MELSEC A/Q Series

Programmable Logic Controllers

User's Manual

D/A Converter module
A62DA

Art. no.: 001568
01 05 2000
IB (NA)-66053-C

● SAFETY PRECAUTIONS ●

(Always read these instructions before using this equipment.)

Before using this product, please read this manual and the relevant manuals introduced in this manual carefully and pay full attention to safety to handle the product correctly.
The instructions given in this manual are concerned with this product. Refer to the User's Manual of the CPU module in use for details on the safety instructions for the programmable logic controller system.
In this manual, the safety instructions are ranked as "DANGER" and "CAUTION".

⚠ DANGER	Indicates that incorrect handling may cause hazardous conditions, resulting in death or severe injury.
⚠ CAUTION	Indicates that incorrect handling may cause hazardous conditions, resulting in medium or slight personal injury or physical damage.

Note that the ⚠ **CAUTION** level may lead to a serious consequence according to the circumstances. Always follow the instructions of both levels because they are important to personal safety.

Please save this manual to make it accessible when required and always forward it to the end user.

[DESIGN PRECAUTIONS]

⚠ DANGER

- Install a safety circuit external to the PLC that keeps the entire system safe even when there are problems with the external power supply or the PLC module.
  Otherwise, trouble could result from erroneous output or erroneous operation.
  (1) The analog output state will differ according to the setting state of the various functions for controlling the analog output.
  Take special care when making the settings.
  Refer to section 3.3.2 for details on the analog output state.
  (2) If there is a fault in the output element or the internal circuit, correct outputs may not be possible or erroneous outputs may be made.
  Provide a circuit to externally monitor output signals that could lead to major faults.

⚠ CAUTION

- Do not bunch the control wires or communication cables with the main circuit or power wires, or install them close to each other.
  They should be installed 100mm (3.94inch) or more from each other.
  Not doing so could result in noise that would cause erroneous operation.

[INSTALLATION PRECAUTIONS]

⚠ CAUTION

- Use the PLC in an environment that meets the general specifications given in the User's Manual of the CPU module in use.
  Using this PLC in an environment outside the range of the general specifications could result in electric shock, fire, erroneous operation, and damage to or deterioration of the product.
- Securely insert the module fixing latch on the module bottom into the fixing holes on the base unit before mounting. Incorrect mounting of the module could lead to erroneous operation, faults or drop.
- Do not directly touch the module's conductive parts or electronic components.
  Touching the conductive parts could cause an operation failure or give damage to the module.

[WIRING PRECAUTIONS]

⚠ CAUTION

- When wiring in the PLC, be sure that it is done correctly by checking the product's rated voltage and the terminal layout.
  Connecting a power supply that is different from the rating or incorrectly wiring the product could result in fire or damage.
- Tighten the terminal screws with the specified torque.
  If the terminal screws are loose, it could result in short circuits, fire, or erroneous operation.
- Be sure there are no foreign substances such as sawdust or wiring debris inside the module.
  Such debris could cause fires, damage, or erroneous operation.

[STARTUP AND MAINTENANCE PRECAUTIONS]

⚠ CAUTION

- Externally shut off all power phases before touching the terminals.
  Failure to observe this could lead to erroneous operation.
- Switch all phases of the external power supply off when cleaning the module or tightening the terminal screws.
  Not doing so could result in erroneous operation.
- Do not disassemble or modify the module.
  Doing so could cause trouble, erroneous operation, injury, or fire.
- Switch all phases of the external power supply off before mounting or removing the module.
  If you do not switch off the external power supply, it will cause failure or malfunction of the module.

[DISPOSAL PRECAUTIONS]

⚠ CAUTION

- When disposing of the product, handle it as industrial waste.

REVISIONS

※The manual number is given on the bottom left of the back cover.

Print Date	*Manual Number	Revision
Nov., 1986	IB (NA) 66053-A	First edition
Jan., 1989	IB (NA) 66053-B	Correction CONTENTS, Page 1-1, 2-2, 2-3, 3-1, 3-2, 3-4, 3-6, 3-8, 4-1, 4-2, 6-2, 6-4, 7-1, 8-1, 8-2, 8-3, 8-4, APP-1 Addition Page 6-1 Deletion Section 2.4 "Instructions for Strategic Materials" added
May, 2000	IB (NA) 66053-C	Addition SAFETY PRECAUTIONS, Section 2.3, WARRANTY Correction Chapter 1, Chapter 2, Section 2.2, 3.1, 3.2.1, 3.2.2, 4.1, 5.2, 5.2.1, 5.2.4

Japanese Manual Version IB-64573-K

INTRODUCTION

Thank you for choosing the Mitsubishi MELSEC-A Series of General Purpose Programmable Controllers. Please read this manual carefully so that the equipment is used to its optimum. A copy of this manual should be forwarded to the end User.

CONTENTS

1. GENERAL DESCRIPTION 1-1

2. SYSTEM CONFIGURATION ..... 2-1 ~ 2-2

2.1 Overall Configuration 2-1
2.2 Applicable System 2-2
2.3 Precautions for Using Two Channels with A62DA 2-2

3. SPECIFICATIONS ..... 3-1 ~ 3-12

3.1 General Specifications 3-1
3.2 Performance Specifications 3-2
3.2.1 Performance specifications 3-2
3.2.2 I/O conversion characteristics 3-3
3.3 I/O List with Respect to Programmable Controller CPU 3-9
3.3.1 I/O list 3-9
3.3.2 I/O signals and analog output 3-10
3.4 Buffer Memory 3-11
3.4.1 Assignment of buffer memory 3-11
3.4.2 Contents and data configuration of buffer memory 3-11

4. HANDLING ..... 4-1 ~ 4-3

4.1 Handling Instructions 4-1
4.2 Nomenclature 4-2
4.3 Wiring 4-3
4.3.1 Wiring instructions 4-3
4.3.2 Unit connection example 4-3
4.4 Maintenance and Inspection 4-3

5. PROGRAMMING ..... 5-1 ~ 5-5

5.1 Initial Setting 5-1
5.2 Programs 5-2
5.2.1 Basic programs for read and write 5-2
5.2.2 Write to digital value 5-3
5.2.3 Reset of check codes 5-4
5.2.4 Application circuit examples 5-4

6. TEST OPERATION AND ADJUSTMENTS ..... 6-1 ~ 6-4

6.1 Offset/Gain Setting 6-1
6.2 Check Points before Start of Operation 6-4

7. TROUBLESHOOTING ..... 7-1 ~ 7-4

7.1 Troubleshooting Flow Chart 7-1
7.2 Flow Chart Used When "RUN" LED Has Flickered or Turned Off 7-2
7.3 Flow Chart Used When Analog Output Is Not Provided Properly 7-3

APPENDIX APP-1

External View APP-1

1. GENERAL DESCRIPTION

This User's Manual describes the specifications, handling, programming procedures, etc. of the A62DA digital-analog converter module (hereinafter referred to as "A62DA") which is used in combination with the MELSEC-A series CPU module.
The CPU types are generically labeled as follows in this User's Manual.

(1) PLC CPU

A1, A2, A2-S1, A3CPU (P21/R21)
A1N, A2N, A2N-S1, A3NCPU (P21/R21)
A3HCPU (P21/R21), A3MCPU (P21/R21)
A73CPU (P21/R21)
A0J2CPU (P23/R23)

(2) Building-block type CPU

A1, A2, A2-S1, A3CPU (P21/R21)
A1N, A2N, A2N-S1, A3NCPU (P21/R21)
A3HCPU (P21/R21), A3MCPU (P21/R21)
A73CPU (P21/R21)

(3) Compact-type CPU

A0J2CPU (P23/R23)

(4) ACPU

A1, A2, A2-S1, A3CPU (P21/R21)
A1N, A2N, A2N-S1, A3NCPU (P21/R21)
A3HCPU (P21/R21), A3MCPU (P21/R21)
A73CPU (P21/R21)
A0J2CPU (P23/R23)

Refer to the User's Manual, Programming Manual and Data Link Reference Manual for each CPU module as required when using the A62DA.

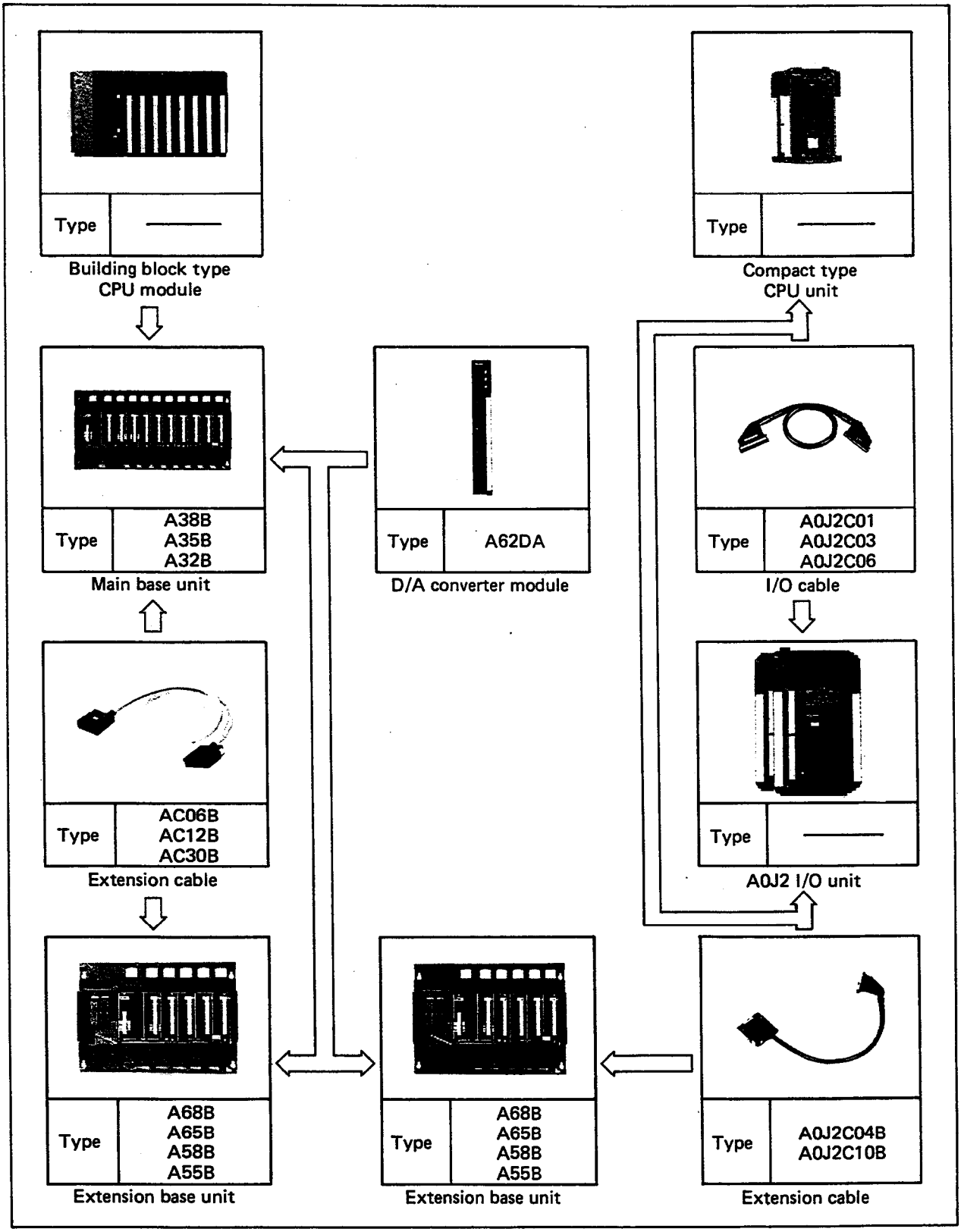
POINT

In this manual, the I/O assignment numbers of the A62DA with respect to the programmable controller CPU assume that the A62DA is loaded into slot No. 0 of the main base unit. When the A62DA is loaded into a slot other than slot No.0, determine the assignment number according to the I/O assignment method as given in the Programming Manual.

2. SYSTEM CONFIGURATION

2.1 Overall Configuration

The overall configuration of A series equipped with the A62DA is shown in Fig. 2.1.



2.2 Applicable System

The A62DA can be used for the following CPU modules:

Applicable models	A0J2	
	A1(E)CPU	A1NCPU
	A2(E)CPU	A2NCPU
	A3(E)CPU	A3NCPU
	A3HCPU	A3MCPU
	A73CPU	

The A62DA can be loaded into any slot of the base unit except in the following cases:

(1) Avoid loading the A62DA into an extension base (Type A5 □ extension base unit) without a power supply module because power capacity may become insufficient. If the A62DA is loaded into such an extension base, refer to Section 3.4 to Section 3.5 of CPU User's Manual for data on the selection of power supply module and extension cable.

(2) For the processing time (read and write) with the A62DA in a data link system, refer to the data link User's Manual.

Master station	A1(E)CPUP21/R21	A1NCPUP21/R21
	A2(E)CPUP21/R21	A2NCPUP21/R21
	A2(E)CPUP21/R21-S1	A2NCPUP21/R21-S1
	A3(E)CPUP21/R21	A3NCPUP21/R21
	A3HCPUP21/R21	A3MCPUP21/R21
	A73CPUP21/R21	
Local station	A0J2CPUP23/R23	
	A1(E)CPUP21/R21	A1NCPUP21/R21
	A2(E)CPUP21/R21	A2NCPUP21/R21
	A2(E)CPUP21/R21-S1	A2NCPUP21/R21-S1
	A3(E)CPUP21/R21	A3NCPUP21/R21
	A3HCPUP21/R21	
	A73CPUP21/R21	
Remote station	AJ72P25/R25	

(3) When use with A3CPU(P21/R21), cannot installed at final slot of the 7th extension base.

Refer to the Data Link System User's Manual for details on the processing time (reading, writing) when using the A62DA in the data link system.

2.3 Precautions for Using Two Channels with A62DA

The output terminal and PLC power supply are insulated with photo couplers for the A62DA. However, the analog output ground is connected internally. Thus, the "–V" and "–I" for each channel will have the same level.

3. SPECIFICATIONS

This chapter describes the general specifications and performance specifications of the A62DA.

3.1 General Specifications

The general specifications of A62DA are indicated in Table 3.1.

<table>
<tr><th>Item</th><th colspan="5">Specifications</th></tr>
<tr><td>Operating ambient temperature</td><td colspan="5">0 to 55°C</td></tr>
<tr><td>Storage ambient temperature</td><td colspan="5">–20 to 75°C</td></tr>
<tr><td>Operating ambient humidity</td><td colspan="5">10 to 90%RH, no condensation</td></tr>
<tr><td>Storage ambient humidity</td><td colspan="5">10 to 90%RH, no condensation</td></tr>
<tr><td rowspan="3">Vibration resistance</td><td rowspan="3">Conforms to JIS C 0911</td><td>Frequency</td><td>Accelera-tion</td><td>Amplitude</td><td>Sweep Count</td></tr>
<tr><td>10 to 55Hz</td><td>–</td><td>0.075mm</td><td rowspan="2">10 times
*(1 octave/minute)</td></tr>
<tr><td>55 to 150Hz</td><td>1g</td><td>–</td></tr>
<tr><td>Shock resistance</td><td colspan="5">Conforms to JIS C 0912 (10g × 3 times in 3 directions)</td></tr>
<tr><td>Noise durability</td><td colspan="5">By noise simulator 1500Vpp noise voltage,
1μs noise width and 25 to 60Hz noise frequency</td></tr>
<tr><td rowspan="2">Dielectric withstand voltage</td><td colspan="5">Across analog output terminal batch and ground: 500VAC for one minute</td></tr>
<tr><td colspan="5">Across 24VDC input terminal batch and ground: 250VAC for one minute</td></tr>
<tr><td rowspan="2">Insulation resistance</td><td colspan="5">Across analog output terminal batch and ground: 5MΩ or more when measured with 500VDC insulation resistance tester</td></tr>
<tr><td colspan="5">Across 24VDC input terminal batch and ground: 5MΩ or more when measured with 250VDC insulation resistance tester</td></tr>
<tr><td>Operating ambience</td><td colspan="5">To be free from corrosive gases. Dust should be minimal.</td></tr>
<tr><td>Cooling method</td><td colspan="5">Self-cooling</td></tr>
</table>

Table 3.1 General Specifications

REMARKS

One octave marked * indicates a change from the initial frequency to double or half frequency. For example, any of the changes from 10Hz to 20Hz, from 20Hz to 40Hz, from 40Hz to 20Hz, and 20Hz to 10Hz are referred to as one octave.

3.2 Performance Specifications

This section describes the performance specifications and I/O conversion characteristics of A62DA.

3.2.1 Performance specifications

The performance specifications of A62DA are indicated in Table 3.2.

Table 3.2 Performance Specifications

<table>
<tr><th colspan="2">Item</th><th>Specifications</th></tr>
<tr><td colspan="2">Digital input</td><td>Voltage output, digital setting range: ±2000
Current output, digital setting range: ±1000
For data configuration and setting procedure,
refer to Section 3.4.2 (page 3-10).</td></tr>
<tr><td colspan="2">Analog input</td><td>Selectively used depending on output terminals.
Voltage: −10 to 0 to +10V DC
(External load resistance: 500Ω to 1MΩ)
Current: +4 to +20mA DC
(External load resistance: 0Ω to 600Ω)
−20 to 0 to +20mA can also be used for current output.</td></tr>
<tr><td colspan="2">I/O characteristics</td><td>
<table>
<tr><th rowspan="2">Digital Input</th><th colspan="2">Analog Output</th></tr>
<tr><th>Voltage</th><th>Current</th></tr>
<tr><td>+2000</td><td>+10V</td><td>–</td></tr>
<tr><td>+1000</td><td>+5V</td><td>+20mA</td></tr>
<tr><td>0</td><td>0V</td><td>+4mA</td></tr>
<tr><td>−1000</td><td>−5V</td><td>−12mA</td></tr>
<tr><td>−2000</td><td>−10V</td><td>–</td></tr>
</table>
For details, refer to Section 3.2.2 (page 3-3).</td></tr>
<tr><td colspan="2">Maximum resolution</td><td>Voltage: 5mV (1/2000)
Current: 20μA (1/1000)</td></tr>
<tr><td colspan="2">Overall accuracy*</td><td>±1% (voltage: ±0.1V, current: ±0.2mA)</td></tr>
<tr><td colspan="2">Maximum conversion speed</td><td>Within 15ms/2 channels (Time for 1 channel is also the same.)
Note: Time from when digital input is written to when analog voltage (current) changes from −10V (−20mA) to +10V (+20mA).</td></tr>
<tr><td colspan="2">Absolute maximum output</td><td>Voltage: ±12V
Current: ±28mA
Note: Max. output voltage and current restricted by output protection circuit.</td></tr>
<tr><td colspan="2">Number of analog output points</td><td>2 channels/module</td></tr>
<tr><td colspan="2">Insulation method</td><td>Photocoupler insulation between output terminals and PC power
(Non-insulated between channels)</td></tr>
<tr><td colspan="2">Number of I/O occupying points</td><td>Special 32 points</td></tr>
<tr><td colspan="2">Connection terminal</td><td>20-point terminal block</td></tr>
<tr><td colspan="2">Applicable wire size</td><td>0.75 to 2mm^2 (Applicable tightening torque: 39 to 59N·cm)</td></tr>
<tr><td colspan="2">Applicable solderless terminal</td><td>V1.25-3, V1.25-YS3A, V2-S3, V2-YS3A</td></tr>
<tr><td colspan="2">Internal current consumption (5V DC)</td><td>0.6A</td></tr>
<tr><td rowspan="3">External supply power</td><td>Voltage</td><td>21.6 to 26.4V DC</td></tr>
<tr><td>Current consumption</td><td>0.35A</td></tr>
<tr><td>Inrush current</td><td>2.4A</td></tr>
<tr><td colspan="2">Weight</td><td>0.5kg (1.1lb)</td></tr>
</table>

* This is the accuracy in respect to the maximum analog output value.

POINT

The analog output ranges for maximum resolution and maximum overall accuracy, is from −10 to 0 to +10V or from −20 to 0 to +20mA.

3.2.2 I/O conversion characteristics

I/O conversion characteristics are indicated by an inclination which is connected between an offset value and a gain value set in the test mode. Fig. 3.1 shows an example at the time of voltage output.

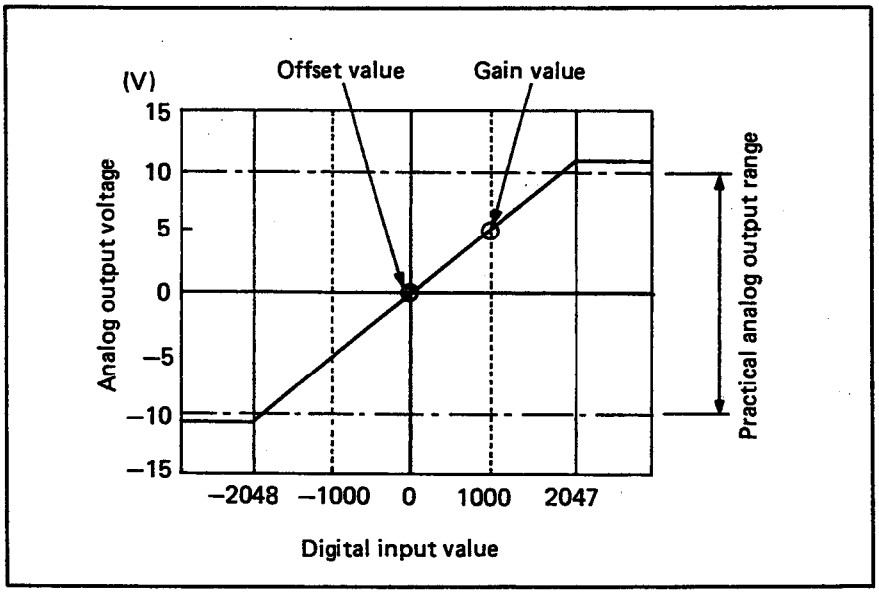


Fig. 3.1 I/O Conversion Characteristics

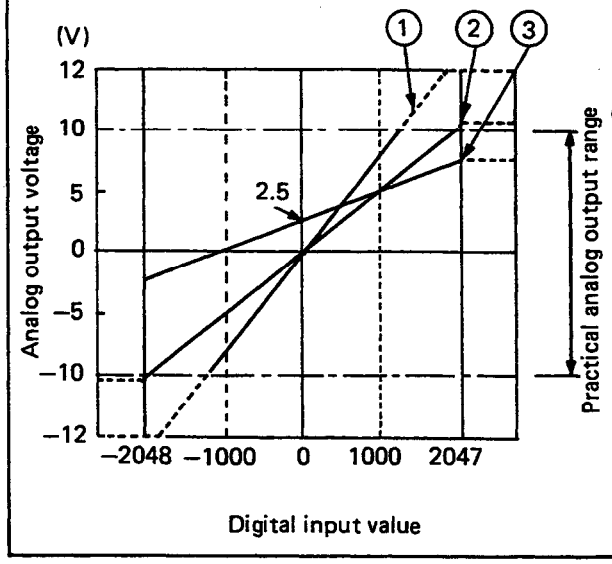
REMARKS

1. The offset value is the analog output voltage or current which is provided when the digital input value is 0. Set the offset value in test mode.

2. The gain value is the analog output voltage or current which is provided when the digital input value is 1000. Set the gain value in test mode.

(1) Voltage output characteristic

Fig. 3.2 shows a voltage output characteristic example for several offset/gain settings.



The offset/gain setting in the figure at left is as follows.

(1) When the offset value is 0V and the gain value is 7.5V, the characteristic is indicated by ①.
Example:
When the digital input value is 800, the analog output value is 6V.
When the digital input value is −400, the analog output value is −3V.

(2) When the offset value is 0V and the gain value is 5V, the characteristic is as indicated by ②.
Example:
When the digital input value is 800, the analog output value is 4V.
When the digital input value is −400, the analog output value is −2V.

(3) When the offset value is 2.5V and the gain value is 5V, the characteristic is as indicated by ③.
Example:
When the digital input value is 800, the analog output value is 4.5V.
When the digital input value is −400, the analog output value is 1.5V.

Fig. 3.2 Voltage Output Characteristic

POINT

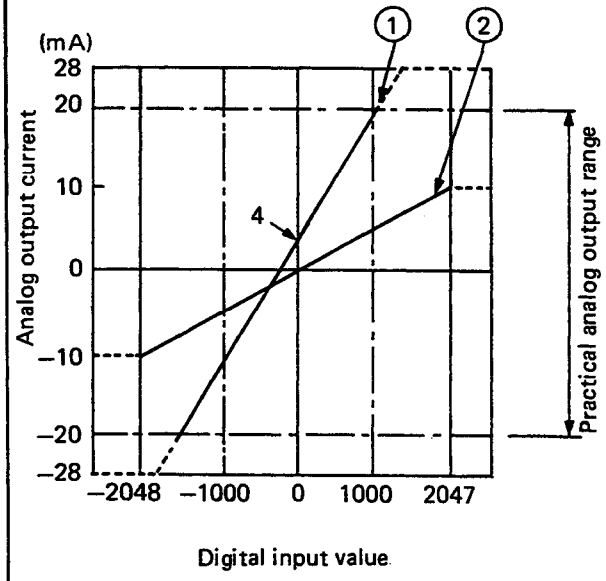
1. **The maximum resolution and overall accuracy are within the range of performance specifications when the working analog output range is −10 to 0 to +10V. Avoid use outside the above indicated range (dotted line on the voltage output characteristic graph in Fig. 3.2).**
   If the unit is used outside the practical analog output range, note the following:
   1) **Prolonged use may load to excessive rise in temperature and failure of the module.**
   2) **Accuracy may not be within the range of performance specifications.**

2. **When the digital input value has been set to less than −2048 or more than +2047, analog output is provided with the digital input value regarded as −2048 or +2047.**

3. **The A62DA limits the maximum output voltage to −12 or +12V to protect against short circuit at the outputs. Therefore, even if the digital input value is set outside the range of output voltage limits, the output signal is limited to the maximum indicated.**

(2) Current output characteristic

Fig. 3.3 shows a current output characteristic graph for several offset/gain settings.



The offset/gain setting in the figure at left is as follows.

(1) When the offset value is 4mA and the gain value is 20mA, the characteristic is as indicated by ①.
Example:
When the digital input value is 800, the analog output value is 16.8mA.
When the digital input value is −400, the analog output value is −2.4mA.

(2) When the offset value is 0mA and the gain value is 5mA, the characteristic is as indicated by ②.
Example:
When the digital input value is 800, the analog output value is 4mA.
When the digital input value is −400, the analog output value is −2mA.

Fig. 3.3 Current Output Characteristic

POINT

1. **The maximum resolution and overall accuracy are within the range of performance specifications when the working analog current range is −20 to 0 to +20mA. Avoid use outside the above indicated range (dotted line on the current output characteristic graph in Fig. 3.3).**
   If the unit is used outside the practical analog output range, note the following:
   1) **Prolonged use may result in excessive rise of temperature and failure of the module.**
   2) **Accuracy may not be within the range of performance specifications.**

2. **When the digital input value has been set to less than −2048 or more than +2047, analog output is provided with the digital input value regarded as −2048 or +2047.**

3. **The A62DA limits the maximum output current to −28mA or +28mA to protect against short circuits at the outputs. Therefore, even if the digital input value is set outside the range of output current limits, the output signal is limited to the maximum indicated.**

(3) Relation between offset/gain setting and analog output value

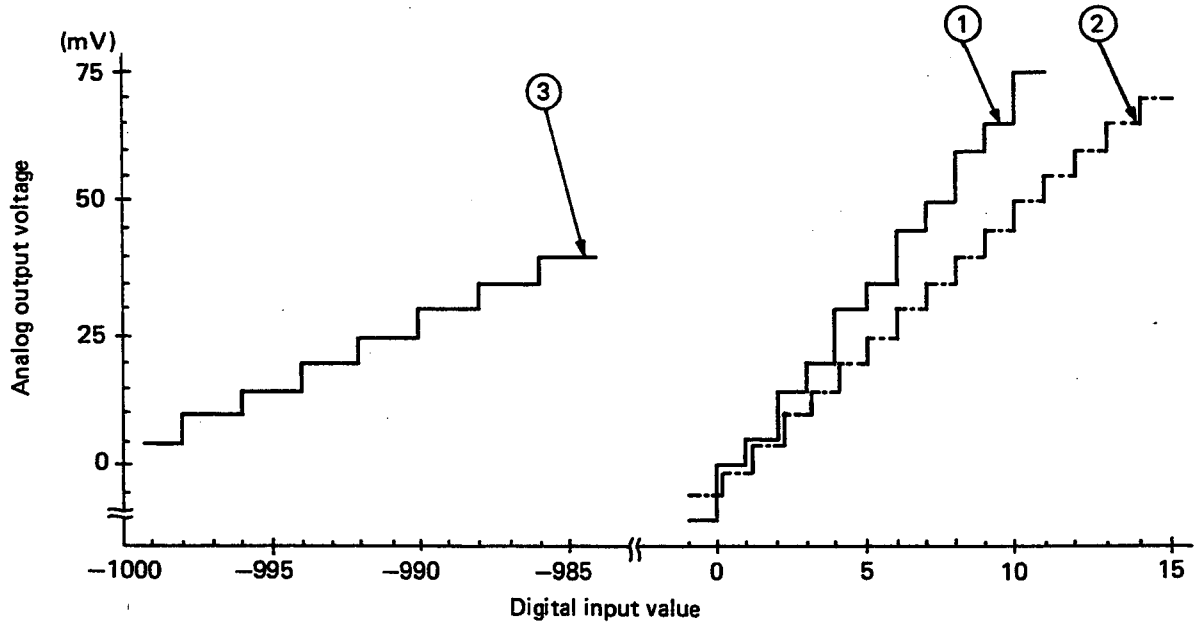
The resolution of the A62DA can be changed by the offset/gain setting. To calculate the resolution and analog output values for various digital input value, use the following expressions.

$$(\text{Resolution}) = \frac{(\text{gain value}) - (\text{offset value})}{1000}$$

$$(\text{Analog output}) = \frac{(\text{gain value}) - (\text{offset value})}{1000} \times (\text{digital input value}) + (\text{offset value})$$

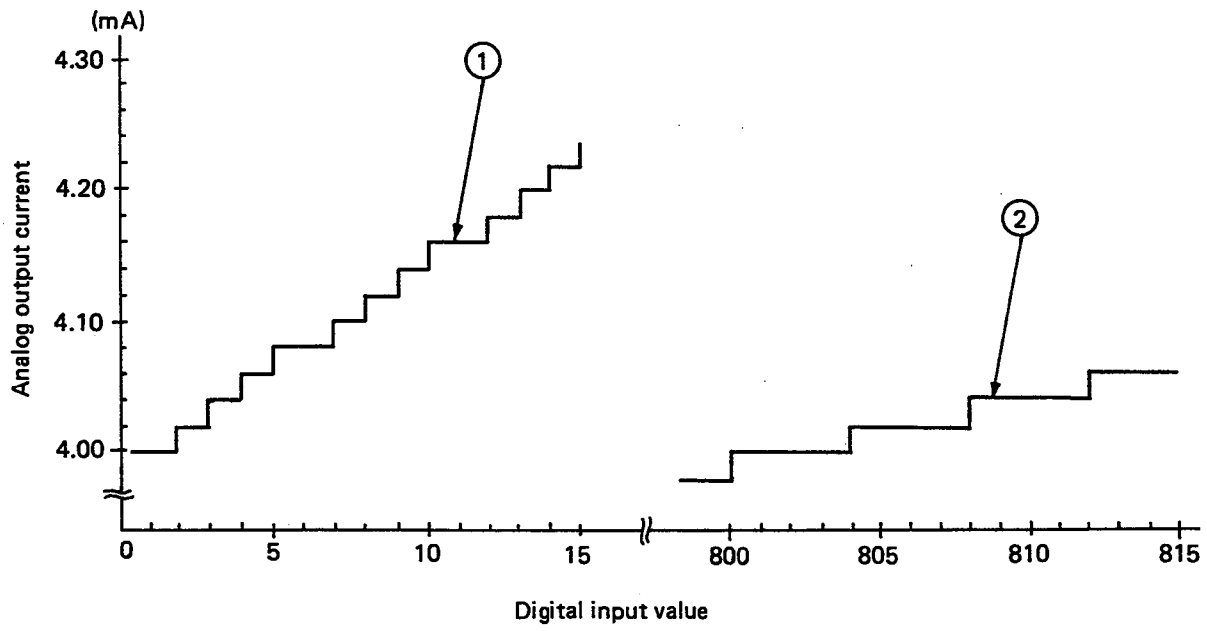
$$= (\text{resolution}) \times (\text{digital input value}) + (\text{offset value})$$

If the resolution is in units of 5mV or 20μA, the variation of analog output value differs depending on the setting of offset and gain for a change of 1 in the digital input value.
Fig. 3.4 and 3.5 show the relation between the digital input value and the analog output value when the offset/gain setting is changed. The offset value and gain value are values in the voltage and current output characteristic graphs in Fig. 3.2 and 3.3.



In ①, the resolution is greater than 5mV. When the digital input value is increased or decreased by 1, the analog output value increases or decreases 5 or 10mV.
In ③, the resolution is less than 5mV. When the digital input value is increased or decreased by 1, the analog output value increases or decreases 0 or 5mV.

Fig. 3.4 Digital Input Value and Voltage Output



As for ① and ②, the resolution is less than 20μA. When the digital input value is increased or decreased 1, the analog output value increases or decreases 0 or 20μA.

Fig. 3.5 Digital Input Value and Current Output

(4) Overall accuracy

The overall accuracy is the accuracy in respect to the maximum analog output value.
Even if the input characteristics are changed by changing the offset/gain settings, the overall accuracy will not change and will be kept within the range of the performance specifications. The overall accuracies of the power/current output characteristics are shown in Fig. 3.6 and Fig. 3.7.

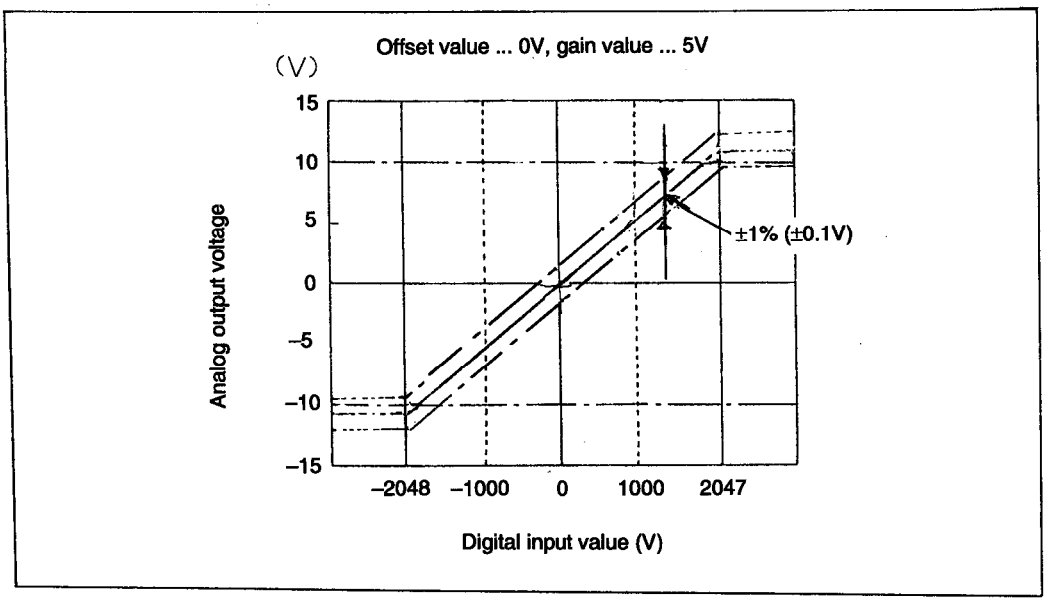


Fig. 3.6 Overall accuracy of voltage output characteristics

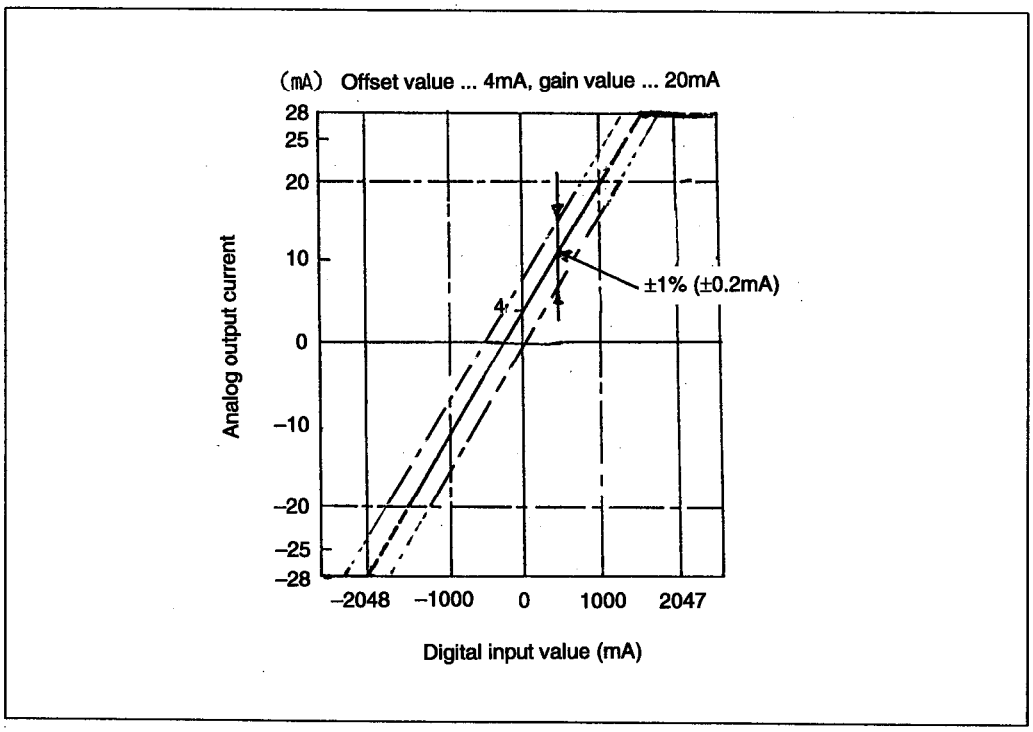


Fig. 3.7 Overall accuracy of current output characteristics

3.3 I/O List with Respect to Programmable Controller CPU

The I/O signals for the A62DA with respect to the programmable controller CPU are as indicated below. Numbers provided for X and Y are determined by the loading position of the A62DA module and the number of points of other I/O units.
The I/O numbers indicated below are used when the A62DA module is loaded into the slot No. 0 of main base unit.

3.3.1 I/O list

(1) Inputs for programmable controller CPU X0 – X1F (32 points).

Input Signal	Description
X0	Watch dog timer error Turns on if a watch dog timer error occurs in the A62DA.
X1	D/A conversion ready (1) Turns on when D/A conversion is ready in normal mode (not in test mode) after the power is turned on or the programmable controller CPU is reset. Turns off when normal mode is changed to test mode. (2) Used as an interlock when read or write is performed from the programmable controller CPU to the A62DA.
X2 to X1F	Not used

(2) Outputs for programmable controller CPU Y0 – Y1F (32 points).

Output Signal	Description	
Y0 to Y17	Not used	
Y18	CPU select signal (1) OFF a) The digital input of the buffer memory is treated as a 16-bit signed binary and the signs specified by Y19 and Y1A are ignored. (2) ON a) The digital input of the buffer memory is treated as a 16-bit binary and signs are specified by Y19 and Y1A.	
Y19	Sign of CH1 digital input	1) Valid when Y18 is on. 2) ON The buffer memory digital input is treated as a negative value. 3) OFF The buffer memory digital input is treated as a positive value.
Y1A	Sign of CH2 digital input	
Y1B	Output enable Used for both channels 1 and 2. Analog output depends on the signal state. (1) OFF The offset value is output as an analog value. (2) ON The analog value converted from the digital value is output.	
Y1C to Y1F	Not used	

IMPORTANT

Do not use devices Y0 – Y1A and Y1C – Y1F in the normal sequence program.
Note, however that if the A62DA is used in a remote I/O system, resetting Y0E and Y0F is permitted. For details, refer to the Data Link User's Manual.

3.3.2 I/O signals and analog output

(1) Relation between I/O signals and analog output in normal mode is indicated in the following table.

Output enable Y1B	OFF		ON	
D/A conversion ready X1	OFF	ON	OFF	ON
Analog output value	0V	Offset value	0V	The digital value written from the programmable controller CPU, is converted into an analog value which is output.
Remarks		The offset value is output as an analog value.		Until a digital value is written, the offset value is output as an analog value.

(2) In test mode, the D/A conversion ready (X1) signal turns off. Regardless of the digital input value, analog values shown in the following table are output depending on the positions of channel select switch and OFFSET/GAIN select switch.

Position of channel select switch / Channel of analog output / Position of OFFSET/GAIN select switch	CH1		CH2	
	Channel 1	Channel 2	Channel 1	Channel 2
OFFSET position	Offset value of channel 1	Offset value of channel 2	Offset value of channel 1	Offset value of channel 2
SET position				
GAIN position	Gain value of channel 1			Gain value of channel 2

3.4 Buffer Memory

The A62DA is equipped with a buffer memory (which is not battery backed) for the communication of data with the programmable controller CPU. The following gives an explanation of the assignment and data configuration of this buffer memory.
For read and write of data by the sequence program, refer to Chapter 6 (page 6-1).

3.4.1 Assignment of buffer memory

The assignment of buffer memory is indicated below.

Address		
0	CH1 digital value	Read and write can be performed from and to programmable controller CPU.
1	CH2 digital value	
2	Voltage set value check code of CH1	
3	Voltage set value check code of CH2	
4	Current set value check code of CH1	
5	Current set value check code of CH2	

*Each data consists of 16 bits.

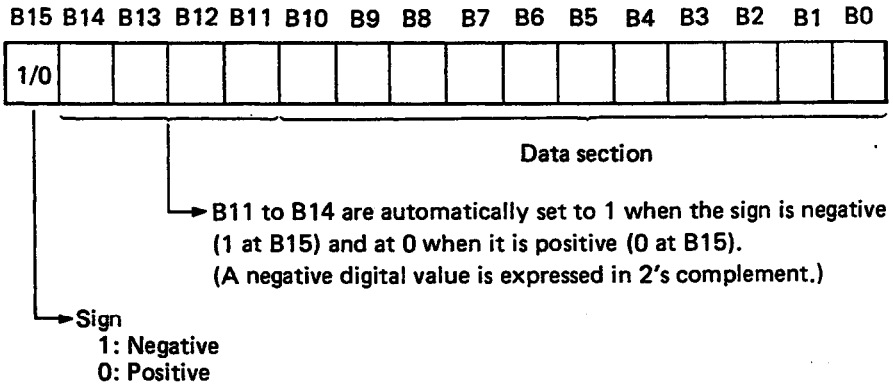
3.4.2 Contents and data configuration of buffer memory

This section describes the contents and data configuration of the buffer memory for each item indicated in Section 3.4.1.

(1) Digital value (CH1, CH2)

a) When the power is turned on and the D/A conversion ready signal is on, the digital value is 0.

b) For the A series-CPUs (CPU select signal off), set a digital value, –2048 to +2047, in 16-bit binary with sign.



POINT

If the digital value has been set outside its range, D/A conversion is made with the set value regarded as the usable maximum value or minimum value.

Example: When –3000 is set to the A series CPU, the value is treated as –2048.
When +3000 is set, it is treated as +2047.

(2) Voltage set value check (CH1, CH2)

When the digital value is set to –2001 or less or to +2001 or more, one of the following check codes is set for each channel.

Check Code	Description
000F	The digital value has been set to +2001 or more.
00F0	The digital value has been set to –2001 or less.
00FF	The digital value is outside the range –2000 to +2000.

*Check codes are expressed in hexadecimal.

(3) Current set value check (CH1, CH2)

When the digital value is set to a negative value or to +1001 or more, one of the following check codes is set for each channel.

Check Code	Description
000F	The digital value has been set to +1001 or more.
00F0	The digital value has been set to a negative value.
00FF	The digital value is outside the range 0 to +1000.

*Check codes are expressed in hexadecimal.

POINT

1. **If the digital value is a negative value or +1001 or more in the case of analog voltage output, the current set value check codes will be set to 4 (CH1) and 5 (CH2) of buffer memory.**

2. **Reset the check codes by use of the sequence program in the programmable controller CPU. For details, refer to Chapter 6 (page 6-1).**

4. HANDLING

This chapter describes the handling instructions, nomenclature, maintenance, and inspection of the A62DA.

4.1 Handling Instructions

(1) Protect the A62DA and its terminal block from impact.

(2) Do not touch or remove the printed circuit board from the case.

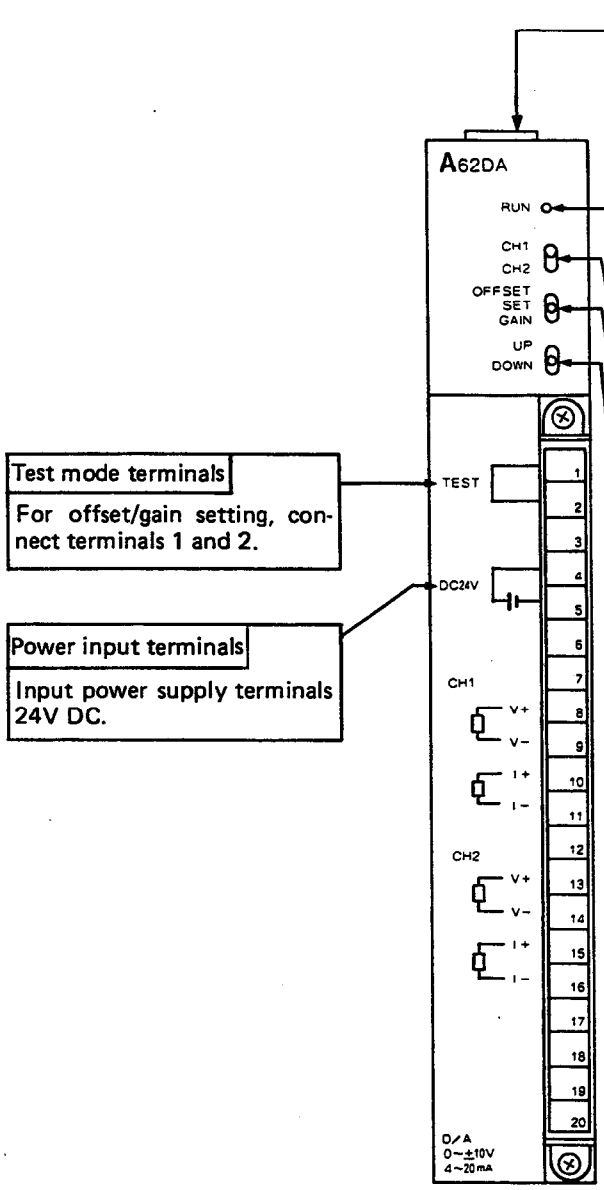
(3) When wiring, ensure that no wire offcuts enter the module and remove any that do enter.

(4) Tighten terminal screws as specified below.

Screw	Tightening Torque Range (N·cm)
I/O terminal block terminal screw (M3 screw)	39 to 59
I/O terminal block mounting screw (M4 screw)	78 to 118

(5) To load the module onto the base, press the module against the base so that the hook is securely locked. To unload the module, push the catch on the top of the module, and after the hook is disengaged from the base, pull the module toward you.

4.2 Nomenclature



Module fixing hook

Hook for fixing the A62DA to the base unit.

RUN LED

Indicates the operating status of the A62DA.
(Normal mode)
ON : During normal operation
OFF: 5V power off or watch dog timer error
(Test mode)
Flicker: Flickers at intervals of 0.5s when the OFFSET/GAIN select switch is located at the OFFSET or GAIN position. Flickers at high speed at intervals of 0.1s when the setting range (refer to Section 7.1 on page 7-1) has been exceeded and the upper limit value or lower limit value has been reached.
OFF: When the OFFSET/GAIN select switch is located at the SET position.

Test mode terminals

For offset/gain setting, connect terminals 1 and 2.

Power input terminals

Input power supply terminals 24V DC.

Channel select switch

Used to select a channel for the adjustment of offset value and gain value.

OFFSET/GAIN select switch

OFFSET position: Offset value calibration mode
GAIN position : Gain value calibration mode
SET position : When the switch is moved from the OFFSET or GAIN position to the SET position, an offset value or a gain value is stored into A62DA.

UP/DOWN switch

Used to increase or decrease the offset value or gain value of specified channel at the following rate:
1) On for less than 1.5 seconds: Increase or decrease of 5mV or 20μA at one time.
2) On for 1.5 seconds or more: Increase or decrease of 5mV or 20μA per 0.05s.

Switches marked ▭ are valid only in test mode. For details, refer to Section 7.1 (page 7-1).

4.3 Wiring

4.3.1 Wiring instructions

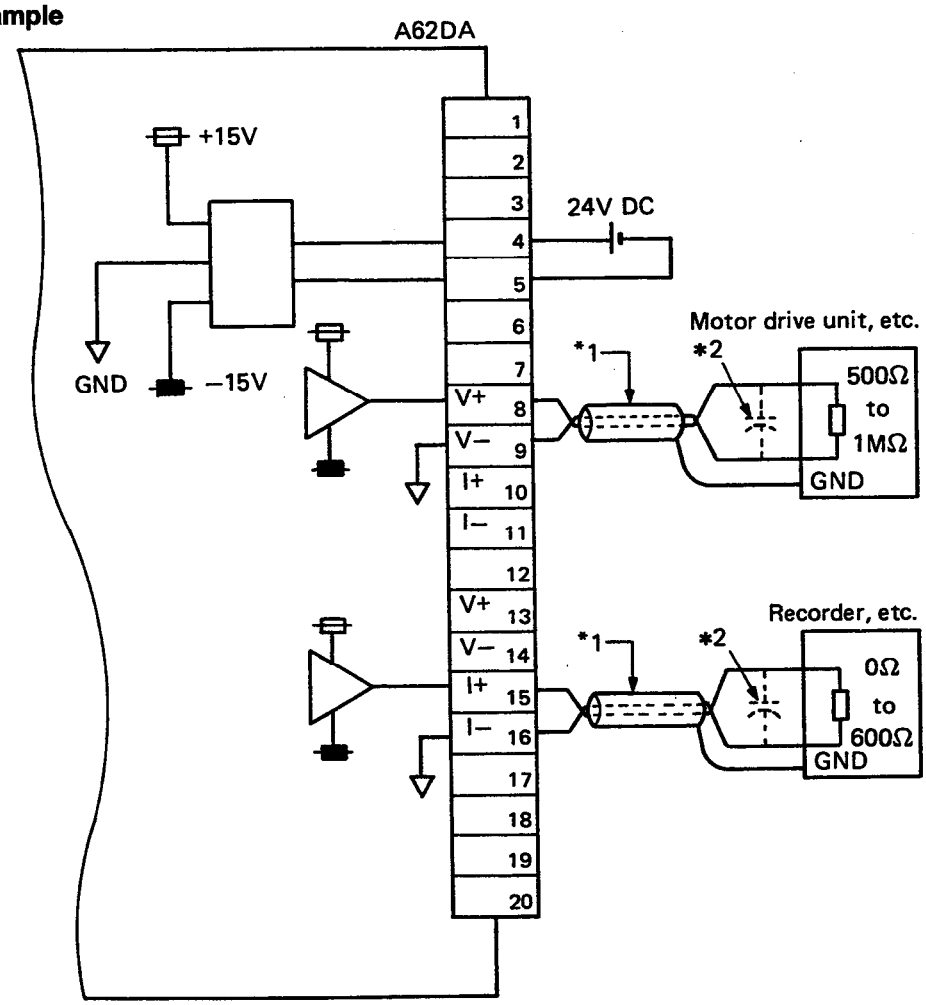
Protect external wiring against noise with the following precautions:

(1) Separate AC and DC wiring.

(2) Separate main circuit and/or high voltage wiring from control and signal wiring.

(3) Where applicable, ground the shielding of all wires to a common ground point.

4.3.2 Unit connection example



*1: Use two core, shielded wiring (twisted).

*2: If noise or ripple is generated by the external wiring, connect a 0.1 to 0.47μF capacitor to the input terminal of external equipment.

IMPORTANT

A given channel cannot be used for voltage and current outputs at the same time. Only use one set of terminals on each channel.

4.4 Maintenance and Inspection

No special maintenance requirements apply to the A62DA. For general maintenance refer to the ACPU User's Manual.

5. PROGRAMMING

5.1 Initial Setting

This section describes a programming procedure for using the A62DA. Perform the initial setting of A62DA from the programmable controller CPU in the procedure shown in Fig. 6.1.

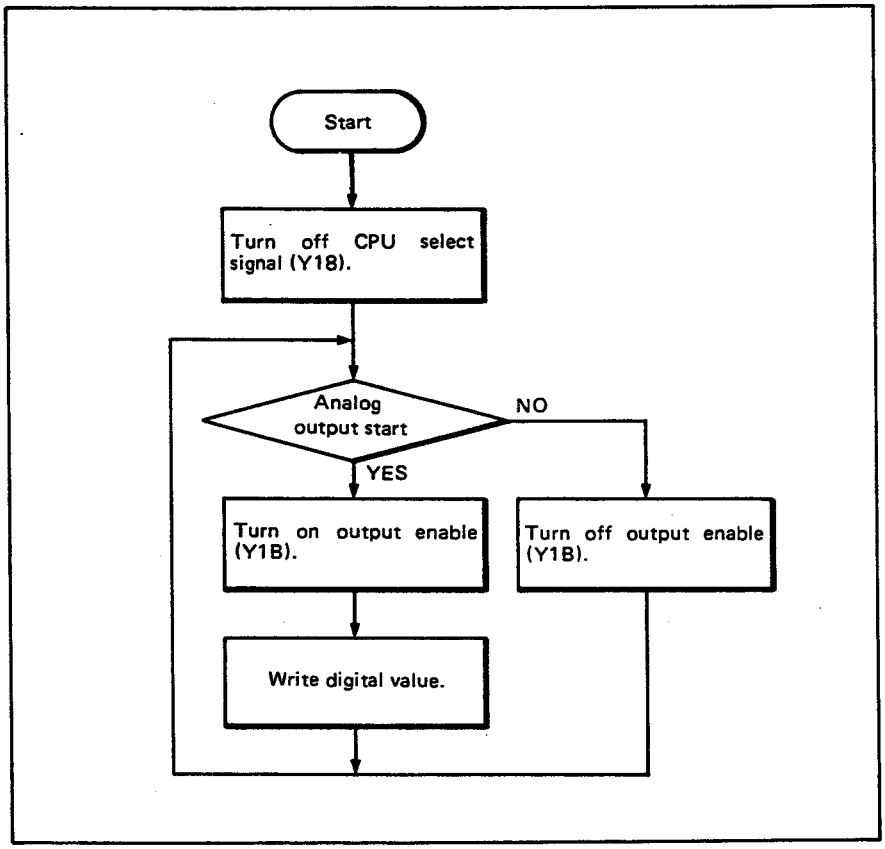


Fig. 5.1 Initial Setting Procedure

I/O numbers shown below are applicable when the A62DA is loaded in slot No. 0 of the main base unit, unless otherwise specified. For I/O numbers with respect to the programmable controller CPU and the assignment of buffer memory, refer to Chapter 3 (page 3-1).

POINT

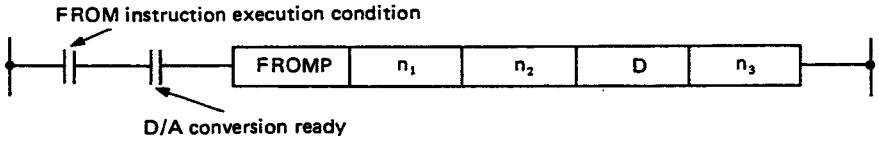
Determine the interlock conditions in accordance with the system used.

5.2 Programs

Examples of the basic read/write program, reading of the digital value and the application circuit when using the APCU are given in this section.
For details refer to the ACPU Programming Manuals or A0J2 Programming Manual. When the module is used for a remote I/O station refer also to the data link User's Manual.

5.2.1 Basic programs for read and write

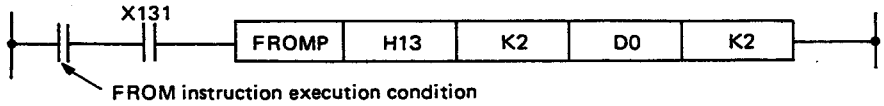
(1) Read from A62DA: FROM, FROMP, DFRO, DFROP instructions



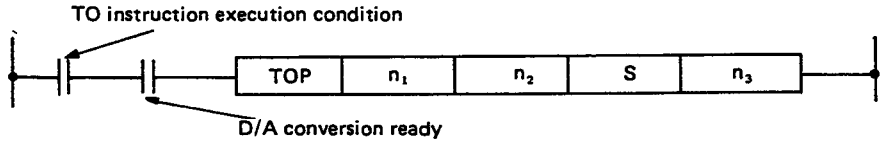
Symbol	Description	Usable Device Number
n_1	Upper 2 digits of head I/O number assigned to A62DA	K, H
n_2	Head address of buffer memory which stores data	K, H
D	Head number of device which will store read data	*T,C,D,W,R
n_3	Number of words of data to be read	K, H

* With the A0J2CPU (P23/R23), only T, C and D can be used.

Example: To read the 2 word data from address 2 of the buffer memory to D0 and 1, with the A62DA assigned to I/O X130 to 14F and Y130 to 14F



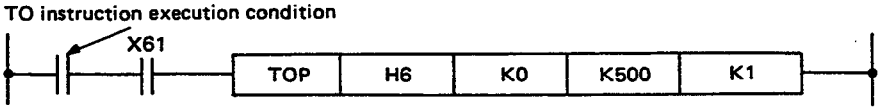
(2) Write to A62DA: TO, TOP, DTO, DTOP instructions



Symbol	Description	Usable Device Number
n_1	Upper 2 digits of head I/O number assigned to A62DA	K, H
n_2	Head address of buffer memory which will store data	K, H
D	Head device number or constant where data to be written is stored.	*T, C, D, W R, K, H
n_3	Number of words of data to be written	K, H

* With the A0J2CPU (P23/R23), only T, C and D can be used.

Example: To write 500 to address 0 of the buffer memory, with the A62DA assigned to I/O X60 to 7F and Y60 to 7F

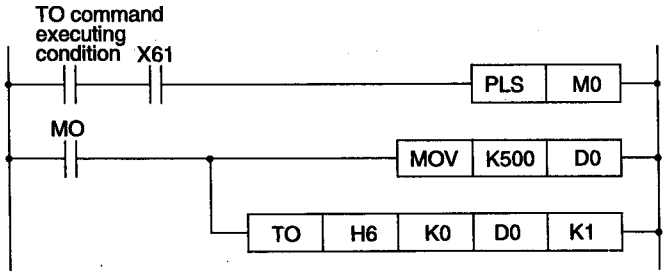


POINT

When using the A0J2CPU (P23/R23), create the program while observing the following points.

(1) The "FROMP, TOP, DFROP and DTOP" commands cannot be used. Create the pulses using the internal relay (M).

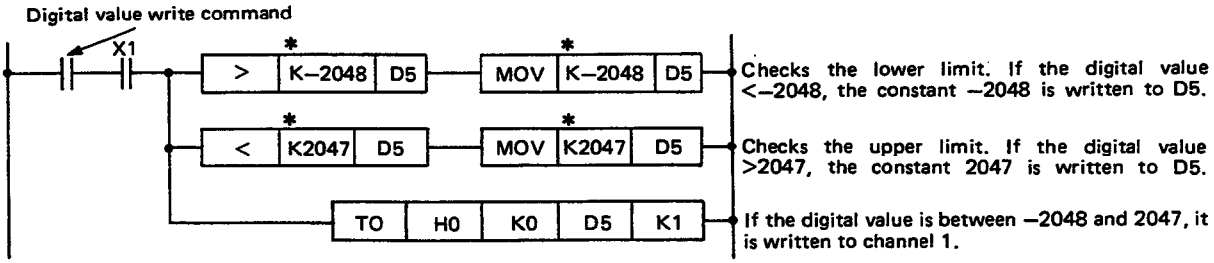
(2) A constant (K, H) cannot be designated for the TO command. Write the constant by setting data in the T, C and D devices.



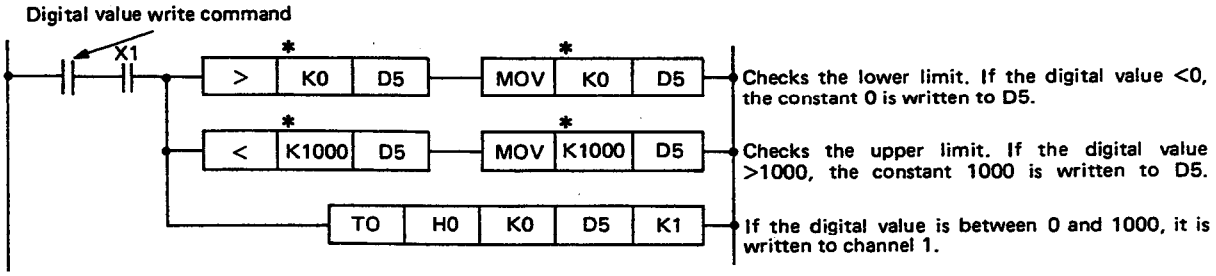
5.2.2 Write of digital value

Writing the contents of data register D5 to channel 1.

(1) Voltage output



(2) Current output

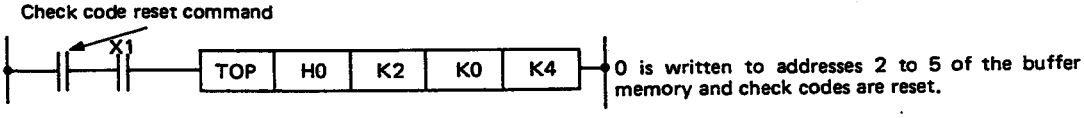


POINT

*** Show an example of interlocking within the sequence program. There are many different ways to interlock depending on the program requirements.**

5.2.3 Reset of check codes

Batch reset of check codes (addresses 2 to 5 of the buffer memory) of channels 1 and 2.



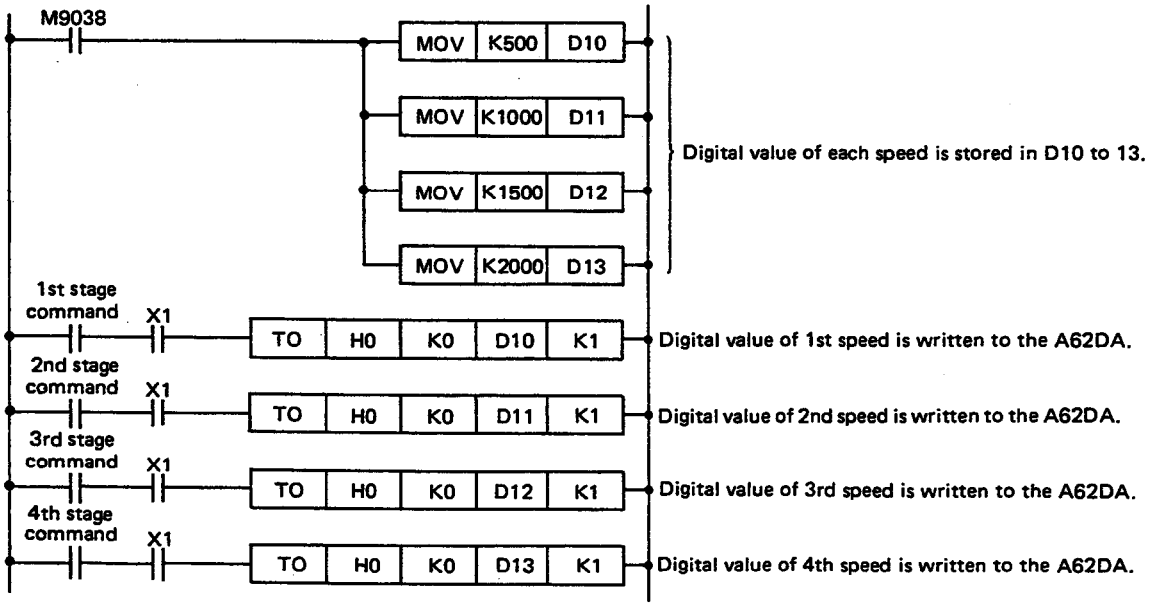
5.2.4 Application circuit examples

An example of the application circuit using the A62DA is shown below.

POINT

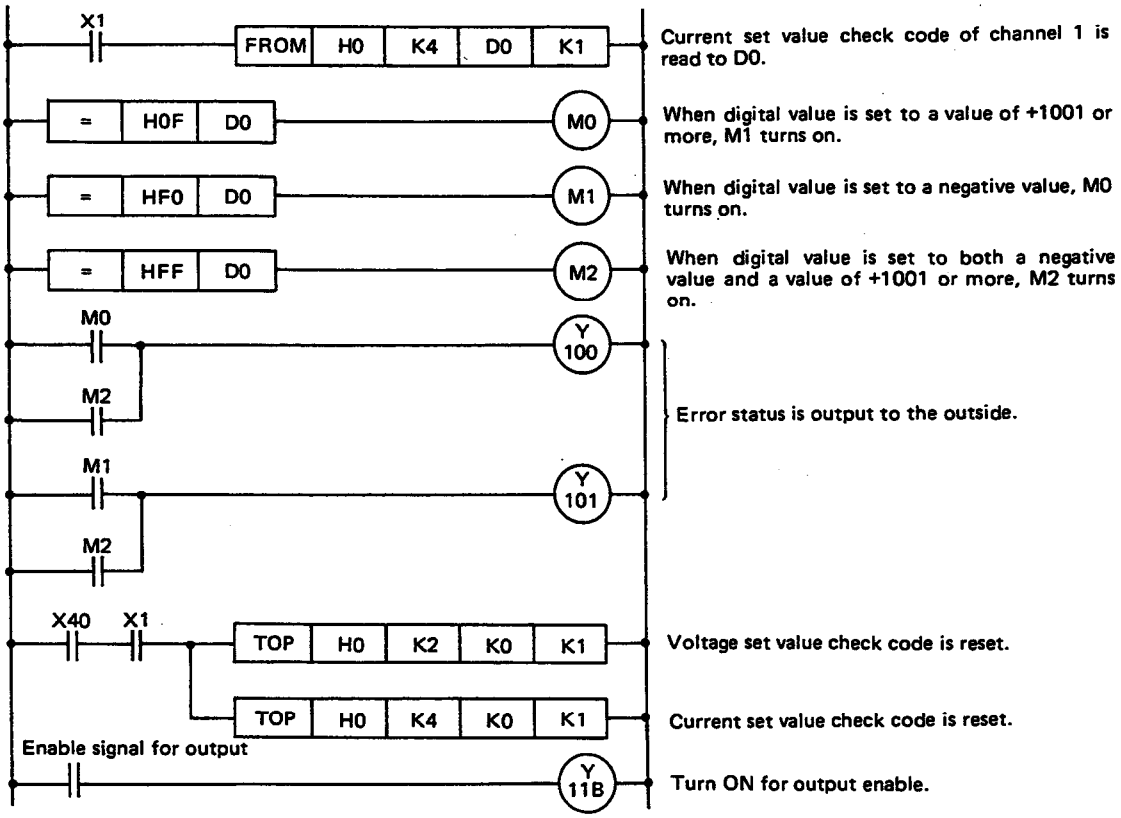
The application circuit example is for a basic circuit. Consider the interlock conditions to match the system being used.

(1) Program giving a voltage analog output from A62DA channel 1 to an inverter for control of 4 set speeds.



(2) Example which provides output to Y100 and Y101 when a digital value setting error occurs during use of analog current output from channel 1. This example also resets the voltage and current set value check codes of channel 1 when X40 turns on.

Check Code	Y100	Y101
000F	ON	OFF
00F0	OFF	ON
00FF	ON	ON



6. TEST OPERATION AND ADJUSTMENTS

6.1 Offset/Gain Setting

The offset/gain setting can be performed in test mode within the following ranges.

	Voltage (V)	Current (mA)
Offset value	–3 to +3 DC	–12 to +12 DC
Gain value	–2 to +10 DC	–8 to +20 DC

Table 7.1 Offset/Gain Setting Range

POINT

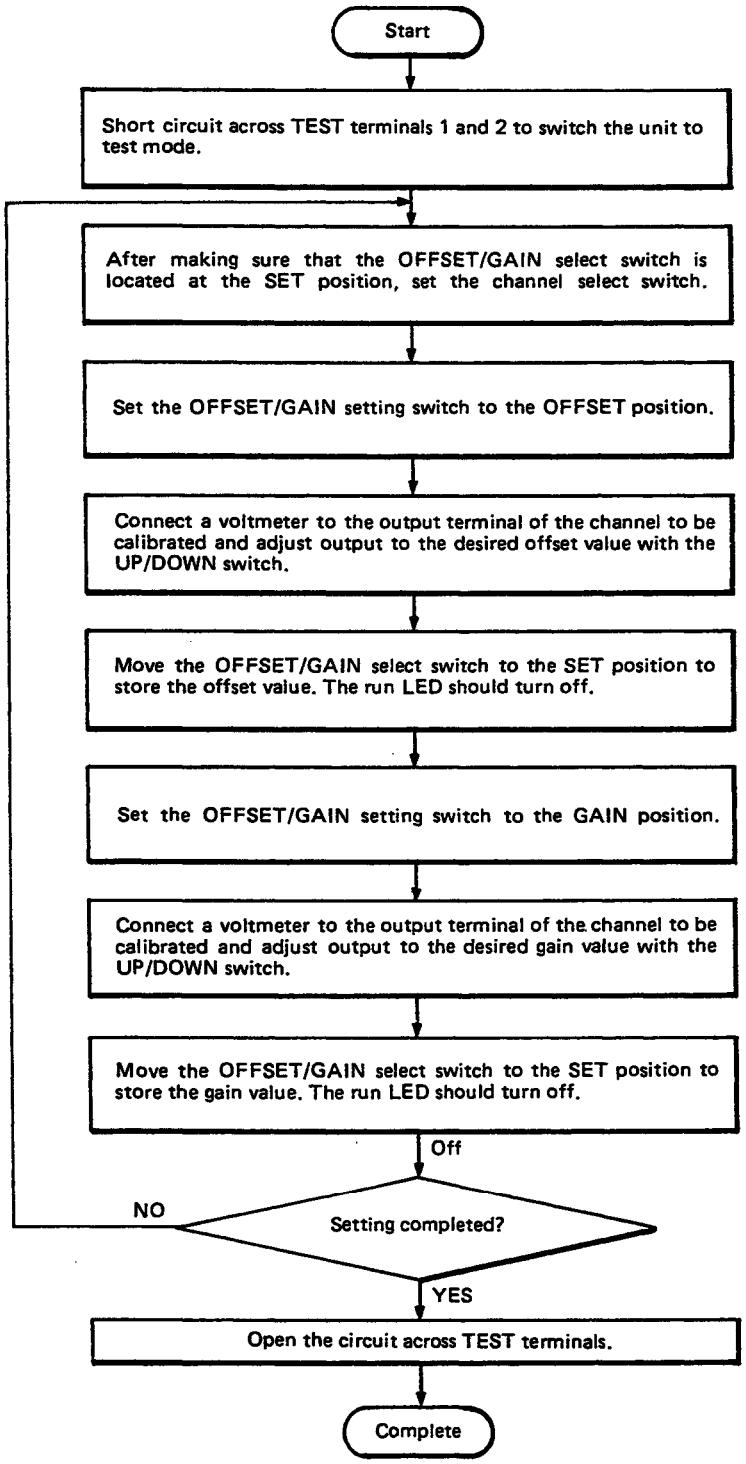
1. **The setting range of the gain value depends on the offset value as follows:**

   Gain range = (Offset value + 1) to +10V (Voltage setting)
   or
   Gain range = (Offset value + 4) to +20mA (Current setting)

   Example: If the offset value has been set to 0V, the gain value can be set within the range +1 to +10V.

2. **If offset (gain value) adjustment is taken outside the range shown in Table 7.1, the RUN LED flickers faster (0.1sec.)**

3. **When turn off power, however offset value and gain value are remained internally.**


Start
Short circuit across TEST terminals 1 and 2 to switch the unit to test mode.
After making sure that the OFFSET/GAIN select switch is located at the SET position, set the channel select switch.
Set the OFFSET/GAIN setting switch to the OFFSET position.
Connect a voltmeter to the output terminal of the channel to be calibrated and adjust output to the desired offset value with the UP/DOWN switch.
Move the OFFSET/GAIN select switch to the SET position to store the offset value. The run LED should turn off.
Set the OFFSET/GAIN setting switch to the GAIN position.
Connect a voltmeter to the output terminal of the channel to be calibrated and adjust output to the desired gain value with the UP/DOWN switch.
Move the OFFSET/GAIN select switch to the SET position to store the gain value. The run LED should turn off.
Off
NO
Setting completed?
YES
Open the circuit across TEST terminals.
Complete

POINT

1. Do not set the A62DA to test mode during its normal control operation. All channels stop D/A conversion in test mode, normal control cannot be performed. By returning the A62DA to normal mode again, D/A conversion is resumed at the newly calibrated gain/offset setting. For the analog output value in test mode, refer to Section 3.3.2 (page 3-9).

2. Set the offset/gain value within the range −10 to 0 to +10V DC or from −20 to 0 to +20mA DC. If setting has been performed outside this range, maximum resolution and overall accuracy may not be within the range of performance specifications.

3. If the RUN LED flickers at high speed (5Hz) when the offset/gain setting range has been exceeded, this excessive value cannot be set into the A62DA and the previously set value is retained.

4. Always switch the OFFSET/GAIN switch to the SET position before switching between channels to prevent accidental over writing of set values.

IMPORTANT

If the CPU is reset in test mode with the OFFSET/GAIN select switch and UP/DOWN switch at the positions described below, proper D/A conversion cannot be made. Therefore, never reset the CPU with the above mentioned switches fixed at such positions. Should the CPU have been reset as described above, restore the system by opening the circuit across the test terminals or by resetting the programmable controller CPU with the switches in their normal positions.

OFFSET/GAIN Select Switch	UP/DOWN Switch	Phenomenon
OFFSET position	DOWN position	Watch dog timer error (X0) signal turns on and analog output is set to 0V (0mA).
GAIN position	DOWN position	Offset/gain setting cannot be performed.

6.2 Check Points before Start of Operation

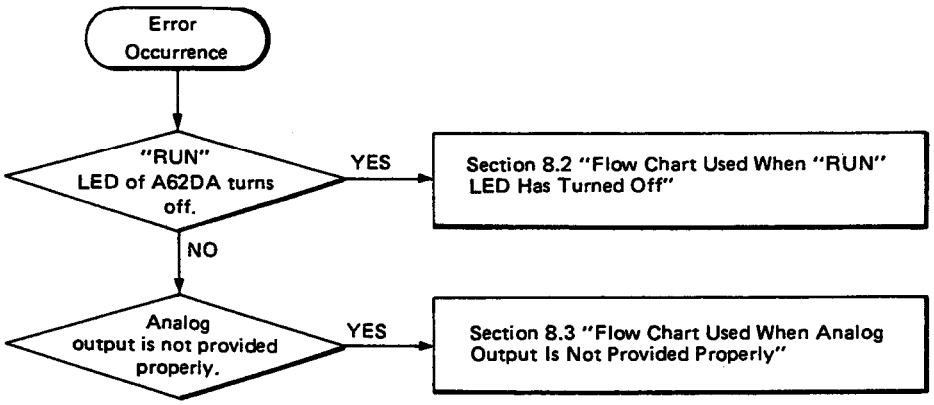
Number	Checking Point	Description	Check
1	Loading of unit	Is the I/O assignment for the A62DA slot correct?	
2	Offset/gain setting	Has offset/gain setting been performed for all channels used?	
		Check for setting errors.	
		Has the unit been returned to normal mode by opening the circuit across TEST terminals?	
3	Connection to A62DA	Does the cable connected to each terminal of terminal block match a signal? Have cables been connected correctly?	
		Are the terminal screws on the terminal block tightened securely?	
		Is the cable size correct?	
		Is the 24V DC connected correctly?	

Table 7.2 Check Points

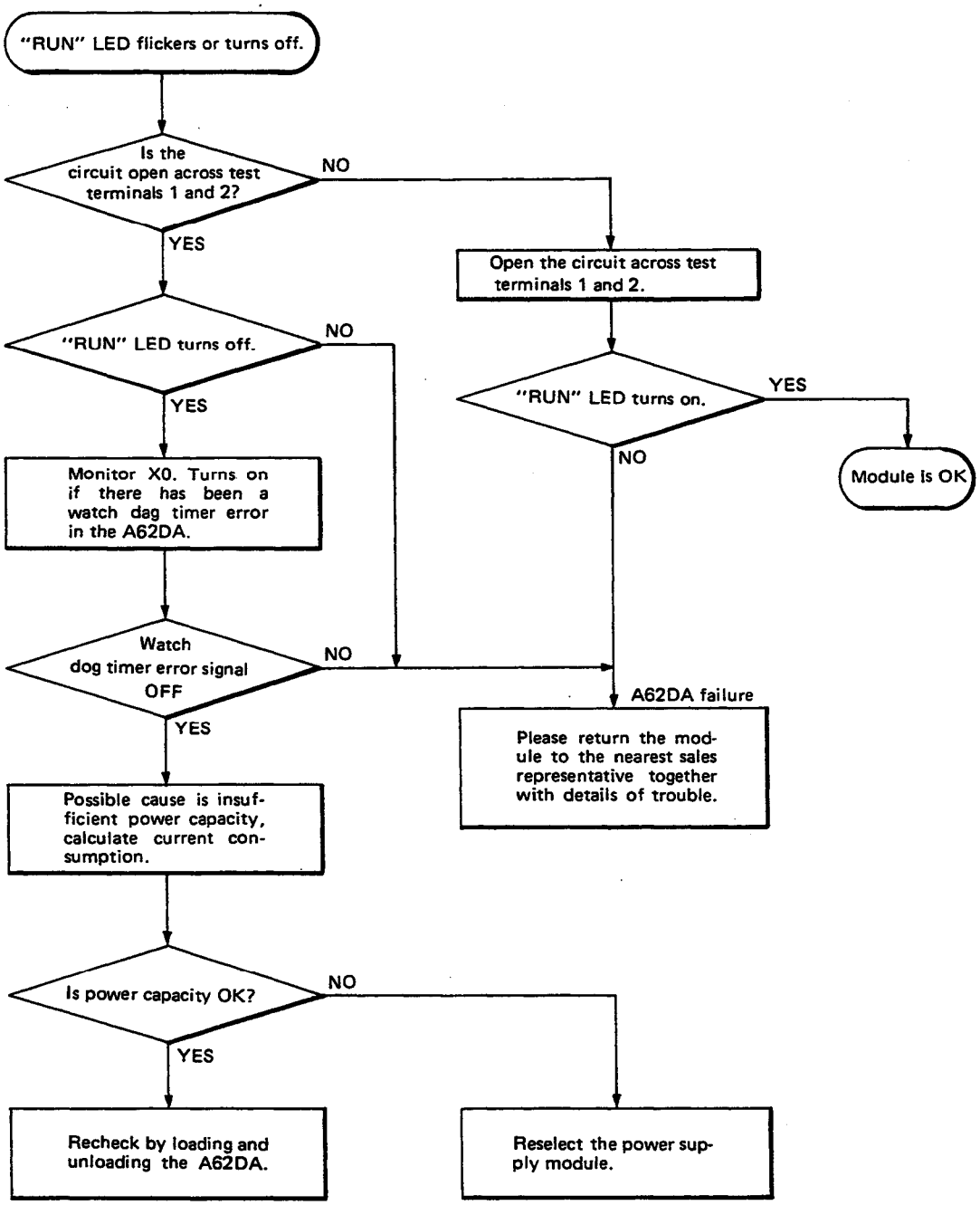
7. TROUBLESHOOTING

This chapter describes simple troubleshooting procedures for the A62DA. For the CPU module, refer to the CPU User's Manual.

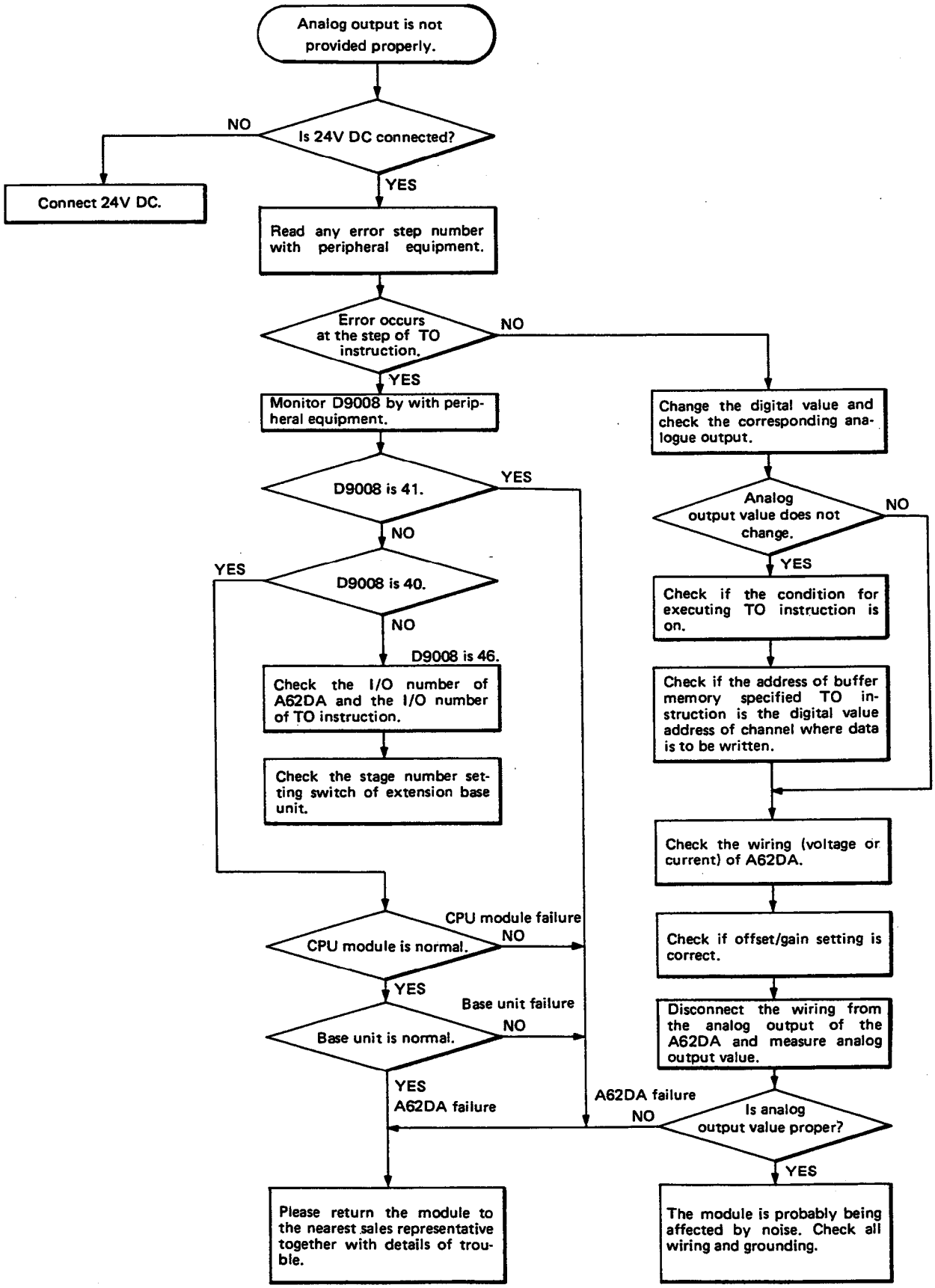
7.1 Troubleshooting Flow Chart



7.2 Flow Chart Used When "RUN" LED Has Flickered or Turned Off



7.3 Flow Chart Used When Analog Output Is Not Provided Properly



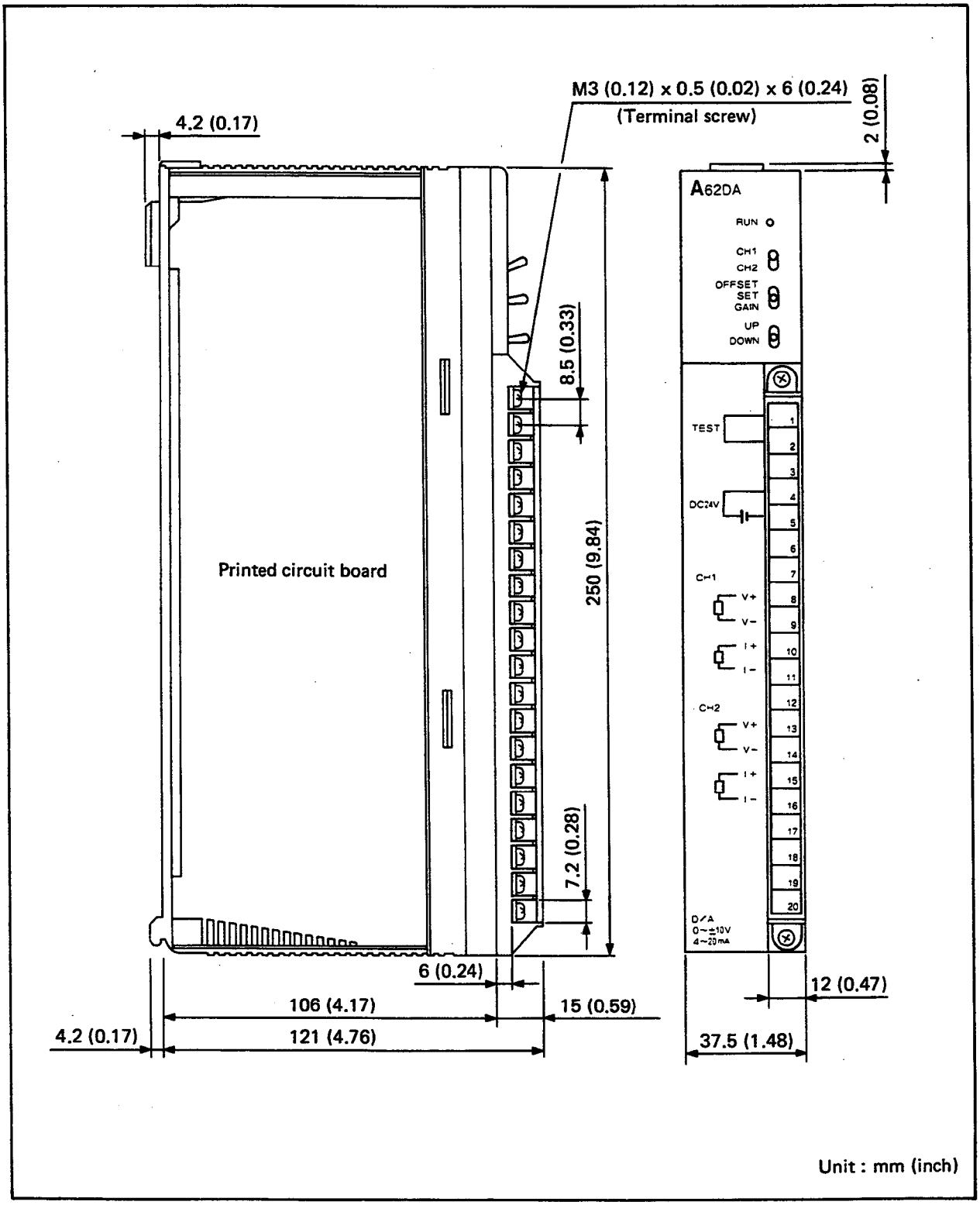
REMARKS

The following contents are written into D9008 when an error has occurred during execution of the FROM or TO instruction.

Content (BIN value) of Special Register D9008	CPU Status	Error and Cause
40	Stop	FROM and TO instructions cannot be executed. Hardware failure of A62DA (special function module), CPU unit, or base unit.
41	Stop	When the FROM or TO instruction has been executed, access has been made to the special function unit but no answer is returned. The accessed A62DA (special function module) has failed.
46	Stop (Continuous operation can be performed by the setting of parameter.)	Access has been made (FROM or TO instruction has been executed) to a slot where the A62DA (special function module) is not loaded. The content of FROM or TO instruction is incorrect or the stage number setting of extension base unit is improper.

APPENDIX

External View



WARRANTY

Please confirm the following product warranty details before starting use.

1. Gratis Warranty Term and Gratis Warranty Range

If any faults or defects (hereinafter "failure") found to be the responsibility of Mitsubishi occurs during use of the product within the gratis warranty term, the product shall be repaired at no cost via the dealer or Mitsubishi Service Company. Note that if repairs are required at a site overseas, on a detached island or remote place, expenses to dispatch an engineer shall be charged for.

[Gratis Warranty Term]

The gratis warranty term of the product shall be for one year after the date of purchase or delivery to a designated place.

Note that after manufacture and shipment from Mitsubishi, the maximum distribution period shall be six (6) months, and the longest gratis warranty term after manufacturing shall be eighteen (18) months. The gratis warranty term of repair parts shall not exceed the gratis warranty term before repairs.

[Gratis Warranty Range]

(1) The range shall be limited to normal use within the usage state, usage methods and usage environment, etc., which follow the conditions and precautions, etc., given in the instruction manual, user's manual and caution labels on the product.

(2) Even within the gratis warranty term, repairs shall be charged for in the following cases.

1. Failure occurring from inappropriate storage or handling, carelessness or negligence by the user. Failure caused by the user's hardware or software design.
2. Failure caused by unapproved modifications, etc., to the product by the user.
3. When the Mitsubishi product is assembled into a user's device, failure that could have been avoided if functions or structures, judged as necessary in the legal safety measures the user's device is subject to or as necessary by industry standards, had been provided.
4. Failure that could have been avoided if consumable parts (battery, backlight, fuse, etc.) designated in the instruction manual had been correctly serviced or replaced.
5. Failure caused by external irresistible forces such as fires or abnormal voltages, and failure caused by force majeure such as earthquakes, lightning, wind and water damage.
6. Failure caused by reasons unpredictable by scientific technology standards at time of shipment from Mitsubishi.
7. Any other failure found to not be the responsibility of Mitsubishi or the user.

2. Onerous repair term after discontinuation of production

(1) Mitsubishi shall accept onerous product repairs for seven (7) years after production of the product is discontinued. Discontinuation of production shall be notified with Mitsubishi Technical Bulletins, etc.

(2) Product supply (including repair parts) is not possible after production is discontinued.

3. Overseas service

Overseas, repairs shall be accepted by Mitsubishi's local overseas FA Center. Note that the repair conditions at each FA Center may differ.

4. Exclusion of chance loss and secondary loss from warranty liability

Regardless of the gratis warranty term, Mitsubishi shall not be liable for compensation to damages caused by any cause found not to be the responsibility of Mitsubishi, chance losses, lost profits incurred to the user by failures in Mitsubishi products, damages and secondary damages caused from special reasons regardless of Mitsubishi's expectations, compensation for accidents, and compensation for damages to products other than Mitsubishi products and other duties.

5. Changes in product specifications

The specifications given in the catalogs, manuals or technical documents are subject to change without prior notice.

6. Product application

(1) In using the Mitsubishi MELSEC programmable logic controller, the usage conditions shall be that the application will not lead to a major accident even if any problem or fault should occur in the programmable logic controller device, and that backup and fail-safe functions are systematically provided outside of the device for any problem or fault.

(2) The Mitsubishi general-purpose programmable logic controller has been designed and manufactured for applications in general industries, etc. Thus, applications in which the public could be affected such as in nuclear power plants and other power plants operated by respective power companies, and applications in which a special quality assurance system is required, such as for each Japan Railways company or the Department of Defense shall be excluded from the programmable logic controller applications.

Note that even with these applications, if the user approves that the application is to be limited and a special quality is not required, application shall be possible.

When considering use in aircraft, medical applications, railways, incineration and fuel devices, manned transport devices, equipment for recreation and amusement, and safety devices, in which human life or assets could be greatly affected and for which a particularly high reliability is required fin terms of safety and control system, please consult with Mitsubishi and discuss the required specifications.

HEADQUARTERS

MITSUBISHI ELECTRIC EUROPE B.V. — EUROPE
Gothaer Straße 8
D-40880 Ratingen
Phone: +49 (0) 21 02 / 486-0
Fax: +49 (0) 21 02 / 4 86-11 20
e mail: megfamail@meg.mee.com

MITSUBISHI ELECTRIC EUROPE B.V. — FRANCE
25, Boulevard des Bouvets
F-92741 Nanterre Cedex
Phone: +33 1 55 68 55 68
Fax: +33 1 55 68 56 85
e mail: factory.automation@fra.mee.com

MITSUBISHI ELECTRIC EUROPE B.V. — UK
Travellers Lane
GB-Hatfield Herts. AL10 8 XB
Phone: +44 (0) 1707 / 27 61 00
Fax: +44 (0) 1707 / 27 86 95

MITSUBISHI ELECTRIC EUROPE B.V. — ITALY
Via Paracelso 12
I-20041 Agrate Brianza (MI)
Phone: +39 039 6053 1
Fax: +39 039 6053 312
e mail: factory.automation@it.mee.com

MITSUBISHI ELECTRIC EUROPE B.V. — SPAIN
Carretera de Rubí 76-80
E-08190 Sant Cugat del Vallés
Phone: +34 9 3 / 565 3131
Fax: +34 9 3 / 589 2948
e mail: industrial@sp.mee.com

MITSUBISHI ELECTRIC CORPORATION — JAPAN
Office Tower "Z" 14 F
8-12,1 chome, Harumi Chuo-Ku
Tokyo 104-6212
Phone: +81 3 6221 6060
Fax: +81 3 6221 6075

MITSUBISHI ELECTRIC AUTOMATION — USA
500 Corporate Woods Parkway
Vernon Hills, IL 60061
Phone: +1 847 / 478 21 00
Fax: +1 847 / 478 22 83

EUROPEAN REPRESENTATIVES

GEVA — AUSTRIA
Wiener Straße 89
A-2500 Baden
Phone: +43 (0) 2252 / 85 55 20
Fax: +43 (0) 2252 / 488 60
e mail: office@geva.at

TEHNIKON — BELARUS
Oktjabrskaya 16/5, Ap 704
BY-220030 Minsk
Phone: +375 (0) 17 / 22 75 704
Fax: +375 (0) 17 / 22 76 669
e mail: tehnikon@belsonet.net

Getronics b.v. Control Systems — BELGIUM
Pontbeeklaan 43
B-1731 Asse-Zellik
Phone: +32 (0) 2 / 467 17 51
Fax: +32 (0) 2 / 467 17 45
e mail: infoautomation@getronics.com

TELECON CO. — BULGARIA
4, A. Ljapchev Blvd.
BG-1756 Sofia
Phone: +359 (0) 2 / 97 44 05 8
Fax: +359 (0) 2 / 97 44 06 1
e mail: —

INEA CR d.o.o. — CROATIA
Drvinje 63
HR-10000 Zagreb
Phone: +385 (0) 1 / 36 67 140
Fax: +385 (0) 1 / 36 67 140
e mail: —

AutoCont Control Systems s.r.o. — CZECHIA
Nemocnicni 12
CZ-702 00 Ostrava 2
Phone: +420 59 / 6152 111
Fax: +420 59 / 6152 562
e mail: consys@autocont.cz

louis poulsen industri & automation — DENMARK
Geminivej 32
DK-2670 Greve
Phone: +45 (0) 43 / 95 95 95
Fax: +45 (0) 43 / 95 95 91
e mail: lpia@lpmail.com

UTU Elektrotehnika AS — ESTONIA
Pärnu mnt.160i
EE-11317 Tallinn
Phone: +372 (0) 6 / 51 72 80
Fax: +372 (0) 6 / 51 72 88
e mail: utu@utu.ee

Beijer Electronics OY — FINLAND
Ansatie 6a
FIN-01740 Vantaa
Phone: +358 (0) 9 / 886 77 500
Fax: +358 (0) 9 / 886 77 555
e mail: info@beijer.fi

PROVENDOR OY — FINLAND
Teljänkatu 8 A 3
FIN-28130 Pori
Phone: +358 (0) 2 / 522 3300
Fax: +358 (0) 2 / 522 3322
e mail: —

UTECO A.B.E.E. — GREECE
5, Mavrogenous Str.
GR-18542 Piraeus
Phone: +302 (0) 10 / 42 10 050
Fax: +302 (0) 10 / 42 12 033
e mail: uteco@uteco.gr

Meltrade Automatika Kft. — HUNGARY
55, Harmat St.
H-1105 Budapest
Phone: +36 (0)1 / 2605 602
Fax: +36 (0)1 / 2605 602
e mail: office@meltrade.hu

EUROPEAN REPRESENTATIVES

MITSUBISHI ELECTRIC EUROPE B.V. – Irish Branch — IRELAND
Westgate Business Park
IRL-Dublin 24
Phone: +353 (0) 1 / 419 88 00
Fax: +353 (0) 1 / 419 88 90
e mail: sales.info@meir.mee.com

SIA POWEL — LATVIA
Lienes iela 28
LV-1009 Riga
Phone: +371 784 / 22 80
Fax: +371 784 / 22 81
e mail: utu@utu.lv

UAB UTU POWEL — LITHUANIA
Savanoriu pr. 187
LT-2053 Vilnius
Phone: +370 (0) 52323-101
Fax: +370 (0) 52322-980
e mail: powel@utu.lt

INTEHSIS SRL — MOLDOVA, REPUBLIC OF
Cuza-Voda 36/1-81
MD-2061 Chisinau
Phone: +373 (0)2 / 562 263
Fax: +373 (0)2 / 562 263
e mail: intehsis@mdl.net

Getronics b.v. Control Systems — NETHERLANDS
Donauweg 2 B
NL-1043 AJ Amsterdam
Phone: +31 (0) 20 / 587 67 00
Fax: +31 (0) 20 / 587 68 39
e mail: info.gia@getronics.com

Beijer Electronics AS — NORWAY
Teglverksveien 1
N-3002 Drammen
Phone: +47 (0) 32 / 24 30 00
Fax: +47 (0) 32 / 84 85 77
e mail: info@beijer.no

MPL Technology Sp. z o.o. — POLAND
ul. Sliczna 36
PL-31-444 Kraków
Phone: +48 (0) 12 / 632 28 85
Fax: +48 (0) 12 / 632 47 82
e mail: krakow@mpl.pl

Sirius Trading & Services srl — ROMANIA
Bd. Lacul Tei nr. 1 B
RO-72301 Bucuresti 2
Phone: +40 (0) 21 / 201 7147
Fax: +40 (0) 21 / 201 7148
e mail: sirius_t_s@fx.ro

ACP Autocomp a.s. — SLOVAKIA
Chalupkova 7
SK-81109 Bratislava
Phone: +421 (02) / 5292-22 54, 55
Fax: +421 (02) / 5292-22 48
e mail: info@acp-autocomp.sk

INEA d.o.o. — SLOVENIA
Stegne 11
SI-1000 Ljubljana
Phone: +386 (0) 1-513 8100
Fax: +386 (0) 1-513 8170
e mail: inea@inea.si

Beijer Electronics AB — SWEDEN
Box 426
S-20124 Malmö
Phone: +46 (0) 40 / 35 86 00
Fax: +46 (0) 40 / 35 86 02
e mail: info@beijer.se

ECONOTEC AG — SWITZERLAND
Postfach 282
CH-8309 Nürensdorf
Phone: +41 (0) 1 / 838 48 11
Fax: +41 (0) 1 / 838 48 12
e mail: info@econotec.ch

EUROPEAN REPRESENTATIVES

GTS — TURKEY
Darülaceze Cad. No. 43 KAT: 2
TR-80270 Okmeydani-Istanbul
Phone: +90 (0) 212 / 320 1640
Fax: +90 (0) 212 / 320 1649
e mail: gts@turk.net

CSC Automation Ltd. — UKRAINE
15, M. Raskova St., Fl. 10, Office 1010
UA-02002 Kiev
Phone: +380 (0) 44 / 238-83-16
Fax: +380 (0) 44 / 238-83-17
e mail: csc-a@csc-a.kiev.ua

AFRICAN REPRESENTATIVE

CBI Ltd — SOUTH AFRICA
Private Bag 2016
ZA-1600 Isando
Phone: +27 (0) 11/ 928 2000
Fax: +27 (0) 11/ 392 2354
e mail: cbi@cbi.co.za

MIDDLE EAST REPRESENTATIVE

TEXEL Electronics LTD. — ISRAEL
Box 6272
IL-42160 Netanya
Phone: +972 (0) 9 / 863 08 91
Fax: +972 (0) 9 / 885 24 30
e mail: texel_me@netvision.net.il

EURASIAN REPRESENTATIVE

AVTOMATIKA SEVER — RUSSIA
Krapivnij Per. 5, Of. 402
RU-194044 St Petersburg
Phone: +7 812 / 1183 238
Fax: +7 812 / 3039 648
e mail: pav@avtsev.spb.ru

CONSYS — RUSSIA
Promyshlennaya St. 42
RU-198099 St Petersburg
Phone: +7 812 / 325 36 53
Fax: +7 812 / 325 36 53
e mail: consys@consys.spb.ru

ELEKTROSTYLE — RUSSIA
Ul Garschina 11
RU-140070 Moscowskaja Oblast
Phone: +7 095/ 261 3808
Fax: +7 095/ 261 3808
e mail: —

ICOS — RUSSIA
Industrial Computer Systems Zao
Ryazanskij Prospekt 8a, Office 100
RU-109428 Moscow
Phone: +7 095 / 232 - 0207
Fax: +7 095 / 232 - 0327
e mail: mail@icos.ru

NPP Uralelektra — RUSSIA
Sverdlova 11a
RU-620027 Ekaterinburg
Phone: +7 34 32 / 53 27 45
Fax: +7 34 32 / 53 27 45
e mail: elektra@etel.ru

STC Drive Technique — RUSSIA
Poslannikov Per. 9, str.1
RU-107005 Moscow
Phone: +7 095 / 786 21 00
Fax: +7 095 / 786 21 01
e mail: info@privod.ru