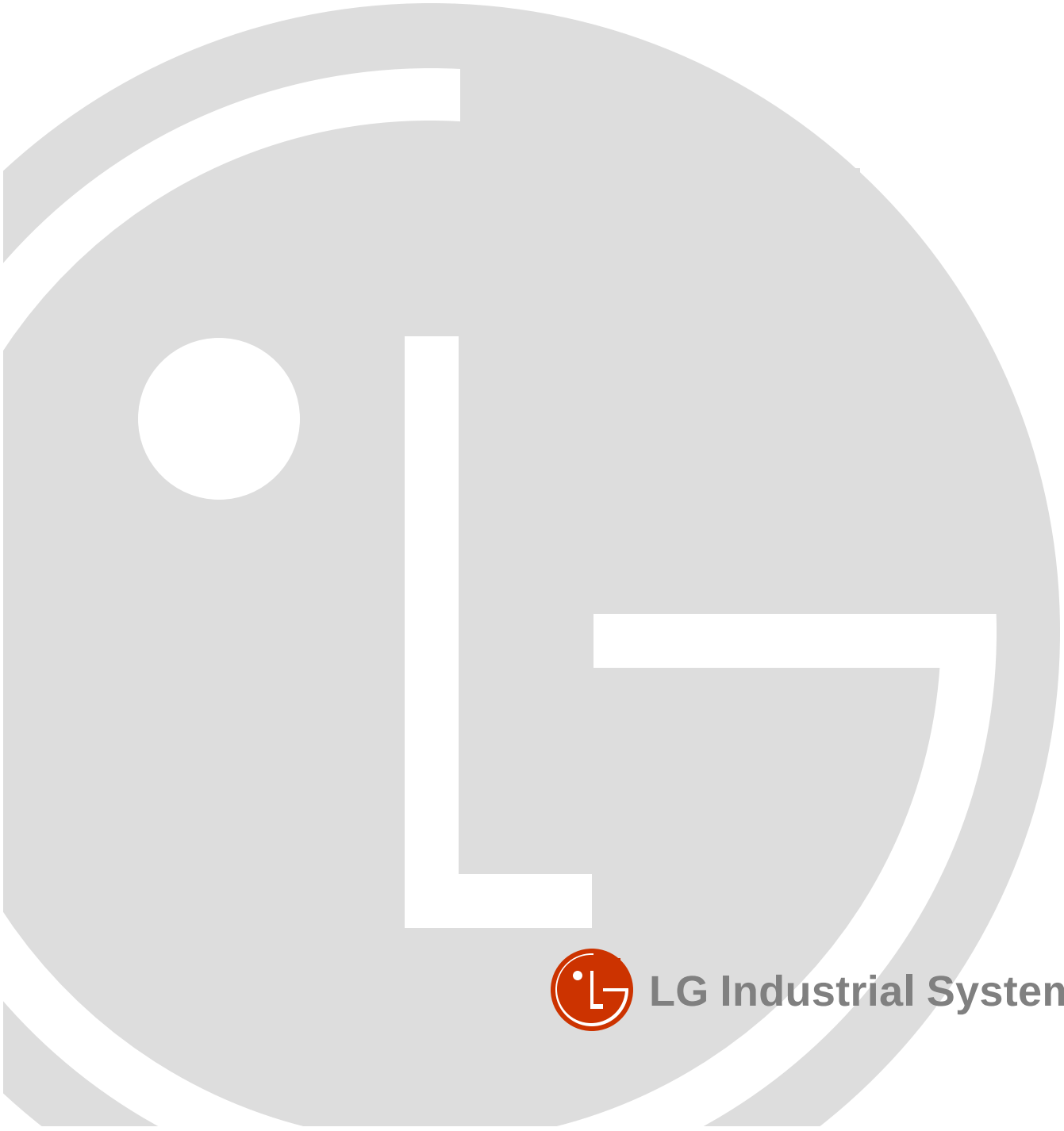
User's Manual

LG Programmable Logic Controller

GLOFA MASTER-K

G3F-DA4V
G3F-DA4I
G4F-DA1A



LG Industrial Systems

SAFETY PRECAUTIONS

Be sure to read carefully the safety precautions given in data sheet and user's manual before operating the module and follow them.

The precautions explained here only apply to the G3F-DA4V, G3F-DA4I and G4F-DA1A(hereafter, called D/A conversion module)

For safety precautions on the PLC system, see the GLOFA GM3/4 User's Manuals and the MASTER-K200S/300S/ 1000S CPU User's Manuals.

A precaution is given with a hazard alert triangular symbol to call your attention, and precautions are represented as follows according to the degree of hazard.

WARNING ⇨ If not provided with proper prevention, it can cause death or fatal injury or considerable loss of property.

CAUTION ⇨ If not properly observed, it can cause a hazard situation to result in severe or slight injury or a loss of property.

However, a precaution followed with **CAUTION** can also result in serious conditions.

Both of two symbols indicate that an important content is mentioned, therefore, be sure to observe it.

Keep this manual handy for your quick reference in necessary.

Design Precautions

CAUTION

▶ Design a safety circuit in the outside of the PLC for system safety in case of disorder of the external power or PLC module body. Otherwise, it can cause injury due to wrong output or malfunction.

1) The following shows analog output states according to various settings of functions that control analog output. When setting an output state, be cautious for safety.

Channel Setting / State	Channel Specification	
	Used	Unused
PLC CPU in RUN state.	A D/A conversion value is output.	Voltage: 0 V Current: 12 mA
PLC CPU in STOP state PLC CPU in Error state	A value of the specified output state will be output. 0: Median value of the output range 1: Previous value 2: Max. value of the output range 3: Min. value of the output range	
Communication error of the remote I/O station (When loaded on the remote I/O station)		

2) Sometimes, fault of output device or internal circuit can make output abnormal. Design a supervising circuit in the outside for output signals which can cause serious accidents.

CAUTION

▶ Do not run I/O signal lines near to high voltage line or power line. Separate them as 100 mm or more as possible. Otherwise, noise can cause module malfunction.

Installation Precautions

CAUTION

- Operate the PLC in the environment conditions given in the general specifications.
- If operated in other environment not specified in the general specifications, it can cause an electric shock, a fire, malfunction or damage or degradation of the module
- Make sure the module fixing projections is inserted into the module fixing hole and fixed.
- Improper installation of the module can cause malfunction, disorder or falling.

Wiring Precautions

CAUTION

- When grounding a FG terminal, be sure to provide class 3 grounding which is dedicated to the PLC.
- Before the PLC wiring, be sure to check the rated voltage and terminal arrangement for the module and observe them correctly.
  If a different power, not of the rated voltage, is applied or wrong wiring is provided, it can cause a fire or disorder of the module.
- Drive the terminal screws firmly to the defined torque.
  If loosely driven, it can cause short circuit, a fire or malfunction.
- Be careful that any foreign matter like wire scraps should not enter into the module.
  It can cause a fire, disorder or malfunction.

Test Run and Maintenance Precautions

WARNING

- Do not contact the terminals while the power is applied.
  It can cause malfunction.
- When cleaning or driving a terminal screw, perform them after the power has been turned off
- Do not perform works while the power is applied, which can cause disorder or malfunction.

CAUTION

- Do not separate the module from the printed circuit board(PCB), or do not remodel the module.
  They can cause disorder, malfunction, and damage of the module or a fire.
  When mounting or dismounting the module, perform them after the power has been turned off.
- Do not perform works while the power is applied, which can cause disorder or malfunction.

Waste Disposal Precautions

CAUTION

- When disposing the module, do it as an industrial waste.

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Chapter 1. INTRODUCTION

The G3F-DA4V, the G3F-DA4I and the G4F-DA1A are digital/analog conversion modules for use with the GLOFA PLC GM 1/2/3/4 series CPU module and the MSTER-K300S/1000S series CPU module. The G4F-DA1A is used on the GM4 series module and the K300S series module. the G3F-DA4V and the G3F-DA4I are used on the GM1/2/3 series module and the K1000S series module. (Here-in-after the G4F-DA1A, G3F-DA4V and G3F-DA4I are called the D/A conversion module)

The D/A conversion module is to convert a 16-bit, signed BIN digital value into an analog output signal (voltage or current).

1.1 Features

1.1.1 G3F-DA4V / G3F- DA4I

1) Allows digital to Analog conversion for 16 channels per a module.

G3F-DA4V: 1 module can be performed for D/A conversion (vdtage output) of 16 channels.

G3F-DA4I: 1 module can be performed for D/A conversion (current output) of 16 channels.

2) High resolution of 1/16000

A digital value resolution can be selected among 1/16000 and so the analog value of high resolution is kept.

4) The number of the D/A conversion module mounted on one base is unlimited.

On use of power supply module of the G3F-PA1A or G3F-PA2A, the G3F-DA4V and G3F- DA4I can be mounted up to 4.

1.1.2 G4F-DA1A

1) Allows digital to Analog conversion for 2 channels per a module.

1 module can be performed for D/A conversion (voltage or current output) of 2 channels.

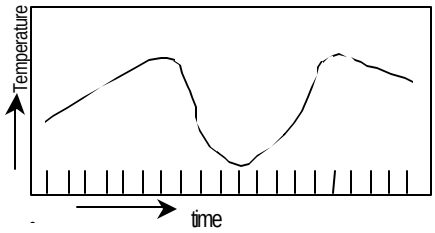
2) High resolution of 1/16000

A digital value resolution can be selected among 1/16000 and the analog value of high resolution is kept.

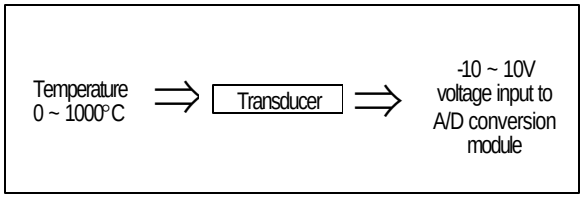
3) The number of the G4F-DA1A mounted on one base is unlimited.

1.2 Glossary

1.2.1 A- Analog Value



[Fig 1.1] Analog Value

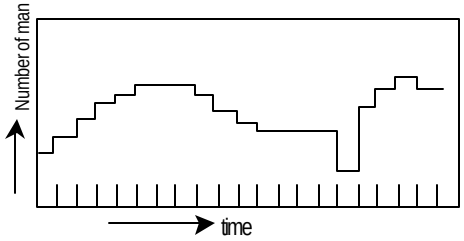


[Fig 1.2] Example of Transducer

Analog value is a sequentially changing value such as voltage, current, temperature, speed, pressure, flux, etc.

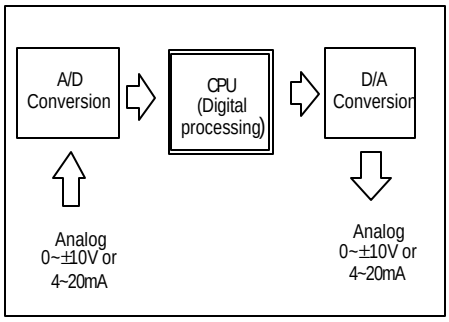
Temperature, for example, is sequentially changing according to the time. Because this temperature is not input on the PLC directly, the same analog value of DC voltage (0 to ±10V) or current (4 to 20mA) in accordance with the temperature should be input on the PLC through transducer.

1.2.2 D- Digital Value



[Fig. 1.3] Digital quality

Digital value is non-sequentially changing value written as the number like 0, 1, 2, 3. The signal of on or off is written as digital value of 0 or 1. There are BCD value and binary value in the range of digital value.

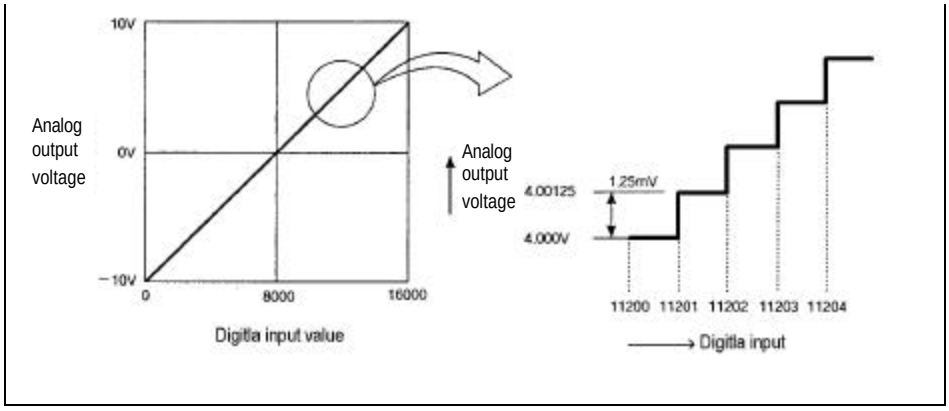


[Fig. 1.4] conversion processing in the PLC

Analog value isn't written directly on the CPU. For analog input to the CPU operation, analog converted to digital value has to be input on the CPU. and for analog output, the digital of CPU should be converted to analog.

1.2.3 Digital/ Analog Conversion Characteristics

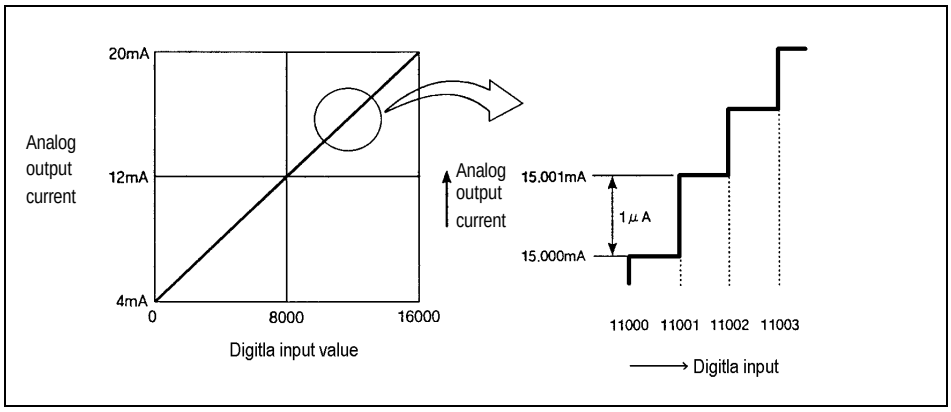
1) Voltage output



[Fig 1.5] D/A conversion characteristics(Voltage output)

Digital/analog conversion module allows digital value of the CPU to be converted into an analog value and to be output externally. Digital input value of 0 leads to analog output value of -10V and 16000 leads to 10V. Digital input value of 1 is equal to 1.25mV.

2) Current output



[Fig 1.6] D/A conversion characteristics(Current output)

On current output, digital value of 0 is to be converted into 4mA and 16000 into 20mA. Digital input of 1 is equal to 1μA.

Chapter 2. SPECIFICATIONS

2.1 General Specifications

Table 2.1 shows the common specifications of GLOFA GM series and MASTER-K series

No	Items	Specifications	Reference Specification
1	Operating ambient temperature	0 ~ 55℃	
2	Storage ambient temperature	-25 ~ 75℃	
3	Operating ambient humidity	5 ~ 95%RH, non-condensing	IEC 61131-2
4	Storage ambient humidity	5 ~ 95%RH, non-condensing	
5	Vibration	Occasional vibration Frequency / Acceleration / Amplitude / Sweep count 10≤f∠57 Hz / - / 0.075mm / 10 times in each direction for X, Y, Z 57 ≤f≤150 Hz / 9.8 m/s² {1G} / - / 10 times in each direction for X, Y, Z Continuous vibration Frequency / Acceleration / Amplitude 10≤f∠57 Hz / - / 0.035mm 57≤f≤150 Hz / 4.9 m/s² {0.5G} / -	
6	Shocks	•Maximum shock acceleration: 147 m/s² {15G} •Duration time :11ms •Pulse wave: half sine wave pulse(3 times in each of X, Y and Z directions)	IEC 61131-2
7	Noise immunity	Square wave impulse noise: ±1,500 V	
		Electrostatic discharge: Voltage :4kV(contact discharge)	IEC 61131-2 IEC 1000-4-2
		Radiated electromagnetic field: 27 to 500 MHz, 10V/m	IEC 61131-2 IEC 1000-4-3
		Fast transient /burst noise Severity Level / All power modules / Digital I/Os(Ue≥ 24 V) / Digital I/Os (Ue < 24 V) Analog/Os communication I/Os Voltage / 2kV / 1kV / 0.25kV	IEC 61131-2 IEC 1000-4-4
8	Operating atmosphere	Free from corrosive gases and excessive dust	
9	Altitude for use	Up to 2,000m	
10	Pollution degree	2 or lower	
11	Cooling method	Self-cooling	

[Table 2.1] General Specifications

REMARK

1) IEC(International Electrotechnical Commission)
:The international civilian organization which produces standards for electrical and electronics industry..

2) Pollution degree
:It indicates a standard of operating ambient pollution level.
The pollution degree 2 means the condition in which only non conductive pollution occurs. Occasionally, however, a temporary conductivity caused by condensation shall be expected.

2.2 Performance Specifications

Table 2..2 shows performance specification of D/A conversion module.

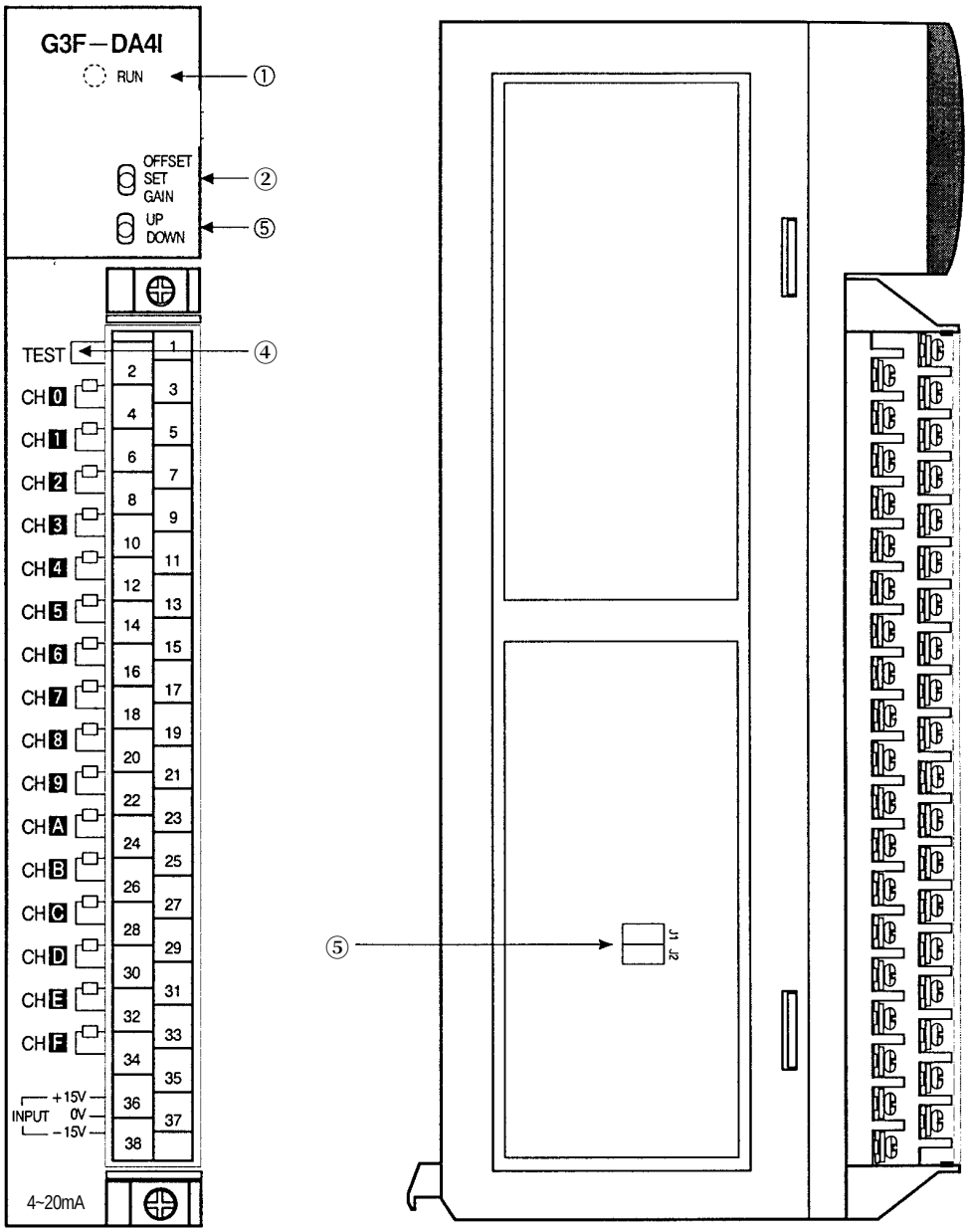
Items		Specifications		
		G3F-DA4I	G3F-DA4V	G4F-DA1A
I/O points		16points		
Digital input		• 16bit(data part :14bits)signed binary • May be set per channel by setting input data.("0" : -192 16191, "1" : -8192 -8191)		
Analog output		DC 4 20mA (External load resistance less than 510Ω)	-5 5 VDC (External load resistance :2KΩ 1MΩ) -10 10 VDC (External load resistance :2KΩ 1MΩ)	-5 5 VDC (External load resistance : 2KΩ 1MΩ) DC-4 20 mA (External load resistance less than550Ω)
Max. resolution		1μA(1/16000)	-5 5 VDC 0.625 mV(1/16000) -10 10 VDC 1.25 mV(1/16000)	-10 10 VDC 1.25mV(1/16000) DC4 20 mA: 1μA(1/16000)
Accuracy		± 0.3% [Full Scale]		
Max. conversion speed (ms/channel)		15ms/ 16 channels		3ms/ 2channels
Max. absolute input		DC 24mA	15 VDC	Voltage: 15 VDC Current:DC 24 mA
Analog output points		16 channels/1module		2channels/1module
Isolation		Between input terminals and the PLC: Photo-coupler isolation		
Terminals connected consumption		38-point terminal block		20-point terminal block
Internal current		0.25 A		0.45 A
External power supply	Voltage	15 VDC / - 15 VDC		-
	Current	15 VDC : 0.5 A -15 VDC : 0.1 A	15 VDC :0.5 A -15 VDC :0.3 A	
Weight		610 g	630 g	370 g

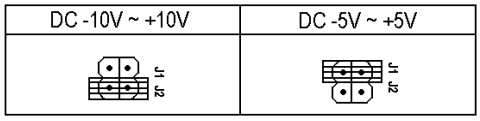
[Table 2.2] Performance Specifications

2.3 Names of Parts and Functions

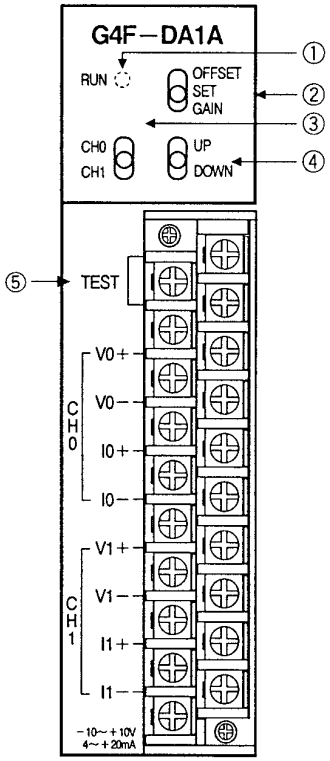
Names of parts and functions are shown as below.

2.3.1 G3F-DA4V / G3F-DA4I



No.	Descriptions
①	RUN LED Indicates the operating condition of the D/A conversion module * On: Normal operation * Flickering: An error has occurred. (For more information, see the Section 6.1) * Off : 5 VDC power off or D/A conversion module fault
②	Channel select switch Used to set the channel of the adjustment of offset/gain in the test mode. Setting range: 0 F
③	Offset/gain select switch Used to select Offset/Set/Gain . *Offset position: offset value adjustment mode *Gain position: gain value adjustment mode *Set position: the mode which stores offset/gain value. (When the switch is changed to "set" position from "Offset/ Gain" position, offset/gain value is stored in the memory of D/A conversion module.)
④	Up/Down switch -Used to make micro adjustment of offset/gain value. -Analog output value according to up/down location is changed as follows.: *Up/down location of less than 2 sec : G3F-DA4I - Add or fall of 1μA/1 time G3F-DA4V-Add or fall of 1.25 mV/1 time *Up/down location of more than 2 sec : G3F-DA4I-Add or fall of 10μA/ 0.2 sec. G3F-DA4V Add or fall of 12.5 mV/0.2 sec
⑤	Test terminal block Test mode is to be a connection of terminal block 1 and 2 Normal mode is to be a disconnection of terminal block 1 and 2
⑥	Output range select switch It's only for the G3F-DA4V. DC -10V ~ +10V / DC -5V ~ +5V  *Factory set is made to -10 10 VDC.

2.3.2 G4F-DA1A



No.	Descriptions
①	RUN LED Indicates the operating status the G4F-DA1A *Normal mode -On: Normal operation -Flicker: error occurring -Off: 5 VDC power off or the G4F-DA1A module fault. *Test mode -Flicker(per 1.0 sec): Offset/Gain select switch is set to offset condition or gain condition. -Off: offset/gain select switch is set to Set condition.
②	Offset/ Set/Gain select switch *Offset position: Offset value control mode *Gain position: Gain value control mode *Set position: Offset/ Gain value set mode (When offset/gain position is changed to set position, offset/gain value is stored onto G4F-DA1A buffer memory.)
③	Channel select switch Used to select channel for adjusting offset/gain value on test mode. *CH0: enabled to adjust the offset/gain value on the CH0 *Neutral: disabled to adjust the offset/gain value *CH1 :enabled to adjust the offset/gain value on the CH1.
④	Up/ Down switch -Used to make micro adjustment of offset/gain value. -Analog output value according to up/down location is changed as follows.: *Up/Down location of less than 2 sec Add or fall of 1.25mA(voltage) Add or fall of 1.0μA(current) *Up/Down location of more than 2 sec Add or fall of 12.5mA(voltage) Add or fall of 10 μA(current)
⑤	Test terminal block Test mode is to be a connection of terminal block 1 and 3 Normal mode is to be a disconnection of terminal block 1 and 3

2.4 External Power Supply(± 15 VDC Specifications)

Be sure to use rated power supply on the table 2. 3 when power(±15 VDC) is supplied to D/A conversion module for use with the GLOFA PLC GM1/2/3 series and the MASTER-K1000S series.

Item		Specifications	
		G3F-DA4I	G3F-DA4V
Voltage		+15VDC ± 3%(14.55 V 15.45 V)	
		-15 VDC ± 3%(-15.45 V -14.55 V)	
*1 Current consumption	+15 VDC	0.5 A	0.5 A
	-15 VDC	0.1 A	0.3 A
Ripple voltage		less than 50 mVp-p	
Spike voltage		less than 100 mVp-p	
transient output change		less than ± 1 V	

[Table 2.3] External power supply specifications

*1: Current consumption shown on the above table 2.3 is applicable to a piece of D/A conversion module.

2.5 Input/Output Conversion Characteristics

I/O characteristics are displayed as a slant of the line connecting offset value and gain value in converting an digital signal from the external PLC into an analog signal(voltage or current).

The I/O conversion characteristics of the D/A conversion module are shown.

2.5.1 Offset/ Gain Value

1) Offset and gain value is as follows

a) Offset value

Data format of -8192 8191: When digital input value is -8000, offset value is analog output value.

Data format of -192 16191: When digital input value is 0, offset value is analog output value.

b) Gain value

Data format of -8192 8191: When digital input value is 0, offset value is analog output value.

Data format of -192 16191: When digital input value is 8000, offset value is analog output value.

2) Factory set value of offset and gain value is like table 2.4.

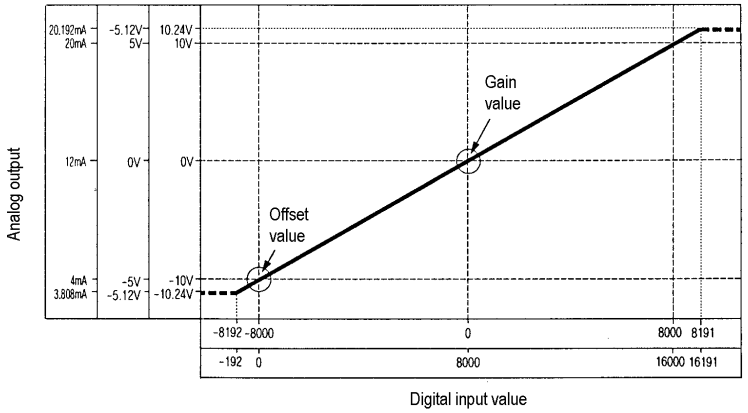
Module name	Analog input range	Offset value	Gain value
G3F-DA4I	DC 4 20 mA	DC 4 mA	DC 12 mA
G3F-DA4V	-10 10 VDC	-10 VDC	0 VDC
G3F-DA1A	-10 10 VDC	-10 VDC	0 VDC

[Table 2.4] Factory set value of offset and gain

3) Offset and gain value can be selected per channel on test mode.

2.5.2 Example for I/O Conversion Characteristic.

Input/ output conversion characteristic example is shown on Fig 2.1



[Fig 2.1] Input/ output conversion characteristic example

2.5.3 Relations between Offset/ Gain Value and Analog Output

The resolution of D/A conversion module can be changed by changing offset/ gain value. At the change of offset/ gain value, the below formula can calculate resolution of analog value and analog output value by digital input value.

$$\text{Resolution} = \frac{\text{Gain value} - \text{Offset value}}{8000}$$

$$\text{Analog output} = \left[\frac{\text{Gain value} - \text{Offset value}}{8000} \times \text{Digital input value} \right] + \text{Offset value}$$

$$\text{Analog output} = \text{Resolution} \times \text{Digital input value} \times \text{Offset value}$$

Ex) Gain value : 0 VDC Offset value : - 10 VDC Digital input value : 12000

$$\text{Resolution} = \frac{0 - (-10)}{8000} = 0.00125$$

$$\text{Analog output} = 0.00125 \times 12000 + (-10) = 5(V)$$

Since maximum resolution of D/A conversion module is like values on table2.5, if digital input value increase or decrease one at a time, analog output value may be different with a result of above formula

Product code	Analog output range	Maximum resolution
G3F-DA4I	DC 4 20 mA	1μA
G3F-DA4V	-10 10 VDC	1.25 mV
	-5 5 VDC	0.625 mV
G4F-DA1A	DC 4 20 mA	1μA
	-10 10 VDC	1.25 mV

[Table 2.5] Maximum resolution

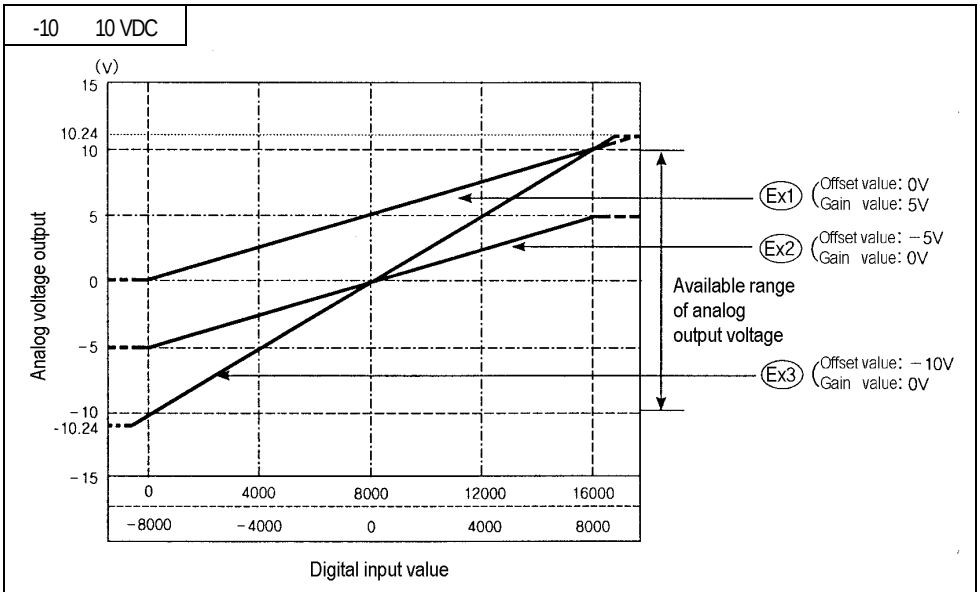
2.5.4 I/O Conversion Characteristics according to Offset/Gain Setting

Input/output conversion characteristics according to offset/ gain setting are as below.

1) Voltage output characteristics

Voltage output characteristics according to offset/ gain setting are shown in the Fig2.2 and Fig2.3.

(1) -10 10 VDC

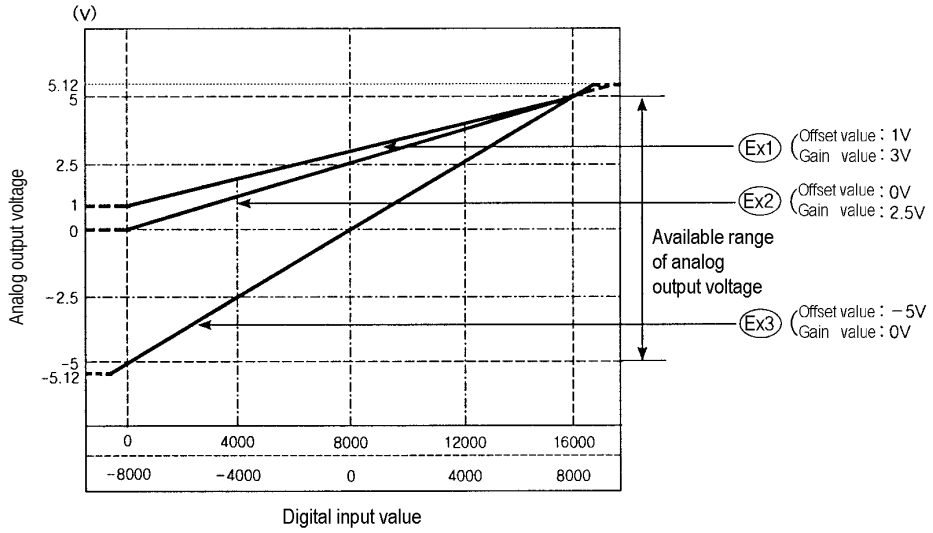


No	Digital Input range	Offset value	Gain value	Digital input value						
				-8000	-4000	0	4000	8000	12000	16000
Ex1	-192 ~ 16191	0 V	5 V	-	-	0 V	2.5 V	5 V	7.5 V	10 V
Ex2		-5 V	0 V	-	-	-5 V	-2.5 V	0 V	2.5 V	5 V
Ex3		-10 V	0 V	-	-	-10 V	-5 V	0 V	5 V	10 V
Ex1	-8192 ~ 8191	0 V	5 V	0 V	2.5 V	5 V	7.5 V	10 V	-	-
Ex2		-5 V	0 V	-5 V	-2.5 V	0 V	2.5 V	5 V	-	-
Ex3		-10 V	0 V	-10 V	-5 V	0 V	5 V	10 V	-	-

[Fig 2.2] Voltage output characteristics(-10 ~ 10 VDC)

(2) -5 ~ 5 VDC

-5 5 VDC

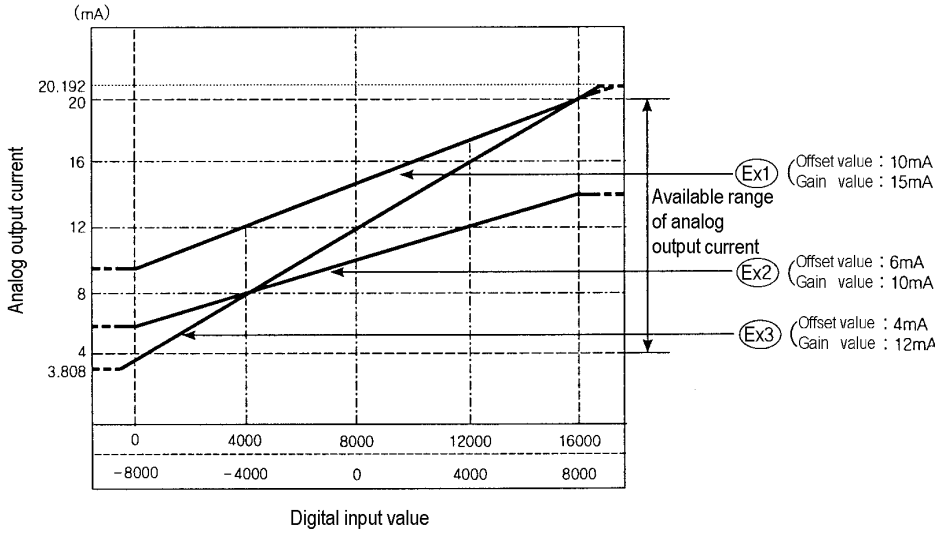


No	Digital Input range	Offset value	Gain value	Digital input value						
				-8000	-4000	0	4000	8000	12000	16000
Ex1	-192 ~ 16191	1 V	3 V	-	-	1 V	2 V	3 V	4 V	5 V
Ex2		0 V	2.5 V	-	-	0 V	1.25V	2.5 V	3.75V	5 V
Ex3		-5 V	0 V	-	-	-5 V	-2.5 V	0 V	2.5 V	5 V
Ex1	-8192 ~ 8191	0 V	3 V	1 V	2 V	3 V	4 V	5 V	-	-
Ex2		1 V	2.5 V	0 V	1.25V	2.5 V	3.75V	5 V	-	-
Ex3		-5 V	0 V	-5 V	-2.5 V	0 V	2.5 V	5 V	-	-

[Fig 2.3] Voltage output characteristics(-5 ~ 5VDC)

2) Current output characteristics

Current output characteristics according to offset/ gain setting are shown in the Fig2.4.



No	Digital Input range	Offset value	Gain value	Digital input value						
				-8000	-4000	0	4000	8000	12000	16000
Ex1	-192 ~ 16191	10 mA	15 mA	-	-	10 mA	12.5mA	15 mA	17.5mA	20 mA
Ex2		6mA	10 mA	-	-	6mA	8mA	10 mA	12 mA	14 mA
Ex3		4mA	12 mA	-	-	4mA	8mA	12 mA	16 mA	20 mA
Ex1	-8192 ~ 8191	10 mA	15 mA	10 mA	12.5mA	15 mA	17.5mA	20 mA	-	-
Ex2		6mA	10 mA	6mA	8mA	10 mA	12 mA	14 mA	-	-
Ex3		4mA	12 mA	4mA	8mA	12 mA	16 mA	20 mA	-	-

[Fig 2.4] Current output characteristics(DC 4 ~ 20 mA)

2.6 D/A Conversion Speed

Conversion speed indicates the period of time between D/A conversion processing and changing analog value to Set value.

Conversion speed of each D/A conversion module is like value in the table 2.6.

Products	Conversion speed
G3F-DA4I	15 ms/ All channel
G3F-DA4V	15 ms/ All channel
G4F-DA1A	3 ms/ All channel

[Table 2.6] Conversion Speed

That is, conversion speed of each D/A conversion module is constant regardless of used channels.

2.7 Offset/Gain Setting

- Factory set to offset/ gain value is set like below table 2.7

Products	Analog output range	Offset value	Gain value
G3F-DA4I	DC 4-20 mA	DC 4 mA	DC 12 mA
G3F-DA4V	-10 10VDC	-10 VDC	0 VDC
G4F-DA1A	-10 10 VDC	-10 VDC	0 VDC

[Table 2.7] Factory set to offset and gain value

- The setting change and micro adjustment of offset/ gain value is executed on test mode.

2.7.1 Notes on Setting Offset/Gain Value

1) Don't make D/A conversion processing on test mode.

D/A conversion processing on test mode allows D/A conversion of every channel to be stopped and external device not to be controlled regularly.

If test mode is changed to normal mode, D/A conversion restarts with new offset/gain value.

2) Offset/ gain setting has to be set in the range of below.

a) Voltage output range of 10 V is applicable to -10 0 10 V

b) Voltage output range of 5 V is applicable to -5V 0 5 V

c) Voltage output range of 20 mA is applicable to 4 12 mA.

The setting exceeding the above range doesn't keep accuracy from being within the range of the performance specification.

3) When offset/gain select switch is located on "Set" position, set value of offset/gain is stored.

When offset/gain select switch is located on "offset" or "gain" position, the end of test mode allows offset/gain value to remain previous value.

4) Change the channel setting offset/ gain value after offset/gain select switch is located on "Set" position.

If channel change is made on offset/gain select switch of "offset" or "gain" position, and set offset/gain select switch is set on "Set" position on the other channel, offset/gain value is stored on first channel which would be changed.

REMARK

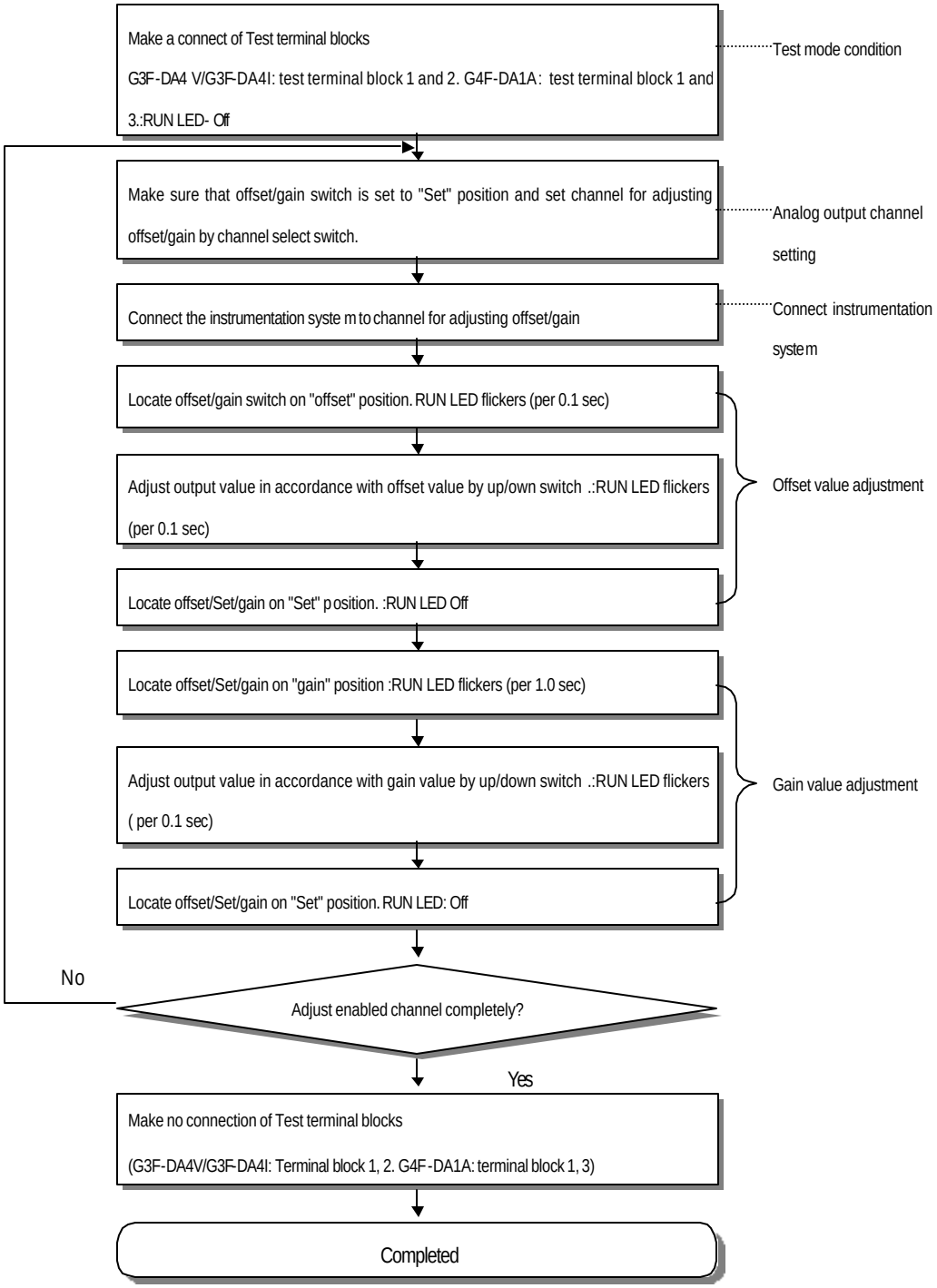
1) When gain value of channel 3 is changed from 10 to 5 Volts, and offset/gain select switch is located on "gain" position, channel change to 4 allows gain value to be like next.
   (1)Gain value of channel 3 : 5 Votls is output.
   (2)Gain value of channel 4 : Previous value is output.
   -When offset /gain select switch is set to "Set" position, gain value is stored as 5 Volts on channel 3 and previous value remains on channel 4.

5) When the range exceeds possible offset/gain setting range, "RUN" LED flickers at high speed (interval time: 0.1 sec). When LED display writes Err 4 and "RUN" LED display flickers at high speed, readjust offset/gain within possible offset/gain setting range, offset/gain value is operated regularly and LED display indicates test mode.

2.7.2 Procedure of Setting Offset/ Gain

Offset/ Gain setting procedure is shown as below.

Offset/ Gain value is adjusted for each channel.



CHAPTER 3. INSTALLATION AND WIRING

3.1 Installation

3.1.1 Installation Ambience

This module has high reliability regardless of its installation ambience. But check the following for system in higher reliability and stability.

1) Ambience requirements

Avoid installing this unit in locations which are subjected or exposed to :

- Water leakage and a large amount of dust, power and other conductive powder, oil mist, salt, of organic solvent
- Mechanical vibrations of impacts transmitted directly to the module body
- Direct sunlight.
- Dew condensation due to sudden temperature change.
- High or low temperatures (outside the range of 0-55°C)

2) Installation and wiring

- During wiring or other work, do not allow any wire scraps to enter into the PLC.
- Install it on locations that are convenient for operation.
- Make sure that it is not located near high voltage equipment on the same panel.
- Make sure that the distance from the walls of duct and external equipment be 50 mm or more.
- Be sure to be grounded to locations that have good noise immunity.

3.1.2 Installation Precautions

From unpacking to installation of the D/A conversion module, be sure to check the following:

1) Do not drop it off, and make sure that strong impacts should not be applied.

2) Do not dismount printed circuit board(PCB) from the case. It can cause malfunctions.

3) During wiring, be sure to check any foreign matter like wire scraps should not enter into the upper side of the PLC, and in the event that foreign matte entered into it, always eliminate it.

4) Be sure to disconnect electrical power before mounting or dismounting the module.

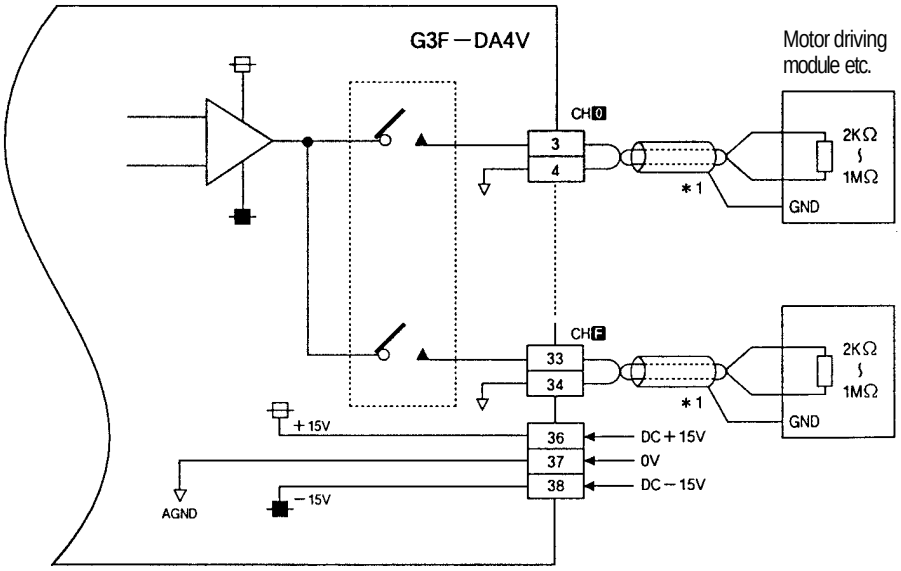
3.2 Wiring

3.2.1 Wiring Precautions

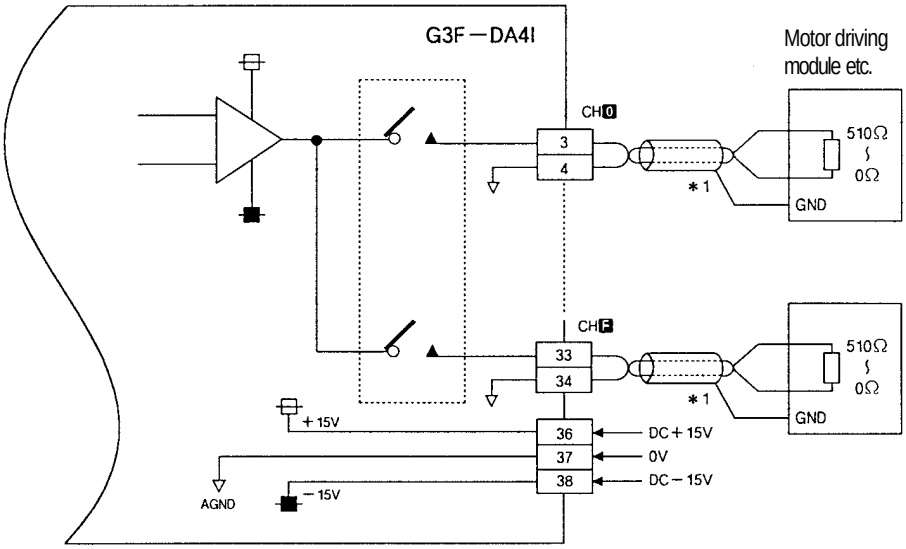
1) Separate AC and external input signal of D/A conversion module wiring not to be affected by surge or induced noise in the AC.
2) External wiring has to be at least AWG22(0.3㎟) and be selected in consideration of operating ambience and/or allowable current.
3) Separate wiring from devices and/or substances generating intense heat, and oil not to make short-circuit which leads to damage and/or mis-operation.
4) Identify the polarity of terminal block before external power supply is made connected.
5) Separate external wiring sufficiently from high voltage and power supply cable not to cause induced failure and/or malfunction.

3.2.2 Wiring Examples

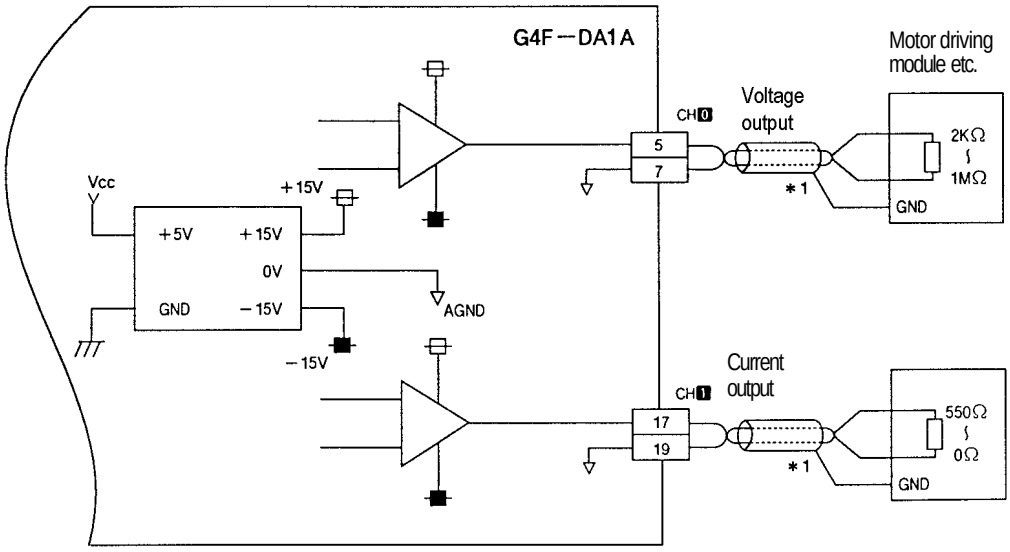
1) G3F-DA4V



2) G3F-DA4I



3) G4F-DA1A



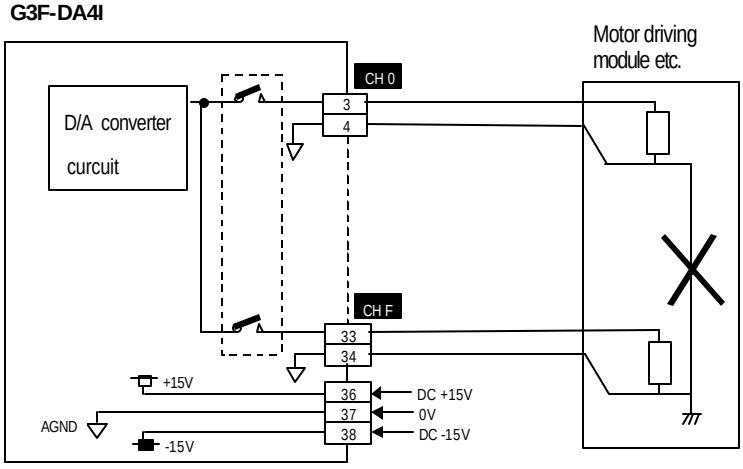
*1 For the cable, use a two-core twisted shielded wire.

Remark

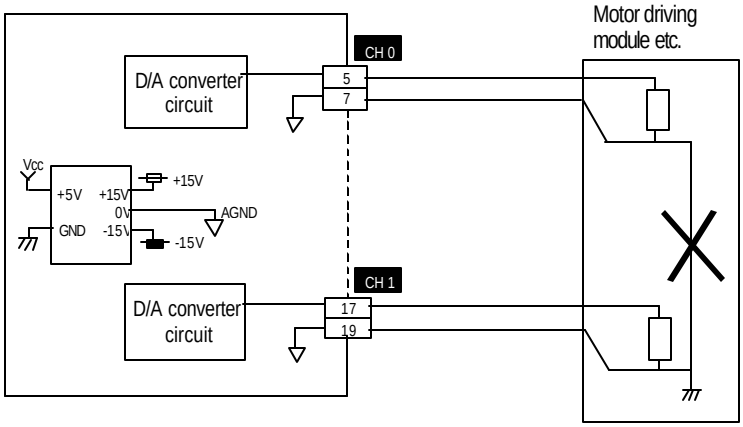
▶ Current output module(G3F-DA4I, G4F-DA1A) cannot be connected with device which i s grounded with common line.

Because it is not normal current output.

1) G3F-DA4I



2) G4F-DA1A (when it is used to current output type for 2 channel all)



▶ The G4F -DA1A is not used to voltage and current in the one channel simultaneously. If it is used to voltage and current in the one channel simultaneously, it is caused abnormal output and malfunction for internal circuit failure

3.3 Connection of G3F-DA4I/ G3F-DA4V and ± 15 VDC

There are two ways which ±15 VDC is supplied to G3F-DA4I or G3F-DA4V.

1) When the G3F-PA1A or G3F-PA2A is used,.

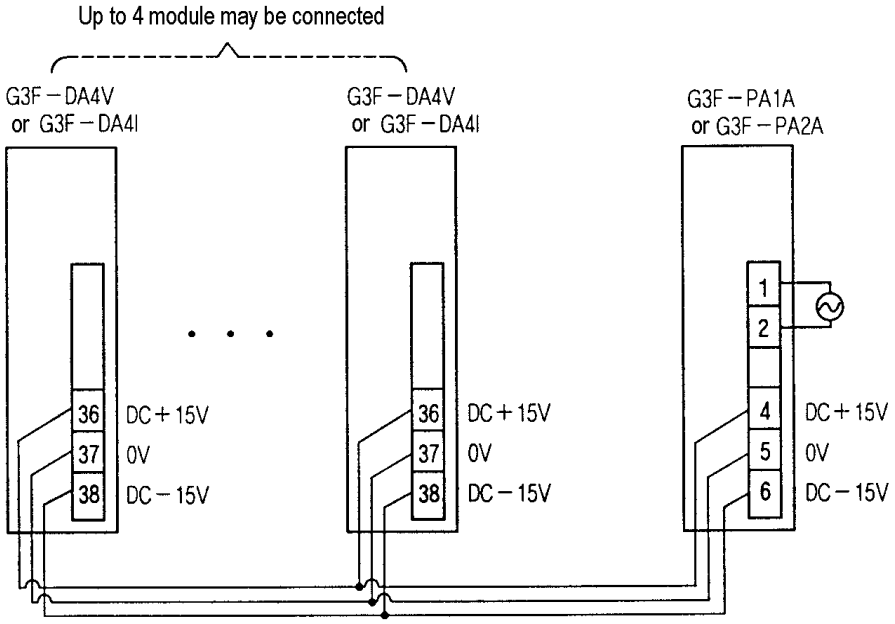
; G3F- PA1A : power supply module for the 110 VAC

; G3F- PA2A : power supply module for the 220 VAC

2) When the external power supply is used,.

3.3.1 On Use of the G3F-PA1A or G3F-PA2A.

- When the G3F-PA1A or G3F-PA2A (Here-in-after called the power supply module for the D/A conversion) is used, connect the D/A conversion module and each part of +15, 0, -15 VDC of power supply module for the D/A conversion.
- One power supply module for the D/A conversion is performed to supply power up to 4 D/A conversion module in block.



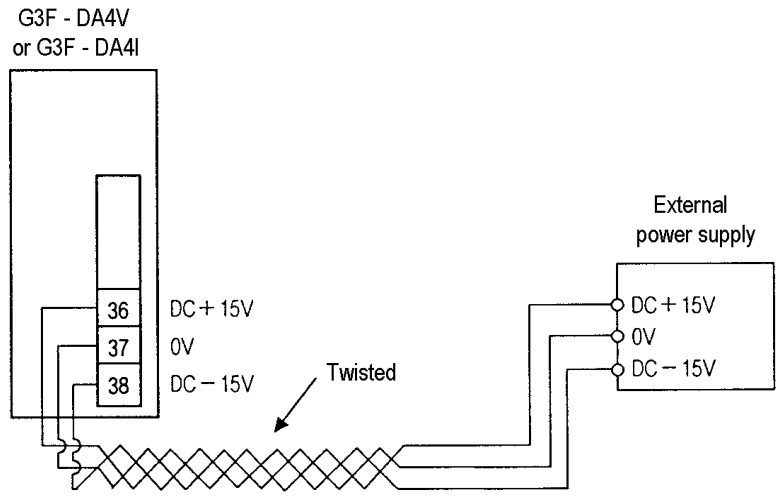
Connection of G3F - DA4V / G3F - DA4I and ± 15 VDC

- Don't put the parallel connecti on of ± 15 VDC output from several power supply modules for the D/A conversion into one D/A conversion module. For it can make the power supply module for the D/A conversion be damaged.

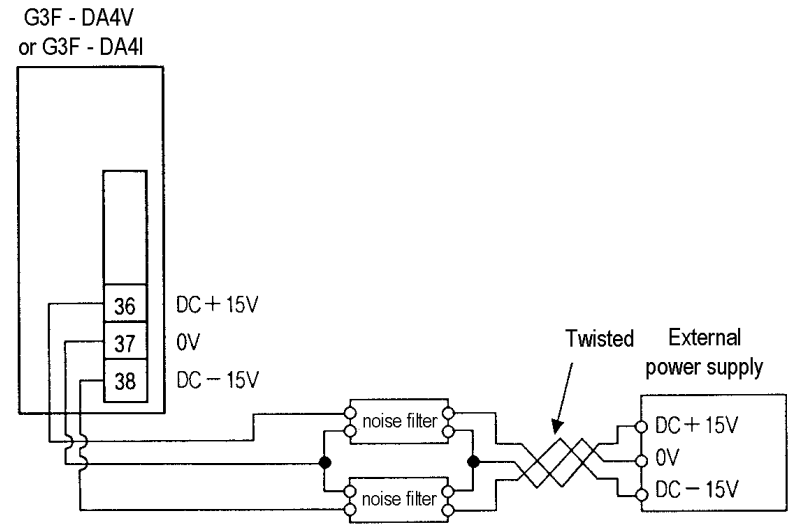
3.3.2 On Use of the External Power Supply.

- Connect the D/A conversion module and the each part of 15, 0, -15 VDC of external power supply.
- Recommend a noise filter for the D/A conversion module.
- For the rated power of ±15 VDC for the D/A conversion module, refer to the General Remarks 2.4.

Use of no noise filter



Use of noise filter



REMARK

1) Separate the connection of noise filter and the D/A conversion module with the other wiring.
2) Make the connection of noise filter and the D/A conversion module in short distance.

Chapter 4. FUNCTION BLOCK

This chapter shows function block for the D/A conversion module on the GMWIN.

A kind of function block is as follows

NO.	G3F-DA4V, G3F-DA4I		G4F-DA1A		Function
	Local	Remote	Local	Remote	
1	DA4INI	DAR4INI	DA1INI	DAR1INI	Module initialization
2	DA4AWR	DAR4WR	DA1AWR	DAR1WR	Writing D/A conversion (Array type)
3	DA4WR	-	DA1WR	-	Writing D/A conversion (Single type)

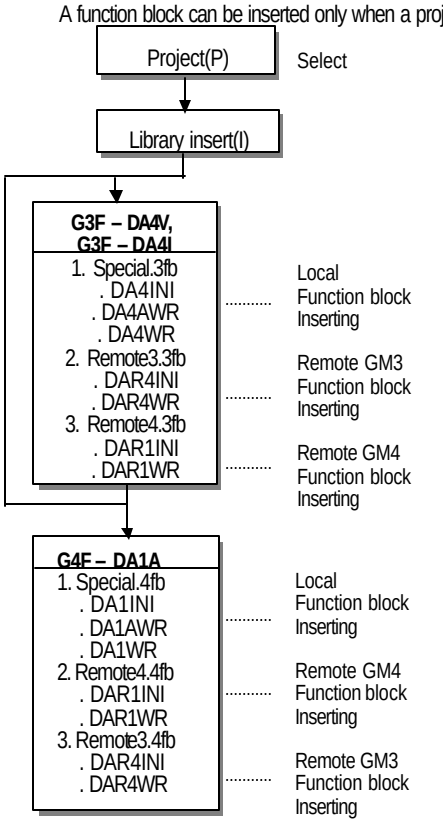
REMARK

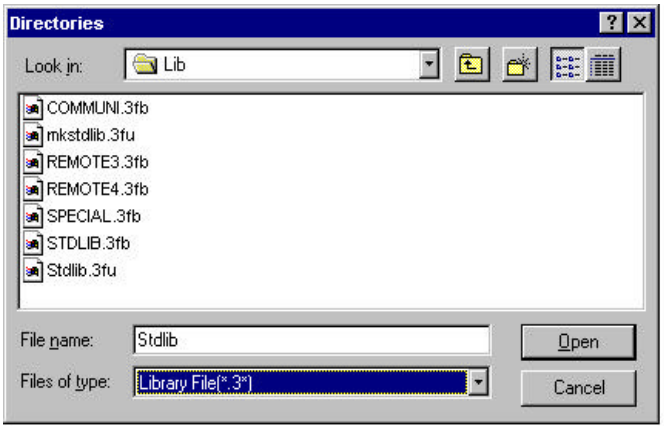
Function block of the G3F-DA4V and G3F-DA4I are same

4.1 Insertion of the Function Block for D/A Conversion Module on the GMWIN

A function block can be inserted during the execution of the GMWIN according to the following procedure..

A function block can be inserted only when a project opens.

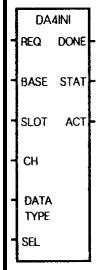
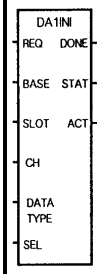




4.2 Local Function Block

4.2.1 Module Initialization (G3F-DA4V/G3F-DA4I : DA4INI, G4F-DA1A : DA1INI)

A module initialization function block is a program for the use in setting a D/A conversion module base location, the slot location number, specifying an available channel enable, a data type for D/A conversion, and output continuing data for D/A conversion when the CPU module stops.

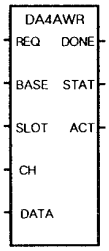
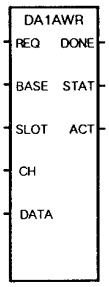
Function Block	I/O	Variable	Data type	Descriptions
G3F - DA4V G3F - DA4I 	Input	REQ	BOOL	Function Block Execution Request Area -The execution of function block initialization is requested in this area. -If the status connected with this area is satisfied on the programexecution and 0 is changed to 1, function block initialization for the module is executed.
		BASE	USINT	Base Location Number Area -The base No. on which D/A conversion module is mounted is written on this area. -Setting range : GM1 series(0 to 31), GM2 series(0 to 7), GM3/4 series(0 to 3)
		SLOT	USINT	Slot Location Number Area -The slot No. on which D/A conversion module is mounted is written on this area. -Setting range: 0 to 7
		CH	BOOL [Array]	Available Channel Specification Area -Available channels are specified in this area. -Enabled channels are specified to 1 and disabled channels are specified to 0.
		DATA TYPE	BOOL [Array]	Input Data Type Specification Area -Input digital data type for each channel is specified in this area. -0 is for the range of -192 to 16191. -1 is for the range of -8192 to 8191.
		SEL	USINT [Array]	When a CPU module stops or channel is disabled, output value is specified in this area. -"0" leads to output the medium value of the range. -"1" leads to output the previous value. -"2" leads to output the maximum value of the range. -"3" leads to output th e minimum value of the range.
G4F - DA1A 	Output	DONE	BOOL	Function Block Execution Complete Area -When function block initialization has been completed with no error, 1 is written and until next execution, 1 is continuing. When error occurs, 0 is written and operation comes to stop.
		STAT	USINT	Error Code Display Area -When error occurs during function block processing, the error code number is written. -For error code, refer to Section 7.4.
		ACT	BOOL [Array] *Note 1	Channel Operation Display Area -Enabled channel specified after executing the function block initialization with no error is normal, 1 is written and, 0 is written to the non-specified channel.

REMARK

*Note 1 :The number of Array are the G3F-DA4V and G3F-DA4I of 16 and the G4F-DA1A of 2

4.2.2 Module Write_ Array Type (G3F-DA4V / G3F-DA4I : DA4AWR, G4F-DA1A : DA1AWR)

Module write function block of the Array type is a program for the use in performing for every channel in block and setting a digital value to be converted into a D/A conversion.

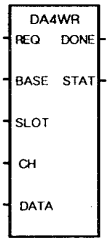
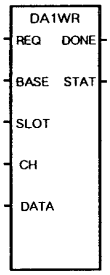
Function Block	I/O	Variable	Data Type	Descriptions
G3F - DA4V G3F - DA4I 	input	REQ	BOOL	Function Block Execution Request Area -The execution of function block initialization is requested in this area. -If the status connected with this area is satisfied on the program execution and 0 is changed to 1, function block for the module is
		BASE	USINT	Base Location Number Area -The base No. on which D/A conversion module is mounted is written on this area. -Setting range : GM1 series(0 to 31), GM2 series(0 to 7), GM3/4 series(0 to 3)
		SLOT	USINT	Slot Location Number Area -The slot No. on which D/A conversion module is mounted is written on this area. -Setting range: 0 to 7
		CH	BOOL [Array] *Note1	Available Channel Specification Area -Available channels are specified in this area. -Enabled channels are specified to 1 and disabled channels are specified
		DATA	INT [Array] *Note1	Input Data Type Specification Area -Input digital data type for each channel is specified in this area.
G4F - DA1A 	output	DONE	BOOL	Function Block Execution Complete Area - When function block has been completed with no error, 1 is written and until next execution, 1 is continuing. When error occurs, 0 is written and operation come to stop.
		STAT	USINT	Error Code Display Area - When error occurs during function block processing, the error code number is written. - For error code, refer to Section 4.4.
		ACT	BOOL [Array] *Note1	Channel Operation Display Area - Enabled channel specified after executing the function block with no error is normal, 1 is written and, 0 is written to the non-specified channel.

REMARK

* Note 1: The number of Array are the G3F-DA4V and G3F-DA4I of 16 and the G4F-DA1A of 2

4.2.3 Module Write_Single Type(G3F-DA4V / G3F-DA4I : DA4WR, G4F-DA1A : DA1WR)

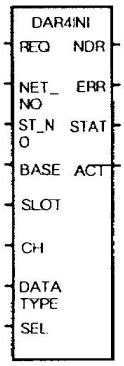
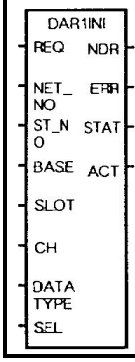
Module write function block of the Single type is a program for the use in performing for a channel of D/A conversion module and setting a digital value to be converted into a D/A conversion.

Function block	I/O	Variable	Data type	Descriptions
G3F - DA4V G3F - DA4I 	input	REQ	BOOL	Function Block Execution Request Area -The execution of function block is requested in this area. - If the status connected with this area is satisfied on the program execution and 0 is changed to 1, function block for the module is executed.
		BASE	USINT	Base Location Number Area - The base No. on which D/A conversion module is mounted is written on this area. - Setting range : GM1 series(0 to 31), GM2 series(0 to 7), GM3/4 series(0 to 3)
		SLOT	USINT	Slot Location Number Area - The slot No. on which D/A conversion module is mounted is written on this area. - Setting range: 0 to 7
		CH	USINT	Available Channel Specification Area - Available channels are specified in this area. -Range:0 15(G4F-DA1A : 0 1)
G4F - DA1A 		DATA	INT	Input Data Type Specification Area - Input digital data type for each channel is specified in this area.
	output	DONE	BOOL	Function Block Execution Complete Area - When function block has been completed with no error, 1 is written and until next execution, 1 is continuing. When error occurs, 0 is written and operation come to stop.
		STAT	USINT	Error Code Display Area - When error occurs during function block processing, the error code number is written. - For error code, refer to Section 4.4.

4.3 Remote Function Block

4.3.1 Module Initialization(G3F-DA4V / G3F-DA4I : DAR4INI, G4F-DA1A : DAR1INI)

A module initialization function block is a program for the use in setting the location number of the slot on which the communication module of the master station is mounted, the address number of communication module which is based on a remote I/O station, the base location number, and the slot location number, and specifying the available channel enable, a data type for D/A conversion, and D/A conversion module condition when the CPU module is stopping

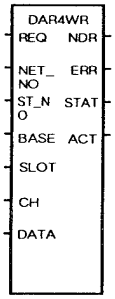
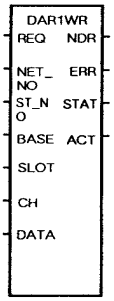
Function block	I/O	Variable	Data type	Descriptions
G3F - DA4V G3F - DA4I 	input	REQ	BOOL	Function Block Execution Request Area at arising edge -The execution of function block initialization is requested in this area. -If the status connected with this area is satisfied on the program execution and 0 is changed to 1, function block initialization for the module is executed.
		NET-NO	USINT	Slot Location Number Area -The slot No. on which communication module of the master station is mounted is written on this area. -Setting range: 0 to 7
		ST__NO	USINT	The address number of communication module which is loaded on a remote I/O station. -Setting range 0 to 63
		BASE	USINT	Base Location Number Area -The base No. on which D/A conversion module is mounted is written on this area. -Setting range: 0 to 3
		SLOT	USINT	Slot Location Number Area -The slot No. on which D/A conversion module is mounted is written on this area. -Setting range: 0 to 7
		CH	BOOL [Array] *Note 1	Available Channel Specification Area -Available channels are specified in this area. -Enabled channels are specified to 1 and disabled channels are specified to 0.
		DATA TYPE	BOOL [Array] *Note 1	Input Data Type Specification Area -Input digital data type for each channel is specified in this area. -0 is for the range of -192 to 16191. -1 is for the range of -8192 to 8191.
G4F - DA1A 		SEL	USINT [Array] *Note 1	When a CPU module stops or enabled channel is unused, output value is specified in this area. -"0" leads to output the medium value of the range. -"1" leads to output the previous value. -"2" leads to output the maximum value of the range. -"3" leads to output the minimum value of the range.
	output	NDR	BOOL	When function block initialization has been completed with no error, 1 is written and then next scan, 0 is written.
		ERR	BOOL	Error Data Display Area When error occurs during function block processing, 1 is written and operation comes to stop. On the next scan, 0 is written.
		STAT	USINT	Error Code Display Area -When error occurs during function block processing, the errorcode number is written. -For error code, refer to Section 7.4.
		ACT	BOOL [Array] *Note 1	Channel Operation Display Area -Enabled channel specified after executing the function block initialization with no error is normal, 1 is written and, 0 is written to the non-specified channel.

REMARK

* Note 1: The number of Array are the G3F-DA4V and G3F-DA4I of 16 and the G4F-DA1A of 2

4.3.2 Module Write (G3F-DA4V / G3F-DA4I : DAR4WR, G4F-DA1A : DAR1WR)

Module write function block of the Array type is a program for the use in performing for every channel in block and setting a digital value to be converted into a D/A conversion.

Function block	I/O	Variable	Data type	Descriptions
G3F - DA4V G3F - DA4I 	input	REQ	BOOL	Function Block Execution Request Area at a rising edge. -The execution of function block is requested in this area. -If the status connected with this area is satisfied on the program execution and 0 is changed to 1, function block for the module is executed.
		NET_NO	USINT	-The slot No. on which the communication module of the master station is mounted - Setting range: 0 to 7
		ST_NO	USINT	The address number of communication module which is loaded on a remote I/O station. - Setting range 0 to 63
		BASE	USINT	Base Location Number Area -The base No. on which D/A conversion module is mounted is written on this area. -Setting range : 0 to 3
		SLOT	USINT	Slot Location Number Area -The slot No. on which D/A conversion module is mounted is written on this area. - Setting range: 0 to 7
		CH	BOOL [Array] *Note 1	Available Channel Specification Area -Available channels are specified in this area. -Enabled channels are specified to 1 and disabled channels are specified to 0.
		DATA	INT [Array] *Note 1	Input Data Type Specification Area -Input digital data type for each channel is specified in this area.
G4F - DA1A 	output	NDR	BOOL	When function block has been completed with no error, 1 is written and then next scan, 0 is written.
		ERR	BOOL	Error Data Display Area When error occurs during function block processing, 1 is written and operation comes to stop. On the next scan, 0 is written.
		STAT	USINT	Error Code Display Area -When error occurs during function block processing, the error code number is written -For error code, refer to Section4.4.
		ACT	BOOL [Array] *Note 1	Channel Operation Display Area -enabled channel specified after executing the function block initialization with no error is normal, 1 is written and, 0 is written to the non-specified channel.

REMARK

* Note 1 - The number of Array are the G3F-DA4V and G3F-DA4I of 16 and the G4F-DA1A of 2

4.4 Errors on Function Block

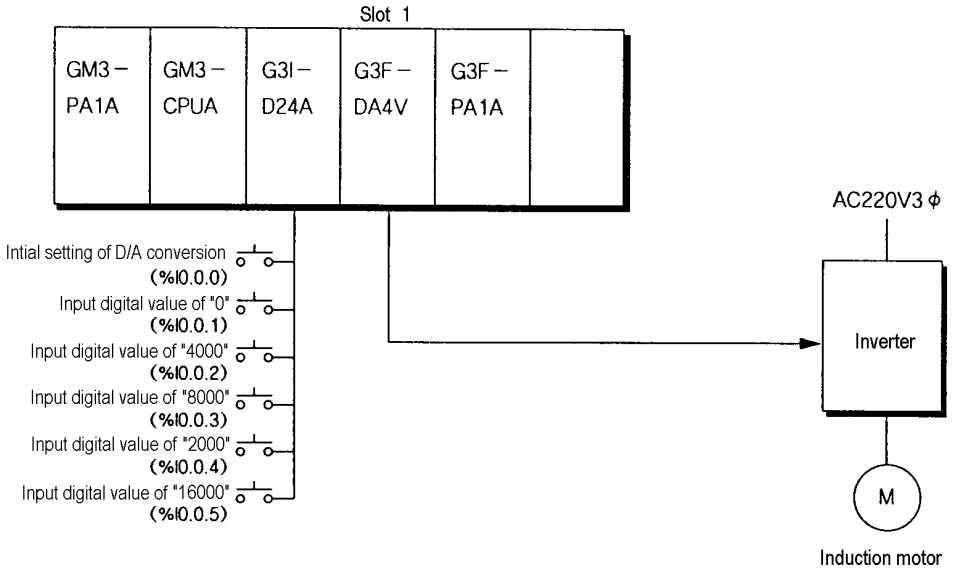
This shows the errors on the output variable "STAT" of variables and the resolutions in accordance with them.

STAT No.	Local/ Remote	Descriptions	Function Block			Resolutions
			Initialization	Write		
				Array type	Single type	
0	Local	Operating with no fault	O	O	O	-
1		The base location number is exceeding the proper setting range	O	O	O	Correct the number in accordance with the proper range (See Section 4.2)
2		H/W error of the base	O	O	O	Contact the service station.
3		The slot location number is exceeding the proper setting range	O	O	O	Set the right number to the slot mounting the D/A conversion module
4		The D/A conversion module on the slot is empty	O	O	O	Mount the D/A conversion module to the specified slot
5		The module loaded isn't the D/A module	O	O	O	Mount the D/A conversion module to the specified slot
6		The channel number is exceeding the proper range	-	-	O	Specify the available channel correctly
7		H/W error of the D/A conversion module	O	O	O	Contact the service station.
8		The D/A conversion module's shared memory error	O	O	O	Contact the service station.
9		The available channels are not specified	-	O	O	Make a correct specification of the available channel on the initialization function block
10		Test mode	O	O	O	Transmit the test mode to normal mode
128	Remote	H/W error of the communication module for remote	O	O	-	See the manual for the remote communication module
129		The base location number is exceeding the proper setting range	O	O		Corsets the number in accordance with the proper range (See Section 4.2)
131		The slot location number is exceeding the proper setting range	O	O		Set the right number to the slot mounting the D/A conversion module
133		The module loaded isn't the D/A module	O	O		Mount the D/A conversion module to the specified slot
135		H/W error of the D/A conversion module	O	O		Contact the service station.
136		The D/A conversion module's shared memory error	O	O		Contact the service station.
137		The available channels are not specified	-	O		Make a correct specification of the available channel on the initialization function block
138		Test mode	O	O		Transmit the test mode to normal mode

Chapter 5. GM PROGRAMMING

5.1 Programming for Controlling Inverter Speed with 5 Step Analog Output Voltage

1) System Configuration



2) Initial Settings

(1) Enabled channel : channel 0

(2) Data input type specification :channel 0(-192 16191)

(3) Output condition of D/A conversion module when the CPU is stopping : minimum value output of the range.

(4) Offset : 0 V Gain :5 V

3) Descriptions of the Program

(1) %I0.0.0 turning On leads to the initial setting of D/A conversion

(2) %I0.0.1 turning On leads to output of "0"(O V) on channel 0.

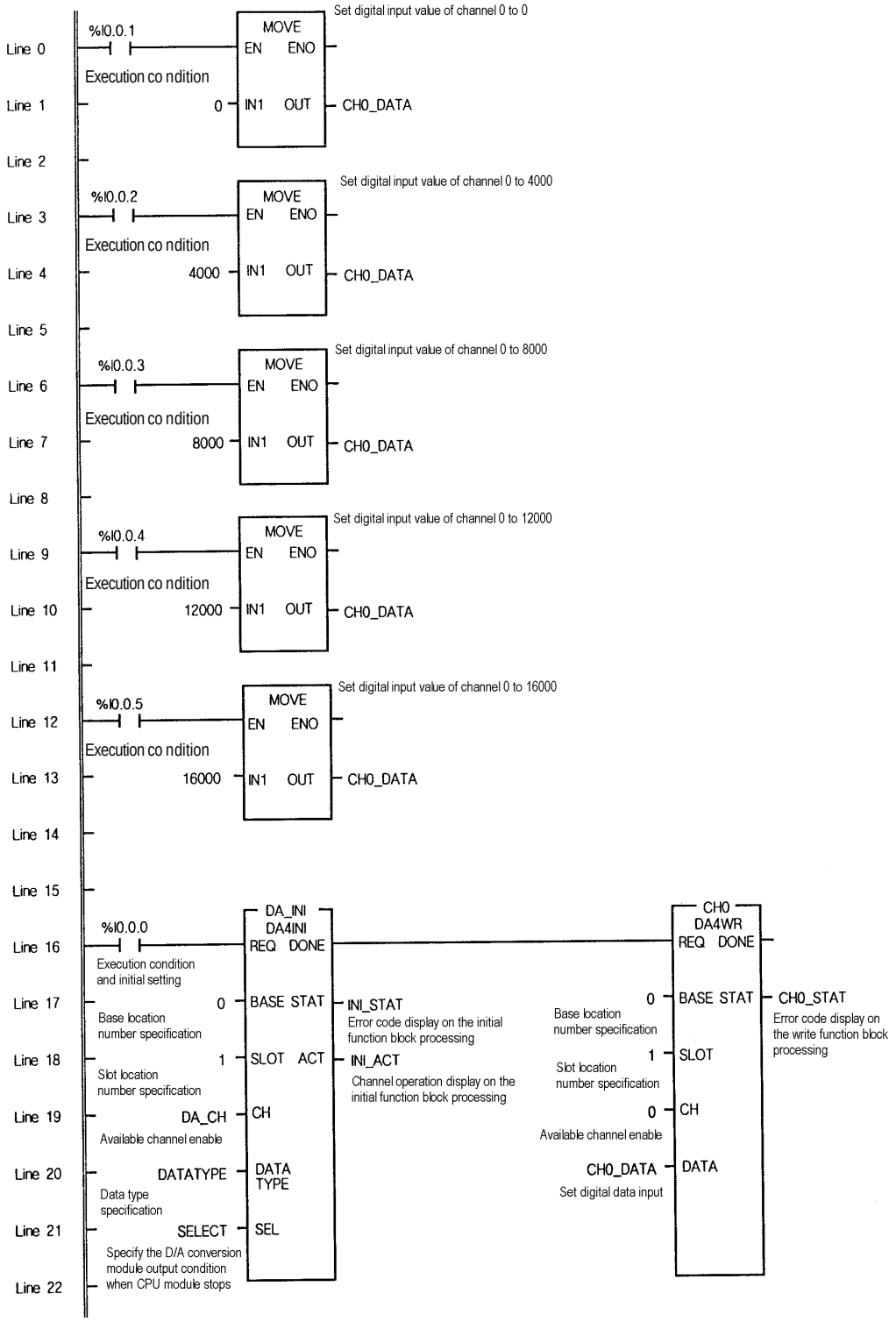
(3) %I0.0.2 turning On leads to output of "4000"(2.5 V) on channel 0

(4) %I0.0.3 turning On leads to output of "8000"(5 V) on channel 0.

(5) %I0.0.4 turning On leads to output of "12000"(7.5 V) on channel 0.

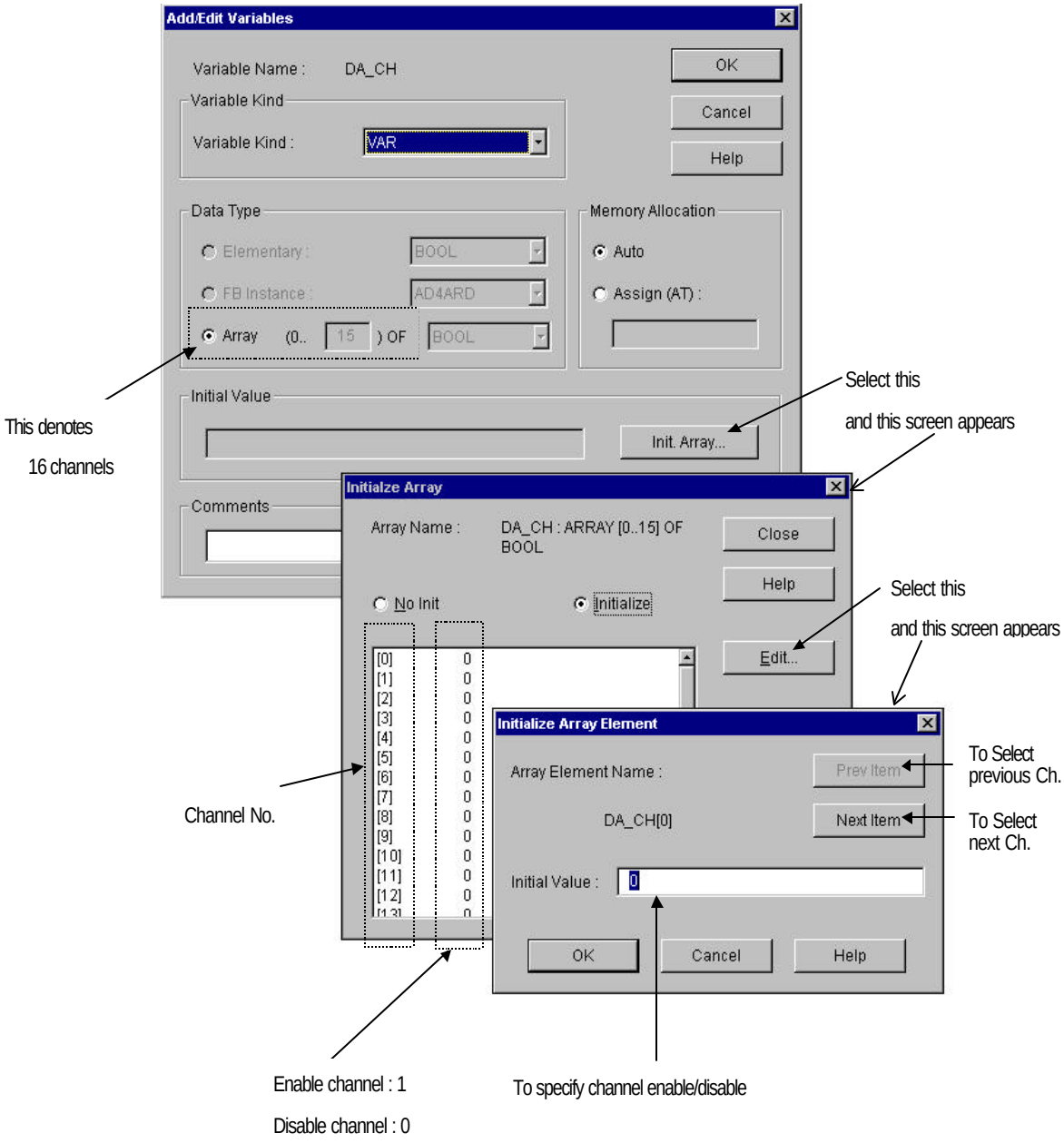
(6) %I0.0.5 turning On leads to output of "16000"(10 V) on channel 0.

4) Program

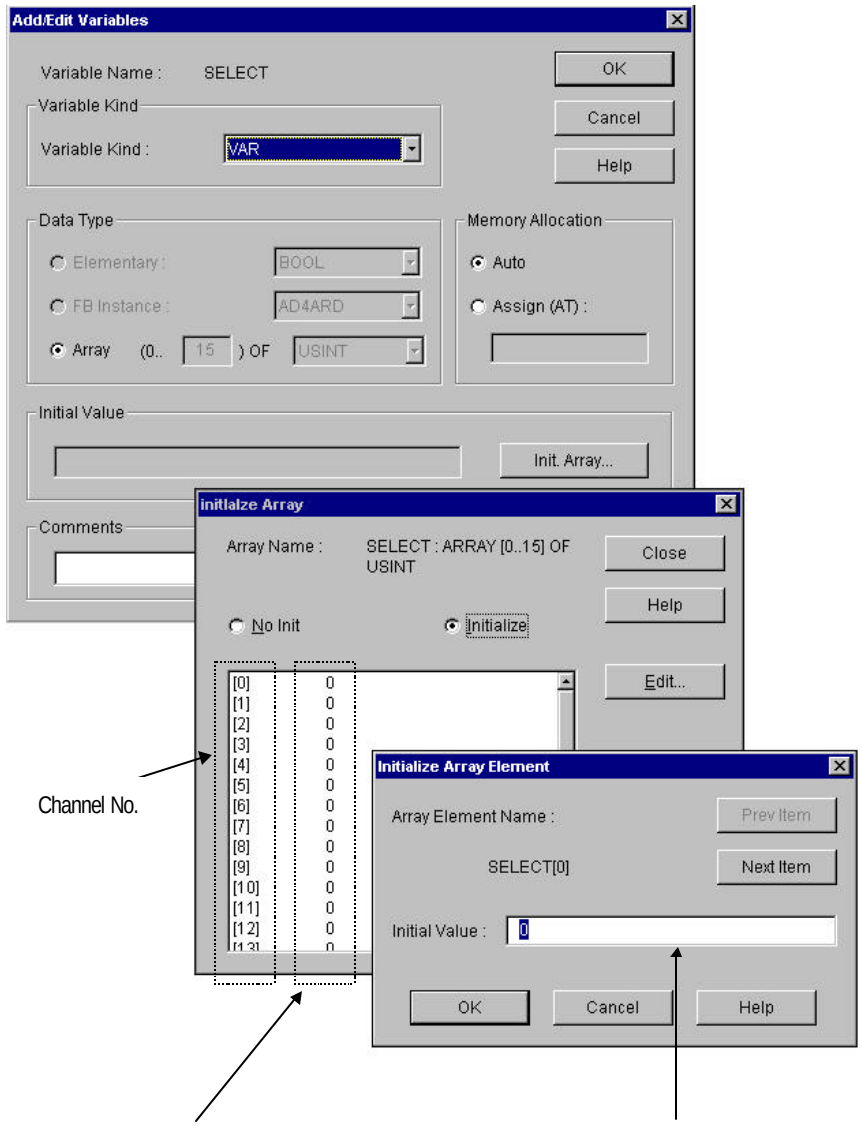

Line 0
%I0.0.1
MOVE
EN ENO
Set digital input value of channel 0 to 0
Execution co ndition
Line 1
0
IN1 OUT
CH0_DATA
Line 2
Line 3
%I0.0.2
MOVE
EN ENO
Set digital input value of channel 0 to 4000
Execution co ndition
Line 4
4000
IN1 OUT
CH0_DATA
Line 5
Line 6
%I0.0.3
MOVE
EN ENO
Set digital input value of channel 0 to 8000
Execution co ndition
Line 7
8000
IN1 OUT
CH0_DATA
Line 8
Line 9
%I0.0.4
MOVE
EN ENO
Set digital input value of channel 0 to 12000
Execution co ndition
Line 10
12000
IN1 OUT
CH0_DATA
Line 11
Line 12
%I0.0.5
MOVE
EN ENO
Set digital input value of channel 0 to 16000
Execution co ndition
Line 13
16000
IN1 OUT
CH0_DATA
Line 14
Line 15
Line 16
%I0.0.0
DA_INI
DA4INI
REQ DONE
Execution condition
and initial setting
Line 17
0
BASE STAT
INI_STAT
Error code display on the initial function block processing
Base location
number specification
Line 18
1
SLOT ACT
INI_ACT
Channel operation display on the initial function block processing
Slot location
number specification
Line 19
DA_CH
CH
Available channel enable
Line 20
DATATYPE
DATA TYPE
Data type
specification
Line 21
SELECT
SEL
Specify the D/A conversion module output condition when CPU module stops
Line 22
CH0
DA4WR
REQ DONE
0
BASE STAT
CH0_STAT
Error code display on the write function block processing
Base location
number specification
1
SLOT
Slot location
number specification
0
CH
Available channel enable
CH0_DATA
DATA
Set digital data input

5) Initial Value Setting of I/O Variables

(1) Channel specification (Array)



(2) When the CPU module stops, output condition of D/A conversion module is specified

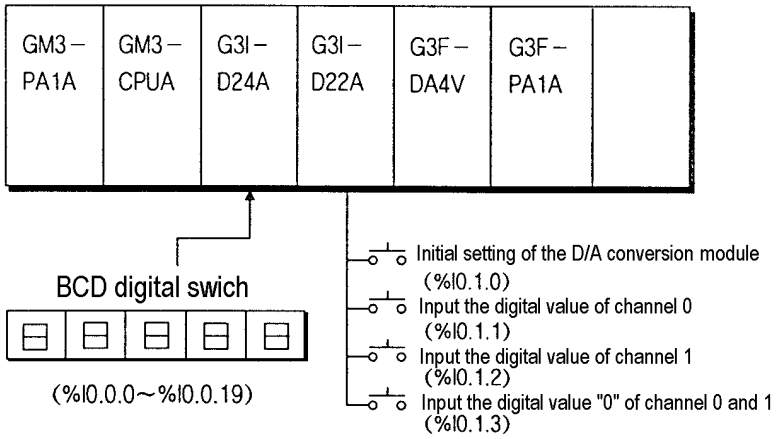


6) I/O Variables on Program

Variable Name	Var_Kind	Data Type	(AT Address) (Initial Value)
CH0	: VAR	: FB Instance	
CH0_DATA	: VAR	: INT	: =0
CH0_STAT	: VAR	: USINT	
DA_CH	: VAR	: ARRAY [0..15] OF BOOL	: = { 1,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0 }
DA_INI	: VAR	: FB Instance	
DATATYPE	: VAR	: ARRAY [0..15] OF BOOL	: = { 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0 }
INI_ACT	: VAR	: ARRAY [0..15] OF BOOL	
INI_STAT	: VAR	: USINT	
SELECT	: VAR	: ARRAY [0..15] OF USINT	: = { 3,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0 }

5.2 Programming for Displaying D/A Conversions which is Set by Digital Switch

1) System Configuration



2) Initial Settings

(1) Enabled channel : channel 0, 1

(2) Data input type specification : channel:0(-8192 8191), channel 1(-192 16191)

(3) Output condition of D/A conversion module when the CPU is stopping : medium value output of the range.

3) Descriptions of the Program

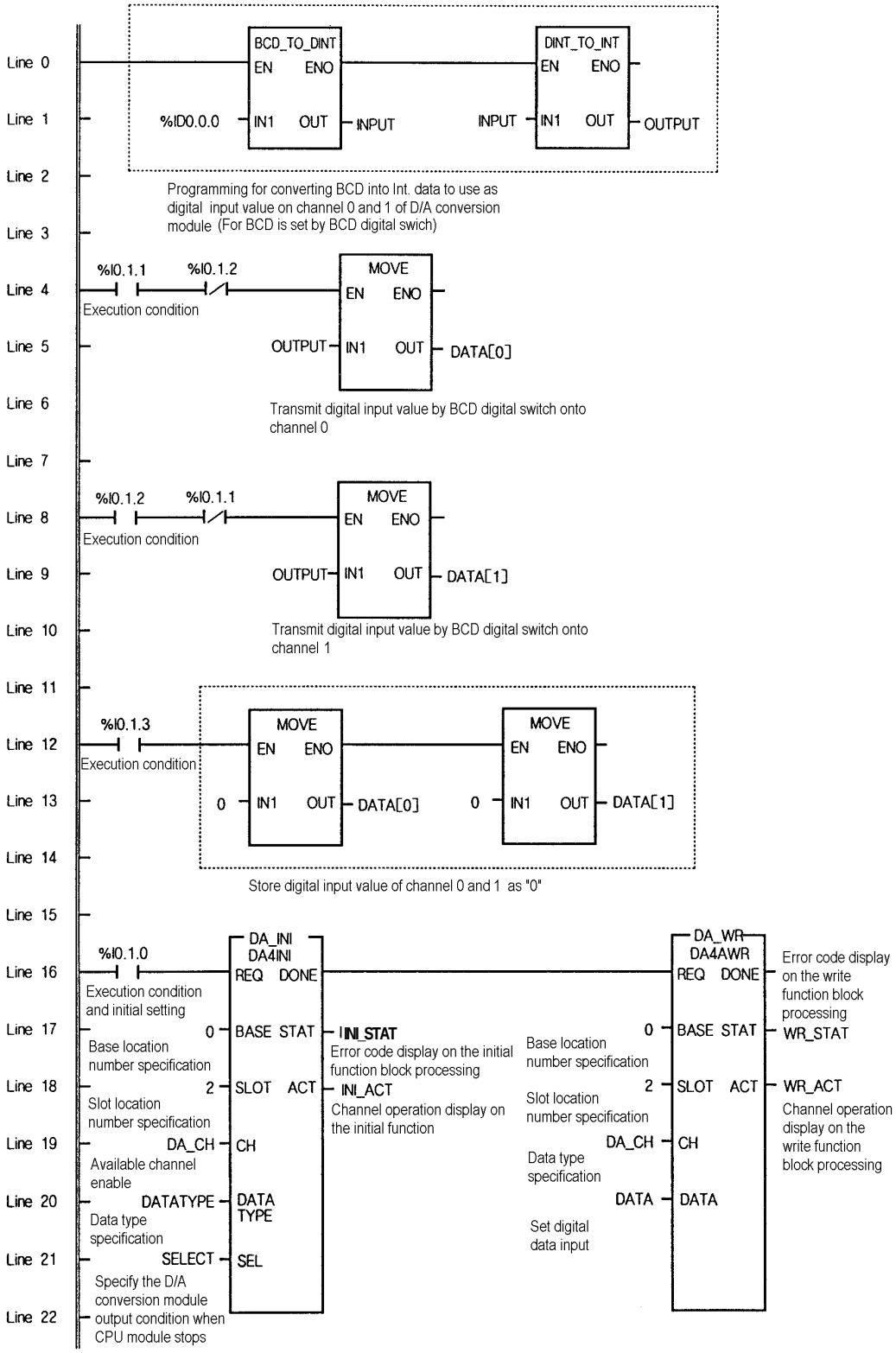
(1) %I0.1.0 turning On leads to the initial setting of D/A conversion

(2) %I0.1.1 turning On leads to output of the values by digital switch on channel 0 of D/A module.

(3) %I0.1.2 turning On leads to output on channel 1.

(4) %I0.1.3 turning On leads to initialization of digital input value to "0" on channel 0 and channel 1.

4) Program


Line 0
Line 1
Line 2
Line 3
Line 4
Line 5
Line 6
Line 7
Line 8
Line 9
Line 10
Line 11
Line 12
Line 13
Line 14
Line 15
Line 16
Line 17
Line 18
Line 19
Line 20
Line 21
Line 22
BCD_TO_DINT
EN ENO
%ID0.0.0
IN1 OUT
INPUT
DINT_TO_INT
EN ENO
INPUT
IN1 OUT
OUTPUT
Programming for converting BCD into Int. data to use as digital input value on channel 0 and 1 of D/A conversion module (For BCD is set by BCD digital swich)
%I0.1.1
%I0.1.2
Execution condition
MOVE
EN ENO
OUTPUT
IN1 OUT
DATA[0]
Transmit digital input value by BCD digital switch onto channel 0
%I0.1.2
%I0.1.1
Execution condition
MOVE
EN ENO
OUTPUT
IN1 OUT
DATA[1]
Transmit digital input value by BCD digital switch onto channel 1
%I0.1.3
Execution condition
MOVE
EN ENO
0
IN1 OUT
DATA[0]
MOVE
EN ENO
0
IN1 OUT
DATA[1]
Store digital input value of channel 0 and 1 as "0"
%I0.1.0
Execution condition and initial setting
DA_INI
DA4INI
REQ DONE
0
Base location number specification
BASE STAT
INI_STAT
Error code display on the initial function block processing
2
Slot location number specification
SLOT ACT
INI_ACT
Channel operation display on the initial function
DA_CH
Available channel enable
CH
DATATYPE
Data type specification
DATA TYPE
SELECT
Specify the D/A conversion module output condition when CPU module stops
SEL
DA_WR
DA4AWR
REQ DONE
Error code display on the write function block processing
0
Base location number specification
BASE STAT
WR_STAT
2
Slot location number specification
SLOT ACT
WR_ACT
Channel operation display on the write function block processing
DA_CH
Data type specification
CH
DATA
Set digital data input
DATA

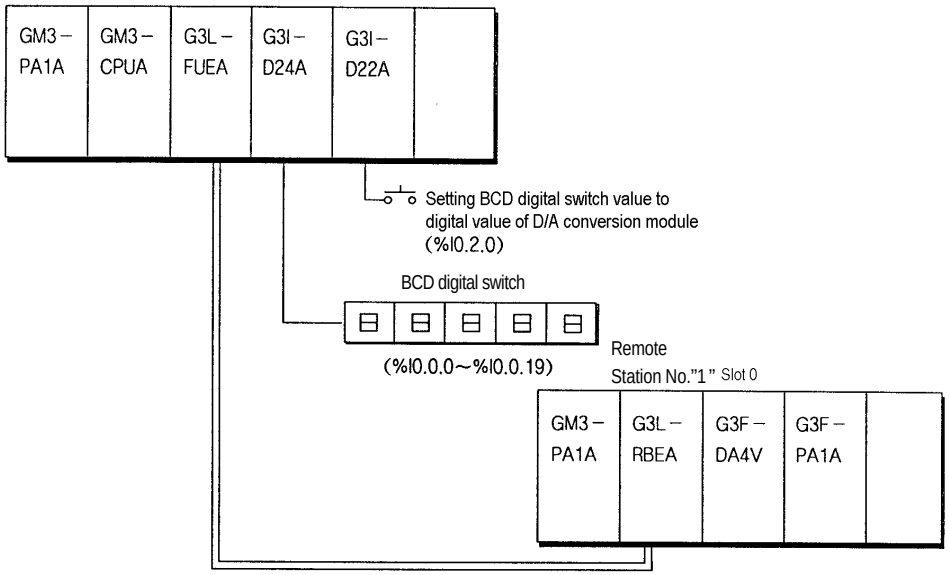
5) I/O Variables on Program

Variable Name	Var_Kind	Data Type	(AT Address) (Initial Value)
DA_CH	: VAR	: ARRAY [0..15] OF BOOL	: = { 1,1,0,0,0,0,0,0,0,0,0,0,0,0,0,0 }
DA_INI	: VAR	: FB Instance	
DA_WR	: VAR	: FB Instance	
DATA	: VAR	: FB Instance	
DATATYPE	: VAR	: ARRAY [0..15] OF INT	: = { 1,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0 }
INI_ACT	: VAR	: ARRAY [0..15] OF BOOL	
INI_STAT	: VAR	: USINT	
INPUT	: VAR	: DINT	
OUTPUT	: VAR	: INT	
SELECT	: VAR	: ARRAY [0..15] OF USINT	: = { 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0 }
WR_ACT	: VAR	: ARRAY [0..15] OF BOOL	
WR_STAT	: VAR	: USINT	

5.3 Programming for Mounting D/A Conversion Module on Remote I/O Station

This is programming for output D/A conversion value set by digital switch.

1) System Configuration



2) Initial Settings

(1) Enabled channel : channel 0,

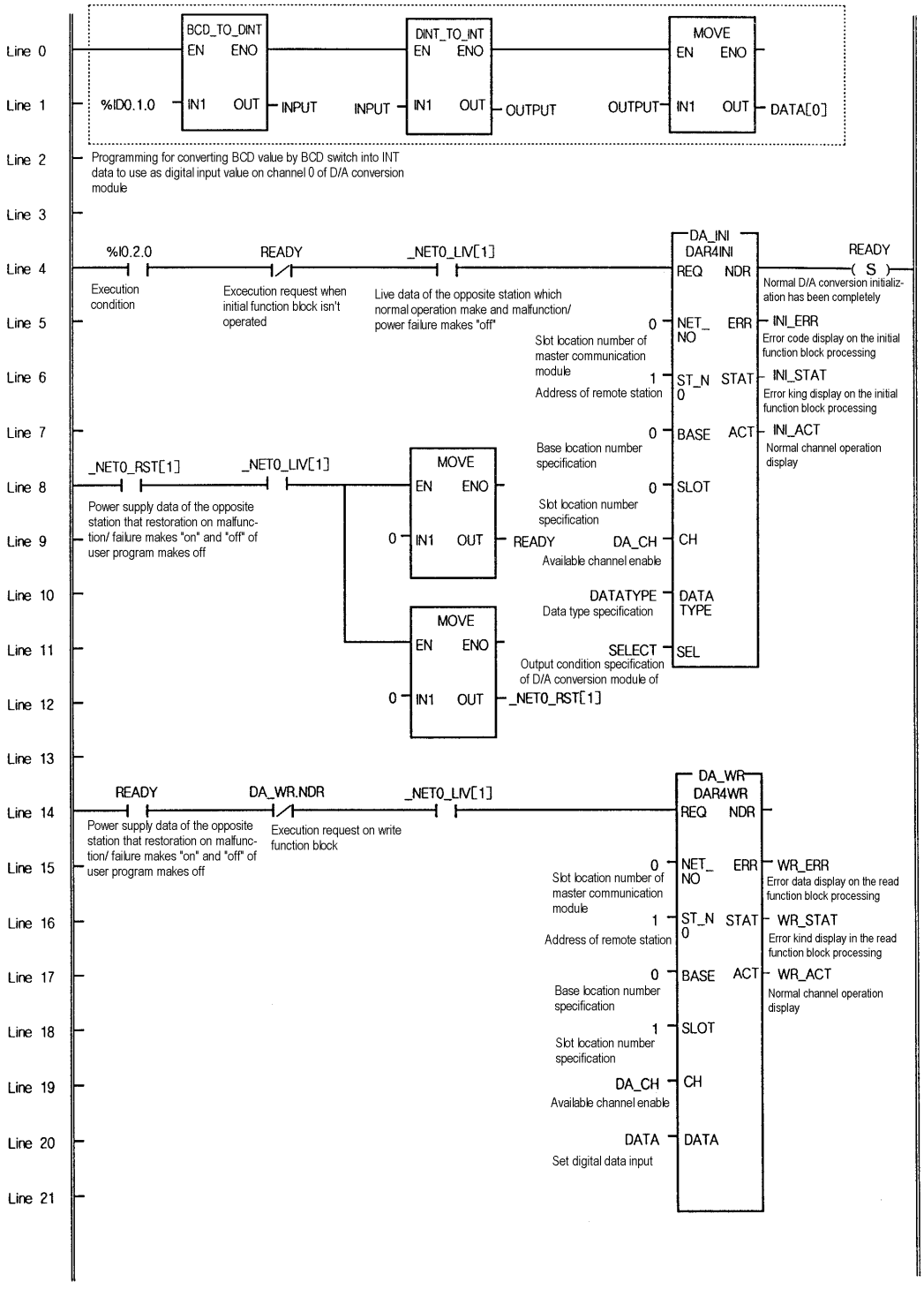
(2) Conversion data input type specification : channel 0(-192 16191)

(3) Output condition of D/A conversion module when the CPU is stopping : minimum value output of the range.

3) Descriptions of the Program

(1) %I0.2.0 turning On leads to displaying D/A conversion value set by digital switch on channel 0.

4) Program


Line 0
Line 1
Line 2
Line 3
Line 4
Line 5
Line 6
Line 7
Line 8
Line 9
Line 10
Line 11
Line 12
Line 13
Line 14
Line 15
Line 16
Line 17
Line 18
Line 19
Line 20
Line 21
BCD_TO_DINT
EN ENO
%ID0.1.0
IN1 OUT
INPUT
DINT_TO_INT
EN ENO
INPUT
IN1 OUT
OUTPUT
MOVE
EN ENO
OUTPUT
IN1 OUT
DATA[0]
Programming for converting BCD value by BCD switch into INT data to use as digital input value on channel 0 of D/A conversion module
%I0.2.0
Execution condition
READY
Excecution request when initial function block isn't operated
_NET0_LIV[1]
Live data of the opposite station which normal operation make and malfunction/ power failure makes "off"
DA_INI
DAR4INI
REQ NDR
READY
(S)
Normal D/A conversion initialization has been completely
0
NET_NO
ERR
INI_ERR
Error code display on the initial function block processing
Slot location number of master communication module
1
ST_N 0
STAT
INI_STAT
Error king display on the initial function block processing
Address of remote station
0
BASE
ACT
INI_ACT
Normal channel operation display
Base location number specification
_NET0_RST[1]
_NET0_LIV[1]
Power supply data of the opposite station that restoration on malfunction/ failure makes "on" and "off" of user program makes off
MOVE
EN ENO
0
IN1 OUT
READY
0
SLOT
Slot location number specification
DA_CH
CH
Available channel enable
DATATYPE
Data type specification
DATA TYPE
MOVE
EN ENO
SELECT
Output condition specification of D/A conversion module of
SEL
0
IN1 OUT
_NET0_RST[1]
READY
DA_WR.NDR
_NET0_LIV[1]
Power supply data of the opposite station that restoration on malfunction/ failure makes "on" and "off" of user program makes off
Execution request on write function block
DA_WR
DAR4WR
REQ NDR
0
NET_NO
ERR
WR_ERR
Error data display on the read function block processing
Slot location number of master communication module
1
ST_N 0
STAT
WR_STAT
Error kind display in the read function block processing
Address of remote station
0
BASE
ACT
WR_ACT
Normal channel operation display
Base location number specification
1
SLOT
Slot location number specification
DA_CH
CH
Available channel enable
DATA
DATA
Set digital data input

5) I/O Variables on Program

Variable Name	Var_Kind	Data Type	(AT Address) (Initial Value)
DA_CH	: VAR	: ARRAY [0..15] OF BOOL	: = { 1,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0 }
DA_INI	: VAR	: FB Instance	
DA_WR	: VAR	: FB Instance	
DATA	: VAR	: ARRAY [0..15] OF INT	: = { 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0 }
DATATYPE	: VAR	: ARRAY [0..15] OF BOOL	: = { 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0 }
INI_ACT	: VAR	: ARRAY [0..15] OF BOOL	
INI_ERR	: VAR	: BOOL	
INI_STAT	: VAR	: USINT	
INPUT	: VAR	: DINT	: = 0
OUTPUT	: VAR	: INT	: = 0
READY	: VAR	: BOOL	
SELECT	: VAR	: ARRAY [0..15] OF USINT	: = { 3,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0 }
WR_ACT	: VAR	: ARRAY [0..15] OF BOOL	
WR_ERR	: VAR	: BOOL	
WR_STAT	: VAR	: USINT	

Chapter 6. BUFFER MEMORY CONFIGURATION AND FUNCTIONS

The D/A conversion module has the buffer memory for communication of data with the PLC CPU.

6.1 Buffer Memory Configuration

This shows buffer memory configuration.

6.1.1 G3F-DA4V / G3F-DA4I

Address (decimal)	Descriptions	Detail Descriptions	Non-initialization	Remarks
0	Available channel specification	Bit On(1):channel enable Bit Off(0): channel disable	No allowance for use	read/write enable
1	Data input type specification	Bit On(1):-8192 8191 Bit Off(0):-192 16191	Set every channel to -192 16191	"
2	Digital input value specification to channel 0	Specify digital data for D/A conversion to these areas.	Digital data is specified to "8000".	"
3	Digital input value specification to channel 1			"
4	Digital input value specification to channel 2			"
5	Digital input value specification to channel 3			"
6	Digital input value specification to channel 4			"
7	Digital input value specification to channel 5			"
8	Digital input value specification to channel 6			"
9	Digital input value specification to channel 7			"
10	Digital input value specification to channel 8			"
11	Digital input value specification to channel 9			"
12	Digital input value specification to channel 10			"
13	Digital input value specification to channel 11			"
14	Digital input value specification to channel 12			"
15	Digital input value specification to channel 13			"
16	Digital input value specification to channel 14			"
17	Digital input value specification to channel 15			"
18	Specified output condition to Channel 0	When the CPU module is stopped, or the specified channel is disabled for conversion, output value has to be set these areas. "0":medium value of the range "1":previous value "2":maximum value "3":minimum value	"0" is set, and medium value remains.	"
19	Specified output condition to Channel 1			"
20	Specified output condition to Channel 2			"
21	Specified output condition to Channel 3			"
22	Specified output condition to Channel 4			"
23	Specified output condition to Channel 5			"
24	Specified output condition to Channel 6			"
25	Specified output condition to Channel 7			"

Address (decimal)	Descriptions	Detail Descriptions	Non-initialization	Remarks
26	Specified output condition to Channel 8	When the CPU module is stopped, or the specified channel is disabled for conversion, output value has to be set these areas. "0":medium value of the range "1":previous value "2":maximum value "3":minimum value	"0" is set, and medium value remains.	read/write enable
27	Specified output condition to Channel 9			"
28	Specified output condition to Channel 10			"
29	Specified output condition to Channel 11			"
30	Specified output condition to Channel 12			"
31	Specified output condition to Channel 13			"
32	Specified output condition to Channel 14			"
33	Specified output condition to Channel 15			"
34	SET data specification	Bit On(1): Update new setting value on address 0, 1 and 18 ~ 33 Bit Off(0):Remain pervious value on address 0, 1, 18 ~ 33	Process by non-specification	"
35	Channel operation data	Bit on(1):Operation Bit off(0):Operation stop	-	Read enable

6.1.2 G4F-DA1A

Address (decimal)	Descriptions	Detail Description	Non-initialization	Remarks
0	available channel enabled	On(1):channel enabled Off(0):channel disabled	No allowance for use	Read/write enable
1	Data type input specification	Bit on(1):-8192 8191 Bit off(0):-192 16191	-192 16191 set in every channel	"
2	Digital input to channel 0	Specify digital data for D/A conversion to these areas.	Set digital data to "8000"	"
3	Digital input to channel 1			"
4	Specified output condition to Channel 0	When the CPU module is stopped, or the specified channel is disabled for conversion, output value has to be set these areas. "0":medium value of the range	"0" is specified and medium value remains.	"
5	Specified output condition to Channel 1	"1":previous value "2":maximum value "3":minimum value		"
6	SET data specification	Bit On(1):Update new setting value on address 0, 1, 4 and 5 Bit Off(0): Remain previous value on address 0, 1, 4 and 5	non-specification process	"
7	Channel operation data	Bit On(1):Operation Bit Off(0):Operation stop	-	Read enable

6.2 Buffer Memory Function

▶ Each address of buffer memory has been occupied by one word, and it is displayed as 16 Bit.

▶ Each address is composed of 16 Bit, and each Bit can be executed by specifying Bit on to 1 or Bit off to 0.

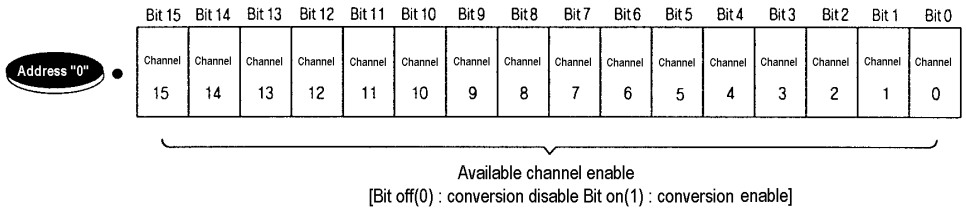
6.2.1 Available Channel Specification (G3F-DA4V/ G3F-DA4I: address 0, G4F-DA1A :address 0)

1) D/A conversion enable/disable can be specified to each channel.

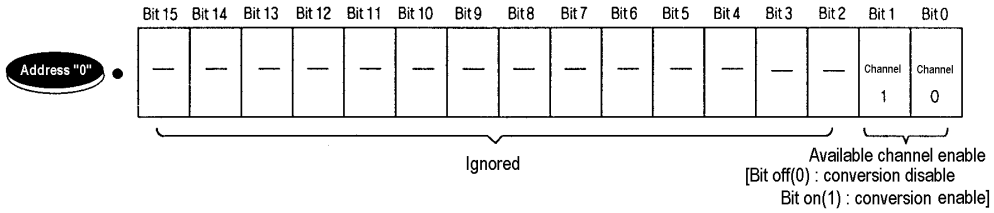
2) If enable channel isn't specified, every channel comes to be disabled

3) D/A conversion enable/disable is as follows.

(1) G3F-DA4V / G3F-DA4I



(2) G4F-DA1A



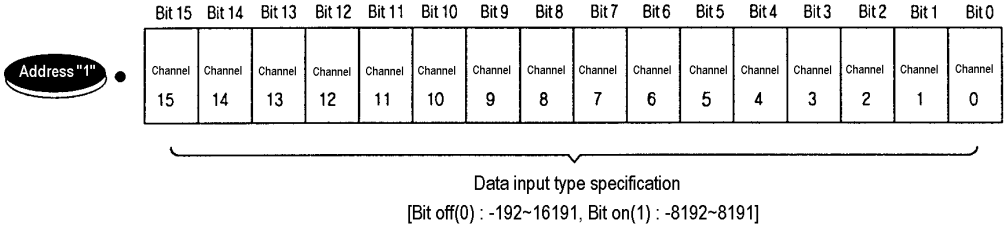
6.2.2 Data Input Type Specification (G3F-DA4V / G3F-DA4I :address 1, G4F-DA1A: address 1)

1) Digital data input type can be specified to every channel.

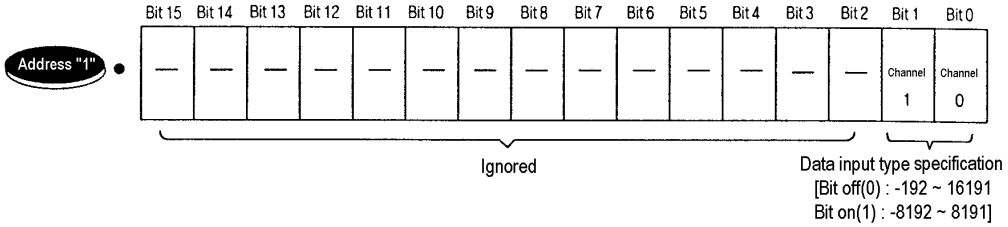
2) When data input type isn't specified, every channel will be set to the range -192 to 19161

3) Data input type specification is as follows

(1) G3F-DA4V / G3F-DA4I



(2) G4F-DA1A



6.2.3 Digital Input (G3F-DA4V / G3F-DA4I : addresses 2 to 17, G4F-DA1A: addresses 2, 3)

1) Digital input value can be used within the range -192 to 16191 or -8192 to 8191 according to the data input type specification(address 1)

2) When digital input value isn't set, digital input value has to be set to 8000.

6.2.4 Specification of CPU Module's Stop Condition or disabled Channel's Output Condition

(G3F-DA4V / G3F-DA4I :addresses 18 to 33, G4F-DA1A :addresses 4, 5)

1) When CPU module is stop, or channel is disabled, analog output value on terminal block is written onto these addresses.

2) Output condition according to set value is as follows.

Set value	Output condition
0	Output of the medium value of setting range.
1	The previous value remains.
2	Output of the maximum value of setting range.
3	Output of the minimum value of setting range.
Excess range	Set value condition remains in the former range before exceeded

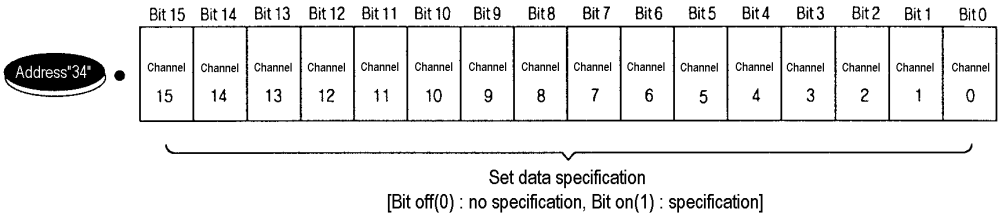
6.2.5 SET Data Specification (G3F-DA4V/G3F-DA4I : address 34, G4F-DA1A: address 6)

1) With each channel Bit turning On(1) on SET data address, the G3F-DA4V / G3F-DA4I which a user has set are executed for the D/A conversion to the data of address 0,1,18 33, G4F-DA1A which a user has set is executed for the D/A conversion to the data of address 0,1,4,5.

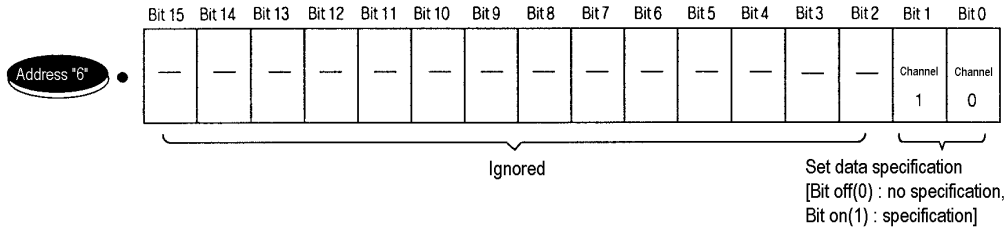
2) Without each channel Bit turning On(1) on SET data address, the D/A module which a user has set isn't executed for D/A conversion but the module is executed for D/A conversion to the previous set data.

3) SET data specification is as follows.

(1) G3F-DA4V / G3F-DA4I



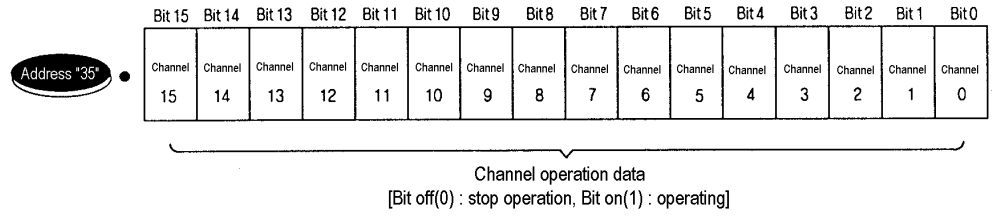
(2) G4F-DA1A



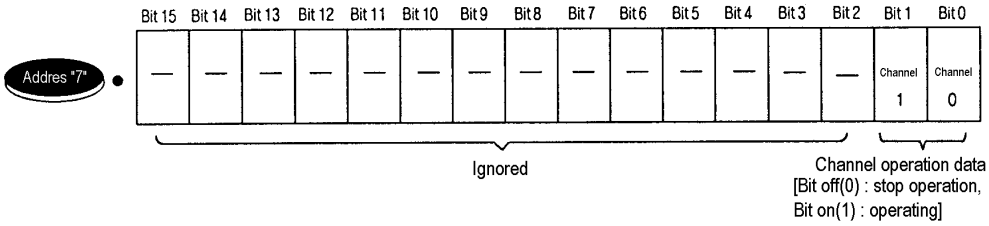
6.2.6 Channel Operation Data Area (G3F-DA4V/G3F-DA4I :address 35, G4F-DA1A :address 7)

The operation data of each channel is stored to this area

(1) G3F-DA4V / G3F-DA4I



(2) G4F-DA1A



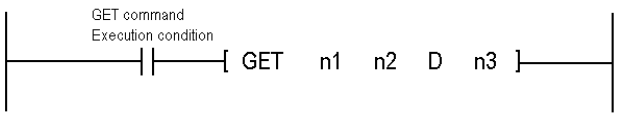
Chapter 7. SPECIAL MODULE COMMAND(BUFFER MEMORY READ/WRITE)

D/A conversion module occupies 16 I/O points.

7.1 LOCAL COMMAND

7.1.1 Buffer Memory Read -GET, GETP Command

<Format>

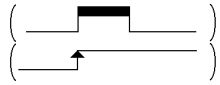


Symbol	Descriptions	Device used
N1	Slot number assigned to special module	Integer
N2	Head address of buffer memory of special module which stores data to read	Integer
D	Head address of device which stores data to read.	M, P, K, L, T, C, D, #D
N3	Number of words of data to read	Integer

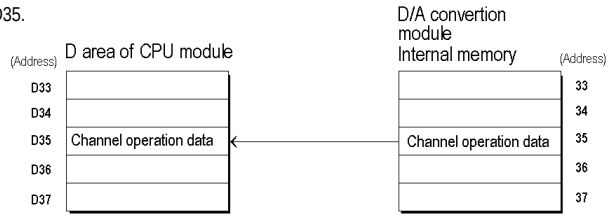
< Distinction of GET and GETP>

GET: Continuously executes read while the read signal is on.

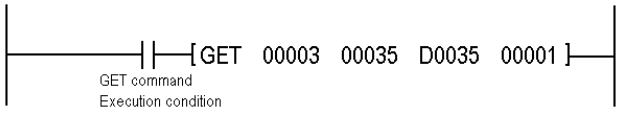
GETP: Execute read by switching on the read signal.



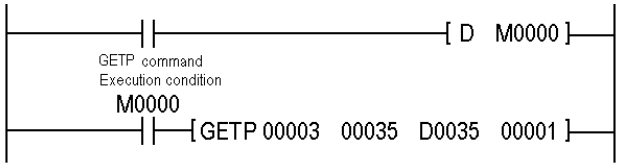
ex1) D/A conversion module is mounted on the slot 3 of base, and data from the buffer memory address 35 is read to the CPU module D35.



<GET>

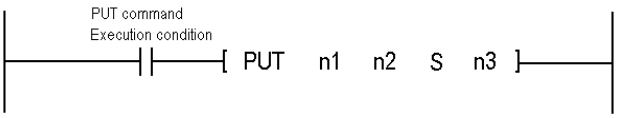


<GETP>



7.1.2 Buffer Memory Write - PUT, PUTP Command

<Format>

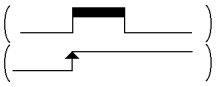


Symbol	Descriptions	Device used
n1	Slot number assigned to special module	Integer
n2	Head address of buffer memory of special module which stores data to write.	Integer
D	Head address of device which stores data to write.	M, P, K, L, T, C, D, #D
n3	Number of words of data to write	Integer

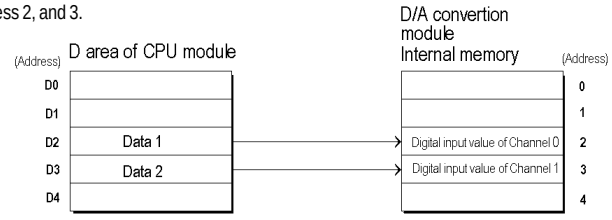
<Distinction of PUT and PUTP>

PUT : Continuously executes write while the write signal is on.

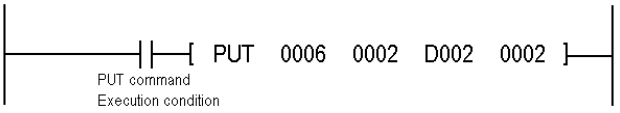
PUTP : Execute write by switching on the write signal.



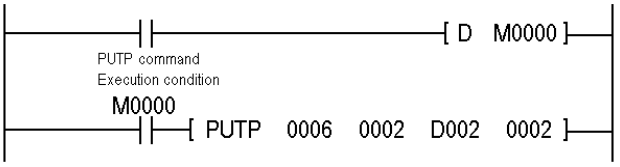
ex1) D/A conversion module is mounted on the slot 6 of base, and data from the CPU module D2 and D3 is written to the buffer memory address 2, and 3.



<PUT>



<PUTP>



7.2 REMOTE COMMAND

7.2.1 Buffer Memory Read- RGET

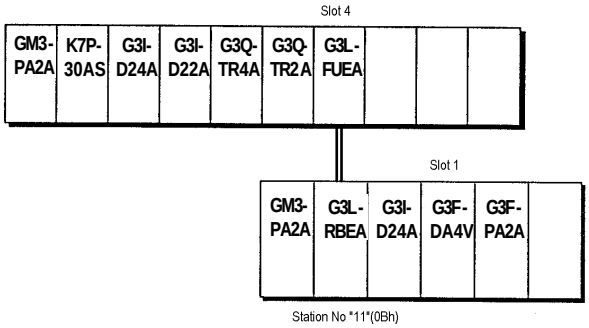
<Format>

Symbol	Descriptions		Device used
Sl	A B | C D Upper (8bit) Lower (8bit)	Upper(AB) : the code value of D/A conversion module G3F-DA4I:01h, G3F-DA4V : 02h G4F-DA1A : 81h Lower(CD) : the slot number of communication module of the master station(FUEA). setting range: 0 to 7	Integer
St	E F | G H Upper (8bit) Lower (8bit)	Upper(EF) : Slot number of D/A conversion module of remote station. setting range: 0 to 31 Lower(GH) : Address number communication module of remote station(RBEA). setting range :0 to 63	Integer
D	Head address of device which stores data to read.		M, P, K, L, T, C, D, #D
S	Head address of special module which stores data to read.		Integer
n	Number of words of data to read		Integer, D
SS	condition data display space of link		M, P, K, L, T, C, D, #D

REMARK

To read buffer memory data of D/A conversion module with RGET command, configure the program so that execution condition of 0 will be changed into 1 on rising edge.
Otherwise, buffer memory data of D/A conversion module won't be read

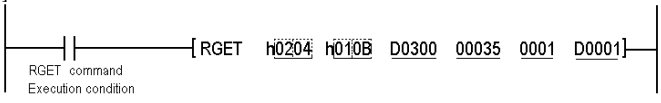
[Configration]



[Buffer memory read]

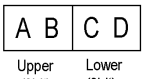
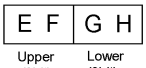
1) Read buffer memory address 35(1 word) which the channel operation data of D/A conversion module is stored.
2) Store read data to the next D300
3) Store the data of communication condition to D1.

[Program]



7.2.2 Buffer Memory Write –RPUT

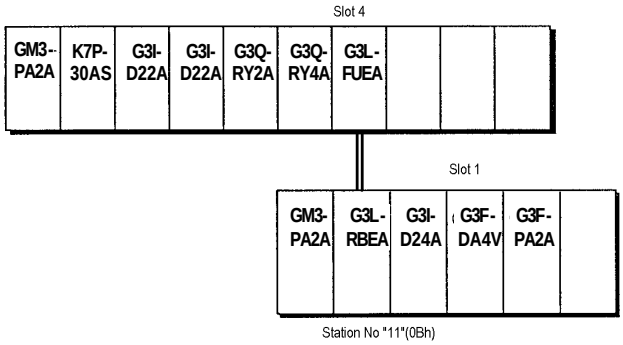
<Format>

Symbol	Descriptions		Device used
Sl		Upper(AB) : the code value of D/A conversion module G3F-DA4I : 01h, G3F-DA4V :02h G4F-DA1A : 81h Lower(CD) : the slot number of communication module of the master station(FUEA). Setting range: 0 to 7	Integer
St		Upper(EF): Slot number of D/A conversion module of remote station. Setting range: 0 to 31 Lower(GH):Address number of communication module of remote station(RBEA). setting range :0 to 63	Integer
S	Head address of special module which stores data to write.		Integer
D	Head address of device which stores data to write.		M, P, K, L, T, C, D, #D
n	Number of words of data to write.		Integer, D
Ss	Condition data display space of link		M, P, K, L, T, C, D, #D

REMARK

To write on buffer memory data of D/A conversion module with RPUT command, configure the program so that execution condition of 0 will be changed into 1 on rising edge.
Otherwise buffer memory data of D/A conversion module won't be updated

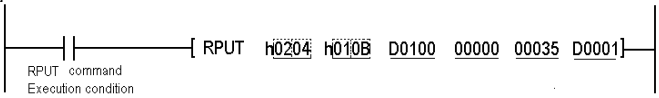
[Configration]



[Buffer memory write]

1) Write data on D100 to D134(35words) of the CPU module device
2) onto buffer memory address 0 to 34 of D/A conversion module
3) and store the data of communication to D0.

[Program]

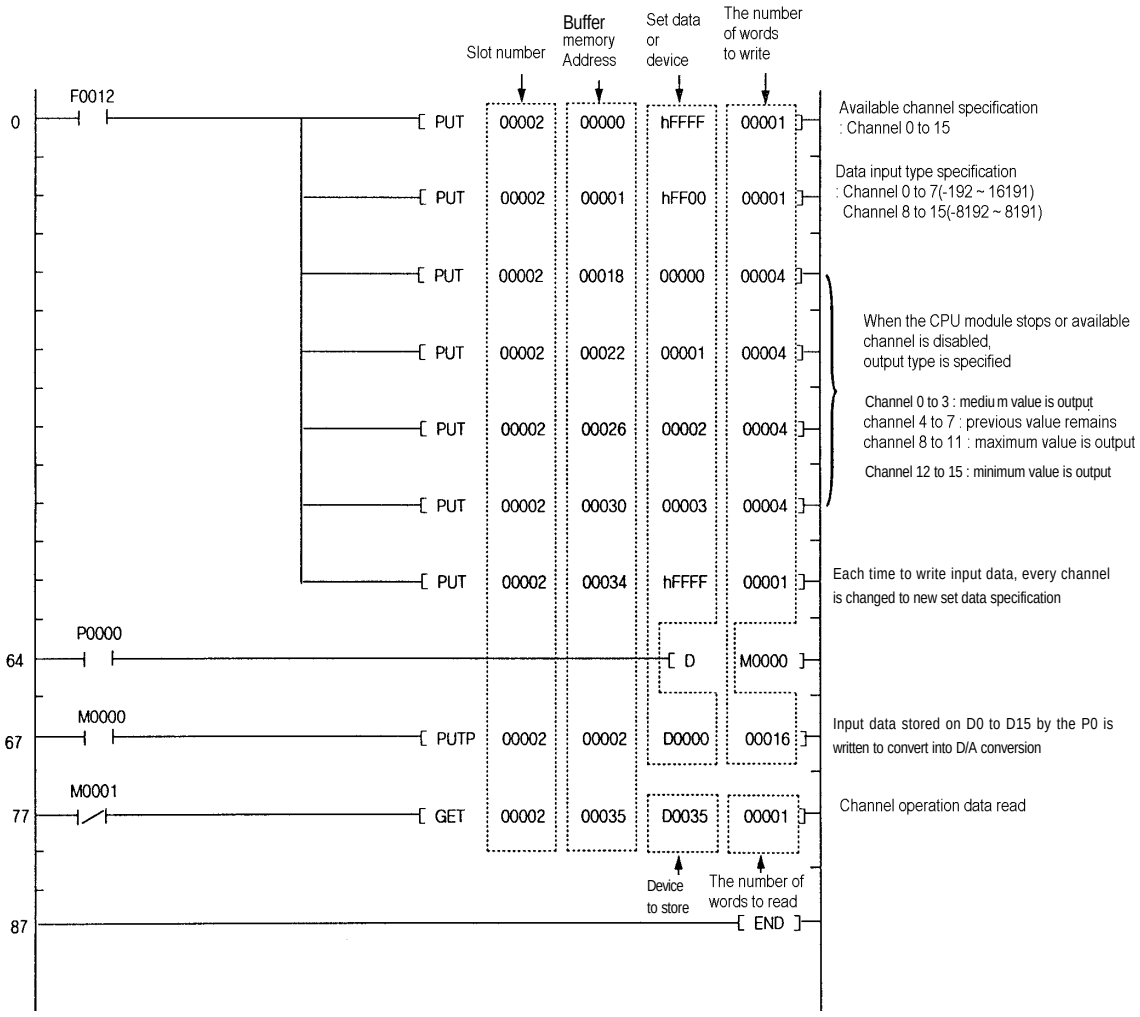


Chapter 8. MK PROGRAMMING

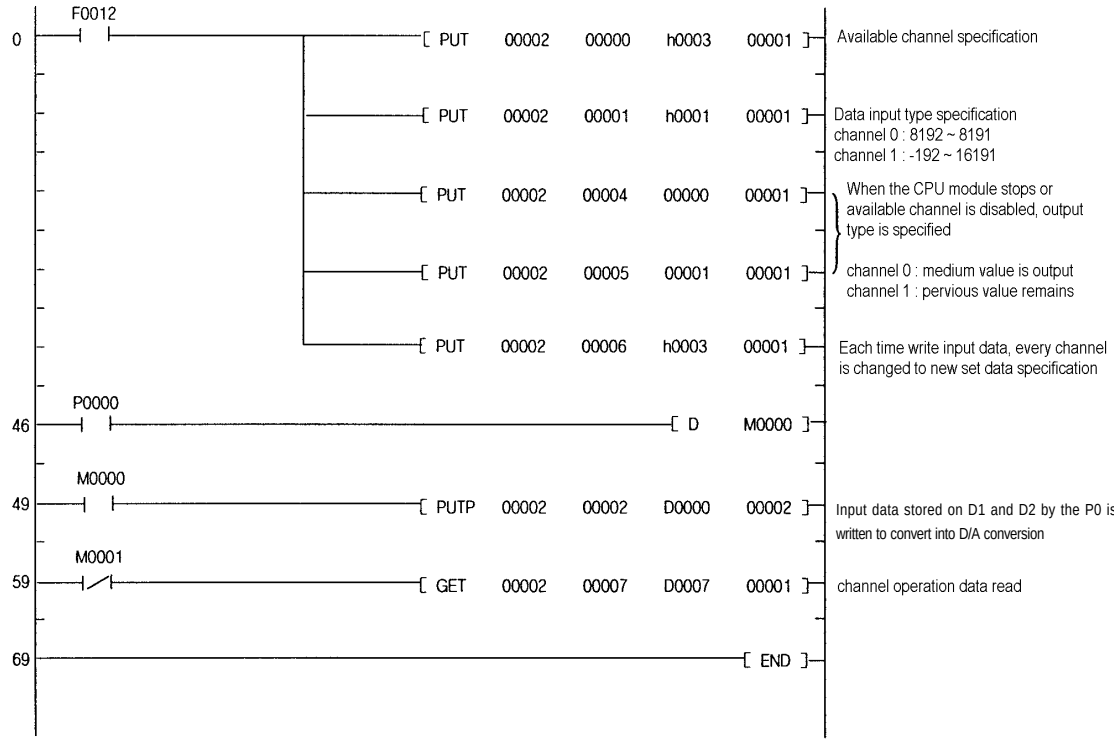
8.1 BASIC PROGRAMMING

- This shows the method of operation condition setting for internal memory on the D/A conversion module.
- The D/A conversion module is mounted on the slot 2.
- D/A conversion module occupies 16 I/O points.

8.1.1 G3F-DA4V / G3F-DA4I



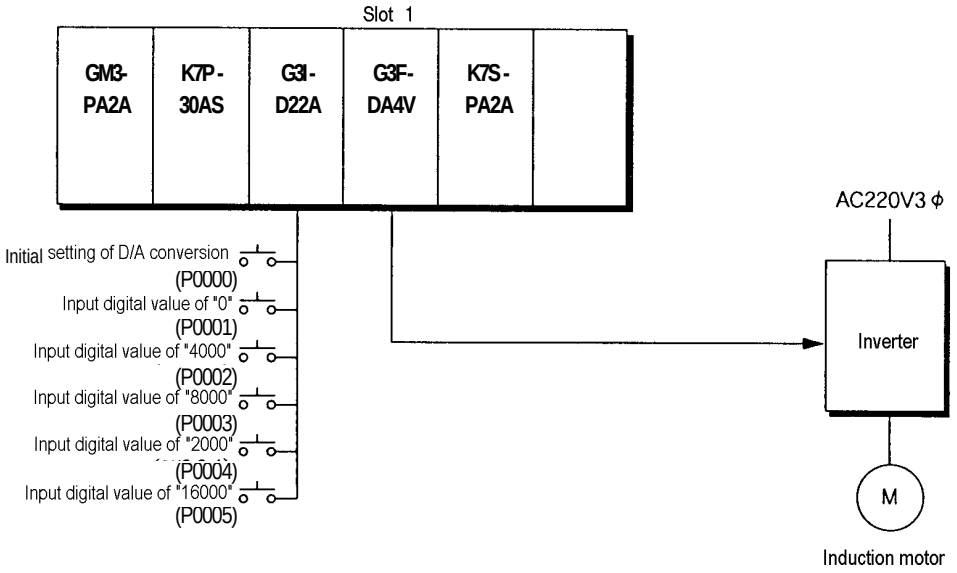
8.1.2 G4F - DA1A


F0012
0
[PUT 00002 00000 h0003 00001]
Available channel specification
[PUT 00002 00001 h0001 00001]
Data input type specification
channel 0 : 8192 ~ 8191
channel 1 : -192 ~ 16191
[PUT 00002 00004 00000 00001]
When the CPU module stops or available channel is disabled, output type is specified
[PUT 00002 00005 00001 00001]
channel 0 : medium value is output
channel 1 : pervious value remains
[PUT 00002 00006 h0003 00001]
Each time write input data, every channel is changed to new set data specification
P0000
46
[D M0000]
M0000
49
[PUTP 00002 00002 D0000 00002]
Input data stored on D1 and D2 by the P0 is written to convert into D/A conversion
M0001
59
[GET 00002 00007 D0007 00001]
channel operation data read
69
[END]

8.2 Application Programming

8.2.1 Programming for Controlling Inverter Speed with 5-step Analog Output Voltage

1) System Configuration



2) Initial Settings

(1) Enabled channel : channel 0

(2) Data input type specification :channel 0(-192 16191)

(3) Output condition of D/A conversion module when the CPU is stopping : minimum value output of the range.

(4) Offset : 0 V Gain :5 V

3) Descriptions of the Program

(1) P0000 turning On leads to the initial setting of D/A conversion

(2) P0001 turning On leads to output of "0"(0 V) on channel 0.

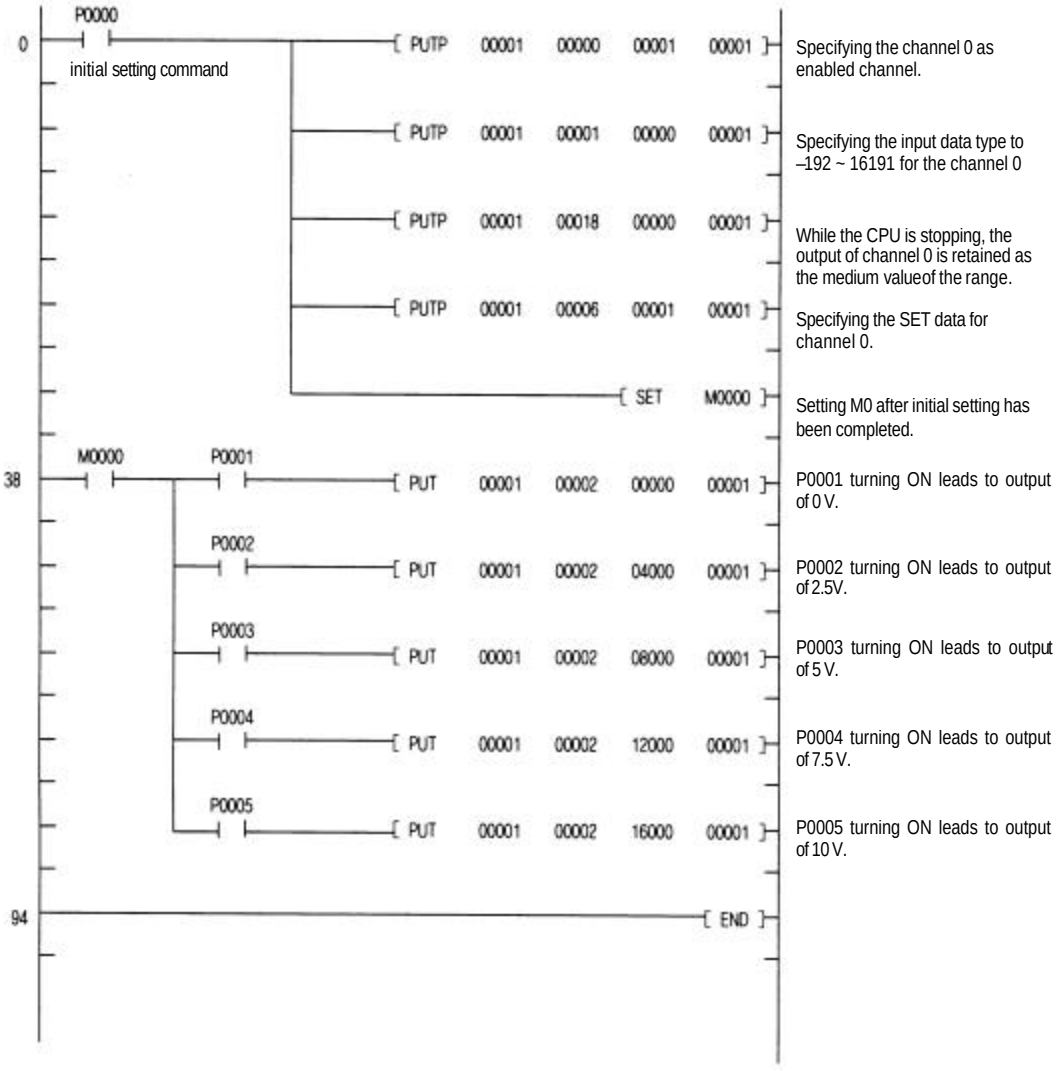
(3) P0002 turning On leads to output of "4000"(2.5 V) on channel 0

(4) P0003 turning On leads to output of "8000"(5 V) on channel 0.

(5) P0004 turning On leads to output of "12000"(7.5 V) on channel 0.

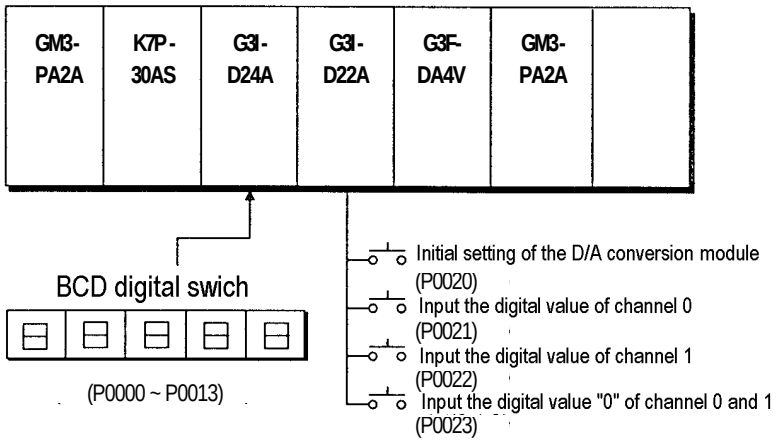
(6) P0005 turning On leads to output of "16000"(10 V) on channel 0.

4) Program


P0000
0
initial setting command
PUTP 00001 00000 00001 00001
PUTP 00001 00001 00000 00001
PUTP 00001 00018 00000 00001
PUTP 00001 00006 00001 00001
SET M0000
M0000
P0001
38
PUT 00001 00002 00000 00001
P0002
PUT 00001 00002 04000 00001
P0003
PUT 00001 00002 08000 00001
P0004
PUT 00001 00002 12000 00001
P0005
PUT 00001 00002 16000 00001
94
END
Specifying the channel 0 as enabled channel.
Specifying the input data type to –192 ~ 16191 for the channel 0
While the CPU is stopping, the output of channel 0 is retained as the medium value of the range.
Specifying the SET data for channel 0.
Setting M0 after initial setting has been completed.
P0001 turning ON leads to output of 0 V.
P0002 turning ON leads to output of 2.5V.
P0003 turning ON leads to output of 5 V.
P0004 turning ON leads to output of 7.5 V.
P0005 turning ON leads to output of 10 V.

8.2.2 Programming for Displaying D/A Conversions which is Set by Digital Switch

1) System Configuration



2) Initial Settings

(1) Enabled channel : channel 0, 1

(2) Data input type specification : channel:0(-8192 8191), channel 1(-192 16191)

(3) Output condition of D/A conversion module when the CPU is stopping : medium value output of the range.

3) Descriptions of the Program

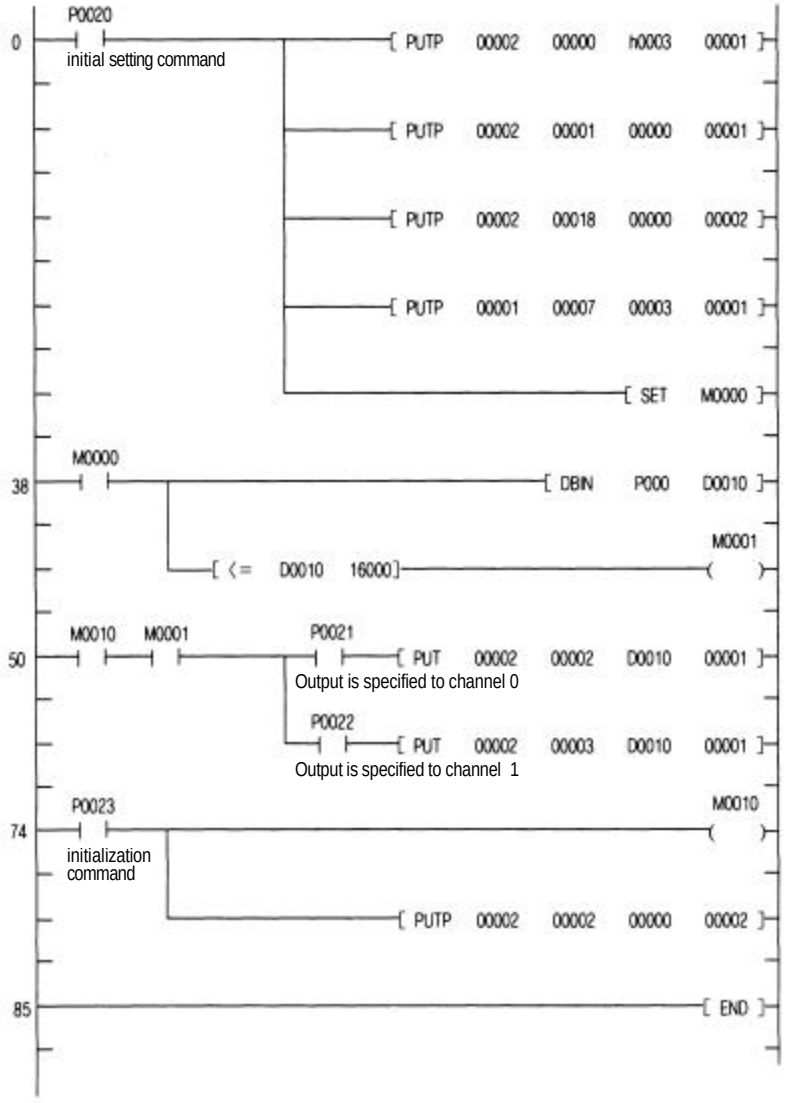
(1) P0020 turning On leads to the initial setting of D/A conversion

(2) P0021 turning On leads to output of the values by digital switch on channel 0 of D/A module.

(3) P0022 turning On leads to output on channel 1.

(4) P0023 turning On leads to initialization of digital input value to "0" on channel 0 and channel 1.

4) Program



Specifying the channels 0 and 1 as enabled channels

Specifying the input data type to –192 ~ 16191

While the CPU is stopping, the outputs of channels 0 and 1 are retained as the medium value of the range.

Specifying the SET data for channels 0 and 1

Setting M0 after initial setting has been completed.

Storing the value input by the BCD digital switch to D10.

If D10 is equal to or less than 16000, M1 is set to ON.

P21 turning On makes the data of D10 output to the channel 0 of the D/A conversion module.

P22 turning On makes the data of D10 output to the channel 1 of the D/A conversion module.

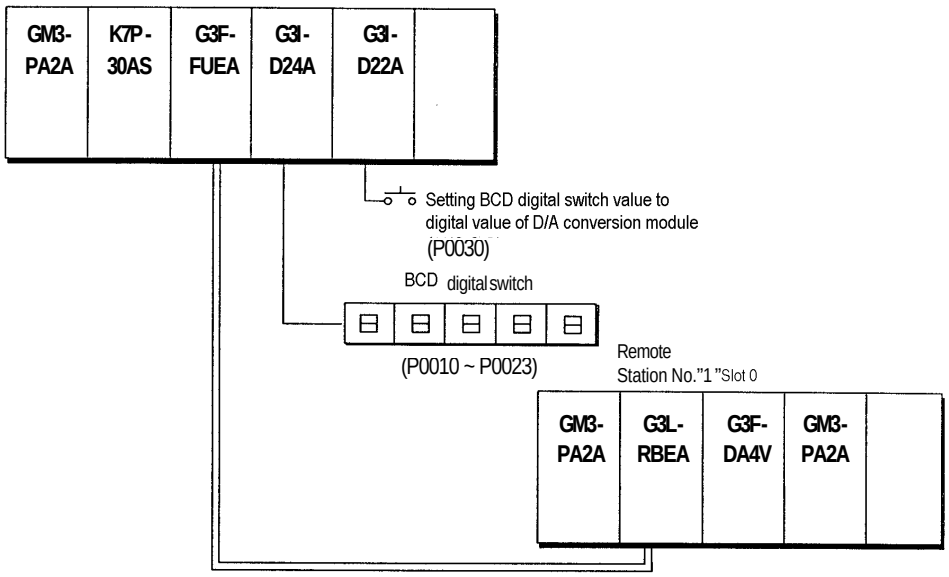
When a initialization command is given, output commands for channels 0 and 1 are disabled.

P23 turning On makes digital input values to the channels 0 and 1 of the D/A conversion module to be 0.

8.2.3 Programming for Mounting D/A Conversion Module on Remote I/O Station

This is programming for output D/A conversion value set by digital switch.

1) System Configuration



2) Initial Settings

(1) Enabled channel : channel 0,

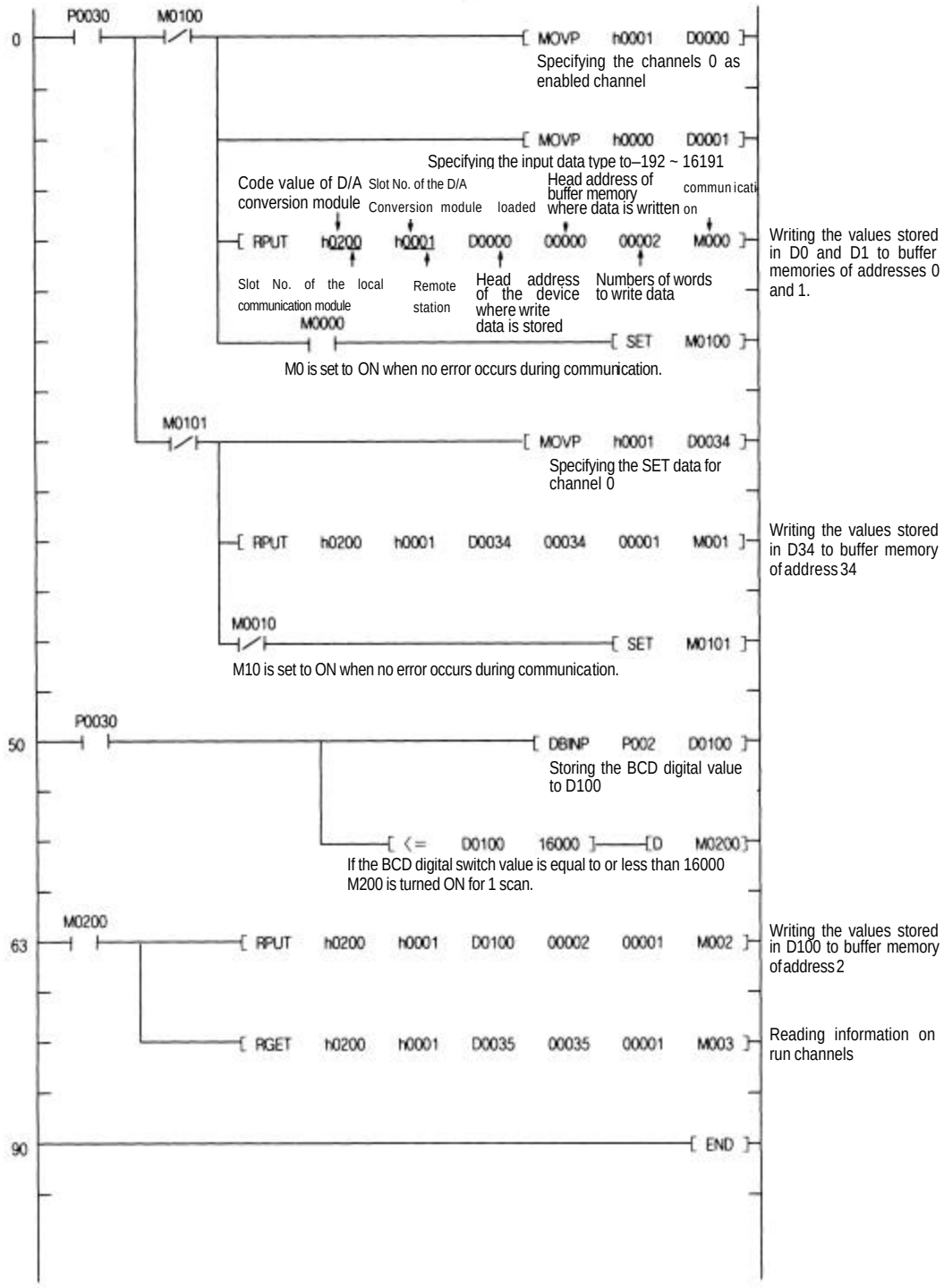
(2) Conversion data input type specification : channel 0(-192 16191)

(3) Output condition of D/A conversion module when the CPU is stopping : minimum value output of the range.

3) Descriptions of the Program

(1) P0030 turning On leads to displaying D/A conversion value set by digital switch on channel 0.

4) Program


P0030
M0100
0
MOVP h0001 D0000
Specifying the channels 0 as enabled channel
MOVP h0000 D0001
Specifying the input data type to–192 ~ 16191
Code value of D/A conversion module
Slot No. of the D/A Conversion module loaded
Head address of buffer memory where data is written
communicati
RPUT h0200 h0001 D0000 00000 00002 M000
Slot No. of the local communication module
Remote station
Head address of the device where write data is stored
Numbers of words to write data
Writing the values stored in D0 and D1 to buffer memories of addresses 0 and 1.
M0000
SET M0100
M0 is set to ON when no error occurs during communication.
M0101
MOVP h0001 D0034
Specifying the SET data for channel 0
RPUT h0200 h0001 D0034 00034 00001 M001
Writing the values stored in D34 to buffer memory of address 34
M0010
SET M0101
M10 is set to ON when no error occurs during communication.
P0030
50
DBINP P002 D0100
Storing the BCD digital value to D100
< = D0100 16000
D M0200
If the BCD digital switch value is equal to or less than 16000 M200 is turned ON for 1 scan.
M0200
63
RPUT h0200 h0001 D0100 00002 00001 M002
Writing the values stored in D100 to buffer memory of address 2
RGET h0200 h0001 D0035 00035 00001 M003
Reading information on run channels
90
END

Chapter 9. TROUBLESHOOTING

This section shows the descriptions of the error code and troubleshooting during use of the D/A conversion module.

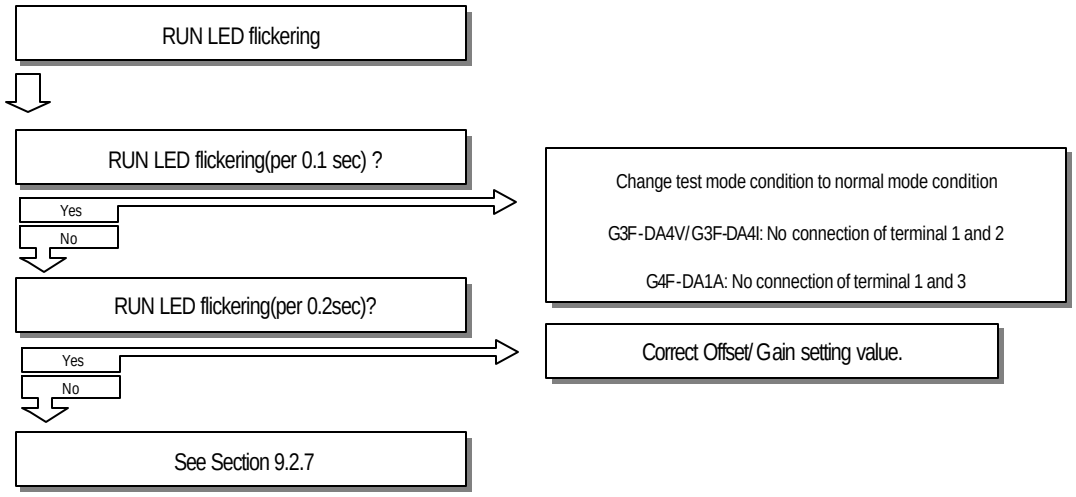
9.1 Error Code Indicated by RUN LED Flickering

This part shows the descriptions of the error code on flickering of RUN LED of D/A conversion module.

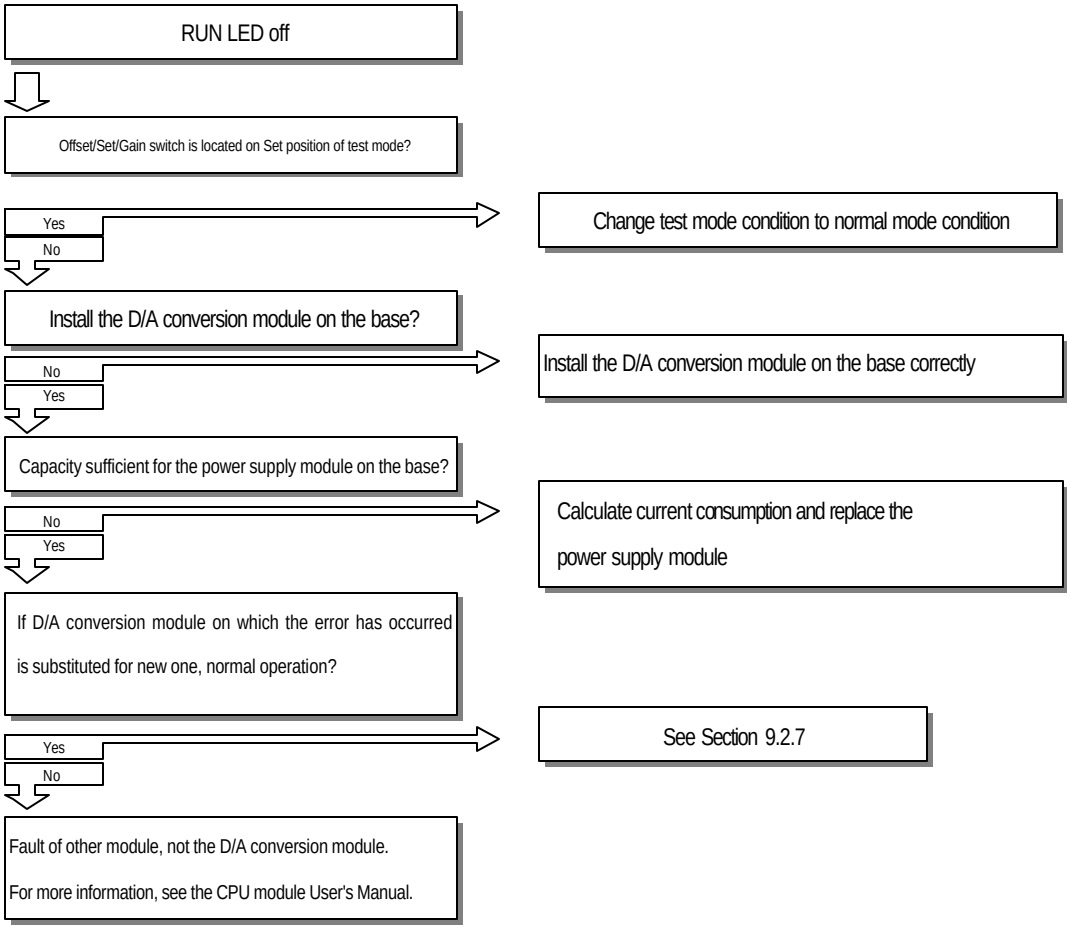
RUN LED	Descriptions	Remark
Flickers(per 0.1sec)	WDT error	
Flickers(per 0.2sec)	System error	
	Buffer memory error	
	Offset/Gain setting error	

9.2 Troubleshooting Procedure

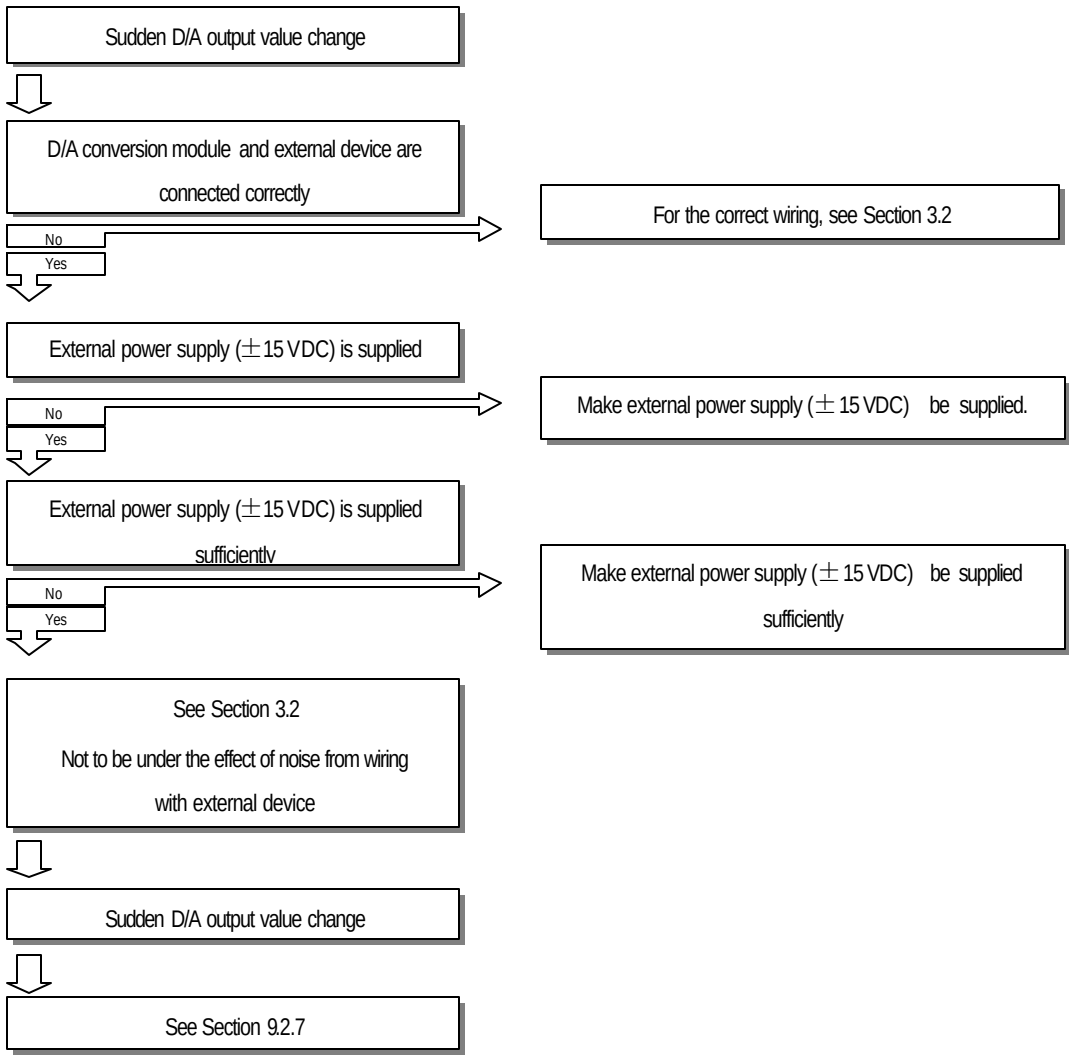
9.2.1 RUN LED Flickering



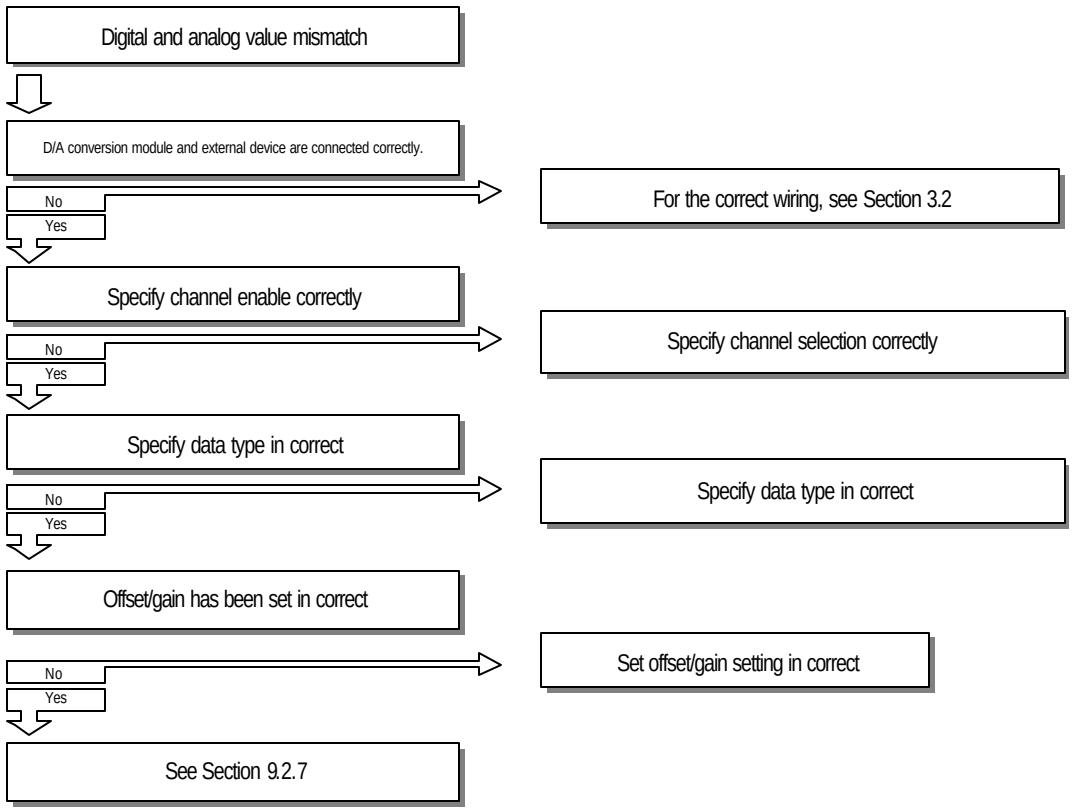
9.2.2 RUN LED Off



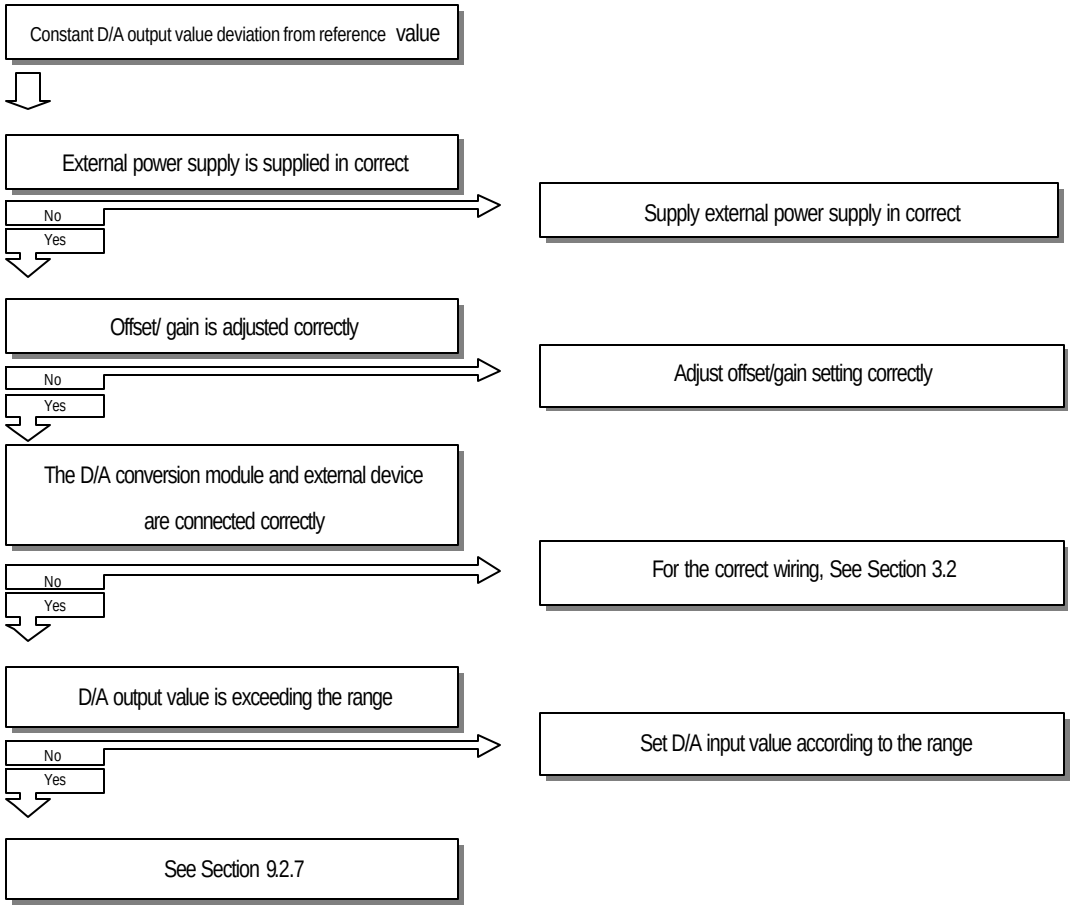
9.2.3 Sudden D/A Output Value Change



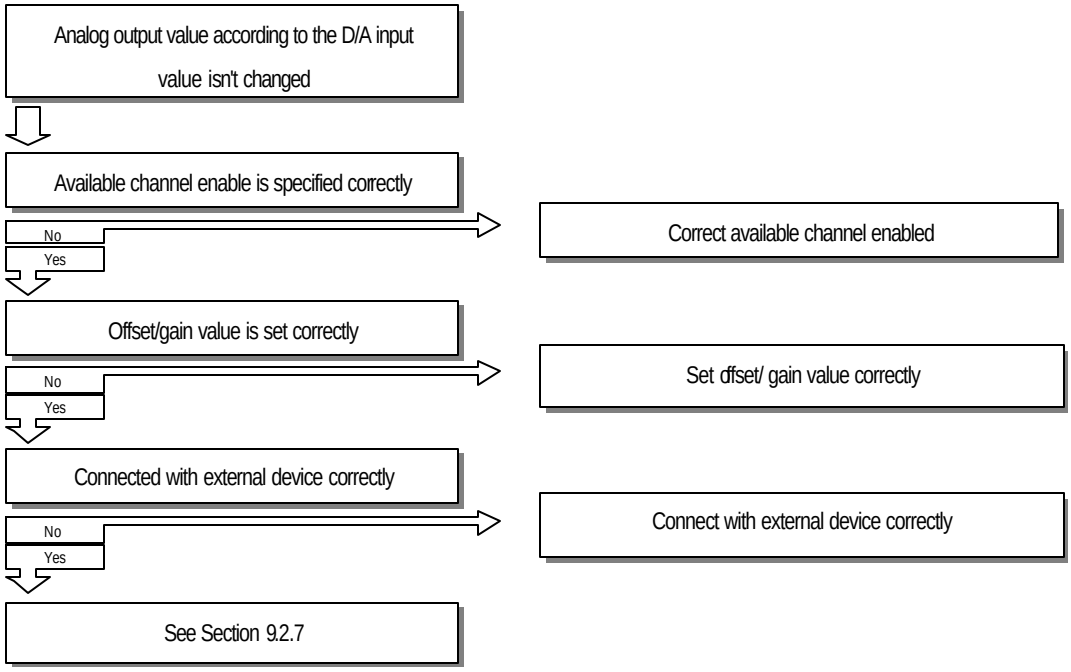
9.2.4 Digital and Analog Value Mismatch



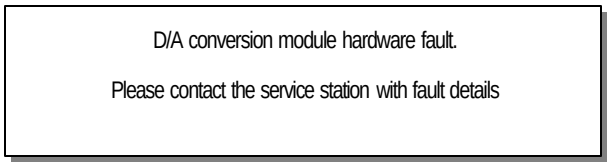
9.2.5 D/A Output Value Always deviates from Specified Value.



9.2.6 Analog Output Value According to the D/A Input Value isn't Changed



9.2.7 D/A conversion module hardware fault



Chapter 10. G3F-PA1A/G3F-PA2A POWER SUPPLY MODULE

G3F-PA1A/G3F-PA2A power supply modules are shown in this section.

10.1 Performance Specifications

Performance specification is like the table 10.1.

Items		Specifications	
		G3F-PA1A	G3F-PA2A
Base location		On slot for mounting input/output module	
Input power supply voltage Input power supply current		110 VAC (85 132 VAC) 1.3A (110 VAC)	220 VAC (170 264 VAC) 0.65A (220 VAC)
Input frequency		47 63Hz	
current		30 Ap-p or less	
Rated output current	15VDC	2.0 A	
	-15VDC	1.2 A	
*1 Over current protection	15VDC	2.2 3.5 A	
	-15VDC	1.3 2.5 A	
Efficiency		65% or more	
Power supply display		LED	
Relevance power cable		0.75 2 ㎟	
Relevance tighten torque		12Kg·Cm	
Weight		820 g	
Rated fuse		250 VAC, 3A	

[Table 10.1] Performance specifications

REMARK

*1 Over current protection

1) When Current more than reference is flowing on the 15 VDC/-15 VDC circuit, over current protection device allows the circuit and/or output value to be stopped

2) Once this device is operated, restart the circuit after getting rid of the causes such as deficiency of current and short circuit

10.2 Notes on Handling

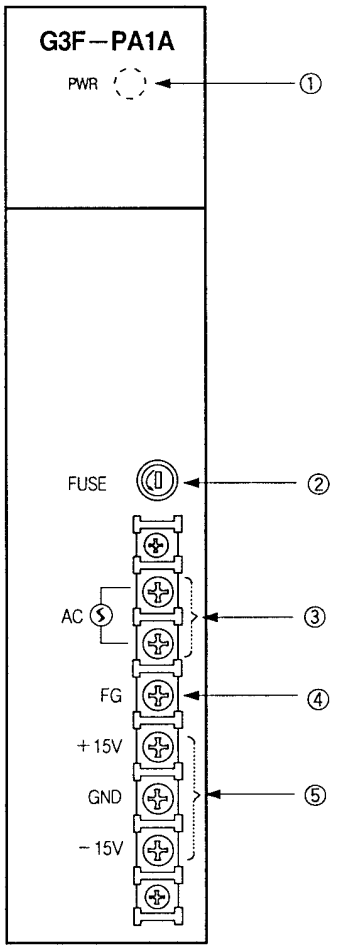
From unpacking to installation, be sure to check the following:

1) Do not drop it off, and make sure that excessive shock should not be applied.

2) Do not dismount the printed circuit board(PCB) from the case. It can cause malfunctions.

3) During wiring, be sure to check any foreign matter like wire scraps should not enter into the upper side of the PLC, and in the event that foreign matter entered into it, always eliminate it.

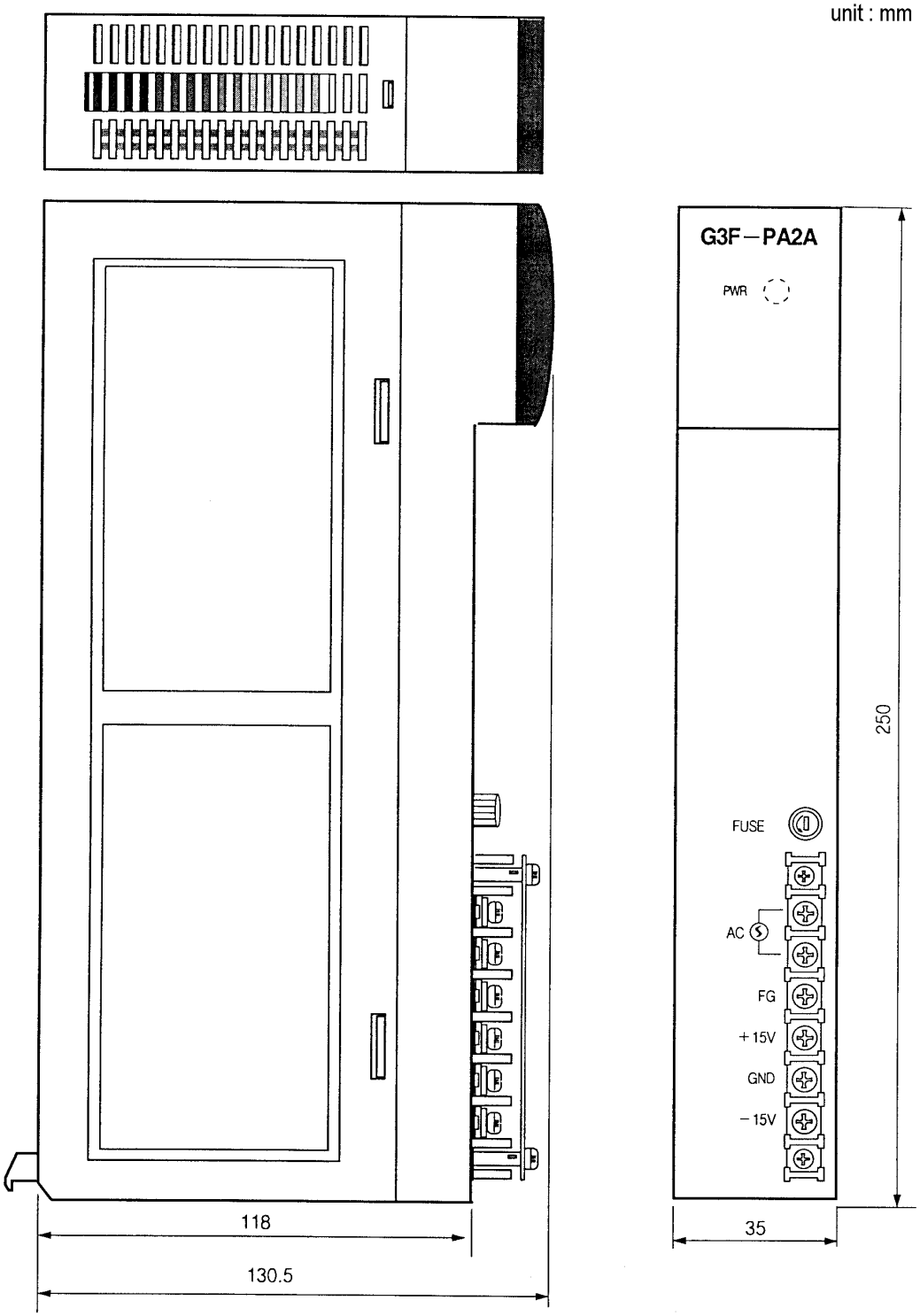
10.3 Names of Parts



NO	Name	Descriptions
①	LED display for power supply	Indicates LED display for displaying power input
②	Power fuse	Indicates 3A fuse fixed for AC input power with a fuse holder.
③	Power input terminal	onnect 110 VAC into the term inal onnect 220 VAC into the terminal.
④	FG	Indicates a term inal grounded with shielding pattern of PCB panel
⑤	Terminal of +15V, 0V, -15V	Indicates terminals for supplying ±15 VDC.

10.4 Dimensions

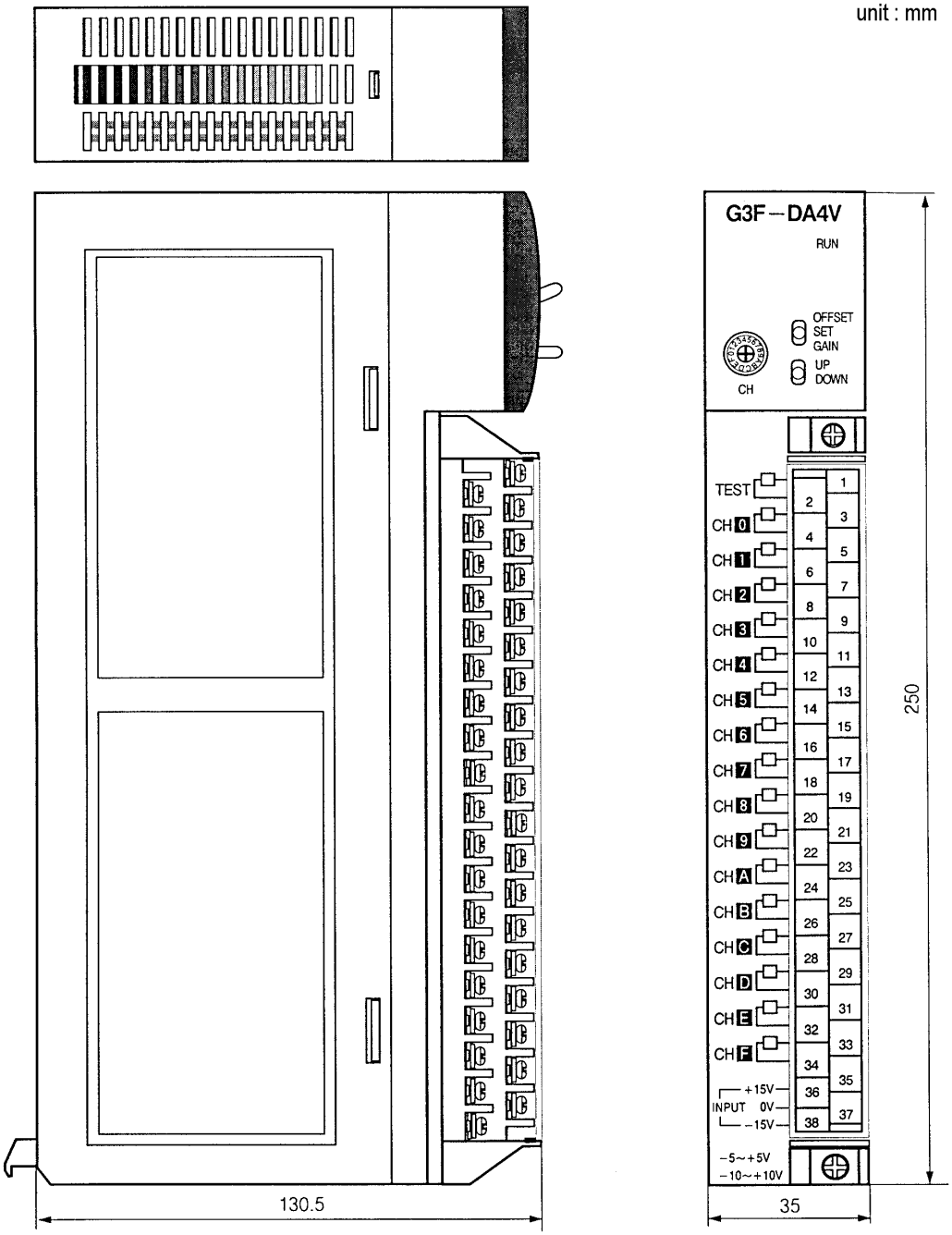
unit : mm

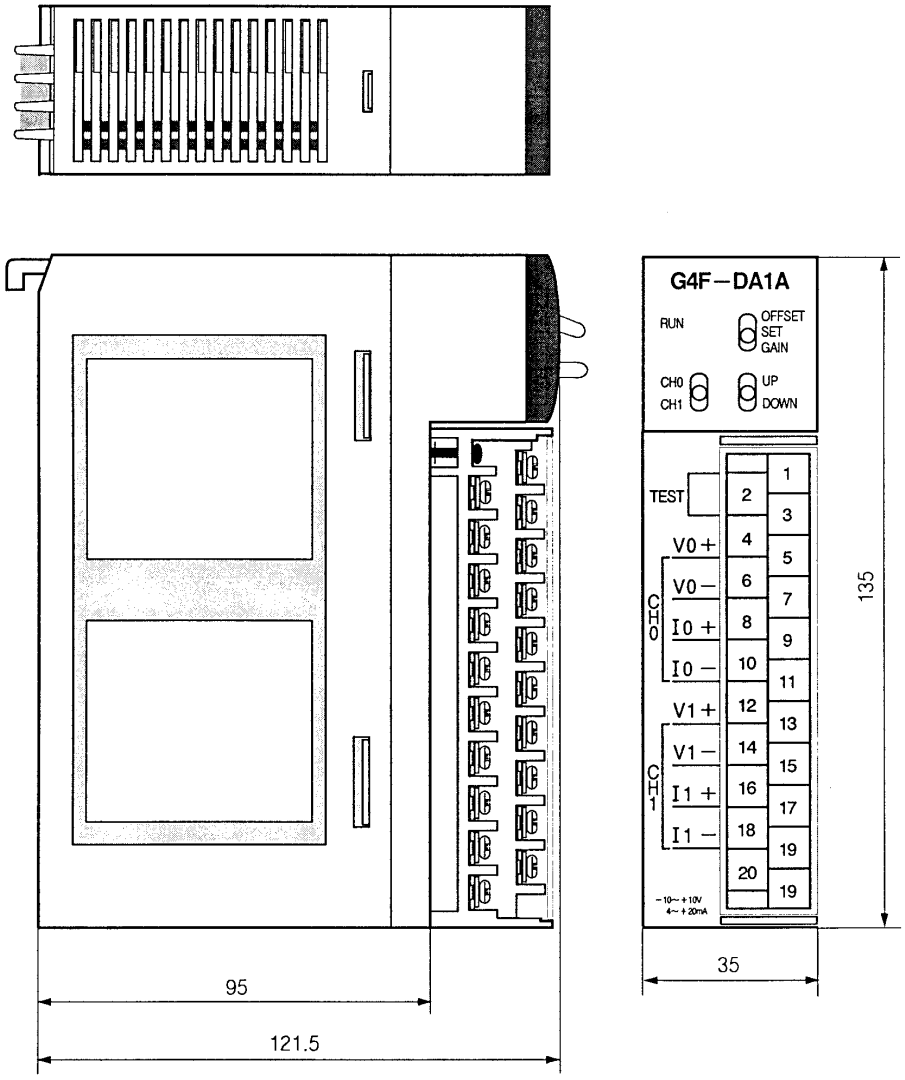


Chapter 11. DIMENSIONS

11.1 G3F-DA4V / G3F-DA4I Dimensions

unit : mm



11.2 G4F-DA1A Dimensions

unit : mm