channel by application program.

* For the detailed specifications and setting, refer to "4-2-2 (8)".

(5) Scaling function

When the operation setting switch on the module rear panel is set to "Software Set Range", the scale for D/A conversion can be set for individual channel by application program.

* For the detailed specifications and setting, refer to "4-2-2 (8)".

> ⚠ When the system is started up, the analog value that corresponds to digital value "0" (zero) is output (for approximately several hundreds milliseconds since the "ONL" LED has lit till the application program starts). Therefore, for scaling, the value that corresponds to digital value "0" (zero) should be set such that fail safe operation will be performed. Also when the system is shut down or becomes abnormal, the analog value that corresponds to digital value "0" (zero) is output (when this module in I/O Reset mode).

Section 2 Specifications

2-4 Functional Specifications

2-4-3 Analog input/output module functions

(1) Switch batch setting function

With the operation setting switches provided on the module rear panel, it is possible to set operation range.
For analog input, it can be set for 4 channels in a batch; for analog output, 2 channels in a batch.

Note 1: If the Switch Batch Setting function is enabled after scaling values or other parameter have been changed from the parameter setting window, the changed parameters are not reflected on operation and the parameters return to the default values.
Note 2: When the switch is set to an invalid value, the status code of "30005" is returned to all the channels.
Note 3: The setting of the switch cannot be checked from application program. Be sure to check the switch setting before the system is started or before maintenance or replacement is performed.

⇨ **For how to set the switch, refer to "2-5 Names and Functions".**

(2) Individual channel operation range setting function

When the operation setting switch on the module rear panel is set to "Software Set Range", operation range can be set for individual channel by application program.

(3) Individual channel moving average execution times setting function

When the operation setting switch on the module rear panel is set to "Software Set Range", moving average execution times can be set for individual channel by application program. Default is once (sampling operation). Averaging execution times can be selected from 1, 2, 4 and 8.

(4) Individual channel conversion enable/disable setting function

When the operation setting switch on the module rear panel is set to "Software Set Range", enable/disable of A/D conversion can be set for individual channel by application program. Default is "enable conversion".
Sampling time can be reduced by disabling A/D conversion for unused channels. For conversion disabled channels, digital output value is fixed to 0 (zero).

(5) Individual channel gain/offset value fine adjustment function

When the operation setting switch on the module rear panel is set to "Software Set Range", gain and offset values can finely be adjusted for individual channel by application program.

* For the detailed specifications and setting, refer to "4-3-2 (8)".

(6) Scaling function

When the operation setting switch on the module rear panel is set to "Software Set Range", the scale for A/D conversion can be set for individual channel by application program.

* For the detailed specifications and setting, refer to "4-3-2 (8)".

Section 2 Specifications

2-5 Names and Functions

2-5-1 Analog input module (NP1AXH8V-MR/NP1AXH8I-MR)

(1) Names

1) Status indication LED
4) Version seal
3) Detachable terminal block
Nameplate
2) Operation setting switches

Front   Rear

(2) Functions

1) Status Indication LED

Indicates the current status of the analog input module.

Symbol	Color	Description
ONL	Green	Lights when the module is operating normally. Blinks while connecting to SX bus.
ERR	Red	Lights when the module is abnormal.
SETTING	Green	Blinks while gain or offset value is being adjusted.

<Example of status indication>

O: Lighting,   △: Blinking,   -: Unlit

Status	ONL (green)	ERR (red)	SETTING (green)
Initializing	△	-	-
Normally operating	O	-	-
Adjusting offset/gain value	O	-	△
Fatal fault	-	O	-

Section 2 Specifications

2-5 Names and Functions

2) Operation setting switches

These switches are used to set input range and moving average execution times.

"Average" switch: Used to set a same value of moving average execution times for all channels. In Software Set Range Operation mode, the setting of this switch is ignored, and instead the initial value is used for operation. For more information, refer to "Section 4 Software Interface".

"Range" switch: When this switch is set to one of numbers "0" to "7", same range is set for all channels. It is impossible to set input range differently for individual channels.
When this switch is set to "8", Software Set Range Operation mode is activated, and it becomes possible to set various parameters differently for individual channels. For more information, refer to "Section 4 Software Interface".
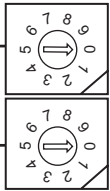
← At shipment, both "Average" and "Range" switches are set to "0" (zero).

<Range switch setting list>

Switch No.	NP1AXH8V-MR	
	Input range	Digital output range
0 At shipment	-10 to 10 V	-8000 to 8000
1	0 to 10 V	0 to 16000
2	0 to 5 V	
3	1 to 5 V	
4	-10 to 10 V	0 to 10000
5	0 to 10 V	
6	0 to 5 V	
7	1 to 5 V	
8	Software Set Range Operation mode (Note1)	
9	Unused (Note 2)	

Switch No.	NP1AXH8I-MR	
	Input range	Digital output range
0 At shipment	4 to 20 mA	0 to 16000
1	0 to 20 mA	
2	-20 to 20 mA	-8000 to 8000
3	4 to 20 mA	0 to 10000
4	0 to 20 mA	
5	-20 to 20 mA	
6	Software Set Range Operation mode	
7	Unused (Note 2)	
8		
9		

<Average switch setting list>

Switch No.	NP1AXH8V-MR	NP1AXH8I-MR
0 At shipment	Once (no moving average)	
1	Twice	
2	4 times	
3	8 times	
4 to 9	Unused (no moving average)	

Note 1: For how to set in Software Set Range Operation mode, refer to "Section 4 Software Interface".

Note 2: If an unused number is set, a "switch setting error" will occur.

3) Detachable terminal block

M3 20-pole detachable terminal block. For terminal arrangement, refer to "5-1-1 Terminal arrangement". For wiring, be sure to use crimp type terminals and surely tighten them (tightening torque: 0.5 to 0.7 N-m.)

4) Version seal

Versions of the hardware and firmware of the module are indicated on this seal.

2 0 ← Hardware version
3 0 ← Firmware version
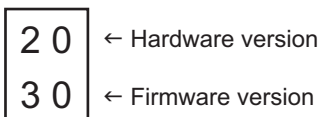
Section 2 Specifications

2-5 Names and Functions

2-5-2 Analog output module (NP1AYH8V-MR, NP1AYH8I-MR, NP1AYH4V-MR, NP1AYH4I-MR)

(1) Names

<Analog 8ch output module>

1) Status indication LED

4) Version seal

ONL SETTING
ERR

3) Detachable terminal block

2) Operation setting switches

Nameplate

Front   Rear

<Analog 4ch output module>

1) Status indication LED

4) Version seal

ONL SETTING
ERR
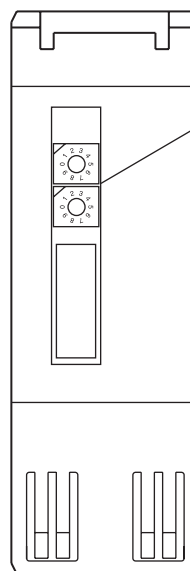
3) Detachable terminal block

2) Operation setting switches

Nameplate

Front   Rear

Section 2 Specifications

2-5 Names and Functions

(2) Functions

1) Status indication LED

Indicates the current status of the analog output module.

Symbol	Color	Description
ONL	Green	Lights when the module is operating normally. Blinks while connecting to SX bus.
ERR	Red	Lights when the module is abnormal.
SETTING	Green	Blinks while gain or offset value is being adjusted.

<Example of status indication>

O: Lighting,   △: Blinking,   -: Unlit

Status	ONL (green)	ERR (red)	SETTING (green)
Initializing	△	-	-
Normally operating	O	-	-
Adjusting offset/gain value	O	-	△
Fatal fault	-	O	-

2) Operation setting switch

Used to set output range.

  "Range" switch: When this switch is set to one of numbers "0" to "7" ("0" to "3" for current output modules), same output range is set for all channels. It is impossible to set output range differently for individual channel. When this switch is set to "8" ("4" for current output modules), Software Set Range Operation mode is activated, and it becomes possible to set various parameters differently for individual channel. For more information, refer to "Section 4 Software Interface".
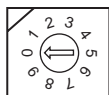
← At shipment, this switch is set to "0" (zero).

<Range switch setting list>

Switch No.	NP1AYH8V-MR	
	Output range	Digital input range
0 At shipment	0 to 10 V	0 to 16000
1	0 to 5 V	
2	1 to 5 V	
3	-10 to 10 V	-8000 to 8000
4	0 to 10 V	0 to 10000
5	0 to 5 V	
6	1 to 5 V	
7	Unused (the operation for switch No. 0)	
8	Software Set Range Operation mode (Note)	
9	Unused (the operation for switch No. 0)	

Switch No.	NP1AYH8I-MR	
	Output range	Digital input range
0 At shipment	4 to 20 mA	0 to 16000
1	0 to 20 mA	
2	4 to 20 mA	0 to 10000
3	0 to 20 mA	
4	Software Set Range Operation mode	
5		
6		
7	Unused (the operation for switch No. 0)	
8		
9		

Note: For how to set in Software Set Range Operation mode, refer to "Section 4 Software Interface".

Section 2 Specifications

2-5 Names and Functions

3) Detachable terminal block

M3 20-pole detachable terminal block (M3 10-pole for 4ch output modules). For terminal arrangement, refer to "5-2-1 Terminal arrangement". For wiring, be sure to use crimp type terminals and surely tighten them (tightening torque: 0.5 to 0.7 N-m.)

4) Version seal

Versions of the hardware and firmware of the module are indicated on this seal.

2 0 ← Hardware version

3 0 ← Firmware version

Section 2 Specifications

2-5 Names and Functions

2-5-3 Analog input/output module (NP1AWH6-MR)
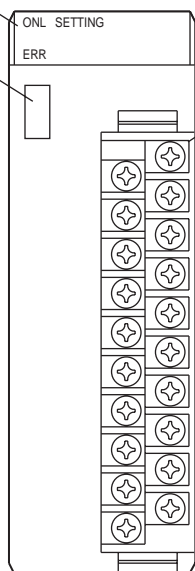
(1) Names

Front

Rear

1) Status indication LED
4) Version seal
3) Detachable terminal block
Nameplate
2) Operation setting switches

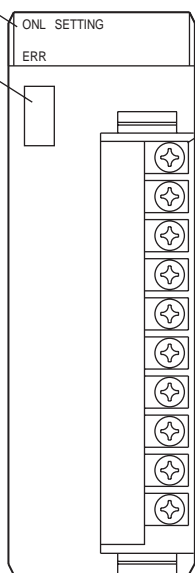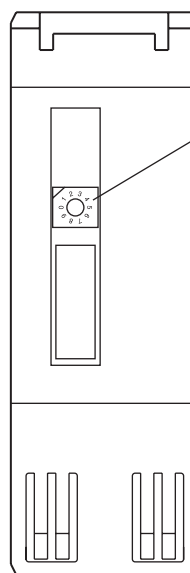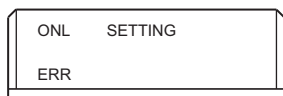#### (2) Functions

1) Status Indication LED

Indicates the current status of the analog input/output module.

Symbol	Color	Description
ONL	Green	Lights when the module is operating normally. Blinks while connecting to SX bus.
ERR	Red	Lights when the module is abnormal.
SETTING	Green	Blinks while gain or offset value is being adjusted.

<Example of status indication>

O: Lighting,　△: Blinking,　-: Unlit

Status	ONL (green)	ERR (red)	SETTING (green)
Initializing	△	-	-
Normally operating	O	-	-
Adjusting offset/gain value	O	-	△
Fatal fault	-	O	-

Section 2 Specifications

2-5 Names and Functions

2) Operation setting switches

These switches are used to set input/output range. When input/output range is set with these switches, the same range is set for input and output channels. It is impossible to set input range differently for individual channels.
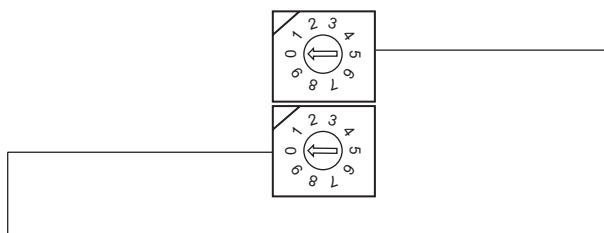
Switch No.	Input range	Digital output range		Switch No.	Output range	Digital input range
0 At shipment	0 to 10 V	0 to 16000		0 At shipment	0 to 10V	0 to 16000
1	0 to 5 V			1	0 to 5V	
2	1 to 5 V			2	1 to 5V	
3	-10 to 10 V	-8000 to 8000		3	-10 to 10V	-8000 to 8000
4	0 to 20 mA	0 to 16000		4	0 to 20 mA	0 to 16000
5	4 to 20 mA			5	4 to 20 mA	
6	-20 to 20mA	-8000 to 8000		6	Unused (the operation for switch No. 0)	
7	Software Set Range Operation mode (Note)			7		
8	Unused (the operation for switch No. 0)			8		
9	Unused (the operation for switch No. 0)			9		

Note: For how to set in Software Set Range Operation mode, refer to "Section 4 Software Interface".

3) Detachable terminal block

M3 20-pole detachable terminal block. For terminal arrangement, refer to "5-3-1 Terminal arrangement". For wiring, be sure to use crimp type terminals and surely tighten them (tightening torque: 0.5 to 0.7 N-m.)

4) Version seal

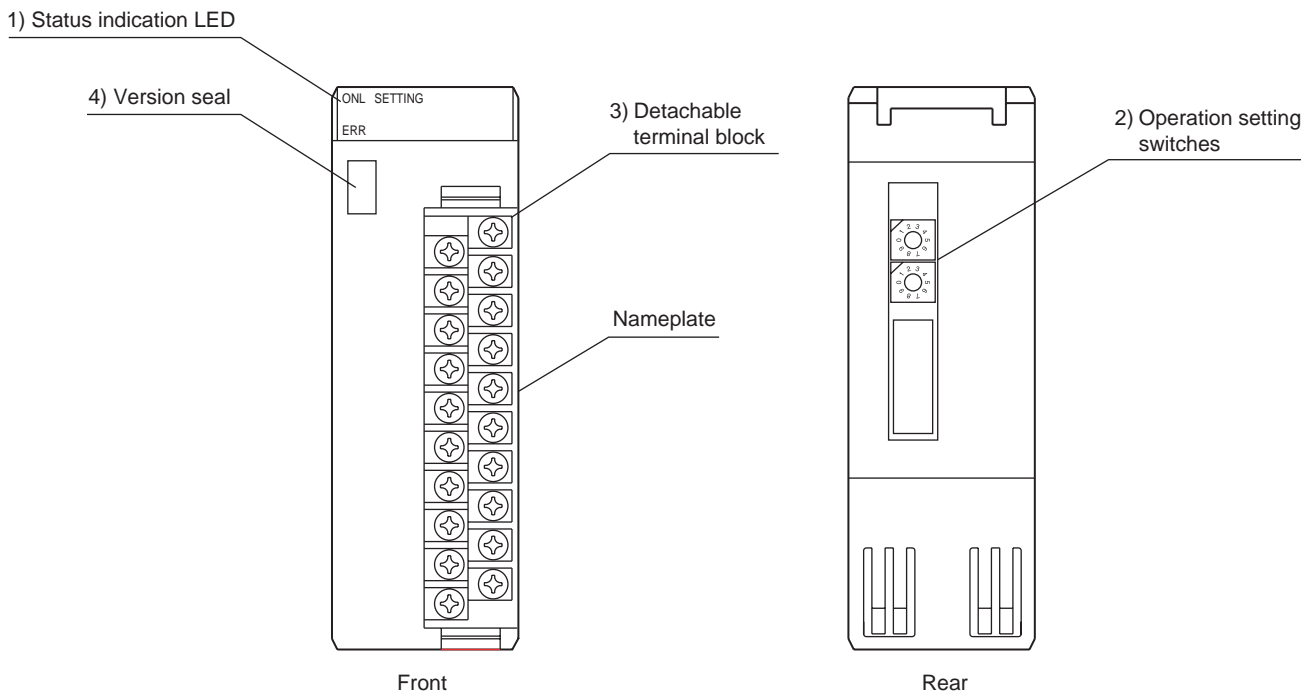Versions of the hardware and firmware of the module are indicated on this seal.

2 0 ← Hardware version

3 0 ← Firmware version

Section 2 Specifications

2-6 Dimensions

(Unit: mm)
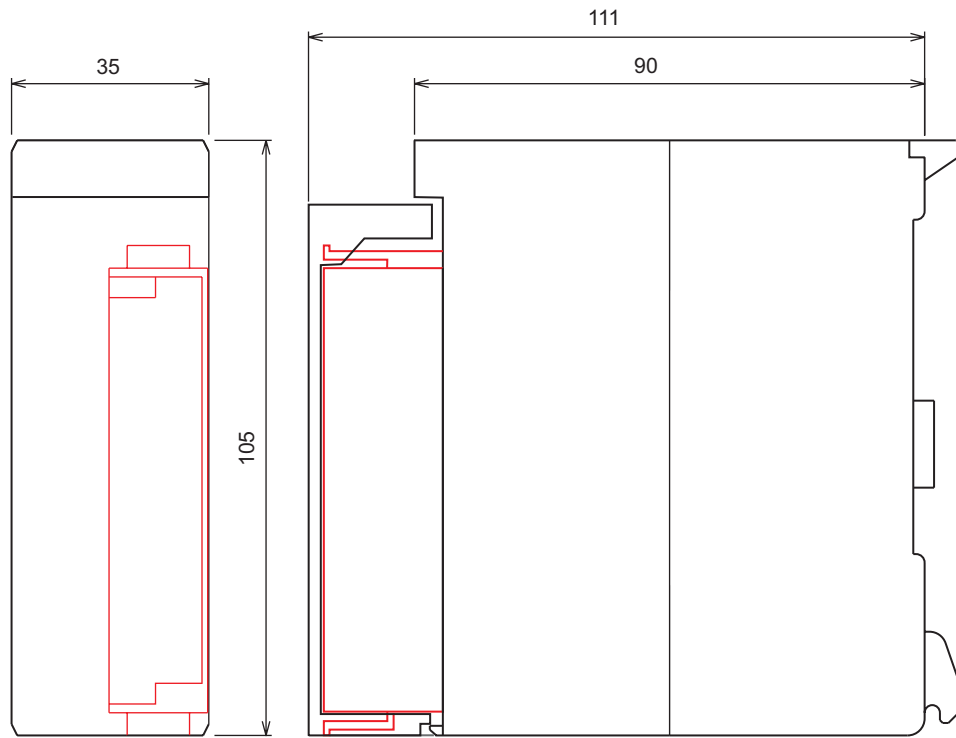
Section 3 System Configuration

3-1 Mounting on the Base Board

3-1-1 Mounting position

To use these modules, they need to be connected to the SX bus of MICREX-SX series SPH or to the link (remote I/O) of I/O master module. Their mounting position on the base board is as follows.

<8/11/13-slot base board>
These modules can be mounted in any slot except those for the power supply module
(the two slots from the left on the base board).

Mountable slots

<3/6-slot base board>

Mountable slots   Mountable slots
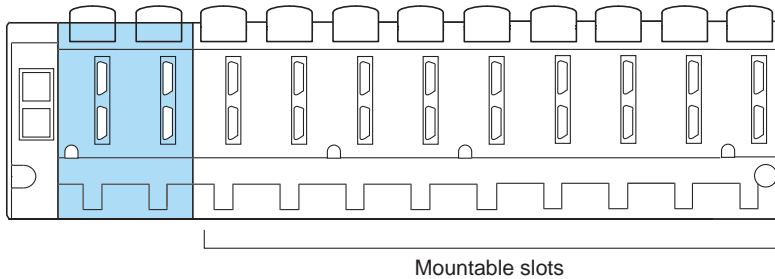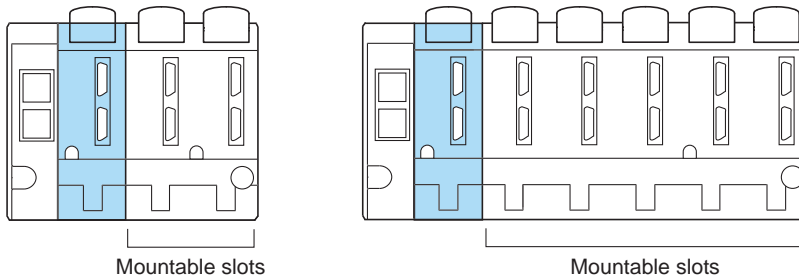
Note: These modules can be mounted also on the base board of remote I/O such as T-link,OPCN-1 and DeviceNet.

Mountable slots
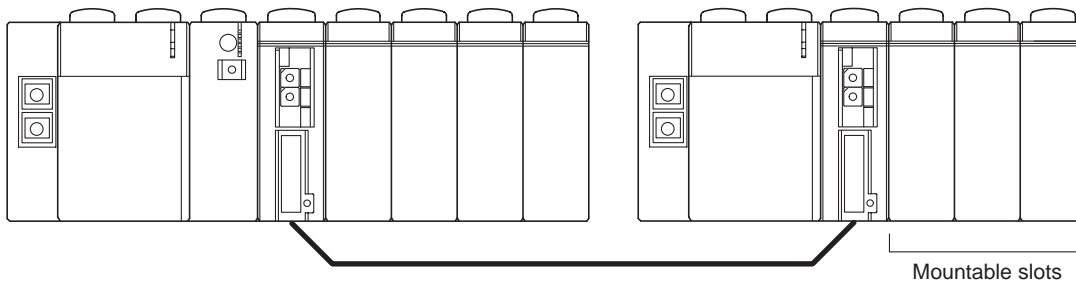
3-1-2 Number of mountable modules

It is possible to connect a maximum of 238 modules to the SX bus (a maximum of 254 modules in one configuration including the link of the I/O master) (due to hardware limitation). It should be noted, however, that the maximum number of analog voltage/current input modules and analog voltage/current output modules that can actually be connected is limited by the number of words (512 words) they occupy in the input/output areas (I/Q areas).
Because the number of words occupied by an analog 8ch module is 12 words and that occupied by an analog 4ch output module and analog input/output module is 8 words, the maximum number of mountable modules becomes as follows:

  Analog 8ch modules: 512 words / 12 words = 42 units
  Analog 4ch modules / Analog input/output module: 512 words / 8 words = 64 units

Note: Suppose that 42 units of 8ch analog modules are connected in one configuration, then the input/output areas that other input/output modules can use become 8 words.

Section 4 Software Interface

4-1 Analog Input Module

NP1AXH8V-MR (voltage input module) and NP1AXH8I-MR (current input module) occupy 12 words of I/O area (input: 8 words, output: 4 words).

4-1-1 Memory allocation in Switch Batch Setting mode

Moving average execution times for conversion operation is set with the "Average" switch (upper side switch on the module rear panel), and operation range is set with the "Range" switch (lower side switch on the module rear panel).

Offset address	15(F)	0	
+0	Channel 1 Digital output value / Status		⎫
+1	Channel 2 Digital output value / Status		
+2	Channel 3 Digital output value / Status		
+3	Channel 4 Digital output value / Status		This module to CPU module
+4	Channel 5 Digital output value / Status		
+5	Channel 6 Digital output value / Status		⎭
+6	Channel 7 Digital output value / Status		⎫
+7	Channel 8 Digital output value / Status		
+8	Unused (fixed to 0 (zero))		
+9	Unused (fixed to 0 (zero))		CPU module to this module
+10	Unused (fixed to 0 (zero))		
+11	Unused (fixed to 0 (zero))		⎭

<Status list>

Status code	Error	Description
30002 (7532h)	EEPROM calibration data error (Module fatal fault)	If the calibration data of EEPROM is destroyed or if EEPROM cannot be written or read, this error is notified. Module internal EEPROM is abnormal. If this error occurred, it is necessary to replace the module.
30003 (7533h)	EEPROM user setting data error	If the user setting data of EEPROM is destroyed, this error is notified. If this error occurred, all parameters need to be reset. If this error recurs even after parameters are reset, the module seems to have failed.
30004 (7534h)	Internal power supply down	If the internal power supply of the module becomes down, this error is notified.
30005 (7535h)	Switch setting error	If the operation setting switch on the module rear panel is set at invalid position, this error is notified.
30006 (7536h)	Conversion error	If conversion became abnormal because the module failed or was used in an out-of-spec environment, this error is notified.

⚠️ Ordinarily digital output values (INT type) are stored in the registers explained above. If the module becomes abnormal, the following status code (INT type) is stored in these registers. When making an application program, be sure to interlock erroneous and normal (A/D conversion) conditions.

Section 4 Software Interface

4-1 Analog Input Module

4-1-2 Memory allocation in Software Set Range Operation mode

In Software Set Range Operation mode, memory allocation differs between when operating in A/D conversion mode (during normal operation) and when operating in parameter mode.

<When operating in A/D conversion mode>

When operating in A/D conversion mode, memory allocation becomes as follows:

Offset address ↓	15(F) 0	
+0	Channel 1 Digital output value / Status	⎫
+1	Channel 2 Digital output value / Status	
+2	Channel 3 Digital output value / Status	This module to CPU module
+3	Channel 4 Digital output value / Status	
+4	Channel 5 Digital output value / Status	
+5	Channel 6 Digital output value / Status	⎭
+6	Channel 7 Digital output value / Status	⎫
+7	Channel 8 Digital output value / Status	
+8	Unused (fixed to 0 (zero))	CPU module to this module
+9	Unused (fixed to 0 (zero))	
+10	Unused (fixed to 0 (zero))	
+11	Unused (fixed to 0 (zero))	⎭

<When operating in parameter mode>

Parameter mode is activated when bit 7 of the parameter type setting register is set ON. In parameter mode, memory allocation becomes as follows:

Offset address ↓	15(F) 0	
+0	Module status	⎫
+1	Parameter type setting status	
+2		
+3		
+4	Parameter read data	This module to CPU module
+5		
+6		
+7		⎭
+8	Parameter type setting	⎫
+9		
+10	Parameter setting data	CPU module to this module
+11		⎭
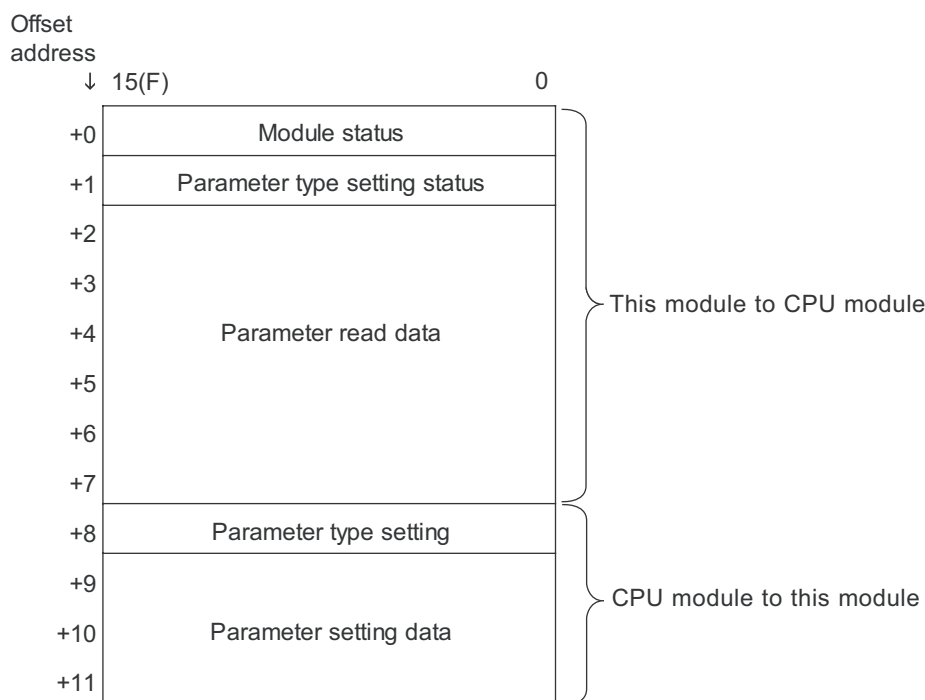
Section 4 Software Interface

4-1 Analog Input Module

(1) Digital output value/status register (offset address: +0 to +7)

When this module is in A/D conversion mode, digital output values and/or statuses are stored in the registers of offset address +0 to +7.

* When using D300win, assign INT type variables to these registers.

Offset
address
↓ 15(F)   0

+0	Channel 1 Digital output value / Status
+1	Channel 2 Digital output value / Status
+2	Channel 3 Digital output value / Status
+3	Channel 4 Digital output value / Status
+4	Channel 5 Digital output value / Status
+5	Channel 6 Digital output value / Status
+6	Channel 7 Digital output value / Status
+7	Channel 8 Digital output value / Status

<Status list>

Status code	Condition of modul	Description
30001 (7531h)	Parameter mode	Parameters are now being set or read out.
30002 (7532h)	EEPROM calibration data error (Module fatal fault)	If the calibration data of EEPROM is destroyed or if EEPROM cannot be written or read, this error is notified. Module internal EEPROM is abnormal. If this error occurred, it is necessary to replace the module.
30003 (7533h)	EEPROM user setting data error	If the user setting data of EEPROM is destroyed, this error is notified. If this error occurred, all parameters need to be reset. If this error recurs even after parameters are reset, the module seems to have failed.
30004 (7534h)	Internal power supply down	If the internal power supply of the module becomes down, this error is notified.
30005 (7535h)	Switch setting error	If the operation setting switch on the module rear panel is set at invalid position, this error is notified.
30006 (7536h)	Conversion error	If conversion became abnormal because the module failed or was used in an out-of-spec environment, this error is notified.

> ⚠️ Ordinarily digital output values (INT type) are stored in the registers explained above. If the module becomes abnormal, the following status code (INT type) is stored in these registers. When making an application program, be sure to interlock erroneous and normal (A/D conversion) conditions.

(2) Module status register (offset address +0)

When the module is in parameter mode, offset address +0 becomes the "module status register", in which the code "30001" (INT type) is stored, indicating that the parameter mode (parameters are now being set or read out) is activated.

* When using D300win, assign an INT type variable to this register.

+0	30001(7531h)

Section 4 Software Interface

4-1 Analog Input Module

(3) Parameter type setting status register (offset address +1)

This register stores the information of what parameter is now being written or read by the module.

* When using D300win, assign a WORD type variable to this register. If you access by the bit, assign a BOOL type variable to each bit.

Bit	Flag name	Description
0	Operation parameter read mode	ON: Operation parameter read mode (all channels in a batch)
1	Scaling parameter read mode	ON: Scaling parameter read mode (individual channel)
2, 3	Unused	
4	Operation parameter write mode	ON: Operation parameter write mode (all channels in a batch)
5	Scaling parameter write mode	ON: Scaling parameter write mode (individual channel)
6	Offset/gain adjustment mode	ON: Offset/gain adjustment mode (individual channel)
7	Unused	
8	Channel 1	In "scaling parameter read mode", "scaling parameter write mode" or "offset/gain adjustment mode", one of bits 8 to 15 is set ON to indicate which channel is now being set or read out.
9	Channel 2	
10(A)	Channel 3	
11(B)	Channel 4	
12(C)	Channel 5	
13(D)	Channel 6	
14(E)	Channel 7	
15(F)	Channel 8	

(4) Parameter read data register (offset address +2 to +7)

In "operation parameter read mode", "scaling parameter read mode" or "offset/gain adjustment mode", the content of the setting for the corresponding mode is stored in this register.

1) When operation parameter read mode is activated

When parameter mode (module status register = 30001(7531h)) is activated and bit 0 of the parameter type setting status register is set ON, the status of the operation parameter is stored.

* When using D300win, assign WORD type variables to these registers.
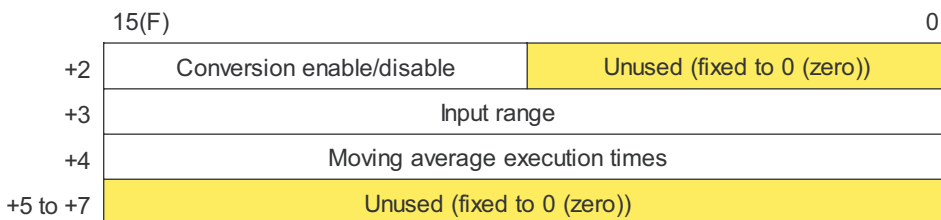
Section 4 Software Interface

4-1 Analog Input Module

<Conversion enable/disable, the unit of digital output value> (offset address +2)

Bit	Flag name	Description
0 to 7	Unused	
8	Channel 1 Conversion enable/disable	OFF: Enable, ON: Disable
9	Channel 2 Conversion enable/disable	
10	Channel 3 Conversion enable/disable	
11	Channel 4 Conversion enable/disable	
12	Channel 5 Conversion enable/disable	
13	Channel 6 Conversion enable/disable	
14	Channel 7 Conversion enable/disable	
15	Channel 8 Conversion enable/disable	

<Input range setting> (Offset address +3)

Bit	Flag name	Description
0 (L)	Channel 1 Input range	The set range is indicted by a combination of ON/OFF status of two bits.
1 (H)		
2 (L)	Channel 2 Input range	<NP1AXH8V-MR>
3 (H)		H L
4 (L)	Channel 3 Input range	OFF OFF : -10 to 10 V
5 (H)		OFF ON : 0 to 10 V
6 (L)	Channel 4 Input range	ON OFF : 0 to 5 V
7 (H)		ON ON : 1 to 5 V
8 (L)	Channel 5 Input range	
9 (H)		<NP1AXH8I-MR>
10 (L)	Channel 6 Input range	H L
11 (H)		OFF OFF : 4 to 20 mA
12 (L)	Channel 7 Input range	OFF ON : 0 to 20 mA
13 (H)		ON OFF : -20 to 20 mA
14 (L)	Channel 8 Input range	ON ON : 4 to 20 mA
15 (H)		

Section 4 Software Interface

4-1 Analog Input Module

<Moving average execution times setting> (offset address +4)

Bit	Flag name	Description
0 (L)	Channel 1	Moving average execution times is indicted by a combination of ON/OFF status of two bits.
1 (H)	Moving average execution times	
2 (L)	Channel 2	H L
3 (H)	Moving average execution times	OFF OFF : Once
4 (L)	Channel 3	OFF ON : Twice
5(H)	Moving average execution times	ON OFF : 4 times
6(L)	Channel 4	ON ON : 8 times
7 (H)	Moving average execution times	
8 (L)	Channel 5	
9 (H)	Moving average execution times	
10 (L)	Channel 6	
11 (H)	Moving average execution times	
12 (L)	Channel 7	
13 (H)	Moving average execution times	
14 (L)	Channel 8	
15 (H)	Moving average execution times	

2) When scaling parameter read mode is activated

When parameter mode is activated (module status register = 30001) and bit 1 of the parameter type setting status register is set ON, the scaling parameter setting status of the corresponding channel is stored.

* When using D300win, assign INT type variables to these registers.

	15(F)　　　　　　　　　　　　　　　　　　　　　　　　　　　0
+2	Offset value
+3	Gain value
+4 to 7	Unused (fixed to 0 (zero))

Section 4 Software Interface

4-1 Analog Input Module

3) When offset/gain adjustment mode is activated

When parameter mode is activated (module status register = 30001(7531h)) and bit 6 of the parameter type setting status register is set ON, the status of offset/gain adjustment is indicated. For this, the digital output values of the 5 channels starting with specified channel, EEPROM writing completion flag, and offset/gain value indication flag are displayed.

* When using D300win, assign an WORD type variable to this register (offset address+2). If you access by the bit, assign a BOOL type variable to each bit.
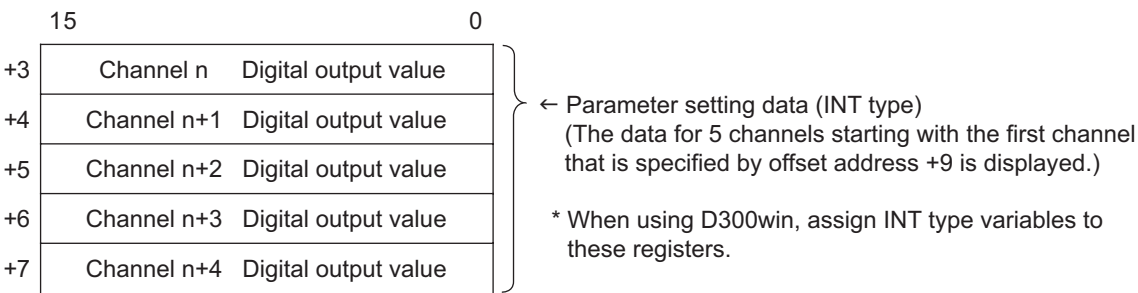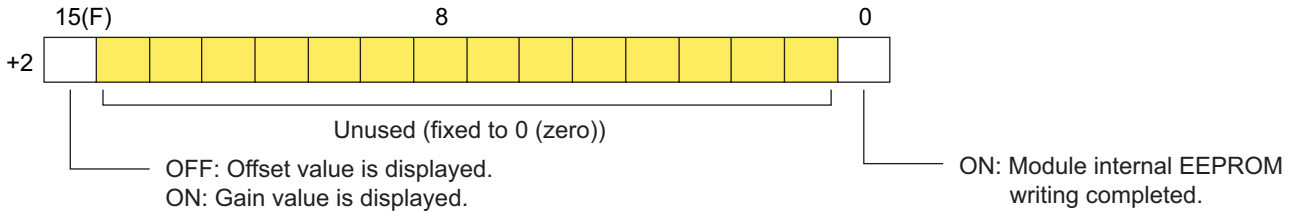
(5) Parameter type setting register (Offset address +8)

Parameter type and channel number for reading/writing parameters are set in this register.

* When using D300win, assign a WORD type variable to this register. If you access by the bit, assign a BOOL type variable to each bit.

Bit	Flag name	Description
0	Operation parameter read mode	ON: Operation parameter read mode (all channels in a batch)
1	Scaling parameter read mode	ON: Scaling parameter read mode (individual channel)
2, 3	Unused	
4	Operation parameter write mode	ON: Operation parameter write mode (all channels in a batch)
5	Scaling parameter write mode	ON: Scaling parameter write mode (individual channel)
6	Offset/gain adjustment mode	ON: Offset/gain adjustment mode (individual channel)
7	Parameter mode	ON: Parameter mode, OFF: A/D conversion mode
8	Channel 1	In "scaling parameter read mode", "scaling parameter write mode" or "offset/gain adjustment mode", arbitrary channel is specified. In "scaling parameter read mode", one of bits 8 to 15 is set ON to specify a channel for which parameters are to be set. When same data is to be set in "scaling parameter write mode" or "offset/gain adjustment mode", multiple arbitrary channels may be specified.
9	Channel 2	
10	Channel 3	
11	Channel 4	
12	Channel 5	
13	Channel 6	
14	Channel 7	
15	Channel 8	

Section 4 Software Interface

4-1 Analog Input Module

(6) Parameter setting data register (offset address +9 to +11)

When bit 7 of the parameter type setting register (offset address +8) is set ON, module status (offset address +0) becomes "30001" (INT type) and "parameter mode" is activated.

The set values of "operation parameter write" mode, "scaling parameter" mode or "offset/gain adjustment" mode are written in this register.

1) When operation parameter write mode is activated

In this mode, data is set in the locations as shown below, and "operation parameter write mode flag" (bit 4 of the parameter type setting register) is set ON.
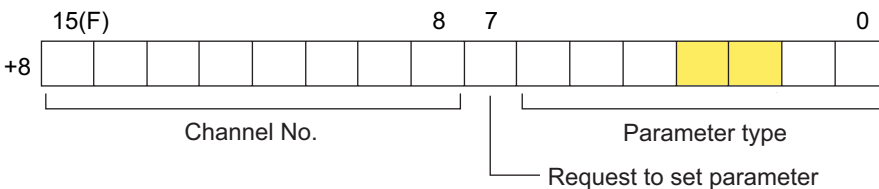
* When using D300win, assign WORD type variables to these registers. If you access by the bit, assign a BOOL type variable to each bit.

	15(F)	0
+9	Conversion enable/disable	Unused (fixed to 0 (zero))
+10(A)	Input range	
+11(B)	Moving average execution times	

<Conversion enable/disable> (offset address +9)

Bit	Flag name	Description
0 to 7	Unused	
8	Channel 1 Conversion enable/disable	Conversion is enabled or disabled when the corresponding bit is set to OFF or ON. OFF: Enable, ON: Disable
9	Channel 2 Conversion enable/disable	
10	Channel 3 Conversion enable/disable	
11	Channel 4 Conversion enable/disable	
12	Channel 5 Conversion enable/disable	
13	Channel 6 Conversion enable/disable	
14	Channel 7 Conversion enable/disable	
15	Channel 8 Conversion enable/disable	

<Input range> (offset address +10)

Bit	Flag name	Description
0 (L), 1 (H)	Channel 1 Input range	Range is set by a combination of ON/OFF status of two bits.
2 (L), 3 (H)	Channel 2 Input range	
4 (L), 5 (H)	Channel 3 Input range	<NP1AXH8V-MR> <NP1AXH8I-MR>
6 (L), 7 (H)	Channel 4 Input range	H L H L
8 (L), 9 (H)	Channel 5 Input range	OFF OFF : -10 to 10 V OFF OFF : 4 to 20 mA
10 (L), 11 (H)	Channel 6 Input range	OFF ON : 0 to 10 V OFF ON : 0 to 20 mA
12 (L), 13 (H)	Channel 7 Input range	ON OFF : 0 to 5 V ON OFF : -20 to 20 mA
14 (L), 15 (H)	Channel 8 Input range	ON ON : 1 to 5 V ON ON : 4 to 20 mA

Section 4 Software Interface

4-1 Analog Input Module

<Moving average execution times> (offset address +11)

Bit	Flag name	Description
0 (L)	Channel 1 Moving average execution times	Moving average execution times is set by a combination of ON/OFF status of two bits.
1 (H)		
2 (L)	Channel 2 Moving average execution times	H L OFF OFF : Once OFF ON : Twice ON OFF : 4 times ON ON : 8 times
3 (H)		
4 (L)	Channel 3 Moving average execution times	
5 (H)		
6 (L)	Channel 4 Moving average execution times	
7 (H)		
8 (L)	Channel 5 Moving average execution times	
9 (H)		
10 (L)	Channel 6 Moving average execution times	
11 (H)		
12 (L)	Channel 7 Moving average execution times	
13 (H)		
14 (L)	Channel 8 Moving average execution times	
15 (H)		

Section 4 Software Interface

4-1 Analog Input Module

2) When scaling parameter write mode is activated

For scaling, data is set in the locations shown below.

* When using D300win, assign INT type variables to these registers.

	15(F)	0
+9	Offset value	
+10	Gain value	
+11	Unused (fixed to 0 (zero))	

<Scaling>

The analog input modules convert the analog values that are input to them into digital values. The operation to change the width (scale) of converted digital values is referred to as "scaling". The available range of scaling of these modules is -25000 to 25000 (INT type). If a value that is out of this range is set, it will be limited to -25000 or 25000.

<Initial value for the scaling of input range>

Input range	Initial value of scaling	Scaling range
0 to 5 V	0 to 16000	0 to 25000
1 to 5 V	0 to 16000	0 to 25000
0 to 10 V	0 to 16000	0 to 25000
-10 to 10 V	-8000 to 8000	-25000 to 25000
4 to 20 mA	0 to 16000	0 to 25000
0 to 20 mA	0 to 16000	0 to 25000
-20 to 20 mA	-8000 to 8000	-25000 to 25000

Note 1: Scaling is enabled only when the operation setting switch on the module rear panel is set to "Soft Set Range Operation mode". In fixed range operation mode, scaling is disabled.

Note 2: Over range is fixed to **"(Gain value - Offset value) x 0.025 + Gain value"**.
   (**"(Gain value - Offset value) x 0.0125 + Gain value"** for the range of -10 to +10 V or of -20 to +20 mA)
   On the other hand, under range is fixed to **"Offset value - (Gain value - Offset value) x 0.025"**.
   (**"Offset value - (Gain value - Offset value) x 0.0125"** for the range of -10 to +10 V or of -20 to +20 mA)

Note 3: If scaling results in "resolution < maximum resolution", digital output value does not change in steps of one.

Note 4: Once scaling values are set, they won't change even when range is changed in Soft Set Range Operation mode.

<Example of scaling>

Section 4 Software Interface

4-1 Analog Input Module

<Procedure for scaling>

1) Set ON bit 7 of the parameter type setting register to activate parameter mode. (Make sure that module status is "30001".)
2) Input gain and offset values to the parameter setting data register, and set ON bit 5 and bit 8 (in the case of channel 1) of the parameter type setting register. Bit 7 must be kept ON.
   (In the above example of scaling, set as follows.)

	15(F)	0
+9	-1000	
+10	4000	
+11	Unused (fixed to 0 (zero))	

3) Make sure that bit 5 (scaling parameter write mode) and bit 8 (channel 1) of the parameter type setting register are set ON.
4) Set OFF all the bits of the parameter type setting register, and clear all the bits of the parameter setting data register to zero. This completes the operation for adjustment.

Section 4 Software Interface

4-1 Analog Input Module

3) When offset/gain adjustment mode is activated

For offset/gain adjustment, data is set in the locations shown below:

* When using D300win, assign INT type variables to these registers.

<Offset/gain adjustment>

In this mode, offset value and/or gain value can finely be adjusted for individual channel.

* Offset value: Means the lower limit value of the range span. When this value is adjusted, the conversion characteristic curve moves parallel in vertical direction.
* Gain value: Means the upper limit value of the range span. When this value is adjusted, only gain value is changed while offset value is kept unchanged.

When offset and gain values are changed by scaling, the values that are set by scaling take effect as offset and gain values.

When offset and/or gain values are to be adjusted after scaling, adjust by the values of scaling.

Note 1: Offset/gain adjustable range is within ±1% of range span. If adjustment is made using an analog value that exceeds the adjustable range (if the value is input to a terminal of the module), the value is limited to ±1% of range span.

Note 2: If range is changed, offset and gain return to the default values.

Note 3: Offset/gain adjustment is disabled when analog range is set in a batch with the switch provided on the module rear panel.

<Example 1 of gain/offset adjustment>

4-12

Section 4 Software Interface

4-1 Analog Input Module

<Example 2 of gain/offset adjustment>

Offset and gain values for the range of -10 to 10 V.

<Offset/gain adjustment procedure>

Offset is adjusted first.

1) Set ON bit 7 and bit 6 of the parameter type setting register to activate offset/gain adjustment mode. (Make sure that module status is "30001".)
2) Set ON the bit for the channel to be adjusted (the corresponding bit of bits 8 to 15 of the parameter type setting register). (The "SETTING" LED of the module blinks.)
3) Apply a voltage (or a current) that corresponds to the offset value to the terminal of the channel that is to be adjusted.
4) Set ON bit 0 (zero) of offset address +10 of the parameter type setting register to write the offset adjustment value in the module internal EEPROM. When bit 0 (zero) of offset address +2 is set ON, the writing of EEPROM is completed. After confirming this, set OFF bit 0 (zero) of the parameter setting data register.
5) Then set bit 0 (zero) OFF and bit 15 ON of offset address +10 of the parameter type setting register. (Gain adjustment)
6) Apply a voltage (or a current) that corresponds to the gain value to the terminal.
7) Set ON bit 0 (zero) of offset address +10 of the parameter type setting register to write the gain adjustment value in the module internal EEPROM. Confirm the completion of writing in the same way as explained for offset adjustment.
8) Set OFF all the bits of the parameter type setting register, and clear all the bits of the parameter setting data register to zero. This completes the operation for adjustment.
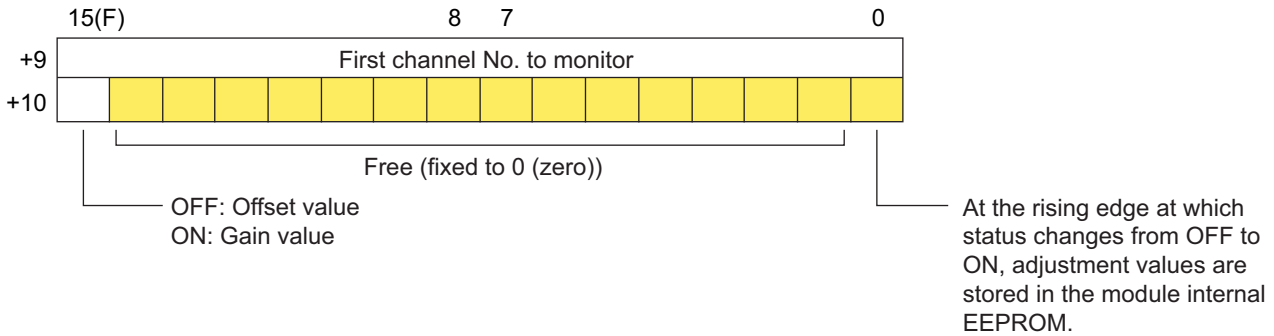
[Reference]

For concrete operating method with the SX Control Utility of D300win, refer to "Appendix 1 Offset/Gain Adjustment <D300win>".
For concrete operating method with SX-Programmer Standard, refer to "Appendix 2 Offset/Gain Adjustment <SX-Programmer Standard>".

Section 4 Software Interface

4-2 Analog Output Module

NP1AYH8V-MR (voltage output module) and NP1AYH8I-MR (current output module) occupy 12 words of I/O area (input: 4 words, output: 8 words); NP1AYH4V-MR (voltage output module) and NP1AYH4I-MR (current output module) occupy 8 words of I/O area (input: 4 words, output: 4 words).

4-2-1 Memory allocation in Switch Batch Setting mode

<Analog 8ch output>

Offset address

	15(F) 0	
+0	Module status	⎫
+1	Operation setting switch No.	
+2	Unused	This module to CPU module
+3	Unused	
+4	Channel 1 Digital input value	
+5	Channel 2 Digital input value	⎭
+6	Channel 3 Digital input value	⎫
+7	Channel 4 Digital input value	
+8	Channel 5 Digital input value	
+9	Channel 6 Digital input value	CPU module to this module
+10	Channel 7 Digital input value	
+11	Channel 8 Digital input value	⎭

<Analog 4ch output>

Offset address

	15(F) 0	
+0	Module status	⎫
+1	Operation setting switch No.	
+2	Unused	This module to CPU module
+3	Unused	⎭
+4	Channel 1 Digital input value	⎫
+5	Channel 2 Digital input value	
+6	Channel 3 Digital input value	CPU module to this module
+7	Channel 4 Digital input value	⎭

Section 4 Software Interface

4-2 Analog Output Module

(1) Module status register (offset address +0)

Operation information and RAS information of this module are stored in this register.

* When using D300win, assign a WORD type variable to this register. If you access by the bit, assign a BOOL type variable to each bit.

Unused
Unused
Unused

EEPROM calibration data error
EEPROM user setting data error
Internal power supply down
Switch setting error
Status of initialization OFF: Initializing
ON: Initialization completed

Error	Cause and remedy
EEPROM calibration data error	If the calibration data of EEPROM is destroyed or if EEPROM cannot be written, this error is notified. Module internal EEPROM is abnormal.
EEPROM user setting data error	If the user setting data of EEPROM is destroyed, this error is notified. If this error occurred, all parameters need to be reset. If this error recurs even after parameters are reset, the module seems to have failed.
Internal power supply down	If the internal power supply of the module becomes down, this error is notified. Because output is stopped in case of this error, interlock should be provided as needed for the interface with external devices.
Switch setting error	If the operation setting switch on the module rear panel is set at invalid position, this error is notified.

(2) Switch setting No. (offset address +1)

The set value (INT type) of the operation setting switch that is provided on the module rear panel is stored in this memory area.

* When using D300win, assign an INT type variable to this register.

(3) Digital input values of channels 1 to 8 (offset address +4 to +11)

The digital values to undergo D/A conversion are stored in these memory areas. Just after the system is powered up, 0 V or 0 mA is output. When the initialization of the module is completed, the analog value that corresponds to the digital input value of 0 (zero) is output, and initialization completion flag (bit 15 of offset address +0) is set ON. For more information of conversion characteristics, refer to "2-3 Conversion Characteristics".

* When using D300win, assign INT type variables to these registers.

Offset
address
↓   15(F)   0

Offset address	Value	
+4	Channel 1 Digital input value	
+5	Channel 2 Digital input value	
+6	Channel 3 Digital input value	
+7	Channel 4 Digital input value	← Up to this address for analog 4ch modules
+8	Channel 5 Digital input value	
+9	Channel 6 Digital input value	
+10	Channel 7 Digital input value	
+11	Channel 8 Digital input value	

Section 4 Software Interface

4-2 Analog Output Module

4-2-2 Memory allocation in Software Set Range Operation mode

In Software Set Range Operation mode, memory allocation differs between when operating in D/A conversion mode (during normal operation) and when operating in parameter mode.

<When operating in D/A conversion mode>

When operating in D/A conversion mode, memory allocation becomes as shown below:

Offset address ↓	15(F)	0	
+0	Module status		This module to CPU module
+1	Operation setting switch No.		
+2	Unused		
+3	Unused		
+4	Channel 1 Digital Input (Note)		CPU module to this module
+5	Channel 2 Digital Input		
+6	Channel 3 Digital Input		
+7	Channel 4 Digital Input		
+8	Channel 5 Digital Input		
+9	Channel 6 Digital Input		
+10	Channel 7 Digital Input		
+11	Channel 8 Digital Input		

Up to this address for analog 4ch modules → +7

Note: In D/A conversion mode, the digital input value register for channel 1 (offset address +4) serves also as the setting command register (for changing over to parameter mode) and therefore interlock is necessary.
When a value in the range from "30000" to "32767" is input to this register, parameter mode is activated. Just after parameter mode is activated, analog output value is equal to the offset value (0 V for the range of -10 to 10 V).

<When operating in parameter mode>

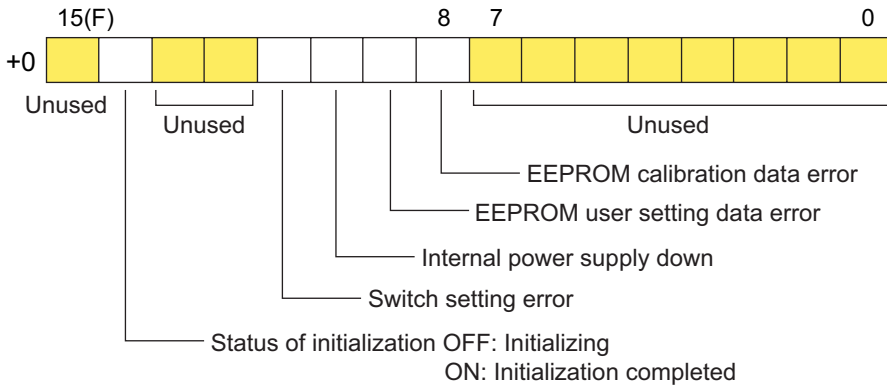| Offset address ↓	15(F)	0	
+0	Module status		This module to CPU module
+1	Parameter type setting status		
+2	Parameter read data		
+3			
+4	Mode changeover		CPU module to this module
+5	Parameter type setting		
+6	Parameter setting data		
+7			
+8	Unused		
+9	Unused		
+10	Unused		
+11	Unused		

Up to this address for analog 4ch modules → +7
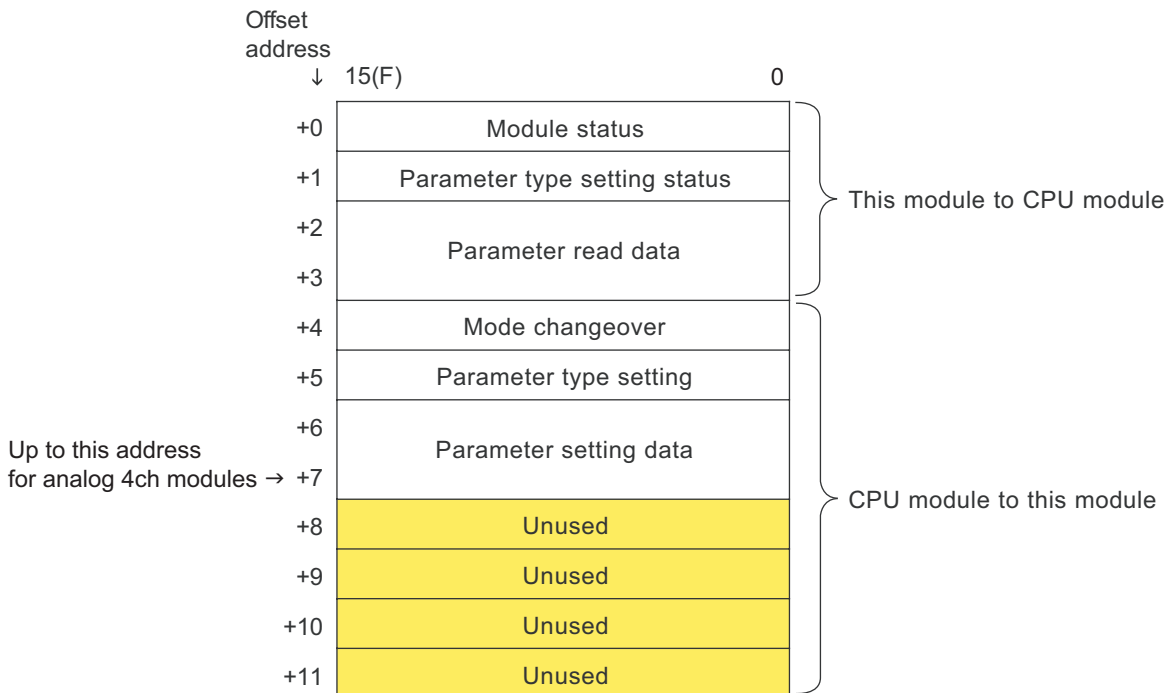
Section 4 Software Interface

4-2 Analog Output Module

(1) Module status (offset address +0)

Operation information and RAS information of this module are stored in this register. This register is common to D/A conversion mode and parameter mode.

* When using D300win, assign a WORD type variable to this register. If you access by the bit, assign a BOOL type variable to each bit.
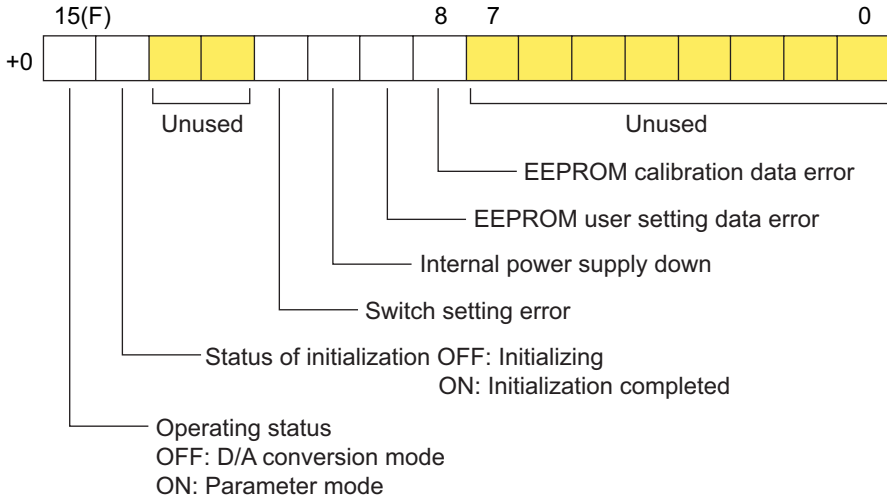
Error	Cause and remedy
EEPROM calibration data error	If the calibration data of EEPROM is destroyed or if EEPROM cannot be written or read out, this error is notified. Module internal EEPROM is abnormal. If this error occurred, it is necessary to replace the module.
EEPROM user setting data error	If the user setting data of EEPROM is destroyed, this error is notified. If this error occurred, all parameters need to be reset. If this error recurs even after parameters are reset, the module seems to have failed.
Internal power supply down	If the internal power supply of the module becomes down, this error is notified. Because output is stopped in case of this error, interlock should be provided as needed for the interface with external devices.
Switch setting error	If the operation setting switch on the module rear panel is set at invalid position, this error is notified.

(2) Operation setting switch setting No. (offset address +1)

The set value (INT type) of the operation setting switch on the module rear panel is stored in this memory area.

* When using D300win, assign an INT type variable to this register.

Section 4 Software Interface

4-2 Analog Output Module

(3) Digital input values of channels 1 to 8 (offset address +4 to +11)

The digital values to undergo D/A conversion are stored in these memory areas. Just after the system is powered up, 0 V or 0 mA is output. When the initialization of the module is completed, the analog value that corresponds to the digital input value of 0 (zero) is output (for example, 1 V for the range of 1 to 5 V). At the same time, initialization completion flag (bit 15 of offset address +0) is set ON. When the system is started (when the CPU module starts running), the analog value that corresponds to the digital value input to this memory area is output. For more information of conversion characteristics, refer to "2-3 Conversion Characteristics".

* When using D300win, assign INT type variables to these registers.

Offset address

	15(F) 0	
+4	Channel 1 Digital input value	← When a value in the range from "30000" to "32767" is input to offset address +4, parameter mode is activated. To change over from parameter mode to D/A conversion mode, input a value that is smaller than "30000".
+5	Channel 2 Digital input value	
+6	Channel 3 Digital input value	
+7	Channel 4 Digital input value	← Up to this address for analog 4ch modules
+8	Channel 5 Digital input value	
+9	Channel 6 Digital input value	
+10	Channel 7 Digital input value	
+11	Channel 8 Digital input value	

(4) Parameter type setting status register (offset address +2)

The information of which parameter is now being written or read out by this module is stored in this register.

* When using D300win, assign a WORD type variable to this register. If you access by the bit, assign a BOOL type variable to each bit.

```
      15 (F)              8  7              0
+2   [ ][ ][ ][ ][ ][ ][ ][ ][█][ ][ ][ ][█][█][ ][ ]
      └──────── Channel No. ────────┘ └──── Parameter type ────┘
```

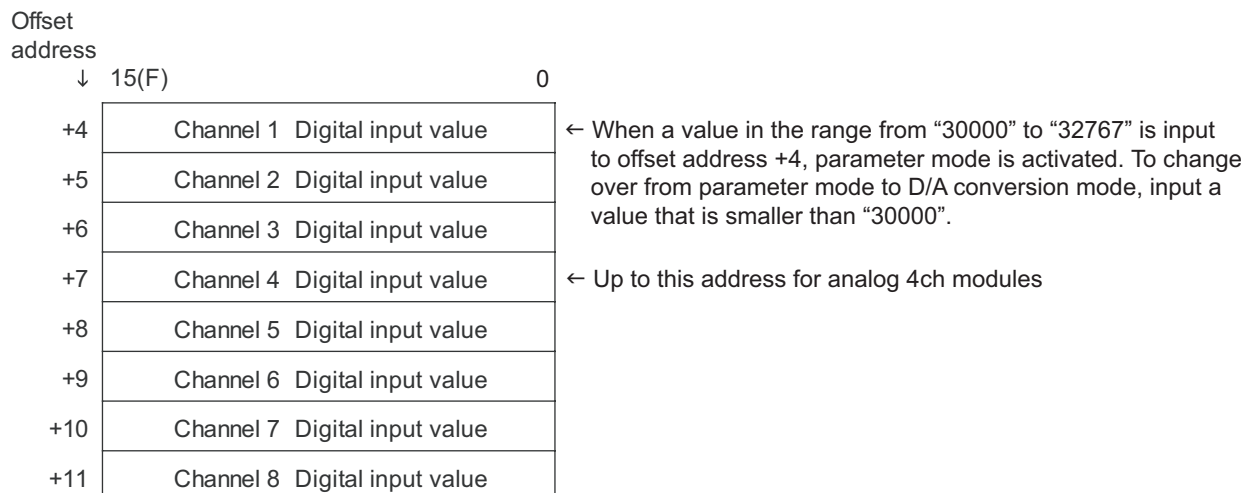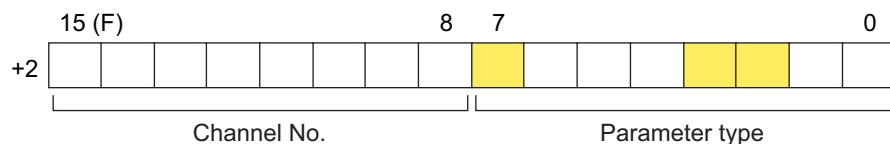| Bit	Flag name	Description
0	Operation parameter read mode	ON: Operation parameter read mode (all channels in a batch)
1	Scaling parameter read mode	ON: Scaling parameter read mode (individual channel)
2, 3	Unused	
4	Operation parameter write mode	ON: Operation parameter write mode (all channels in a batch)
5	Scaling parameter write mode	ON: Scaling parameter write mode (individual channel)
6	Offset/gain adjustment mode	ON: Offset/gain adjustment mode (individual channel)
7	Unused	
8	Channel 1	In "scaling parameter read mode", "scaling parameter write mode" or "offset/gain adjustment mode", one of bits 8 to 15 is set ON to indicate which channel is now being set or read out by this module.
9	Channel 2	
10(A)	Channel 3	
11(B)	Channel 4	
12(C)	Channel 5	
13(D)	Channel 6	
14(E)	Channel 7	
15(F)	Channel 8	

Section 4 Software Interface
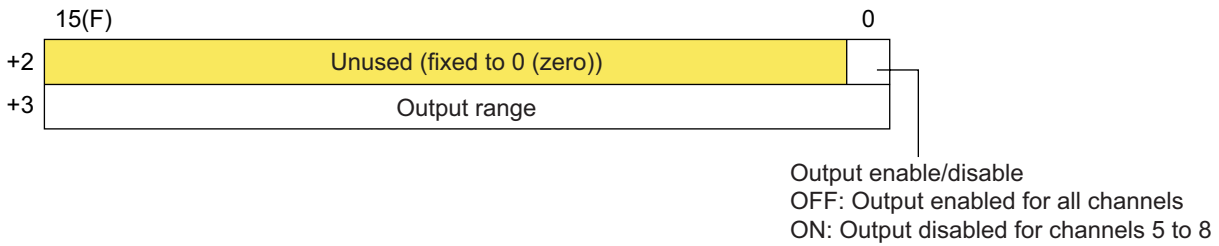
4-2 Analog Output Module

(5) Parameter read data register (offset address +2 to +7)

In "operation parameter read mode", "scaling parameter read mode" or "offset/gain adjustment mode", the content of the setting for the corresponding mode is stored in this register.

1) When operation parameter read mode is activated

When parameter mode is activated (when bit 15 of the module status register is set ON) and bit 0 (zero) of the changeover command status register is set ON, the status of the operation parameter is stored in this memory area.

* When using D300win, assign WORD type variables to these registers. If you access by the bit, assign a BOOL type variable to each bit.

	15(F)	0
+2	Unused (fixed to 0 (zero))	
+3	Output range	

Output enable/disable
OFF: Output enabled for all channels
ON: Output disabled for channels 5 to 8

\<Output range\>

Bit	Flag name	Description
0 (L)	Channel 1 Output range	The set range is indicated by a combination of ON/OFF status of two bits.
1 (H)		
2 (L)	Channel 2 Output range	\<NP1AYH8V-MR\>
3 (H)		H L
4 (L)	Channel 3 Output range	OFF OFF : 0 to 10 V
5 (H)		OFF ON : 0 to 5 V
6 (L)	Channel 4 Output range	ON OFF : 1 to 5 V
7 (H)		ON ON : -10 to 10 V
8 (L)	Channel 5 Output range	
9 (H)		\<NP1AYH8I-MR\>
10 (L)	Channel 6 Output range	H L
11 (H)		OFF OFF : 4 to 20 mA
12 (L)	Channel 7 Output range	OFF ON : 0 to 20 mA
13 (H)		ON OFF : 4 to 20 mA
14 (L)	Channel 8 Output range	ON ON : 0 to 20 mA
15 (H)		

2) When scaling parameter read mode is activated

When parameter mode is activated (when bit 15 of the module status register is set ON) and bit 1 (one) of the parameter type setting status register is set ON, the current setting of the scaling parameter for the corresponding channel is displayed.

* When using D300win, assign INT type variables to these registers.

	15(F)	0
+2	Offset value	
+3	Gain value	
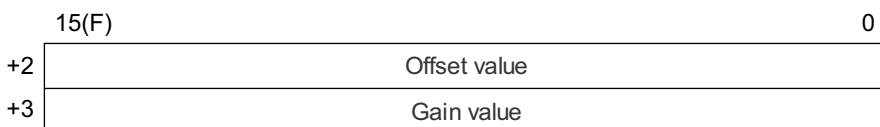
Section 4   Software Interface

4-2   Analog Output Module

3) When offset/gain adjustment mode is activated

When parameter mode is activated (when bit 15 of the module status register is set ON) and bit 6 of the parameter type setting status register is set ON, the status of offset/gain adjustment is indicated. For this, the status of EEPROM writing completion flag, voltage or current up/down status, and which of offset and gain values is now indicated are displayed. In this mode, offset address +3 is unused.

* When using D300win, assign a WORD type variable to this register. If you access by the bit, assign a BOOL type variable to each bit.
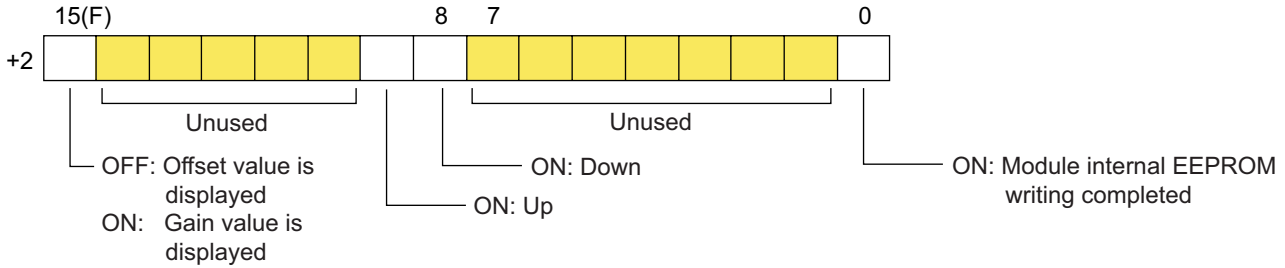
(6) Mode changeover register (offset address +4)

When a value in the range from "30000" to "32767" (INT type) is input to offset address +4, parameter mode is activated. In this mode, offset address +5 becomes the parameter type setting register, and offset addresses +6 and +7 become the parameter setting data registers.
To change over from parameter mode to D/A conversion mode, input a digital value (smaller than "30000") that corresponds to the analog value to be output.

* When using D300win, assign an INT type variable to this register.

Note: When mode is changed over from "D/A conversion" to "parameter", the value that corresponds to the digital input value of 0 (zero) is output as analog output value. The values shown in the table below may not apply when conversion characteristic has been changed by scaling.

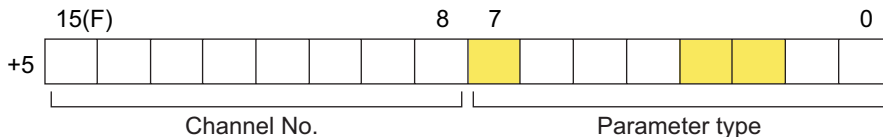| Output range	Output value in parameter mode
0 to 5 V	0 V
1 to 5 V	1 V
0 to 10 V	0 V
-10 to 10V	0 V
4 to 20 mA	4 mA
0 to 20 mA	0 mA

Section 4 Software Interface

4-2 Analog Output Module

(7) Parameter type setting register (offset address +5)

Parameter type and channel number for reading/writing parameters are set in this register.

* When using D300win, assign a WORD type variable to this register. If you access by the bit, assign a BOOL type variable to each bit.

Bit	Flag name	Description
0	Operation parameter read mode	ON: Operation parameter read mode (all channels in a batch)
1	Scaling parameter read mode	ON: Scaling parameter read mode (individual channel)
2, 3	Unused	
4	Operation parameter write mode	ON: Operation parameter write mode (all channels in a batch)
5	Scaling parameter write mode	ON: Scaling parameter write mode (individual channel)
6	Offset/gain adjustment mode	ON: Offset/gain adjustment mode (individual channel)
7	Unused	
8	Channel 1	In "scaling parameter read mode", "scaling parameter write mode" or "offset/gain adjustment mode", arbitrary channel is specified. In "scaling parameter read mode", one of bits 8 to 15 is set ON to indicate for which channel to set parameters. When same data is to be set in "scaling parameter write mode" or "offset/gain adjustment mode", multiple arbitrary channels may be specified.
9	Channel 2	
10	Channel 3	
11	Channel 4	
12	Channel 5	
13	Channel 6	
14	Channel 7	
15	Channel 8	

Section 4 Software Interface

4-2 Analog Output Module

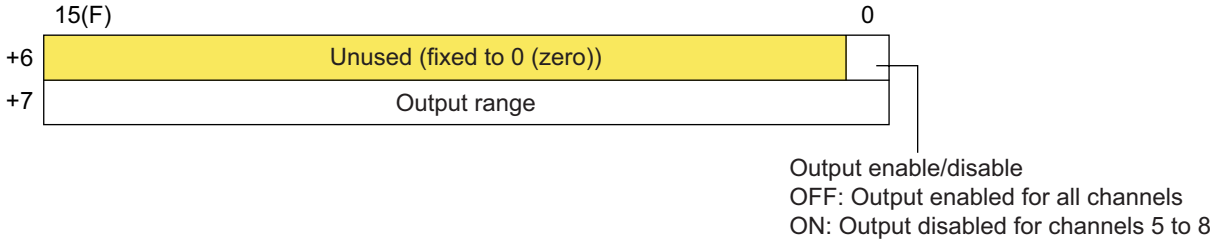### (8) Parameter setting data register (offset address +6, +7)

When a value in the range from "30000" to "32767" (INT type) is input to the mode changeover register (offset address +4), bit 15 of the module status register (offset address +0) is set ON, and "parameter mode" is activated.

The set values of "operation parameter write" mode, "scaling parameter" mode or "offset/gain adjustment" mode are written in this register.

1) When operation parameter write mode is activated

Data is set in the locations shown below, and "operation parameter write mode flag" (bit 4 of the parameter type setting register) is set ON.

* When using D300win, assign WORD type variables to these registers. If you access by the bit, assign a BOOL type variable to each bit.
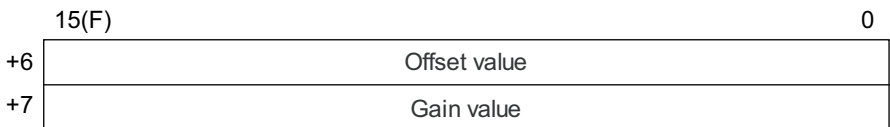
```
        15(F)                                                   0
+6  │          Unused (fixed to 0 (zero))              │   │
+7  │                 Output range                         │
```

Output enable/disable
OFF: Output enabled for all channels
ON: Output disabled for channels 5 to 8

<Output range>

Bit	Flag name	Description
0 (L)	Channel 1 Output range	Output range is set by a combination of ON/OFF status of two bits.
1 (H)		
2 (L)	Channel 2 Output range	<NP1AYH8V-MR>
3 (H)		H L
4 (L)	Channel 3 Output range	OFF OFF : 0 to 10 V
5 (H)		OFF ON : 0 to 5 V
6 (L)	Channel 4 Output range	ON OFF : 1 to 5 V
7 (H)		ON ON : -10 to 10 V
8 (L)	Channel 5 Output range	
9 (H)		<NP1AYH8I-MR>
10 (L)	Channel 6 Output range	H L
11 (H)		OFF OFF : 4 to 20 mA
12 (L)	Channel 7 Output range	OFF ON : 0 to 20 mA
13 (H)		ON OFF : 4 to 20 mA
14 (L)	Channel 8 Output range	ON ON : 0 to 20 mA
15 (H)		

2) When scaling parameter setting mode is activated

For scaling, offset and gain values are set in the locations shown below.

* When using D300win, assign INT type variables to these registers.

```
        15(F)                                                   0
+6  │                 Offset value                        │
+7  │                  Gain value                         │
```

<Scaling>

The analog output modules convert the digital values that are input to them by application program into analog values. The operation to change the width (scale) of input digital values is referred to as "scaling". The available range of scaling of these modules is -25000 to 25000 (INT type). If a value that is out of this range is set, it will be limited to -25000 or 25000.
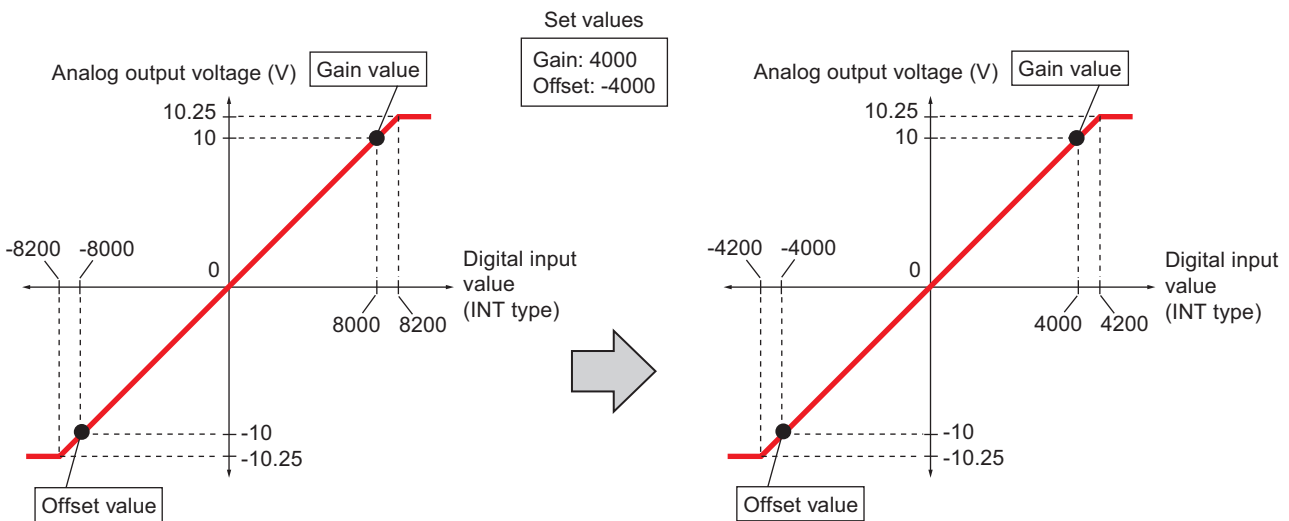
Section 4 Software Interface
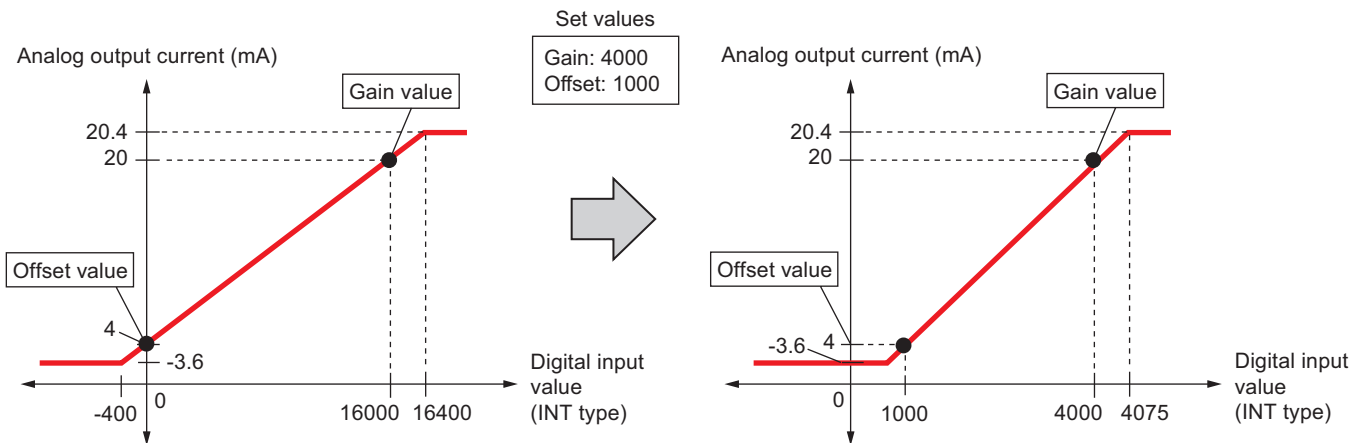
4-2 Analog Output Module

<Initial value of scaling for each output range>

Output range	Initial value of scaling	Available range of scaling (See note.)
0 to 5 V	0 to 16000	0 to 25000
1 to 5 V	0 to 16000	0 to 25000
0 to 10 V	0 to 16000	0 to 25000
-10 to 10 V	-8000 to 8000	-25000 to 25000
4 to 20 mA	0 to 16000	0 to 25000
0 to 20 mA	0 to 16000	0 to 25000

Note 1: Scaling is enabled only when the operation setting switch on the module rear panel is set to "Soft Set Range Operation mode". In fixed range operation mode, scaling is disabled.
Note 2: Over range is fixed to **"(Gain value - Offset value) x 0.025 + Gain value"**.
(**"(Gain value - Offset value) x 0.0125 + Gain value"** for the range of -10 to +10 V)
On the other hand, under range is fixed to **"Offset value - (Gain value - Offset value) x 0.025"**.
(**"Offset value - (Gain value - Offset value) x 0.0125"** for the range of -10 to +10 V)
Note 3: If scaling results in "resolution < maximum resolution", digital output value does not change in steps of one.
Note 4: Once scaling values are set, they won't change even when range is changed.

<Example 1 of scaling>

<Example 2 of scaling>

Section 4 Software Interface

4-2 Analog Output Module

\<Procedure for scaling\>

1) Input "30000" (INT type) to the mode changeover register (offset address +4) to activate parameter mode.
   (Make sure that bit 15 of the module status register is set ON.)
2) Input gain and offset values to the parameter setting data register, and set ON bit 5 and bit 8 (in the case of channel 1) of the parameter type setting register. (In the above example 1 of scaling, set as follows.)
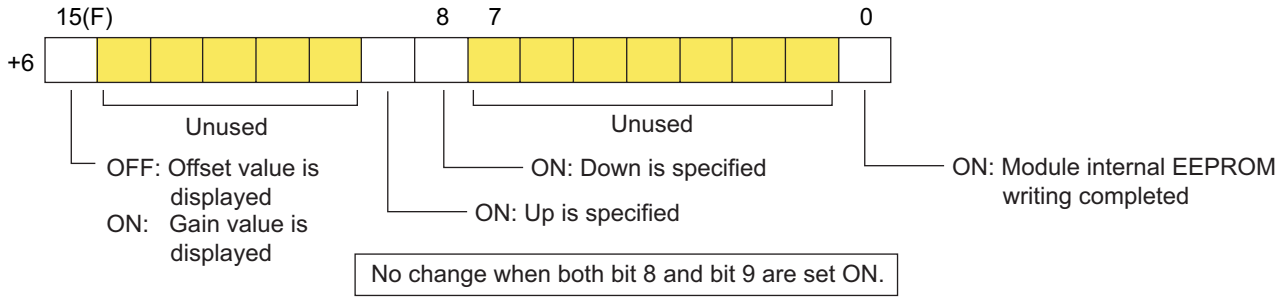
	15(F)	0
+6	-4000	
+7	4000	
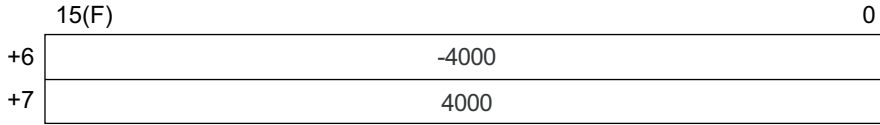
3) Make sure that bit 5 (scaling parameter write mode) and bit 8 (channel 1) of the parameter type setting register are set ON.
4) Set OFF all the bits of the parameter setting data register, and clear al the bits of the parameter setting data register to zero. This completes the operation for scaling.

3) When offset/gain adjustment mode is activated

For offset/gain adjustment, data is set in the locations shown below:

* When using D300win, assign a WORD type variable to this register. If you access by the bit, assign a BOOL type variable to each bit.

OFF: Offset value is displayed
ON: Gain value is displayed

ON: Up is specified

ON: Down is specified

ON: Module internal EEPROM writing completed

No change when both bit 8 and bit 9 are set ON.

\<Offset/gain adjustment\>

In this mode, offset value and/or gain value can finely be adjusted for individual channel.
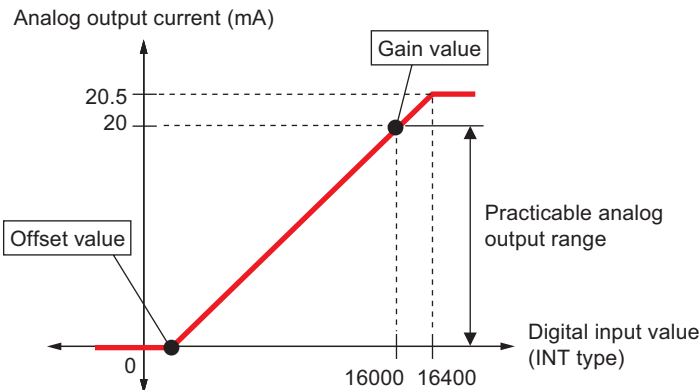- Offset value: Means the lower limit value of the range span. When this value is adjusted, the conversion characteristic curve moves parallel in vertical direction.
- Gain value: Means the upper limit value of the range span. When this value is adjusted, only gain value is changed while offset value is kept unchanged.

When offset and gain values are changed by scaling, the values that are set by scaling take effect as offset and gain values.
When offset and/or gain values are to be adjusted after scaling, adjust by the values of scaling.

Note 1: Offset/gain adjustable range is within ±1% of range span. It takes approximately 2 minutes to adjust from 0% to ±1%. If adjustment is made using an analog value that exceeds the adjustable range (if the value is input to a terminal of the module), the value is limited to ±1% of range span.
Note 2: If range is changed, offset and gain return to the default values.
Note 3: Negative current value cannot be output. If offset value is set too low, the conversion characteristic curve becomes as follows:
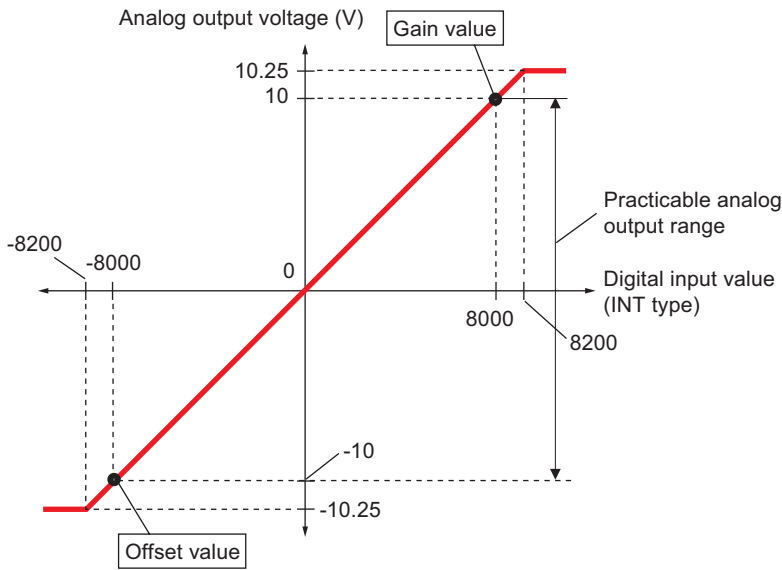
Section 4 Software Interface

4-2 Analog Output Module

Offset and gain values for the range of -10 to 10 V.

<Offset/gain adjustment procedure>

Offset is adjusted first.
1) Input "30000" (INT type) to the mode changeover register (offset address +4) to activate parameter mode.
   (Make sure that bit 15 of the module status register is set ON.)
2) Set ON bit 6 of the parameter type setting register to activate offset/gain adjustment mode. (Make sure that bit 15 of the module status register is set ON.)
3) Set ON the bit for the channel to be adjusted (the corresponding bit of bits 8 to 15 of the parameter type setting register).
   (The "SETTING" LED of the module blinks.)
4) With an external device, etc. connected to the terminal of the channel that is to be adjusted, observe the output voltage or current value.
5) First, in the condition that bit 15 of the parameter setting data register (offset address +6) is set OFF, adjust output value by setting ON and OFF bit 8 (output value Down) and bit 9 (output value Up).
6) After the completion of offset adjustment, set ON bit 0 (zero) of the parameter setting data register (offset address +6) to write the offset adjustment value in the module internal EEPROM. When bit 0 (zero) of offset address +2 is set ON, the writing of EEPROM is completed. After confirming this, set OFF bit 0 (zero) of the parameter setting data register.
7) Then set bit 15 ON of the parameter setting data register (offset address +6) and, in the same way as offset adjustment, adjust output value by setting ON and OFF bit 8 (output value Down) and bit 9 (output value Up). (Gain adjustment)
8) After the completion of gain adjustment, set ON bit 0 (zero) of the parameter setting data register (offset address +6) to write the gain adjustment value in the module internal EEPROM. Confirm the completion of EEPROM writing, in the same way as explained for offset adjustment.
9) Set OFF all the bits of the parameter type setting register, and clear all the bits of the parameter setting data register to zero. This completes the adjustment work.
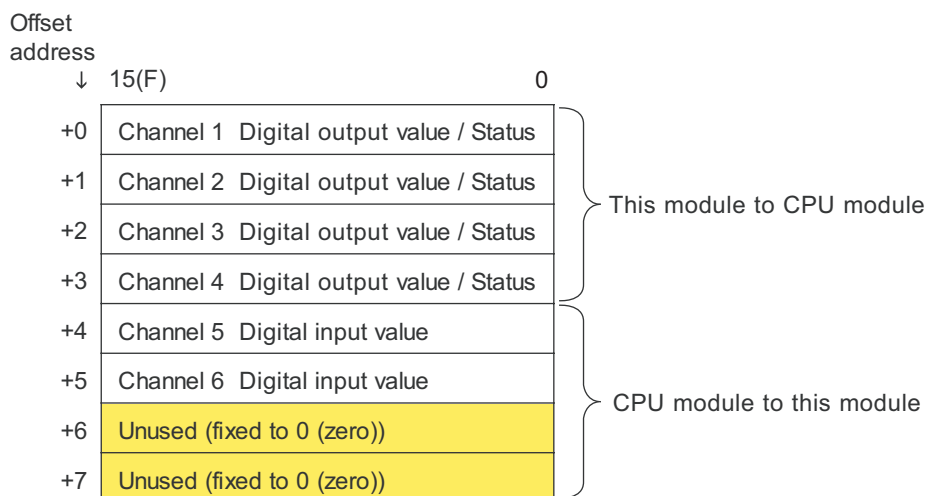
[Reference]

For concrete operating method with the SX Control Utility of D300win, refer to "Appendix 1 Offset/Gain Adjustment <D300win>". For concrete operating method with SX-Programmer Standard, refer to "Appendix 2 Offset/Gain Adjustment <SX-Programmer Standard>".

Section 4 Software Interface

4-3 Analog Input/Output Module

NP1AWH6-MR occupies 8 words of I/O area (input: 4 words, output: 4 words).

4-3-1 Memory allocation in Switch Batch Setting mode

Offset
address
	15(F)	0	
+0	Channel 1 Digital output value / Status		
+1	Channel 2 Digital output value / Status		This module to CPU module
+2	Channel 3 Digital output value / Status		
+3	Channel 4 Digital output value / Status		
+4	Channel 5 Digital input value		
+5	Channel 6 Digital input value		CPU module to this module
+6	Unused (fixed to 0 (zero))		
+7	Unused (fixed to 0 (zero))		

Status code	Error	Description
30002 (7532h)	EEPROM calibration data error (Module fatal fault)	If the calibration data of EEPROM is destroyed or if EEPROM cannot be written or read, this error is notified. Module internal EEPROM is abnormal. If this error occurred, it is necessary to replace the module.
30003 (7533h)	EEPROM user setting data error	If the user setting data of EEPROM is destroyed, this error is notified. If this error occurred, all parameters need to be reset. If this error recurs even after parameters are reset, the module seems to have failed.
30004 (7534h)	Internal power supply down	If the internal power supply of the module becomes down, this error is notified.
30006 (7536h)	Conversion error	If conversion became abnormal because the module failed or was used in an out-of-spec environment, this error is notified.

⚠️ Ordinarily digital output values (INT type) are stored in the registers explained above. If the module becomes abnormal, the following status code (INT type) is stored in these registers. When making an application program, be sure to interlock erroneous and normal (A/D conversion) conditions.
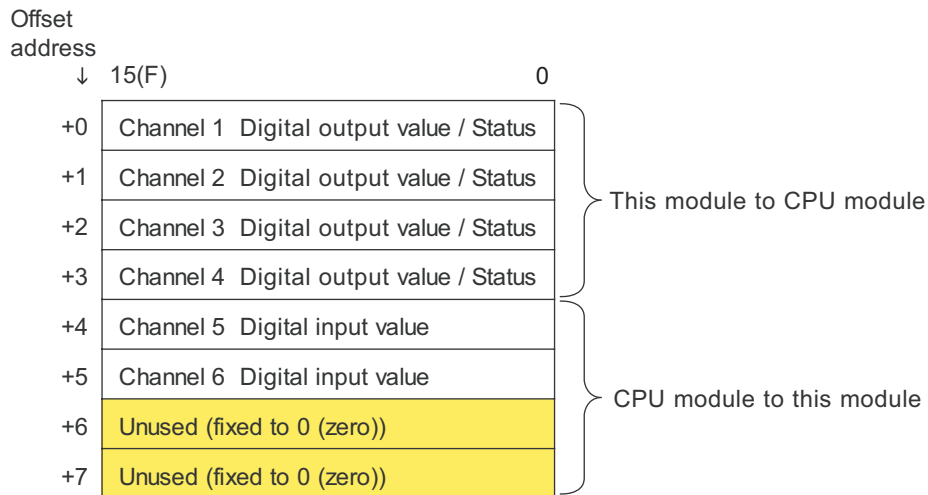
Section 4 Software Interface

4-3 Analog Input/Output Module

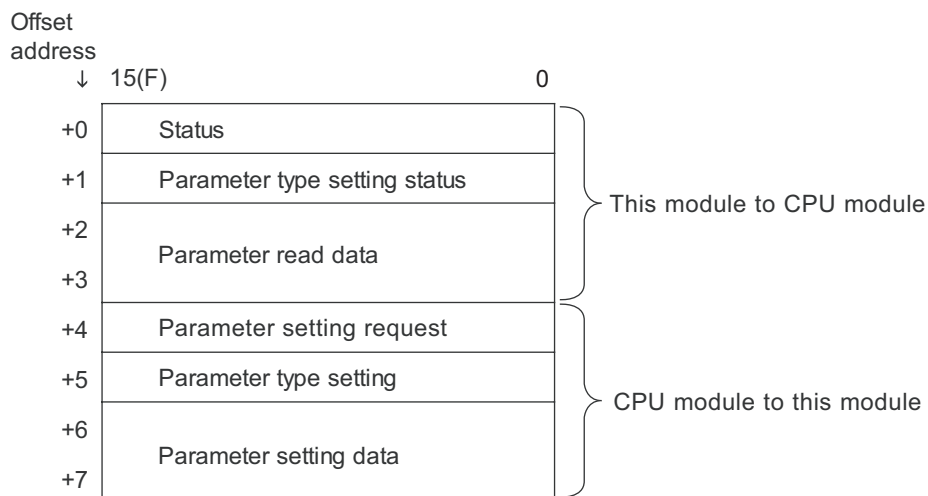### 4-3-2 Memory allocation in Software Set Range Operation mode

In Software Set Range Operation mode, memory allocation differs between when operating in A/D conversion mode (during normal operation) and when operating in parameter mode.

<When operating in conversion mode>

When operating in conversion mode, memory allocation becomes as follows:

Offset address

	15(F) ... 0	
+0	Channel 1 Digital output value / Status	⎫ This module to CPU module
+1	Channel 2 Digital output value / Status	
+2	Channel 3 Digital output value / Status	
+3	Channel 4 Digital output value / Status	
+4	Channel 5 Digital input value	⎫ CPU module to this module
+5	Channel 6 Digital input value	
+6	Unused (fixed to 0 (zero))	
+7	Unused (fixed to 0 (zero))	

<When operating in parameter mode>

Offset address

	15(F) ... 0	
+0	Status	⎫ This module to CPU module
+1	Parameter type setting status	
+2	Parameter read data	
+3		
+4	Parameter setting request	⎫ CPU module to this module
+5	Parameter type setting	
+6	Parameter setting data	
+7		

Section 4 Software Interface

4-3 Analog Input/Output Module

(1) Digital output value/status register (offset address: +0 to +3)

When this module is in conversion mode, digital output values and/or statuses are stored, in the registers of offset address +0 to +3.

* When using D300win, assign INT type variables to these registers.

Offset
address
↓   15(F)   0

Offset	Register
+0	Channel 1 Digital output value / Status
+1	Channel 2 Digital output value / Status
+2	Channel 3 Digital output value / Status
+3	Channel 4 Digital output value / Status

Status code	Condition of modul	Description
30002 (7532h)	EEPROM calibration data error (Module fatal fault)	If the calibration data of EEPROM is destroyed or if EEPROM cannot be written or read, this error is notified. Module internal EEPROM is abnormal. If this error occurred, it is necessary to replace the module.
30003 (7533h)	EEPROM user setting data error	If the user setting data of EEPROM is destroyed, this error is notified. If this error occurred, all parameters need to be reset. If this error recurs even after parameters are reset, the module seems to have failed.
30004 (7534h)	Internal power supply down	If the internal power supply of the module becomes down, this error is notified.
30006 (7536h)	Conversion error	If conversion became abnormal because the module failed or was used in an out-of-spec environment, this error is notified.

⚠ Ordinarily digital output values (INT type) are stored in the registers explained above. If the module becomes abnormal, the following status code (INT type) is stored in these registers. When making an application program, be sure to interlock erroneous and normal (A/D conversion) conditions.

(2) Digital input values of channels 5 and 6 (offset address +4 and +5)

The digital values to undergo D/A conversion are stored in these memory areas. Just after the system is powered up, 0 V or 0 mA is output. When the initialization of the module is completed, the analog value that corresponds to the digital input value of 0 (zero) is output (for example, 1 V for the range of 1 to 5 V).

When the system is started (when the CPU module starts running), the analog value that corresponds to the digital value input to this memory area is output. For more information of conversion characteristics, refer to "2-3 Conversion Characteristics".

* When using D300win, assign INT type variables to these registers.

Offset
address
↓   15(F)   0

Offset	Register
+4	Channel 5 Digital input value
+5	Channel 6 Digital input value

(3) Status register (offset address +0)

When parameters are being set or read out, "30001" is output by the module.
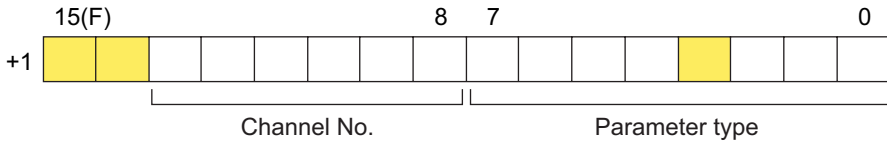
Section 4 Software Interface

4-3 Analog Input/Output Module

(4) Parameter type setting status register (offset address +1)

This register stores the information of what parameter is now being written or read by the module.

* When using D300win, assign a WORD type variable to this register. If you access by the bit, assign a BOOL type variable to each bit.


| Bit	Flag name	Description
0	Operation parameter read mode	ON: Operation parameter read mode (all channels in a batch)
1	Scaling parameter read mode	ON: Scaling parameter read mode (individual channel)
2	Operation range parameter read mode	ON: Operation range parameter read mode (all channels in a batch)
3	Unused	
4	Operation parameter write mode	ON: Operation parameter write mode (all channels in a batch)
5	Scaling parameter write mode	ON: Scaling parameter write mode (individual channel)
6	Operation range parameter write mode	ON: Operation range parameter write mode (all channels in a batch)
7	Offset/gain adjustment mode	ON: Offset/gain adjustment mode (individual channel)
8	Channel 1	In "scaling parameter read mode" or "scaling parameter write mode", one of bits 8 to 15 is set ON to indicate which channel is now being set or read out.
9	Channel 2	
10	Channel 3	
11	Channel 4	
12	Channel 5	
13	Channel 6	
14	Unused	
15	Unused	

(5) Parameter read data register (offset address +2 and +3)

In "operation parameter read mode", "scaling parameter read mode", "operation range parameter read mode"or "offset/gain adjustment mode", the content of the setting for the corresponding mode is stored in this register.
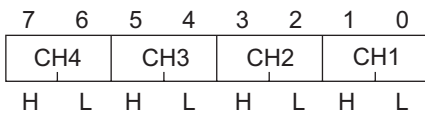
1) When operation parameter read mode is activated
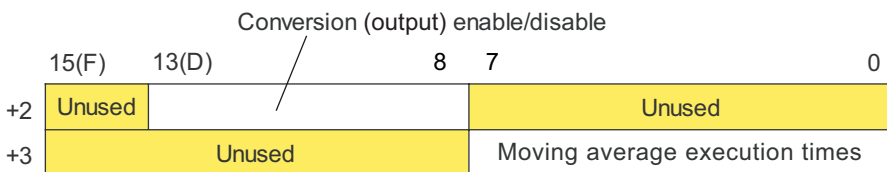
Conversion (output) enable/disable   OFF: (Output) enable, ON: (Output) disable
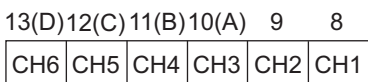
Moving average execution times H/L = OFF/OFF: Once, OFF/ON: Twice, ON/OFF: 4 times, ON/ON: 8 times
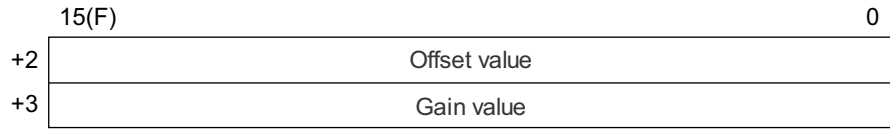

* When using D300win, assign WORD type variables to these registers. If you access by the bit, assign a BOOL type variable to each bit.
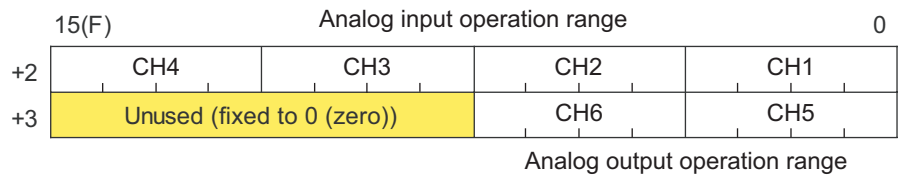
Section 4 Software Interface

4-3 Analog Input/Output Module

2) When scaling parameter read mode is activated

```
      15(F)                                         0
     ┌─────────────────────────────────────────────┐
  +2 │               Offset value                  │
     ├─────────────────────────────────────────────┤
  +3 │               Gain value                    │
     └─────────────────────────────────────────────┘
```

* When using D300win, assign INT type variables to these registers.

3) When operation range parameter read mode is activated

```
      15(F)        Analog input operation range     0
     ┌──────────┬──────────┬──────────┬────────────┐
  +2 │   CH4    │   CH3    │   CH2    │    CH1     │
     ├──────────┴──────────┼──────────┼────────────┤
  +3 │ Unused (fixed to 0 (zero)) │ CH6 │   CH5    │
     └─────────────────────┴──────────┴────────────┘
                    Analog output operation range
```

OFF/OFF/OFF/OFF : 0 to 10 V
OFF/OFF/OFF/ON : 0 to 5 V
OFF/OFF/ON/OFF : 1 to 5 V
OFF/OFF/ON/ON   : -10 to 10 V
OFF/ON/OFF/OFF : 4 to 20 mA
OFF/ON/OFF/ON   : 0 to 20 mA
OFF/ON/ON/ON   : -20 to 20 mA
Others   : 0 to 10 V

4) When offset/gain adjustment mode is activated

* When using D300win, assign a WORD type variable to this register (offset address +2). If you access by the bit, assign a
  BOOL type variable to each bit.

```
      15(F)                                         0
     ┌──┬──┬──┬──┬──┬──┬──┬──┬──┬──┬──┬──┬──┬──┬──┬──┐
  +2 │  │  │  │  │  │  │  │  │  │  │  │  │  │  │  │  │
     └──┴──┴──┴──┴──┴──┴──┴──┴──┴──┴──┴──┴──┴──┴──┴──┘
```

Unused (fixed to 0 (zero))

Analog input
  OFF: Offset value is displayed
  ON: Gain valu is displayed

Analog output
  OFF: Offset value is displayed
  ON: Gain valu is displayed

For analog input
  ON: Writing to module internal EEPROM

For analog output
  ON: Writing to module internal EEPROM

ON: Down is specified.

ON: Up is specified.

```
     ┌─────────────────────────────────────────────┐
  +3 │              AD converted value             │
     └─────────────────────────────────────────────┘
```
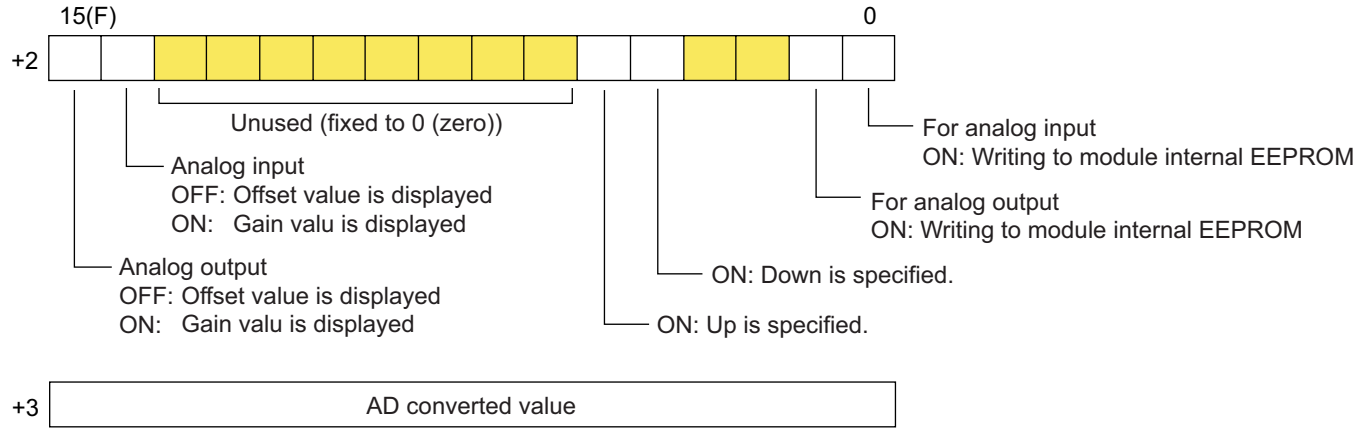
AD converted value (INT type)
(A converted value of a channel specified by the affset address +6 can be monitored.)

* When using D300win, assign an INT type variable to this register.

Section 4 Software Interface

4-3 Analog Input/Output Module
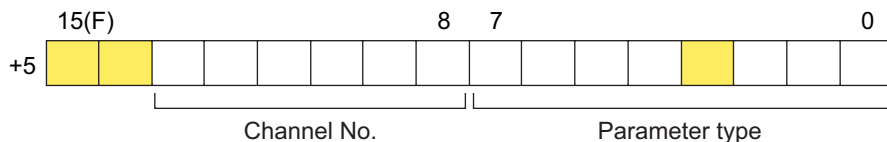
(6) Parameter setting request (offset address +4)

When a value in the range from "30000" to "32767" is input to the parameter setting request register (offset address +4), the status register (offset address +0) becomes "30001", and "parameter" mode is activated. Make sure that the status register (offset address +0) is "30001" and then set parameters.

If a value that is smaller than "30000" is input to this register, the mode is changed over from "parameter" mode to "conversion mode (normal mode)".

(7) Parameter type setting register (offset address +5)

Parameter type and channel number for reading/writing parameters are set in this register.

* When using D300win, assign a WORD type variable to this register. If you access by the bit, assign a BOOL type variable to each bit.

Bit	Flag name	Description
0	Operation parameter read mode	ON: Operation parameter read mode (all channels in a batch)
1	Scaling parameter read mode	ON: Scaling parameter read mode (individual channel)
2	Operation range parameter read mode	ON: Operation range parameter read mode (all channels in a batch)
3	Unused	
4	Operation parameter write mode	ON: Operation parameter write mode (all channels in a batch)
5	Scaling parameter write mode	ON: Scaling parameter write mode (individual channel)
6	Operation range parameter write mode	ON: Operation range parameter write mode (all channels in a batch)
7	Offset/gain adjustment mode	ON: Offset/gain adjustment mode (individual channel)
8	Channel 1	In "scaling parameter read mode", "scaling parameter write mode" or "offset/gain adjustment mode", one of bits 8 to 15 is set ON to specify a channel for which parameters are to be set.
9	Channel 2	
10	Channel 3	
11	Channel 4	
12	Channel 5	
13	Channel 6	
14	Unused	
15	Unused	

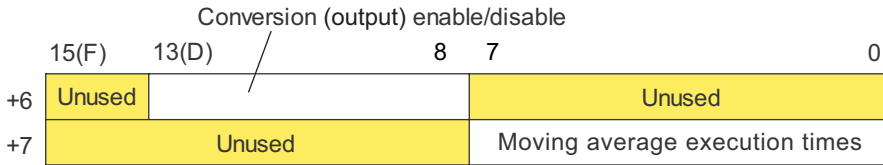# Section 4   Software Interface

4-3   Analog Input/Output Module

(8) Parameter setting data register (offset address +6 and +7)

When "parameter" mode is activated, the set values of "operation parameter write" mode, "scaling parameter" mode "operation range parameter" mode or "offset/gain adjustment" mode are written in this register.
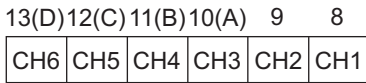
1) When operation parameter write mode is activated

Data is set in the locations shown below, and "operation parameter write mode flag" (bit 4 of the parameter type setting register) is set ON.

* When using D300win, assign WORD type variables to these registers. If you access by the bit, assign a BOOL type variable to each bit.

Conversion (output) enable/disable

	15(F)	13(D)		8	7		0
+6	Unused				Unused		
+7	Unused				Moving average execution times		

Conversion (output) enable/disable   OFF: (Output) enable, ON: (Output) disable

13(D)	12(C)	11(B)	10(A)	9	8
CH6	CH5	CH4	CH3	CH2	CH1

Moving average execution times H/L = OFF/OFF: Once, OFF/ON: Twice, ON/OFF: 4 times, ON/ON: 8 times

7	6	5	4	3	2	1	0
CH4		CH3		CH2		CH1	
H	L	H	L	H	L	H	L
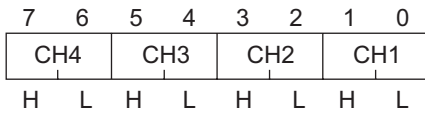
2) When scaling parameter write mode is activated

For scaling, offset and gain values are set in the locations shown below, and "scaling parameter write mode flag" (bit 5 of the parameter type setting register) is set ON.

* When using D300win, assign INT type variables to these registers.

	15(F)	0
+6	Offset value	
+7	Gain value	

<Initial value for the scaling of input range>

Input range	Initial value of scaling	Scaling range
0 to 5 V	0 to 16000	0 to 25000
1 to 5 V	0 to 16000	0 to 25000
0 to 10 V	0 to 16000	0 to 25000
-10 to 10 V	-8000 to 8000	-25000 to 25000
4 to 20 mA	0 to 16000	0 to 25000
0 to 20 mA	0 to 16000	0 to 25000
-20 to 20 mA	-8000 to 8000	-25000 to 25000

Note 1: Scaling is enabled only when the operation setting switch on the module rear panel is set to "Soft Set Range Operation mode". In fixed range operation mode, scaling is disabled.

Note 2: Over range is fixed to **"(Gain value - Offset value) x 0.025 + Gain value"**.
("**(Gain value - Offset value) x 0.0125 + Gain value**" for the range of -10 to +10 V or of -20 to +20 mA)
On the other hand, under range is fixed to **"Offset value - (Gain value - Offset value) x 0.025"**.
(**"Offset value - (Gain value - Offset value) x 0.0125"** for the range of -10 to +10 V or of -20 to +20 mA)

Note 3: If scaling results in "resolution < maximum resolution", digital output value does not change in steps of one.
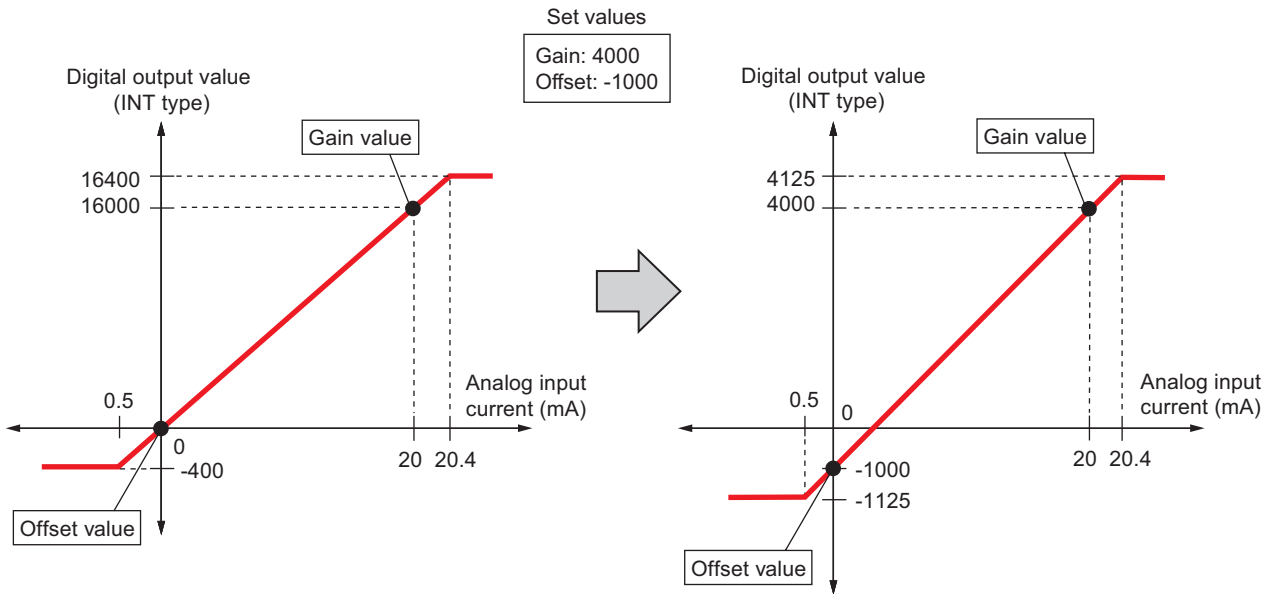
Note 4: Once scaling values are set, they won't change even when range is changed in Soft Set Range Operation mode.

Section 4 Software Interface

4-3 Analog Input/Output Module

<Example of scaling>

Set values
Gain: 4000
Offset: -1000

<Procedure for scaling>

1) Input "30000" to the parameter setting request register to activate parameter mode. (Make sure that the status register is "30001".)
2) Input gain and offset values to the parameter setting data register, and set ON bit 5 and bit 8 (in the case of channel 1) of the parameter type setting register.
   (In the above example of scaling, set as follows.)

	15(F)	0
+6	-1000	
+7	4000	

3) Make sure that bit 5 (scaling parameter write mode) and bit 8 (channel 1) of the parameter type setting register are set ON.
4) Set OFF all the bits of the parameter type setting register, and clear all the bits of the parameter setting data register to zero. This completes the operation for adjustment.

<Scaling for analog output>

The analog output converts the digital values that are input to them by application program into analog values. The operation to change the width (scale) of input digital values is referred to as "scaling". The available range of scaling of these modules is -25000 to 25000 (INT type). If a value that is out of this range is set, it will be limited to -25000 or 25000.

<Initial value of scaling for each output range>

Output range	Initial value of scaling	Available range of scaling (See note.)
0 to 5 V	0 to 16000	0 to 25000
1 to 5 V	0 to 16000	0 to 25000
0 to 10 V	0 to 16000	0 to 25000
-10 to 10 V	-8000 to 8000	-25000 to 25000
4 to 20 mA	0 to 16000	0 to 25000
0 to 20 mA	0 to 16000	0 to 25000

Section 4 Software Interface

4-3 Analog Input/Output Module

Note 1: Scaling is enabled only when the operation setting switch on the module rear panel is set to "Soft Set Range Operation mode". In fixed range operation mode, scaling is disabled.

Note 2: Over range is fixed to **"(Gain value - Offset value) x 0.025 + Gain value"**.
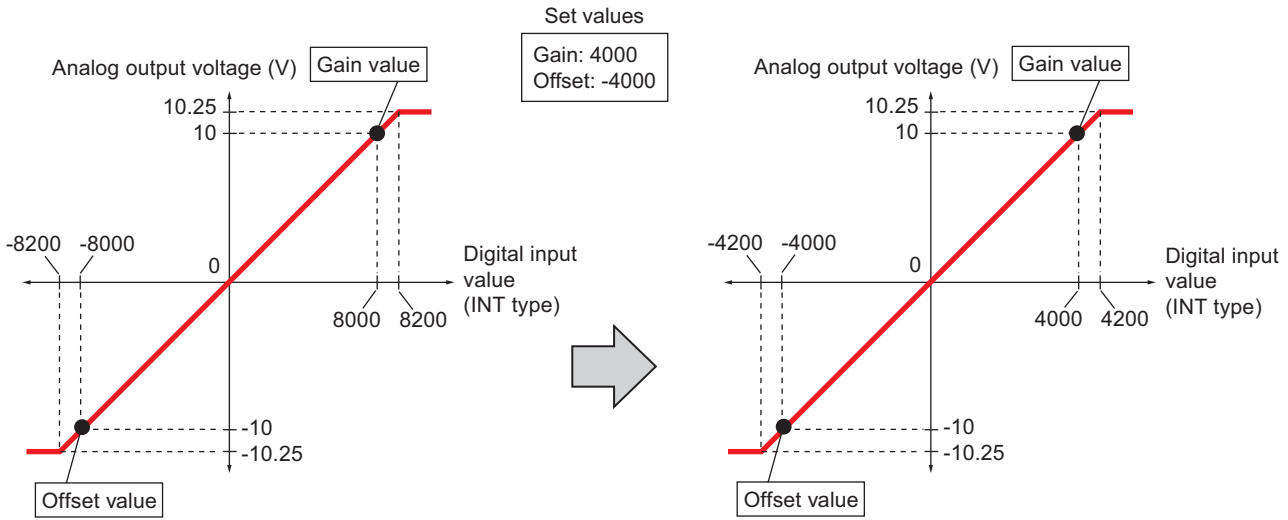(**"(Gain value - Offset value) x 0.0125 + Gain value"** for the range of -10 to +10 V)
On the other hand, under range is fixed to **"Offset value - (Gain value - Offset value) x 0.025"**.
(**"Offset value - (Gain value - Offset value) x 0.0125"** for the range of -10 to +10 V)
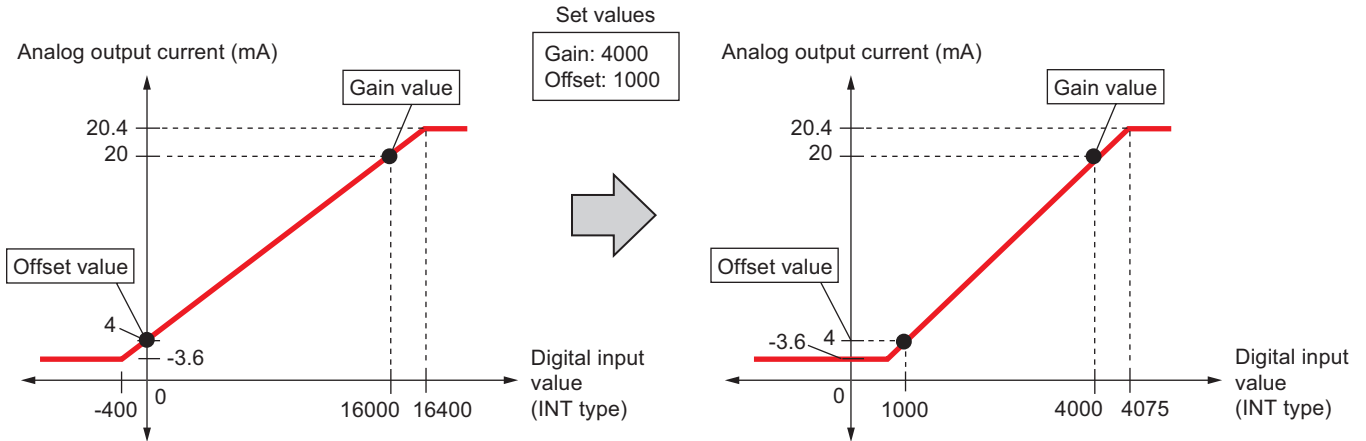
Note 3: If scaling results in "resolution < maximum resolution", digital output value does not change in steps of one.

Note 4: Once scaling values are set, they won't change even when range is changed.

<Example 1 of scaling>

Set values
Gain: 4000
Offset: -4000

Analog output voltage (V) Gain value
10.25
10
-8200 -8000
0
Digital input value (INT type)
8000 8200
-10
-10.25
Offset value

Analog output voltage (V) Gain value
10.25
10
-4200 -4000
0
Digital input value (INT type)
4000 4200
-10
-10.25
Offset value

<Example 2 of scaling>

Set values
Gain: 4000
Offset: 1000

Analog output current (mA) Gain value
20.4
20
Offset value
4
-3.6
-400 0
Digital input value (INT type)
16000 16400

Analog output current (mA) Gain value
20.4
20
Offset value
-3.6 4
0
1000
Digital input value (INT type)
4000 4075

<Procedure for scaling>

1) Input "30000" to the parameter setting request register (offset address +4) to activate parameter mode. (Make sure that the status register is "30001".)

2) Input gain and offset values to the parameter setting data register, and set ON bit 5 and bit 12 (in the case of channel 5) of the parameter type setting register.
(In the above example 1 of scaling, set as follows.)

	15(F)	0
+6	-4000	
+7	4000	

3) Make sure that bit 5 (scaling parameter write mode) and bit 12 (channel 5) of the parameter type setting register are set ON.

4) Set OFF all the bits of the parameter setting data register, and clear al the bits of the parameter setting data register to zero.
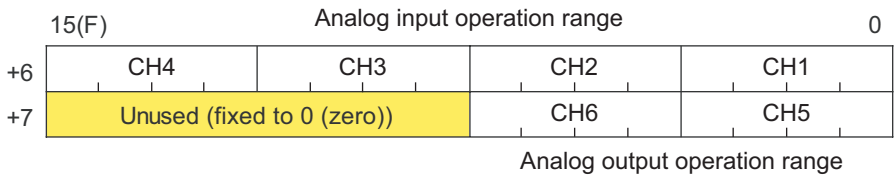This completes the operation for scaling.

Section 4 Software Interface

4-3 Analog Input/Output Module

3) When operation range parameter write mode is activated

For offset/gain adjustment, data is set in the locations shown below:

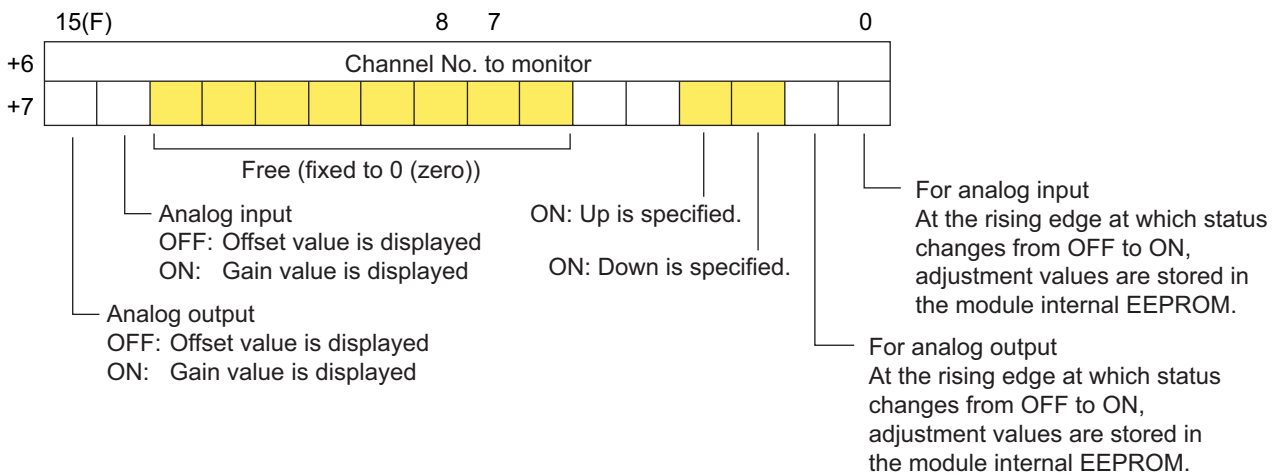* When using D300win, assign INT type variables to these registers.


```
        15(F)          Analog input operation range          0
     +6 │   CH4   │   CH3   │   CH2   │   CH1   │
     +7 │   Unused (fixed to 0 (zero))   │   CH6   │   CH5   │
                            Analog output operation range
```

OFF/OFF/OFF/OFF : 0 to 10 V
OFF/OFF/OFF/ON : 0 to 5 V
OFF/OFF/ON/OFF : 1 to 5 V
OFF/OFF/ON/ON   : -10 to 10 V
OFF/ON/OFF/OFF : 4 to 20 mA
OFF/ON/OFF/ON   : 0 to 20 mA
OFF/ON/ON/ON   : -20 to 20 mA
Others   : 0 to 10 V

4) When offset/gain adjustment mode is activated

For offset/gain adjustment, data is set in the locations shown below:

* When using D300win, assign INT type variables to these registers.


```
     15(F)              8  7              0
  +6 │        Channel No. to monitor        │
  +7 │ │ │ │ │ │ │ │ │ │ │ │ │ │ │ │ │
```

Free (fixed to 0 (zero))

Analog input
OFF: Offset value is displayed
ON: Gain value is displayed

Analog output
OFF: Offset value is displayed
ON: Gain value is displayed

ON: Up is specified.

ON: Down is specified.

For analog input
At the rising edge at which status changes from OFF to ON, adjustment values are stored in the module internal EEPROM.

For analog output
At the rising edge at which status changes from OFF to ON, adjustment values are stored in the module internal EEPROM.

<Analog input Offset/gain adjustment>

In this mode, offset value and/or gain value can finely be adjusted for individual channel.
- Offset value: Means the lower limit value of the range span. When this value is adjusted, the conversion characteristic curve moves parallel in vertical direction.
- Gain value: Means the upper limit value of the range span. When this value is adjusted, only gain value is changed while offset value is kept unchanged.

When offset and gain values are changed by scaling, the values that are set by scaling take effect as offset and gain values.
When offset and/or gain values are to be adjusted after scaling, adjust by the values of scaling.

Note 1: Offset/gain adjustable range is within ±1% of range span. If adjustment is made using an analog value that exceeds the adjustable range (if the value is input to a terminal of the module), the value is limited to ±1% of range span.
Note 2: If range is changed, offset and gain return to the default values.
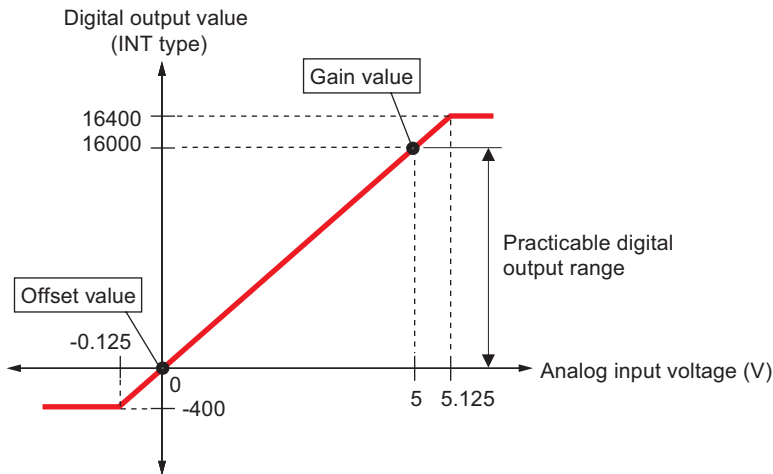Note 3: Offset/gain adjustment is disabled when analog range is set in a batch with the switch provided on the module rear panel.

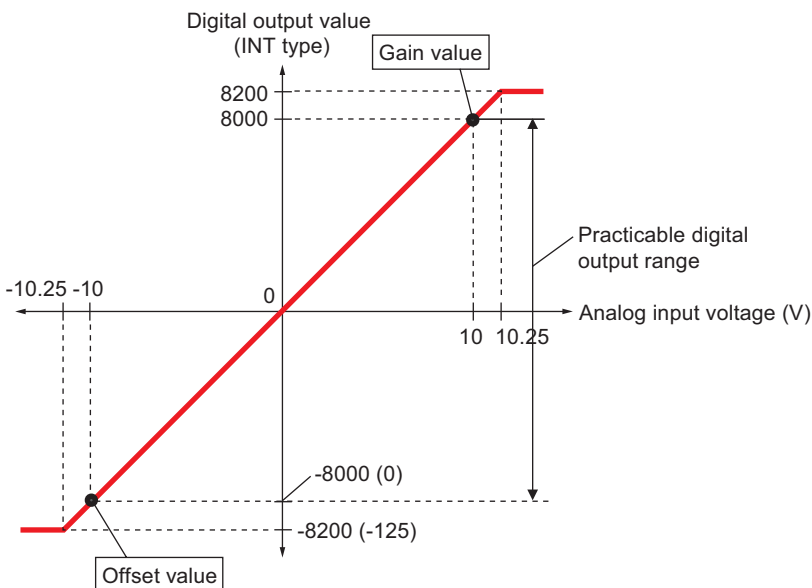# Section 4   Software Interface

4-3   Analog Input/Output Module

<Example 1 of gain/offset adjustment>

Offset and gain values for the range of 0 to 5 V.

<Example 2 of gain/offset adjustment>

Offset and gain values for the range of -10 to 10 V.

<Offset/gain adjustment procedure>

Offset is adjusted first.
 1) Input "30000" to the the parameter setting request register to activate parameter mode. (Make sure that the status register is "30001".)
 2) Set ON bit 7 of the parameter type setting register to activate offset/gain adjustment mode.
 3) Set ON the bit for the channel to be adjusted (the corresponding bit of bits 8 to 15 of the parameter type setting register). (The "SETTING" LED of the module blinks.)
 4) Apply a voltage (or a current) that corresponds to the offset value to the terminal of the channel that is to be adjusted.
 5) Set ON bit 0 (zero) of offset address +7 of the parameter setting data register to write the offset adjustment value in the module internal EEPROM. When bit 0 (zero) of offset address +2 is set ON, the writing of EEPROM is completed. After confirming this, set OFF bit 0 (zero) of the parameter setting data register (offset address +7).
 6) Then set bit 14 ON of offset address +7 of the parameter setting data register. (Gain adjustment of analog input)
 7) Apply a voltage (or a current) that corresponds to the gain value to the terminal.
 8) Set ON bit 0 (zero) of offset address +7 of the parameter type setting register to write the gain adjustment value in the module internal EEPROM. Confirm the completion of writing in the same way as explained for offset adjustment.
 9) Set OFF all the bits of the parameter type setting register, and clear all the bits of the parameter setting data register to zero. This completes the operation for adjustment.

Section 4 Software Interface

4-3 Analog Input/Output Module

<Analog output   Offset/gain adjustment>
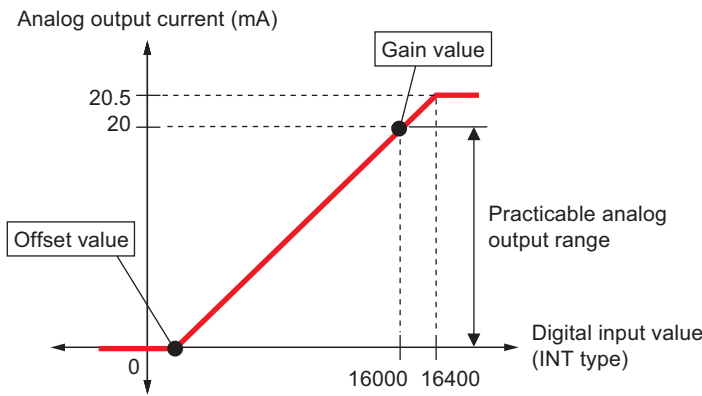In this mode, offset value and/or gain value can finely be adjusted for individual channel.
- ⬩ Offset value: Means the lower limit value of the range span. When this value is adjusted, the conversion characteristic curve moves parallel in vertical direction.
- ⬩ Gain value: Means the upper limit value of the range span. When this value is adjusted, only gain value is changed while offset value is kept unchanged.

When offset and gain values are changed by scaling, the values that are set by scaling take effect as offset and gain values.
When offset and/or gain values are to be adjusted after scaling, adjust by the values of scaling.

Note 1: Offset/gain adjustable range is within ±1% of range span. It takes approximately 2 minutes to adjust from 0% to ±1%. If adjustment is made using an analog value that exceeds the adjustable range (if the value is input to a terminal of the module), the value is limited to ±1% of range span.
Note 2: If range is changed, offset and gain return to the default values.
Note 3: Negative current value cannot be output. If offset value is set too low, the conversion characteristic curve becomes as follows:

Offset and gain values for the range of -10 to 10 V.
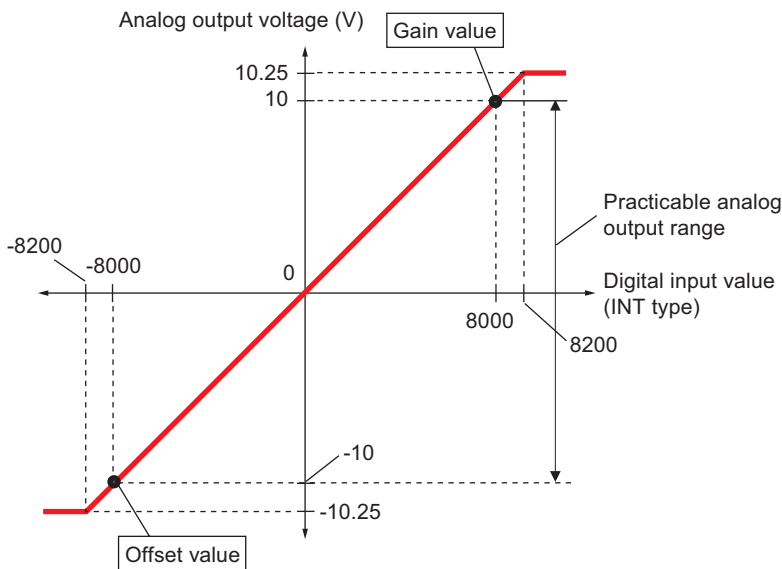
Section 4 Software Interface

4-3 Analog Input/Output Module

**<Offset/gain adjustment procedure>**

Offset is adjusted first.

1) Input "30000" to the parameter setting request register to activate the parameter mode. (Make sure that the status register is "30001".)
2) Set ON bit 7 of the parameter type setting register to activate offset/gain adjustment mode.
3) Set ON the bit for the channel to be adjusted (the corresponding bit of bits 12 or 13 of the parameter type setting register). (The "SETTING" LED of the module blinks.)
4) With an external device, etc. connected to the terminal of the channel that is to be adjusted, observe the output voltage or current value.
5) First, in the condition that bit 15 of the parameter setting data register (offset address +7) is set OFF, adjust output value by setting ON and OFF bit 4 (output value Down) and bit 5 (output value Up).
6) After the completion of offset adjustment, set ON bit 0 (zero) of the parameter setting data register (offset address +7) to write the offset adjustment value in the module internal EEPROM. When bit 0 (zero) of offset address +2 is set ON, the writing of EEPROM is completed. After confirming this, set OFF bit 0 (zero) of the parameter setting data register (offset address +7).
7) Then set bit 15 ON of the parameter setting data register (offset address +7) and, in the same way as offset adjustment, adjust output value by setting ON and OFF bit 4 (output value Down) and bit 5 (output value Up). (Gain adjustment)
8) After the completion of gain adjustment, set ON bit 0 (zero) of the parameter setting data register (offset address +7) to write the gain adjustment value in the module internal EEPROM. Confirm the completion of EEPROM writing, in the same way as explained for offset adjustment.
9) Set OFF all the bits of the parameter type setting register, and clear all the bits of the parameter setting data register to zero. This completes the adjustment work.
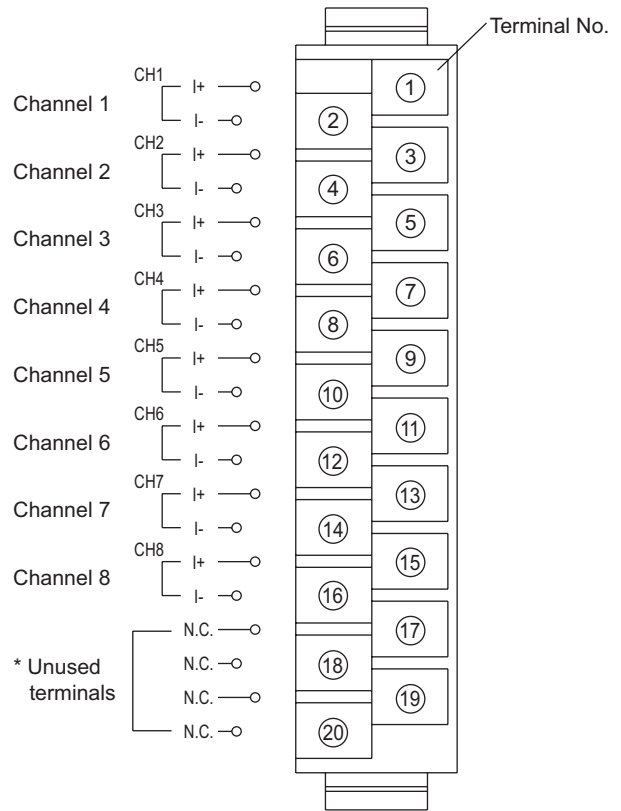
Section 5 Wiring

5-1 Wiring of Analog Input Module

5-1-1 Terminal arrangement
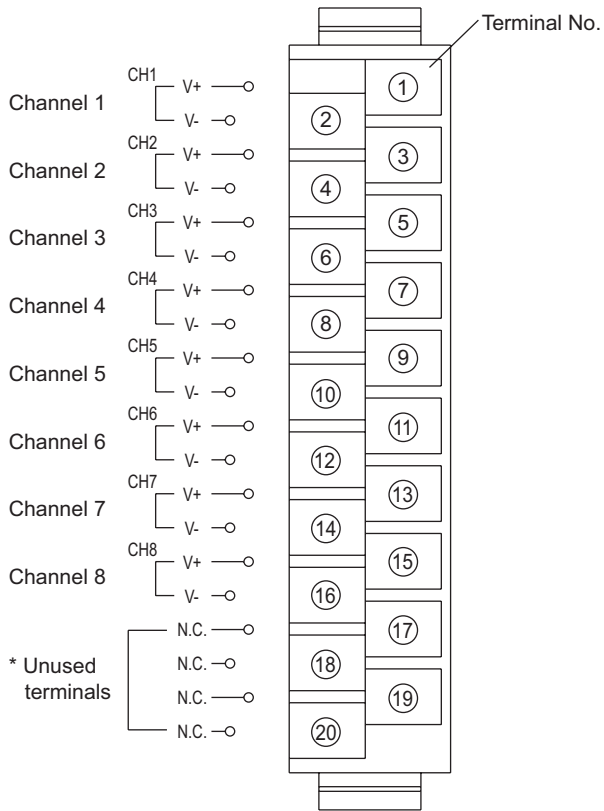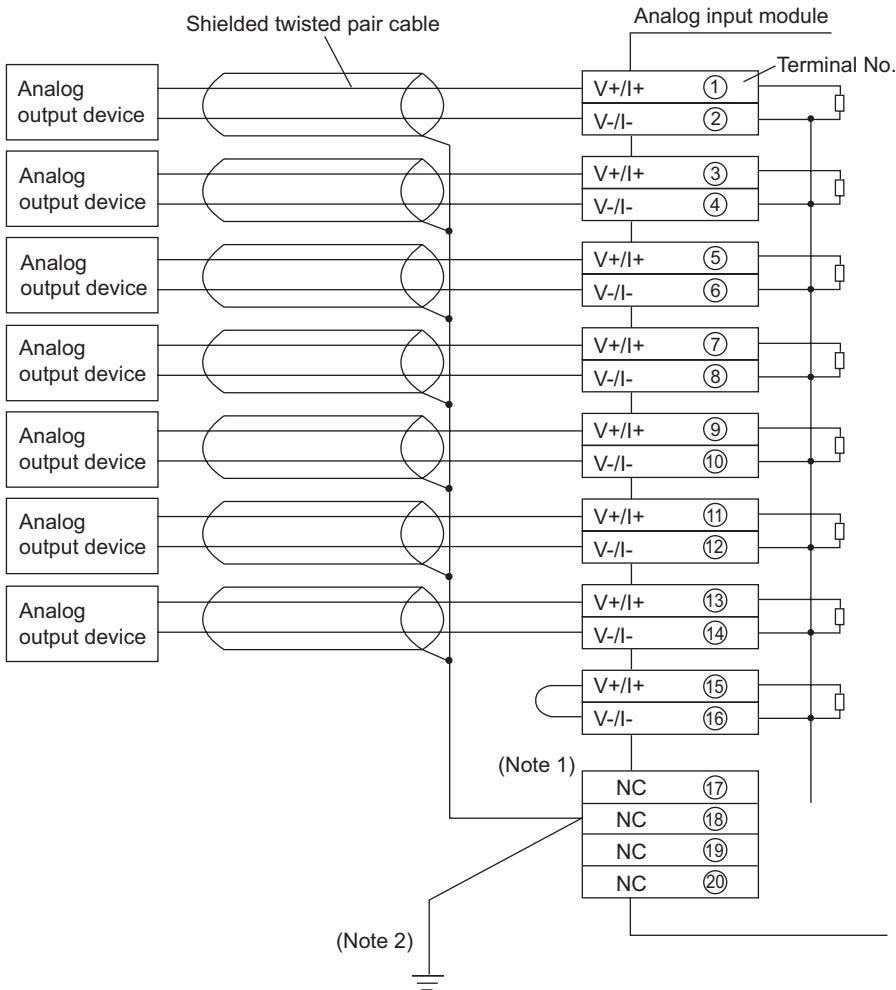
<NP1AXH8V-MR>

<NP1AXH8I-MR>

* Unused terminals can be used as relay terminals for shielded wires or analog signal cables.

Section 5 Wiring

5-1 Wiring of Analog Input Module

5-1-2 Wiring example

The analog input modules shall be wired according to the figure below, using shielded twisted pair cables.

Note 1: Unused channels shall basically be short-circuited.
Note 2: Ground shielded wires at one point on the PC side (class D grounding). However, when shielded wires had better be grounded on the external device side due to the condition of external noise, their ends on the module side must be open. For grounding, NC terminals can be used as relay terminals for shielded wires. However, they must not be used as relay terminals for other control signal cables or power cables.
Note 3: Keep signal wires that go out of this module sufficiently away from high-voltage or power cables, and avoid parallel wiring.
Note 4: Avoid wiring the signal cables in the vicinity of load cables coming from devices other than PLC or bundling them with such cables.
Note 5: Keep the signal cables sufficiently away from circuits where high frequencies occur, such as inverter main load circuit.
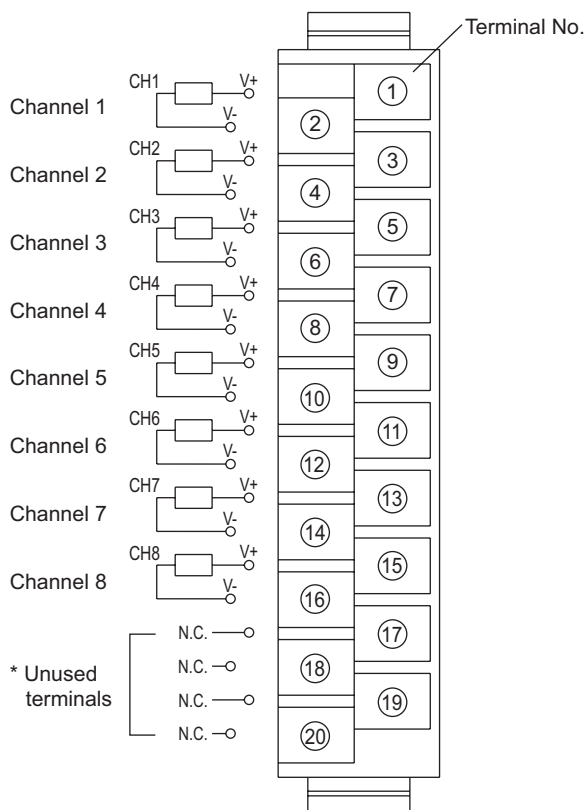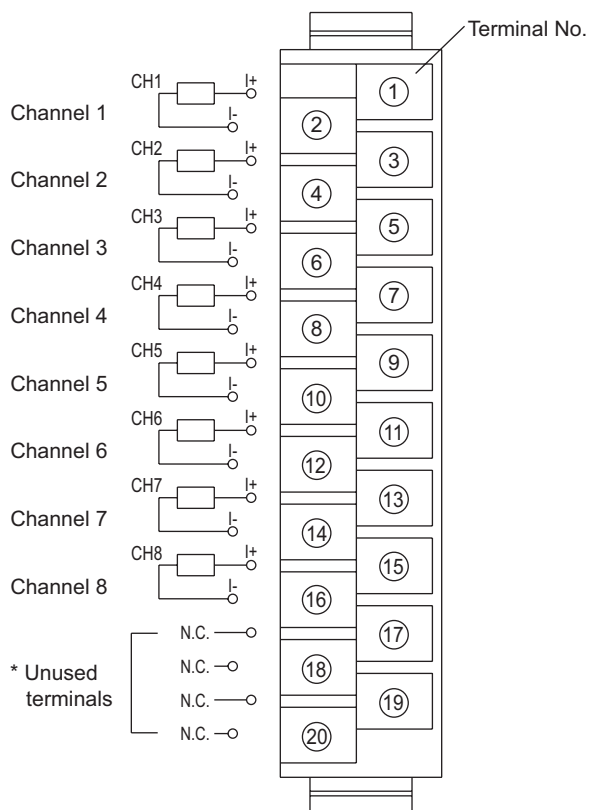
Section 5 Wiring

5-2 Wiring of Analog Output Module
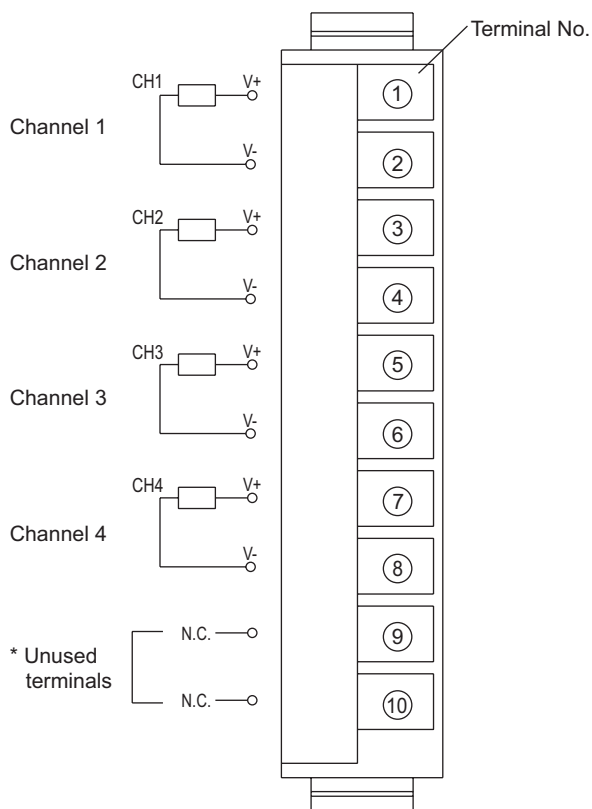
5-2-1 Terminal arrangement

<NP1AYH8V-MR>

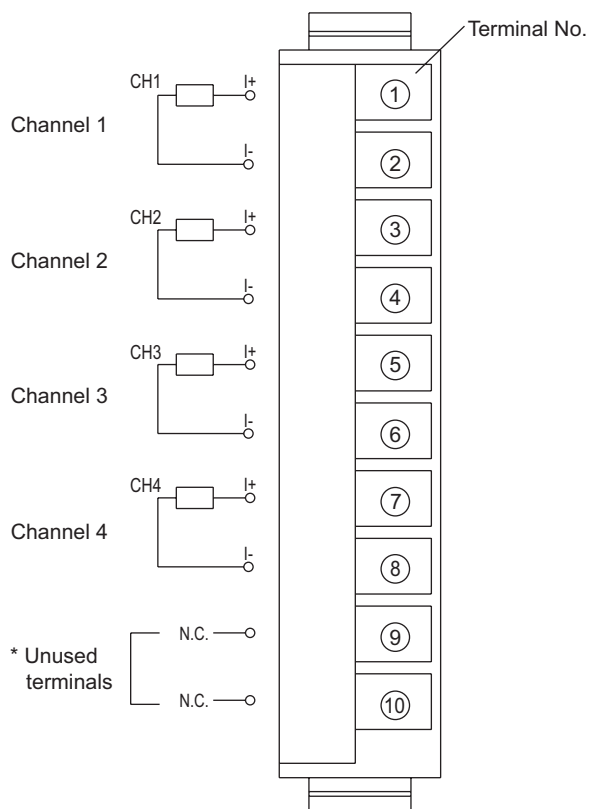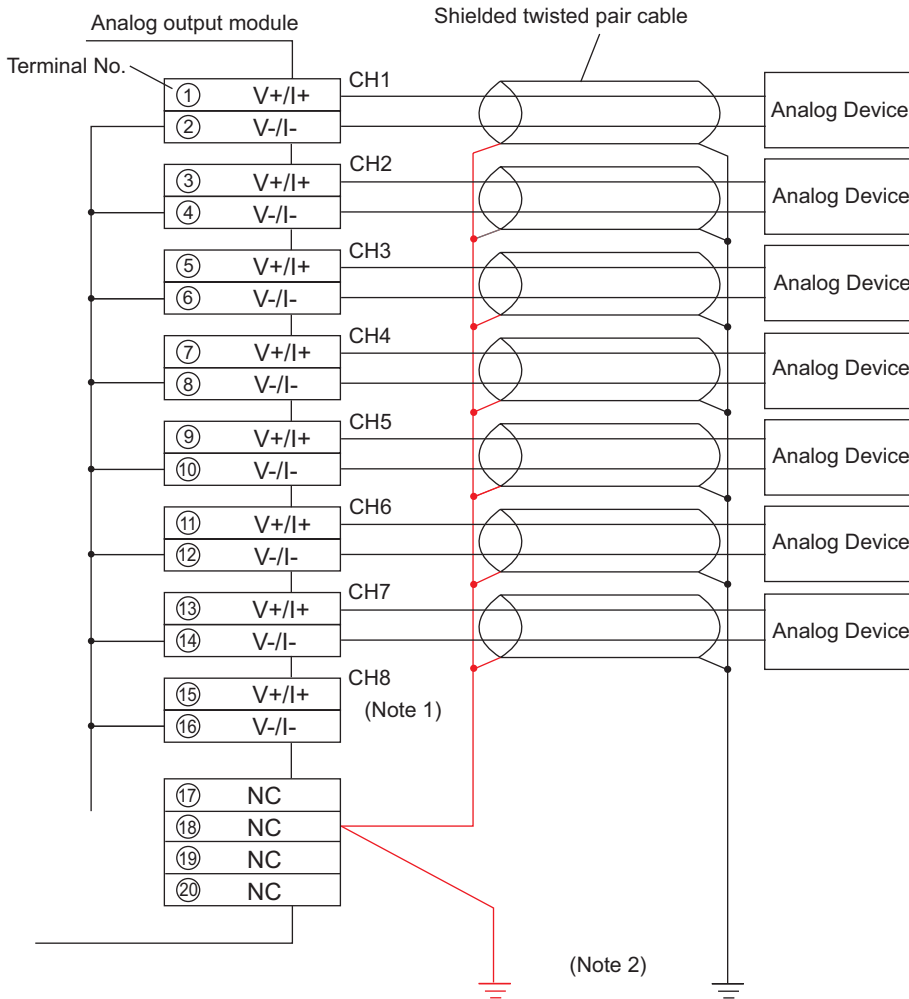**<NP1AYH8I-MR>**

<NP1AYH4V-MR>

<NP1AYH4I-MR>

* Unused terminals can be used as relay terminals for shielded wires or analog signal cables.

Section 5 Wiring

5-2 Wiring of Analog Output Module

5-2-2 Wiring example

The analog output modules shall be wired according to the figure below, using shielded twisted pair cables.

Note 1: Unused channels shall basically be opened when the voltage output module is used or short-circuited when the current output module is used.

Note 2: Shielded wires shall be grounded basically on the external device side (class D grounding). When shielded wires are grounded on the analog output module side (class D grounding) due to the condition of external noise, NC terminals can be used as relay terminals for shielded wires. However, they must not be used as relay terminals for other control signal cables or power cables.

Note 3: Keep signal wires that go out of this module sufficiently away from high-voltage or power cables, and avoid parallel wiring.
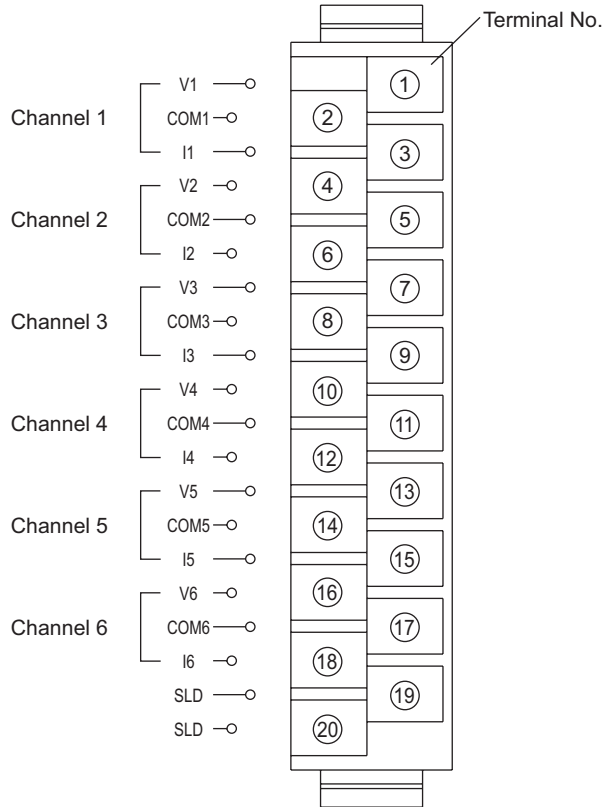
Note 4: Avoid wiring the signal cables in the vicinity of load cables coming from devices other than PLC or bundling them with such cables.

Note 5: Keep the signal cables sufficiently away from circuits where high frequencies occur, such as inverter main load circuit.

Section 5 Wiring

5-3 Wiring of Analog Input/Output Module

5-3-1 Terminal arrangement

Terminal No.

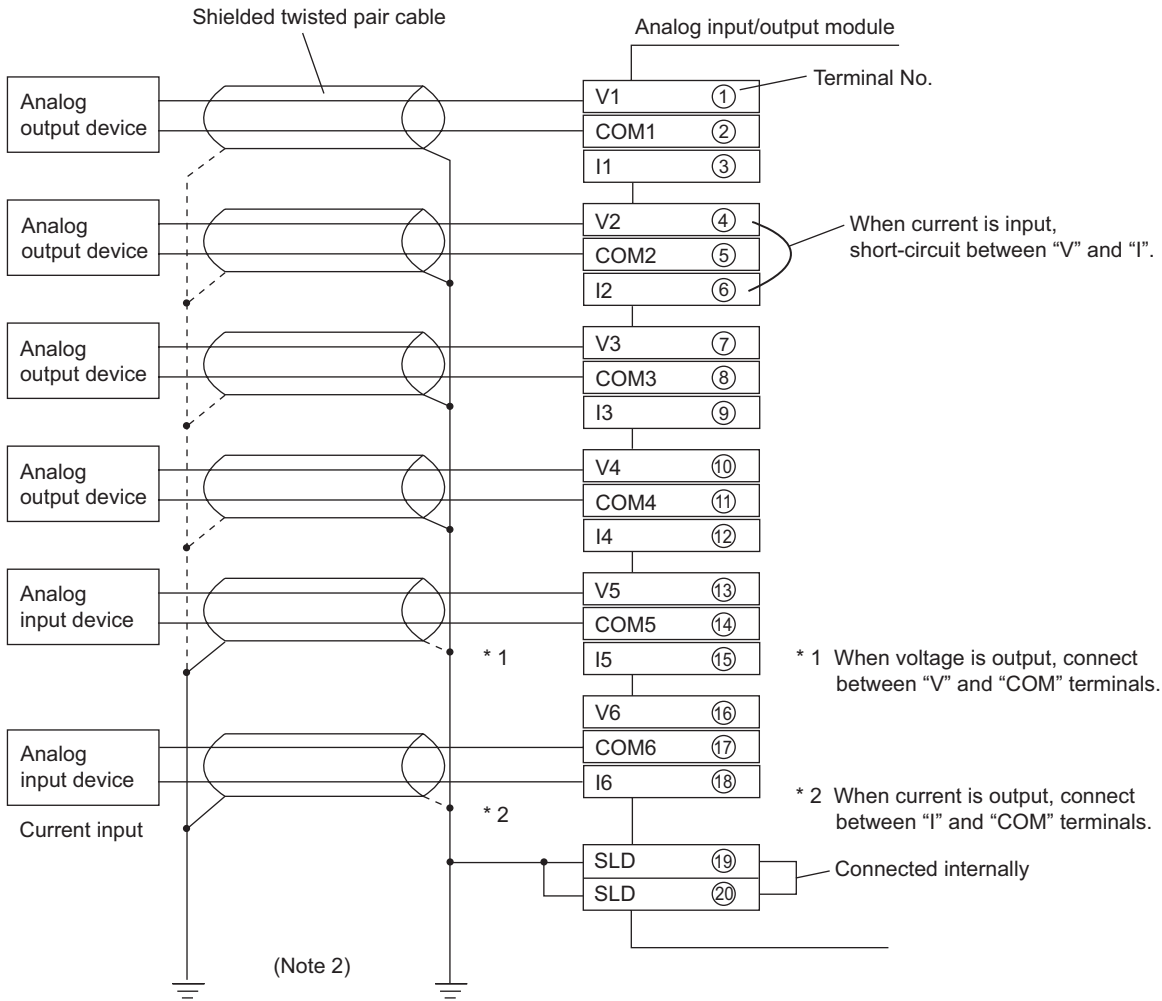|		
Channel 1	V1	①
	COM1	②
	I1	③
Channel 2	V2	④
	COM2	⑤
	I2	⑥
Channel 3	V3	⑦
	COM3	⑧
	I3	⑨
Channel 4	V4	⑩
	COM4	⑪
	I4	⑫
Channel 5	V5	⑬
	COM5	⑭
	I5	⑮
Channel 6	V6	⑯
	COM6	⑰
	I6	⑱
	SLD	⑲
	SLD	⑳

Section 5 Wiring

5-3 Wiring of Analog Input/Output Module

5-3-2 Wiring example

The analog input/output module shall be wired according to the figure below, using shielded twisted pair cables.

Note 1: Unused channels shall basically be short-circuited and output terminals shall be open.
Note 2: Ground shielded wires at one point on the PC side (class D grounding). However, when shielded wires had better be grounded on the external device side due to the condition of external noise, their ends on the module side must be open. If an external input device has the same FG, it may be better to ground both sides.
Note 3: Keep signal wires that go out of this module sufficiently away from high-voltage or power cables, and avoid parallel wiring.
Note 4: Avoid wiring the signal cables in the vicinity of load cables coming from devices other than PLC or bundling them with such cables.
Note 5: Keep the signal cables sufficiently away from circuits where high frequencies occur, such as inverter main load circuit.

Appendix 1 Offset/Gain Adjustment <D300win>

Appendix 1-1 Offset/Gain Adjustment of Analog Input Module

<Offset/gain adjustment>

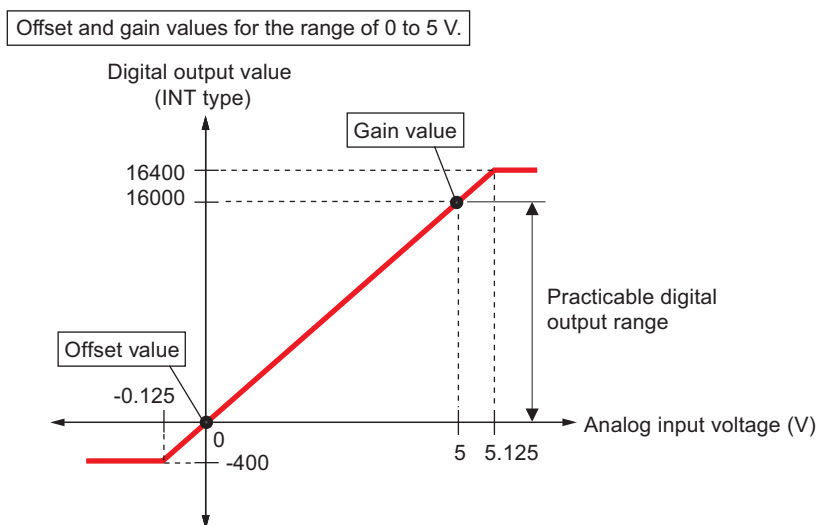In this mode, offset value and/or gain value can finely be adjusted for individual channel.
  ⬥ Offset value: Means the lower limit value of the range span. When this value is adjusted, the conversion characteristic curve moves parallel in vertical direction.
  ⬥ Gain value: Means the upper limit value of the range span. When this value is adjusted, only gain value is changed while offset value is kept unchanged.

When offset and gain values are changed by scaling, the values that are set by scaling take effect as offset and gain values.
When offset and/or gain values are to be adjusted after scaling, adjust by the values of scaling.

Note 1: Offset/gain adjustable range is within ±1% of range span. If adjustment is made using an analog value that exceeds the adjustable range (if the value is input to a terminal of the module), the value is limited to ±1% of range span.
Note 2: If range is changed, offset and gain return to the default values.
Note 3: Offset/gain adjustment is disabled when analog range is set in a batch with the switch provided on the module rear panel.

<Offset/gain adjustment with SX Control Utility of D300win>

1) Start SX Control Utility to monitor the input/output areas of the analog input module that is to be adjusted.

Appendix 1   Offset/Gain Adjustment <D300win>

Appendix 1-1   Offset/Gain Adjustment of Analog Input Module

2) Offset is adjusted first.
   Set ON bit 7 and bit 6 of the parameter type setting register (offset address +8) to activate offset/gain adjustment mode.

Bit 6 of the parameter type setting status register (offset address +1) is set ON, indicating that offset/gain adjustment mode is activated.

Make sure that module status is "30001".

3) Set ON the bit for the channel that is to be adjusted (the corresponding one of bits 8 to 15 of the parameter type setting register). (The "SETTING" LED of the module starts blinking.)

The bit of the parameter type setting status register that corresponds to the channel to be adjusted is set ON. In this example, bit 8 (channel 1) is set ON.
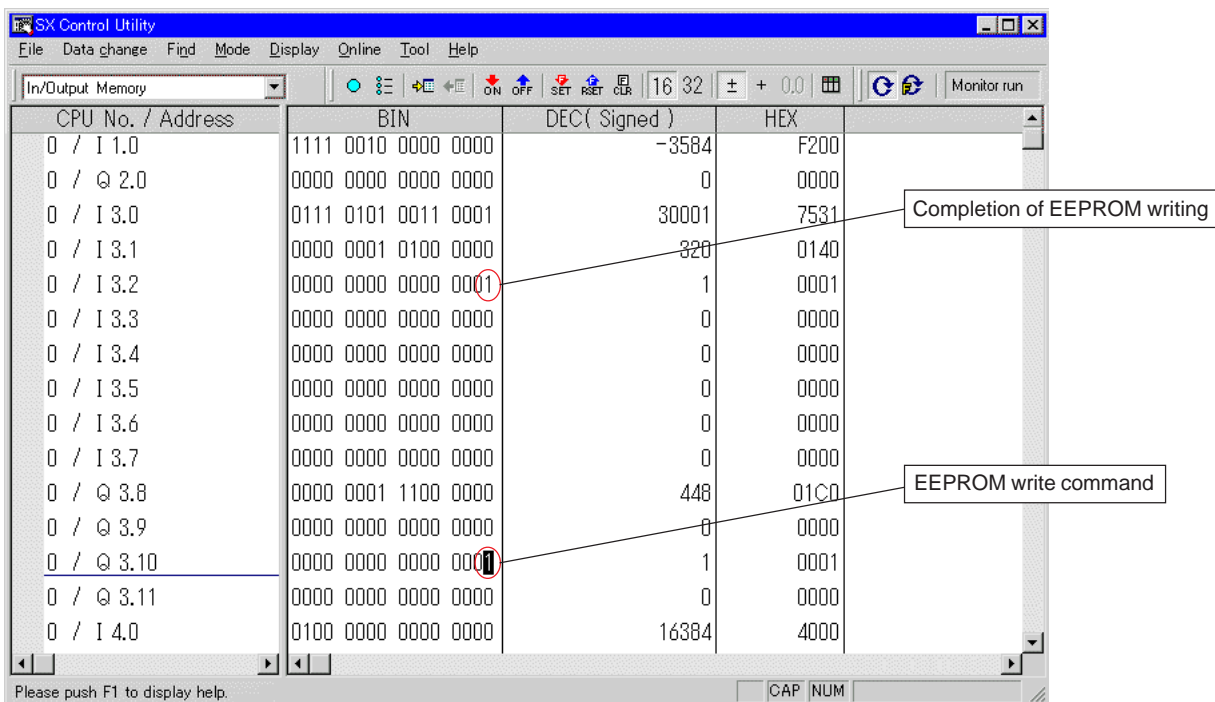

Channel 8   Channel 7   Channel 6   Channel 5   Channel 4   Channel 3   Channel 2   Channel 1
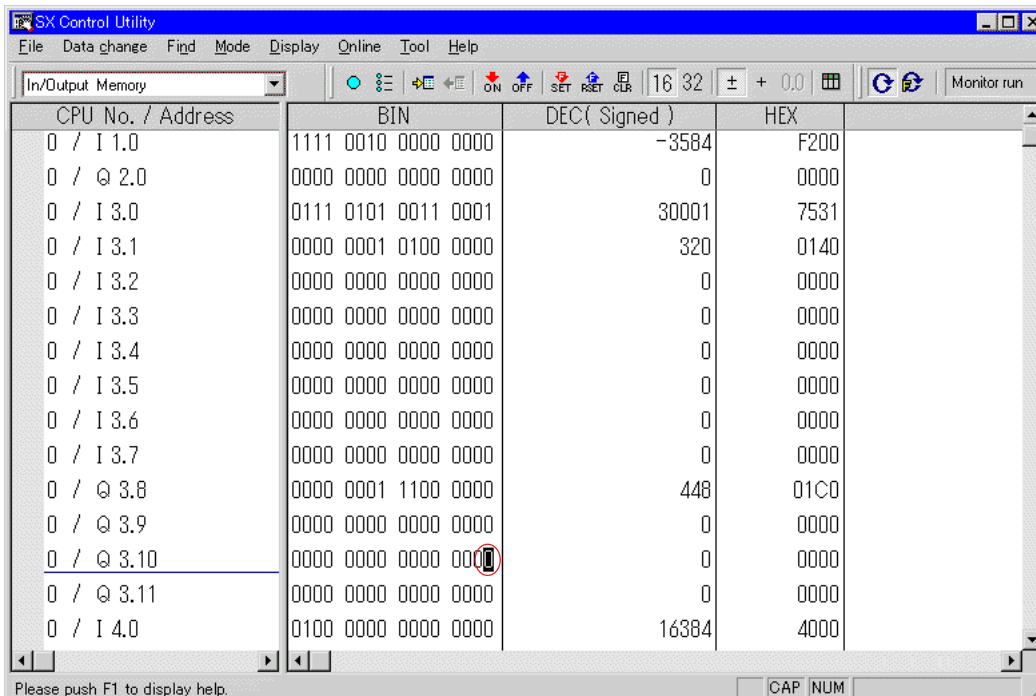
Appendix 1 Offset/Gain Adjustment <D300win>

Appendix 1-1 Offset/Gain Adjustment of Analog Input Module

4) Apply a voltage (or a current) that corresponds to **the offset value** to the terminal of the channel that is to be adjusted. Set ON bit 0 (zero) of the parameter setting data register (offset address +0) to write the offset adjustment value in the module internal EEPROM. The completion of EEPROM writing can be confirmed by that bit 0 (zero) of offset address +2 is set ON.

SX Control Utility	_ □ ×

File Data change Find Mode Display Online Tool Help

In/Output Memory

○ ≣ | ◄□ ◄□ | ON OFF | SET RSET CLR | 16 32 | ± | + 0.0 | ⊞ | ↻ ↻ | Monitor run

CPU No. / Address	BIN	DEC(Signed)	HEX	
0 / I 1.0	1111 0010 0000 0000	-3584	F200	
0 / Q 2.0	0000 0000 0000 0000	0	0000	
0 / I 3.0	0111 0101 0011 0001	30001	7531	Completion of EEPROM writing
0 / I 3.1	0000 0001 0100 0000	320	0140	
0 / I 3.2	0000 0000 0000 0001	1	0001	
0 / I 3.3	0000 0000 0000 0000	0	0000	
0 / I 3.4	0000 0000 0000 0000	0	0000	
0 / I 3.5	0000 0000 0000 0000	0	0000	
0 / I 3.6	0000 0000 0000 0000	0	0000	
0 / I 3.7	0000 0000 0000 0000	0	0000	
0 / Q 3.8	0000 0001 1100 0000	448	01C0	EEPROM write command
0 / Q 3.9	0000 0000 0000 0000	0	0000	
0 / Q 3.10	0000 0000 0000 0001	1	0001	
0 / Q 3.11	0000 0000 0000 0000	0	0000	
0 / I 4.0	0100 0000 0000 0000	16384	4000	

Please push F1 to display help.   CAP NUM

5) After confirming that the data is written in the EEPROM, set OFF bit 0 (zero) of offset address +10 of the parameter type setting register.

SX Control Utility	_ □ ×

File Data change Find Mode Display Online Tool Help

In/Output Memory

○ ≣ | ◄□ ◄□ | ON OFF | SET RSET CLR | 16 32 | ± | + 0.0 | ⊞ | ↻ ↻ | Monitor run

CPU No. / Address	BIN	DEC(Signed)	HEX	
0 / I 1.0	1111 0010 0000 0000	-3584	F200	
0 / Q 2.0	0000 0000 0000 0000	0	0000	
0 / I 3.0	0111 0101 0011 0001	30001	7531	
0 / I 3.1	0000 0001 0100 0000	320	0140	
0 / I 3.2	0000 0000 0000 0000	0	0000	
0 / I 3.3	0000 0000 0000 0000	0	0000	
0 / I 3.4	0000 0000 0000 0000	0	0000	
0 / I 3.5	0000 0000 0000 0000	0	0000	
0 / I 3.6	0000 0000 0000 0000	0	0000	
0 / I 3.7	0000 0000 0000 0000	0	0000	
0 / Q 3.8	0000 0001 1100 0000	448	01C0	
0 / Q 3.9	0000 0000 0000 0000	0	0000	
0 / Q 3.10	0000 0000 0000 0000	0	0000	
0 / Q 3.11	0000 0000 0000 0000	0	0000	
0 / I 4.0	0100 0000 0000 0000	16384	4000	

Please push F1 to display help.   CAP NUM

Appendix 1 Offset/Gain Adjustment <D300win>

Appendix 1-1 Offset/Gain Adjustment of Analog Input Module

6) When offset/gain adjustment mode is activated, offset adjustment value can be monitored.
Input the first channel number of the channels that are to be monitored to the parameter setting data register (offset address +9), and the statuses of offset values for 5 channels will be displayed in the fields for offset addresses +3 to +7 of the parameter read data register. (Gain adjustment values can be monitored in the same way.)

7) Set ON bit 15 of the parameter type setting register and adjust gain.

Appendix 1 Offset/Gain Adjustment <D300win>

Appendix 1-1 Offset/Gain Adjustment of Analog Input Module

8) Apply a voltage (or a current) that corresponds to the gain adjustment value to the terminal.
Set ON bit 0 (zero) of offset address +10 of the parameter type setting register to write gain adjustment value in the module internal EEPROM. Confirm the completion of EEPROM writing in the same way as offset adjustment.

9) Set OFF all the bits of the parameter type setting register and clear all the bits of the parameter setting data register to zero. This completes the adjustment work.

Appendix 1 Offset/Gain Adjustment <D300win>

Appendix 1-2 Offset/Gain Adjustment of Analog Output Module

<Offset/gain adjustment>

In this mode, offset value and/or gain value can finely be adjusted for individual channel.
- Offset value: Means the lower limit value of the range span. When this value is adjusted, the conversion characteristic curve moves parallel in vertical direction.
- Gain value: Means the upper limit value of the range span. When this value is adjusted, only gain value is changed while offset value is kept unchanged.

When offset and gain values are changed by scaling, the values that are set by scaling take effect as offset and gain values.
When offset and/or gain values are to be adjusted after scaling, adjust by the values of scaling.

Note 1: Offset/gain adjustable range is within ±1% of range span. It takes approximately 2 minutes to adjust from 0% to ±1%. If adjustment is made using an analog value that exceeds the adjustable range (if the value is input to a terminal of the module), the value is limited to ±1% of range span.

Note 2: If range is changed, offset and gain return to the default values.

Note 3: The current output modules cannot output negative current value.

Offset and gain values for the range of -10 to 10 V.

App.1-6

Appendix 1 Offset/Gain Adjustment <D300win>

Appendix 1-2 Offset/Gain Adjustment of Analog Output Module

<Offset/gain adjustment with SX Control Utility of D300win>

1) Start SX Control Utility to monitor the input/output areas of the analog output module that is to be adjusted.
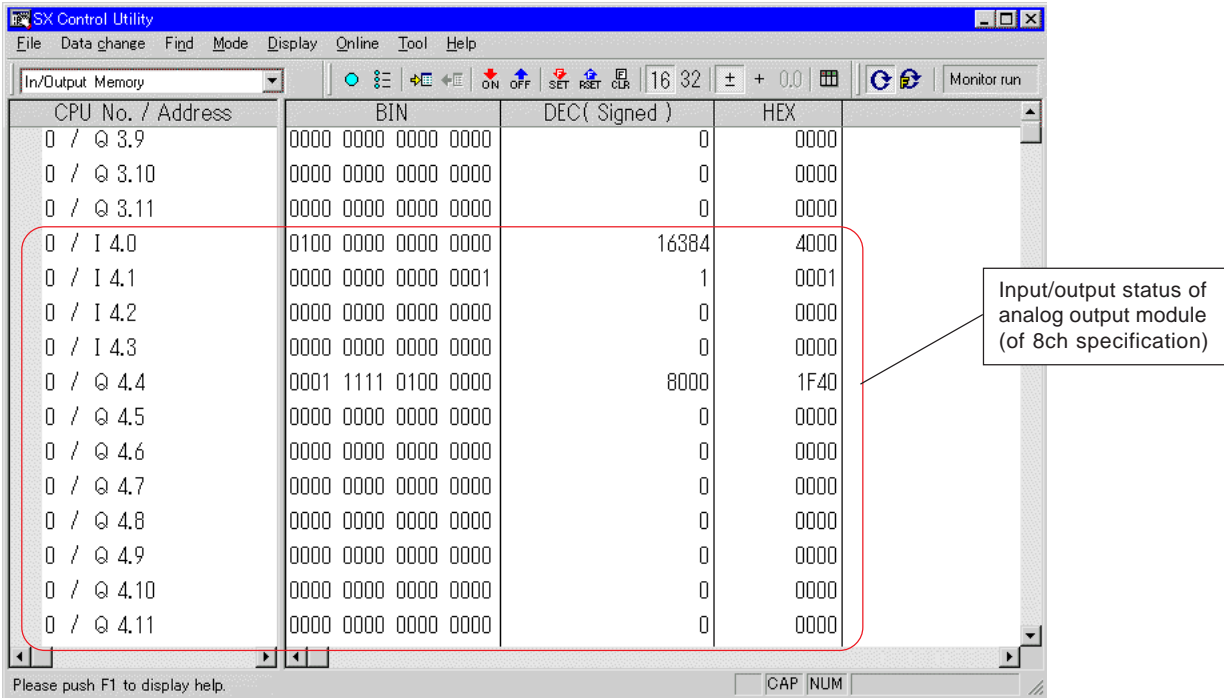
2) Offset is adjusted first.
   Input a value in the range from "30000" to "32767" to offset address +4 to change mode.
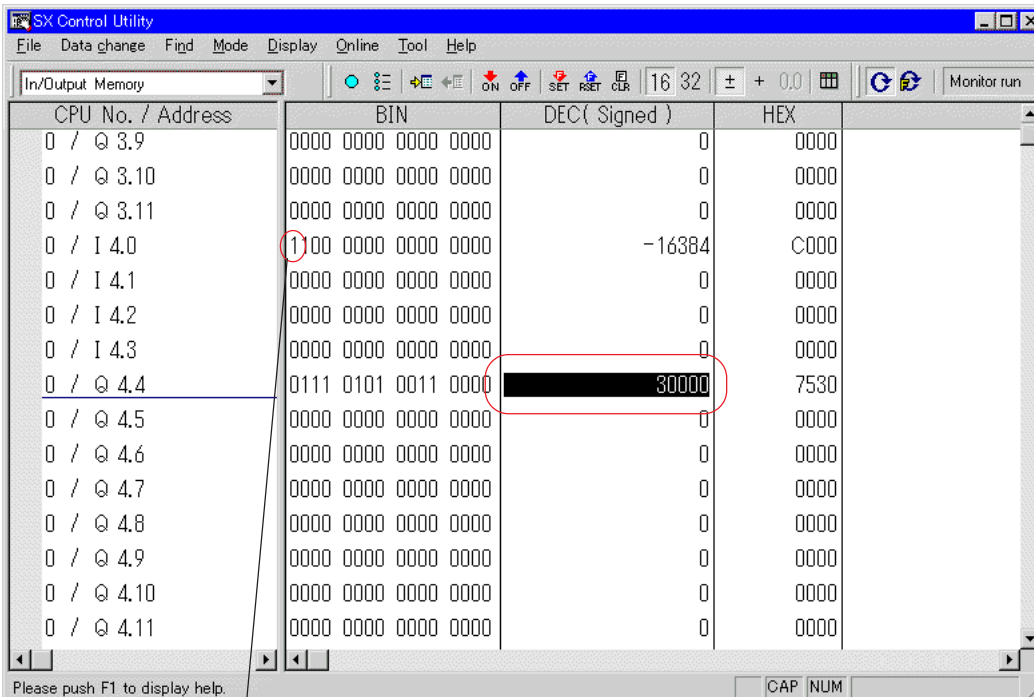
Make sure that bit 15 of the module status register (offset address +0) is set ON (parameter mode).

Appendix 1   Offset/Gain Adjustment <D300win>

Appendix 1-2   Offset/Gain Adjustment of Analog Output Module

3) Set ON bit 6 of the parameter type setting register (offset address +5) to activate offset/gain adjustment mode, and set ON the bit for the channel that is to be adjusted (the corresponding one of bits 8 to 15 of the parameter type setting register).

Channel 8   Channel 7   Channel 6   Channel 5   Channel 4   Channel 3   Channel 2 Channel 1

4) With an external device, etc. connected to the terminal of the channel to be adjusted, observe output voltage or current value. First, in the condition that bit 15 of the parameter setting data register (offset address +6) is set OFF, adjust output value by setting ON and OFF bit 8 (output value Down) and bit 9 (output value Up).

0: Offset value adjustment   Output value Down

Output value Up

* While the output value up bit and down bit are on, the values change. (1% per 2minutes)

Appendix 1 Offset/Gain Adjustment <D300win>

Appendix 1-2 Offset/Gain Adjustment of Analog Output Module

5) After the completion of offset adjustment, set ON bit 0 (zero) of the parameter setting data register (offset address +6) to write the offset adjustment value in the module internal EEPROM. When bit 0 (zero) of offset address +2 is set ON, the writing of EEPROM is completed. After confirming this, set OFF bit 0 (zero) of the parameter setting data register.

6) Then set bit 15 ON of the parameter setting data register (offset address +6) and, in the same way as offset adjustment, adjust output value by setting ON and OFF bit 8 (output value Down) and bit 9 (output value Up). (Gain adjustment)

0: Offset value adjustment   Output value Down

Output value Up

* While the output value up bit and down bit are on, the values change. (1% per 2minutes)

Appendix 1 Offset/Gain Adjustment <D300win>

Appendix 1-2 Offset/Gain Adjustment of Analog Output Module

7) After the completion of gain adjustment, set ON bit 0 (zero) of the parameter setting data register (offset address +6) to write the gain adjustment value in the module internal EEPROM. Confirm the completion of EEPROM writing, in the same way as explained for offset adjustment.

8) Set OFF all the bits of the parameter type setting register, and clear all the bits of the parameter setting data register to zero. This completes the adjustment work.

Appendix 2 Offset/Gain Adjustment <SX-Programmer Standard>

Appendix 2-1 Offset/Gain Adjustment of Analog Input Module

<Offset/gain adjustment>

In this mode, offset value and/or gain value can finely be adjusted for individual channel.

⬧ Offset value: Means the lower limit value of the range span. When this value is adjusted, the conversion characteristic curve moves parallel in vertical direction.

⬧ Gain value: Means the upper limit value of the range span. When this value is adjusted, only gain value is changed while offset value is kept unchanged.

When offset and gain values are changed by scaling, the values that are set by scaling take effect as offset and gain values.

When offset and/or gain values are to be adjusted after scaling, adjust by the values of scaling.

Note 1: Offset/gain adjustable range is within ±1% of range span. If adjustment is made using an analog value that exceeds the adjustable range (if the value is input to a terminal of the module), the value is limited to ±1% of range span.

Note 2: If range is changed, offset and gain return to the default values.

Note 3: Offset/gain adjustment is disabled when analog range is set in a batch with the switch provided on the module rear panel.

Offset and gain values for the range of 0 to 5 V.

<Offset/gain adjustment with the data monitor and the setting function of SX-Programmer Standard>

1) Connect the loader to the PLC online to monitor the input/output areas of the analog input module that is to be adjusted.

Address	Tag		DEC	HEX	ASCII
WX02.0000		1111 1111 1101 0001	-47	FFD1	↳·
WX02.0001		1111 1111 1110 1001	-23	FFE9	·
WX02.0002		1111 1111 1110 1010	-22	FFEA	·
WX02.0003		1111 1111 1110 1000	-24	FFE8	·
WX02.0004		1111 1111 1110 1001	-23	FFE9	·
WX02.0005		1111 1111 1110 1000	-24	FFE8	·
WX02.0006		1111 1111 1110 1000	-24	FFE8	·
WX02.0007		1111 1111 1110 0111	-25	FFE7	·
WY02.0008		0000 0000 0000 0000	0	0000	
WY02.0009		0000 0000 0000 0000	0	0000	
WY02.000A		0000 0000 0000 0000	0	0000	
WY02.000B		0000 0000 0000 0000	0	0000	
WX03.0000		0100 0000 0000 0000	16384	4000	@

Input/output status of analog input module

Appendix 2 Offset/Gain Adjustment <SX-Programmer Standard>

Appendix 2-1 Offset/Gain Adjustment of Analog Input Module

2) Offset is adjusted first.
Set ON bit 7 and bit 6 of the parameter type setting register (offset address +8) to activate offset/gain adjustment mode.

Bit 6 of the parameter type setting status register (offset address +1) is set ON, indicating that offset/gain adjustment mode is activated.

Make sure that module status is "30001".

Address	Tag		DEC	HEX	ASCII
WX02.0000		0111 0101 0011 0001	30001	7531	1ᶸ
WX02.0001		0000 0000 0100 0000	64	0040	@
WX02.0002		0000 0000 0000 0000	0	0000	
WX02.0003		0000 0000 0000 0000	0	0000	
WX02.0004		0000 0000 0000 0000	0	0000	
WX02.0005		0000 0000 0000 0000	0	0000	
WX02.0006		0000 0000 0000 0000	0	0000	
WX02.0007		0000 0000 0000 0000	0	0000	
WY02.0008		0000 0000 1100 0000	192	00C0	ᵧ
WY02.0009		0000 0000 0000 0000	0	0000	
WY02.000A		0000 0000 0000 0000	0	0000	
WY02.000B		0000 0000 0000 0000	0	0000	
WX03.0000		0100 0000 0000 0000	16384	4000	@

3) Set ON the bit for the channel that is to be adjusted (the corresponding one of bits 8 to 15 of the parameter type setting register). (The "SETTING" LED of the module starts blinking.)

The bit of the parameter type setting status register that corresponds to the channel to be adjusted is set ON. In this example, bit 8 (channel 1) is set ON.

Address	Tag		DEC	HEX	ASCI
WX02.0000		0111 0101 0011 0001	30001	7531	1
WX02.0001		0000 0001 0100 0000	320	0140	@
WX02.0002		0000 0000 0000 0000	0	0000	
WX02.0003		0000 0000 0000 0000	0	0000	
WX02.0004		0000 0000 0000 0000	0	0000	
WX02.0005		0000 0000 0000 0000	0	0000	
WX02.0006		0000 0000 0000 0000	0	0000	
WX02.0007		0000 0000 0000 0000	0	0000	
WY02.0008		0000 0001 1100 0000	448	01C0	ᵧ
WY02.0009		0000 0000 0000 0000	0	0000	
WY02.000A		0000 0000 0000 0000	0	0000	
WY02.000B		0000 0000 0000 0000	0	0000	
WX03.0000		0100 0000 0000 0000	16384	4000	

Channel 8 Channel 7 Channel 6 Channel 5 Channel 4 Channel 3 Channel 2 Channel 1

Appendix 2 Offset/Gain Adjustment <SX-Programmer Standard>

Appendix 2-1 Offset/Gain Adjustment of Analog Input Module

4) Apply a voltage (or a current) that corresponds to **the offset value** to the terminal of the channel that is to be adjusted. Set ON bit 0 (zero) of the parameter setting data register (offset address +0) to write the offset adjustment value in the module internal EEPROM. The completion of EEPROM writing can be confirmed by that bit 0 (zero) of offset address +2 is set ON.

```
                                                      Completion of EEPROM writing

Address        Tag                                               DEC      HEX   ASCII
WX02.0000                            0111 0101 0011 0001        30001     7531    1u
WX02.0001                            0000 0001 0100 0000          320     0140    @r
WX02.0002                            0000 0000 0000 0001            1      0001     r
WX02.0003                            0000 0000 0000 0000            0      0000
WX02.0004                            0000 0000 0000 0000            0      0000
WX02.0005                            0000 0000 0000 0000            0      0000
WX02.0006                            0000 0000 0000 0000            0      0000
WX02.0007                            0000 0000 0000 0000            0      0000
WY02.0008                            0000 0001 1100 0000          448     01C0    ⅓r
WY02.0009                            0000 0000 0000 0000            0      0000
WY02.000A                            0000 0000 0000 0001            1      0001     r
WY02.000B                            0000 0000 0000 0000            0      0000
WX03.0000                            0100 0000 0000 0000        16384     4000     @

                                                      EEPROM write command
```

5) After confirming that the data is written in the EEPROM, set OFF bit 0 (zero) of offset address +10 of the parameter type setting register.

```
Address        Tag                                               DEC      HEX   ASCII
WX02.0000                            0111 0101 0011 0001        30001     7531    1u
WX02.0001                            0000 0001 0100 0000          320     0140    @r
WX02.0002                            0000 0000 0000 0000            0      0000
WX02.0003                            0000 0000 0000 0000            0      0000
WX02.0004                            0000 0000 0000 0000            0      0000
WX02.0005                            0000 0000 0000 0000            0      0000
WX02.0006                            0000 0000 0000 0000            0      0000
WX02.0007                            0000 0000 0000 0000            0      0000
WY02.0008                            0000 0001 1100 0000          448     01C0    ⅓r
WY02.0009                            0000 0000 0000 0000            0      0000
WY02.000A                            0000 0000 0000 0000            0      0000
WY02.000B                            0000 0000 0000 0000            0      0000
WX03.0000                            0100 0000 0000 0000        16384     4000     @
```

Appendix 2 Offset/Gain Adjustment <SX-Programmer Standard>

Appendix 2-1 Offset/Gain Adjustment of Analog Input Module

6) When offset/gain adjustment mode is activated, offset adjustment value can be monitored.
   Input the first channel number of the channels that are to be monitored to the parameter setting data register (offset address +9), and the statuses of offset values for 5 channels will be displayed in the fields for offset addresses +3 to +7 of the parameter read data register. (Gain adjustment values can be monitored in the same way.)

The statuses of offset values can be monitored.

Address	Tag		DEC	HEX	ASCII
WX02.0000		0111 0101 0011 0001	30001	7531	1u
WX02.0001		0000 0001 0100 0000	320	0140	@ r
WX02.0002		0000 0000 0000 0000	0	0000	
WX02.0003		0000 0000 0000 0010	2	0002	┐
WX02.0004		1111 1111 1110 1000	-24	FFE8	·
WX02.0005		1111 1111 1110 1010	-22	FFEA	·
WX02.0006		1111 1111 1110 1000	-24	FFE8	·
WX02.0007		1111 1111 1110 1001	-23	FFE9	·
WY02.0008		0000 0001 1100 0000	448	01C0	? r
WY02.0009		0000 0000 0000 0001	1	0001	r
WY02.000A		0000 0000 0000 0000	0	0000	
WY02.000B		0000 0000 0000 0000	0	0000	
WX03.0000		0100 0000 0000 0000	16384	4000	@

Set "1" (one) when you want to monitor channel 1 (one) and following channels.

7) Set ON bit 15 of the parameter type setting register and adjust gain.

Bit 15 of the parameter type setting status register is set ON.

Address	Tag		DEC	HEX	ASCII
WX02.0000		0111 0101 0011 0001	30001	7531	1u
WX02.0001		0000 0001 0100 0000	320	0140	@ r
WX02.0002		1000 0000 0000 0000	-32768	8000	0
WX02.0003		0000 0000 0000 0011	3	0003	L
WX02.0004		1111 1111 1110 1001	-23	FFE9	·
WX02.0005		1111 1111 1110 1010	-22	FFEA	·
WX02.0006		1111 1111 1110 1001	-23	FFE9	·
WX02.0007		1111 1111 1110 1001	-23	FFE9	·
WY02.0008		0000 0001 1100 0000	448	01C0	? r
WY02.0009		0000 0000 0000 0001	1	0001	r
WY02.000A		1000 0000 0000 0000	-32768	8000	0
WY02.000B		0000 0000 0000 0000	0	0000	
WX03.0000		0100 0000 0000 0000	16384	4000	@

Appendix 2 Offset/Gain Adjustment <SX-Programmer Standard>

Appendix 2-1   Offset/Gain Adjustment of Analog Input Module

8) Apply a voltage (or a current) that corresponds to the gain adjustment value to the terminal.
   Set ON bit 0 (zero) of offset address +10 of the parameter type setting register to write gain adjustment value in the module internal EEPROM. Confirm the completion of EEPROM writing in the same way as offset adjustment.

Completion of EEPROM writing

Address	Tag		DEC	HEX	ASCII
WX02.0000		0111 0101 0011 0001	30001	7531	1u
WX02.0001		0000 0001 0100 0000	320	0140	@r
WX02.0002		1000 0000 0000 0001	-32767	8001	⌐
WX02.0003		0000 0000 0000 0010	2	0002	⌐
WX02.0004		1111 1111 1110 1000	-24	FFE8	·
WX02.0005		1111 1111 1110 1010	-22	FFEA	·
WX02.0006		1111 1111 1110 1001	-23	FFE9	·
WX02.0007		1111 1111 1110 1001	-23	FFE9	·
WY02.0008		0000 0001 1100 0000	448	01C0	½r
WY02.0009		0000 0000 0000 0001	1	0001	r
WY02.000A		1000 0000 0000 0001	-32767	8001	⌐
WY02.000B		0000 0000 0000 0000	0	0000	
WX03.0000		0100 0000 0000 0000	16384	4000	@

EEPROM write command

9) Set OFF all the bits of the parameter type setting register and clear all the bits of the parameter setting data register to zero. This completes the adjustment work.

Address	Tag		DEC	HEX	ASCII
WX02.0000		0000 0000 0000 0010	2	0002	⌐
WX02.0001		1111 1111 1110 1001	-23	FFE9	·
WX02.0002		1111 1111 1110 1001	-23	FFE9	·
WX02.0003		1111 1111 1110 1001	-23	FFE9	·
WX02.0004		1111 1111 1110 1001	-23	FFE9	·
WX02.0005		1111 1111 1110 1000	-24	FFE8	·
WX02.0006		1111 1111 1110 1001	-23	FFE9	·
WX02.0007		1111 1111 1110 1001	-23	FFE9	·
WY02.0008		0000 0000 0000 0000	0	0000	
WY02.0009		0000 0000 0000 0000	0	0000	
WY02.000A		0000 0000 0000 0000	0	0000	
WY02.000B		0000 0000 0000 0000	0	0000	
WX03.0000		0100 0000 0000 0000	16384	4000	@

Clear all these to zero.

Appendix 2 Offset/Gain Adjustment <SX-Programmer Standard>

Appendix 2-2 Offset/Gain Adjustment of Analog Output Module

<Offset/gain adjustment>
In this mode, offset value and/or gain value can finely be adjusted for individual channel.
  • Offset value: Means the lower limit value of the range span. When this value is adjusted, the conversion characteristic curve moves parallel in vertical direction.
  • Gain value: Means the upper limit value of the range span. When this value is adjusted, only gain value is changed while offset value is kept unchanged.
When offset and gain values are changed by scaling, the values that are set by scaling take effect as offset and gain values.
When offset and/or gain values are to be adjusted after scaling, adjust by the values of scaling.

Note 1: Offset/gain adjustable range is within ±1% of range span. It takes approximately 2 minutes to adjust from 0% to ±1%.
         If adjustment is made using an analog value that exceeds the adjustable range (if the value is input to a terminal of the module), the value is limited to ±1% of range span.
Note 2: If range is changed, offset and gain return to the default values.
Note 3: The current output modules cannot output negative current value.

Offset and gain values for the range of -10 to 10 V.

Analog output voltage (V)

Gain value

10.25
10

Practicable analog output range

8200
-8000

0

Digital input value (INT type)

8000

8200

-10

-10.25

Offset value

Appendix 2 Offset/Gain Adjustment <SX-Programmer Standard>

Appendix 2-2 Offset/Gain Adjustment of Analog Output Module

<Offset/gain adjustment with SX Control Utility of D300win>

1) Connect a loader to a PLC online to monitor the input/output areas of the analog input module that is to be adjusted.

Address	Tag		DEC	HEX	ASCII
WX003.0000		0100 0000 0000 0000	16384	4000	@
WX003.0001		0000 0000 0000 1000	8	0008	□
WX003.0002		0000 0000 0000 0000	0	0000	
WX003.0003		0000 0000 0000 0000	0	0000	
WY003.0004		0000 0000 0000 0000	0	0000	
WY003.0005		0000 0000 0000 0000	0	0000	
WY003.0006		0000 0000 0000 0000	0	0000	
WY003.0007		0000 0000 0000 0000	0	0000	
WY003.0008		0000 0000 0000 0000	0	0000	
WY003.0009		0000 0000 0000 0000	0	0000	
WY003.0010		0000 0000 0000 0000	0	0000	
WY003.0011		0000 0000 0000 0000	0	0000	

Input/output status of analog output module (of 8ch specification)

2) Offset is adjusted first.
   Input a value in the range from "30000" to "32767" to offset address +4 to change mode.

Address	Tag		DEC	HEX	ASCII
WX003.0000		1100 0000 0000 0000	-16384	C000	ㄌ
WX003.0001		0000 0000 0000 0000	0	0000	
WX003.0002		0000 0000 0000 0000	0	0000	
WX003.0003		0000 0000 0000 0000	0	0000	
WY003.0004		0111 0101 0011 0000	30000	7530	0u
WY003.0005		0000 0000 0000 0000	0	0000	
WY003.0006		0000 0000 0000 0000	0	0000	
WY003.0007		0000 0000 0000 0000	0	0000	
WY003.0008		0000 0000 0000 0000	0	0000	
WY003.0009		0000 0000 0000 0000	0	0000	
WY003.0010		0000 0000 0000 0000	0	0000	
WY003.0011		0000 0000 0000 0000	0	0000	

Make sure that bit 15 of the module status register (offset address +0) is set ON (parameter mode).

3) Set ON bit 6 of the parameter type setting register (offset address +5) to activate offset/gain adjustment mode, and set ON the bit for the channel that is to be adjusted (the corresponding one of bits 8 to 15 of the parameter type setting register).

Address	Tag		DEC	HEX	ASCII
WX003.0000		1100 0000 0000 0000	-16384	C000	ㄌ
WX003.0001		0000 0000 0100 0000	64	0040	@
WX003.0002		0000 0000 0000 0000	0	0000	
WX003.0003		0000 0000 0000 0000	0	0000	
WY003.0004		0111 0101 0011 0000	30000	7530	0u
WY003.0005		0000 0000 0100 0000	64	0040	@
WY003.0006		0000 0000 0000 0000	0	0000	
WY003.0007		0000 0000 0000 0000	0	0000	
WY003.0008		0000 0000 0000 0000	0	0000	
WY003.0009		0000 0000 0000 0000	0	0000	
WY003.0010		0000 0000 0000 0000	0	0000	
WY003.0011		0000 0000 0000 0000	0	0000	

Channel 8 Channel 7 Channel 6 Channel 5 Channel 4 Channel 3 Channel 2 Channel 1

Appendix 2 Offset/Gain Adjustment <SX-Programmer Standard>

Appendix 2-2 Offset/Gain Adjustment of Analog Output Module

4) With an external device, etc. connected to the terminal of the channel to be adjusted, observe output voltage or current value. First, in the condition that bit 15 of the parameter setting data register (offset address +6) is set OFF, adjust output value by setting ON and OFF bit 8 (output value Down) and bit 9 (output value Up).

Address	Tag		DEC	HEX	ASCII
WX003.0000		1100 0000 0000 0000	-16384	C000	㋐
WX003.0001		0000 0000 0100 0000	64	0040	@
WX003.0002		0000 0000 0000 0000	0	0000	
WX003.0003		0000 0000 0000 0000	0	0000	
WY003.0004		0111 0101 0011 0000	30000	7530	0u
WY003.0005		0000 0000 0100 0000	64	0040	@
WY003.0006		0000 0001 0000 0000	256	0100	r
WY003.0007		0000 0000 0000 0000	0	0000	
WY003.0008		0000 0000 0000 0000	0	0000	
WY003.0009		0000 0000 0000 0000	0	0000	
WY003.0010		0000 0000 0000 0000	0	0000	
WY003.0011		0000 0000 0000 0000	0	0000	

0: Offset value adjustment
Output value Up
Output value Down

5) After the completion of offset adjustment, set ON bit 0 (zero) of the parameter setting data register (offset address +6) to write the offset adjustment value in the module internal EEPROM. When bit 0 (zero) of offset address +2 is set ON, the writing of EEPROM is completed. After confirming this, set OFF bit 0 (zero) of the parameter setting data register.

Completion of EEPROM writing

Address	Tag		DEC	HEX	ASCII
WX003.0000		1100 0000 0000 0000	-16384	C000	㋐
WX003.0001		0000 0001 0100 0000	320	0140	@r
WX003.0002		0000 0000 0000 0001	1	0001	r
WX003.0003		0000 0000 0000 0000	0	0000	
WY003.0004		0111 0101 0011 0000	30000	7530	0u
WY003.0005		0000 0001 0100 0000	320	0140	@r
WY003.0006		0000 0000 0000 0001	1	0001	r
WY003.0007		0000 0000 0000 0000	0	0000	
WY003.0008		0000 0000 0000 0000	0	0000	
WY003.0009		0000 0000 0000 0000	0	0000	
WY003.0010		0000 0000 0000 0000	0	0000	
WY003.0011		0000 0000 0000 0000	0	0000	

EEPROM write command

6) Then set bit 15 ON of the parameter setting data register (offset address +6) and, in the same way as offset adjustment, adjust output value by setting ON and OFF bit 8 (output value Down) and bit 9 (output value Up). (Gain adjustment)

Address	Tag		DEC	HEX	ASCII
WX003.0000		1100 0000 0000 0000	-16384	C000	㋐
WX003.0001		0000 0001 0100 0000	320	0140	@r
WX003.0002		1000 0001 0000 0000	-32512	8100	
WX003.0003		0000 0000 0000 0000	0	0000	
WY003.0004		0111 0101 0011 0000	30000	7530	0u
WY003.0005		0000 0001 0100 0000	320	0140	@r
WY003.0006		1000 0001 0000 0000	-32512	8100	
WY003.0007		0000 0000 0000 0000	0	0000	
WY003.0008		0000 0000 0000 0000	0	0000	
WY003.0009		0000 0000 0000 0000	0	0000	
WY003.0010		0000 0000 0000 0000	0	0000	
WY003.0011		0000 0000 0000 0000	0	0000	

0: Offset value adjustment
Output value Up
Output value Down

Appendix 2 Offset/Gain Adjustment <SX-Programmer Standard>

Appendix 2-2 Offset/Gain Adjustment of Analog Output Module

7) After the completion of gain adjustment, set ON bit 0 (zero) of the parameter setting data register (offset address +6) to write the gain adjustment value in the module internal EEPROM. Confirm the completion of EEPROM writing, in the same way as explained for offset adjustment.

Completion of EEPROM writing

Address	Tag		DEC	HEX	ASCII
WX003.0000		1100 0000 0000 0000	-16384	C000	½
WX003.0001		0000 0001 0100 0000	320	0140	@r
WX003.0002		1000 0001 0000 0001	-32511	8101	r
WX003.0003		0000 0000 0000 0000	0	0000	
WY003.0004		0111 0101 0011 0000	30000	7530	0u
WY003.0005		0000 0001 0100 0000	320	0140	@r
WY003.0006		1000 0001 0000 0001	-32511	8101	r
WY003.0007		0000 0000 0000 0000	0	0000	
WY003.0008		0000 0000 0000 0000	0	0000	
WY003.0009		0000 0000 0000 0000	0	0000	
WY003.0010		0000 0000 0000 0000	0	0000	
WY003.0011		0000 0000 0000 0000	0	0000	

EEPROM write command

8) Set OFF all the bits of the parameter type setting register, and clear all the bits of the parameter setting data register to zero. This completes the adjustment work.

Address	Tag		DEC	HEX	ASCII
WX003.0000		0100 0000 0000 0000	16384	4000	@
WX003.0001		0000 0000 0000 1000	8	0008	□
WX003.0002		0000 0000 0000 0000	0	0000	
WX003.0003		0000 0000 0000 0000	0	0000	
WY003.0004		0000 0000 0000 0000	0	0000	
WY003.0005		0000 0000 0000 0000	0	0000	
WY003.0006		0000 0000 0000 0000	0	0000	
WY003.0007		0000 0000 0000 0000	0	0000	
WY003.0008		0000 0000 0000 0000	0	0000	
WY003.0009		0000 0000 0000 0000	0	0000	
WY003.0010		0000 0000 0000 0000	0	0000	
WY003.0011		0000 0000 0000 0000	0	0000	

Clear all these to zero.
Finally clear the mode changeover register (offset address +4) to zero.

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Information in this manual is subject to change without notice.