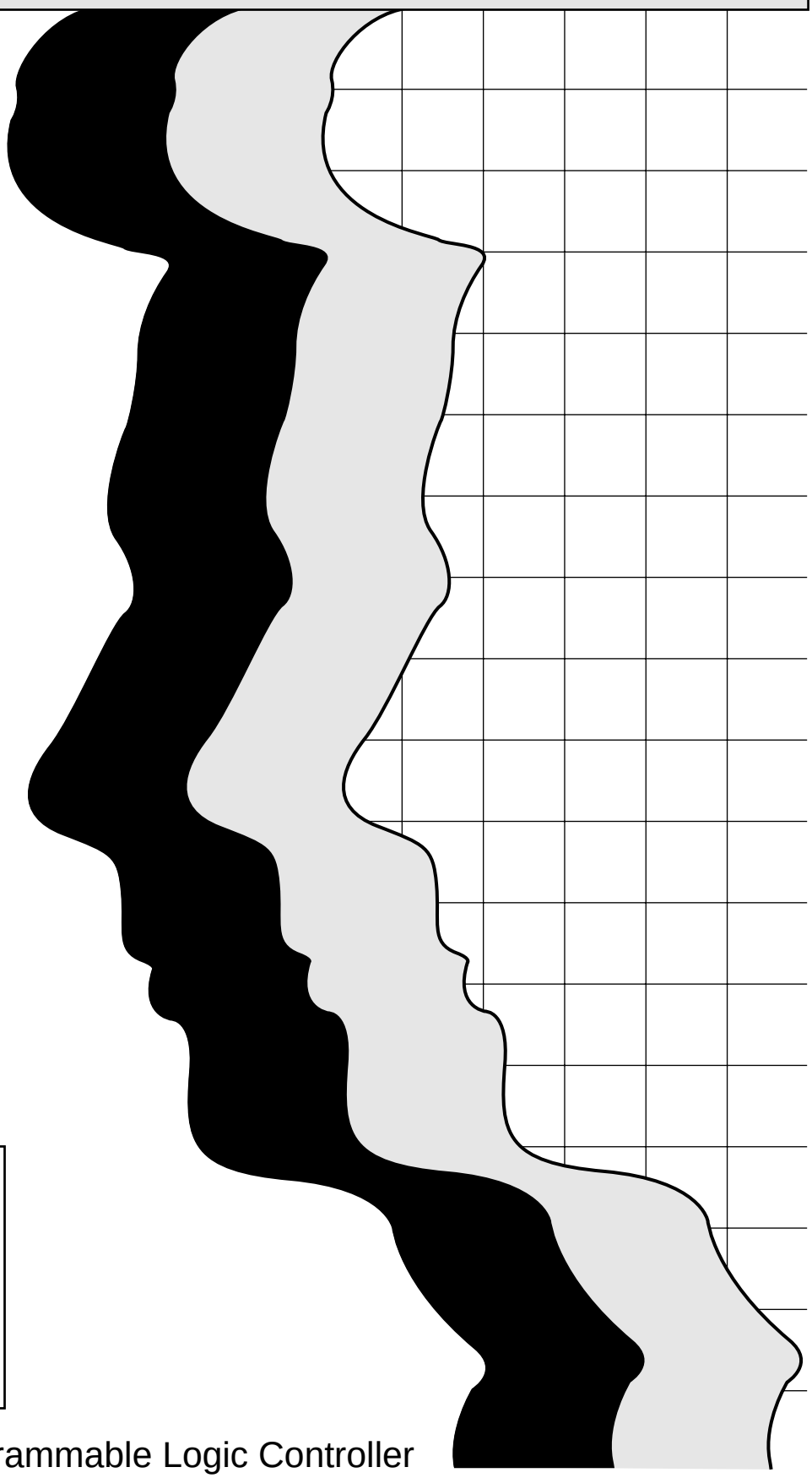
MITSUBISHI

D/A Converter Module Type A62DA-S1

User's Manual



A

MELSEC

Mitsubishi Programmable Logic Controller

● SAFETY PRECAUTIONS ●

(Read these precautions before using.)

When using Mitsubishi equipment, thoroughly read this manual and the associated manuals introduced in this manual. Also pay careful attention to safety and handle the module properly.

The instructions given in this manual are concerned with this product. Refer to the User's Manual of instructions for the programmable logic controller the CPU module in use for details on the safety system.

These ● SAFETY PRECAUTIONS ● classify the safety precautions into two categories: "DANGER" and "CAUTION".

DANGER	Procedures which may lead to a dangerous condition and cause death or serious injury if not carried out properly.
CAUTION	Procedures which may lead to a dangerous condition and cause superficial to medium injury, or physical damage only, if not carried out properly.

Depending on circumstances, procedures indicated by **CAUTION** may also be linked to serious results.

In any case, it is important to follow the directions for usage.

Store this manual in a safe place so that you can take it out and read it whenever necessary.
Always forward it to the end user.

[Design Precautions]

DANGER

- Safety circuits should be installed external to the programmable controller to ensure that the system as a whole will continue to operate safely in the event of an external power supply malfunction or a programmable controller failure.
  Erroneous outputs and operation could result in an accident.
  1) The following circuitry should be installed outside the programmable controller:
     Interlock circuitry for the emergency stop circuit protective circuit, and for reciprocal operations such as forward/reverse, etc., and interlock circuitry for upper/lower positioning limits, etc., to prevent machine damage.
  2) When the programmable controller detects an abnormal condition, processing is stopped and all outputs are switched OFF. This happens in the following cases:
     - When the power supply module's over-current or over-voltage protection device is activated
     - When an error (watchdog timer error, etc.) is detected at the PLC CPU by the self-diagnosis function.

     Some errors, such as input/output control errors, cannot be detected by the PLC CPU, and there may be cases when all outputs are turned ON when such errors occur. In order to ensure that the machine operates safely in such cases, a failsafe circuit or mechanism should be provided outside the programmable controller. Refer to the CPU module user's manual for an example of such a failsafe circuit.
  3) Outputs may become stuck at ON or OFF due to an output module relay or transistor failure. An external circuit should therefore be provided to monitor output signals whose incorrect operation could cause serious accidents.

- Continuous overcurrent operation of the output module, due to operation over the rated capacity or load shorting, could result in smoke or fire. Always provide a safety circuit, such as an external fuse.

- A circuit should be installed which permits the external power supply to be switched ON only after the programmable controller power has been switched ON. Accidents caused by erroneous outputs and motion could result if the external power supply is switched ON first.

- When a data link communication error occurs, the status shown below will be established at the faulty station. In order to ensure that the system operates safely at such times, an interlock circuit should be provided in the sequence program (using the communication status information).
  Erroneous outputs and operation could result in an accident.
  1) The data link data which existed prior to the error will be held.
  2) All outputs will be switched OFF at MELSECNET (II, /B, /10) remote I/Ostations.
  3) At the MELSECNET/MINI-S3 remote I/O stations, all outputs will be switched OFF or output statuses will be held, depending on the E.C. mode setting.

  For details on procedures for checking faulty stations, and for operation statuses when such errors occur, refer to the appropriate data link manual.

[Design Precautions]

CAUTION

- Do not bundle control lines or communication wires together with main circuit or power lines, or lay them close to these lines.
  As a guide, separate the lines by a distance of at least 100 mm, otherwise malfunctions may occur due to noise.
- At power ON/OFF, voltage or current may instantaneously be output from the output terminal of this module. In such case, wait until the analog output becomes stable to start controlling the external device.

[Installation Precautions]

⚠ CAUTION

- Use the PC in an environment that conforms to the general specifications in the manual.
  Using the PC in environments outside the ranges stated in the general specifications will cause electric shock, fire, malfunction, or damage to/deterioration of the product.
- Make sure that the module fixing projection on the base of the module is properly engaged in the module fixing hole in the base unit before mounting the module.
  Failure to mount the module properly will result in malfunction or failure, or in the module falling.
- Extension cables should be securely connected to base unit and module connectors. Check for loose connection after installation.
  A poor connection could result in contact problems and erroneous inputs/outputs.
- Plug the memory card firmly into the memory card mounting connector. Check for loose connection after installation. A poor connection could result in erroneous operation.
- Be sure to insert the memory securely into the memory socket.
  After mounting, make sure that it does not lift up.
  Poor contact could cause malfunctioning.
- 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]

⚠ DANGER

- Be sure to shut off all phases of the external power supply used by the system before installation or wiring.
  Not doing so can cause the product to be damaged or malfunction.
- After installation and wiring is completed, be sure to attach the terminal cover before switching the power ON and starting operation.
  Failure to do so could result in electrical shocks.

⚠ CAUTION

- Be sure to ground the FG and LG terminals, carrying out at least class 3 grounding work with a ground exclusive to the PLC.
  Otherwise there will be a danger of electric shock and malfunctions.
- Carry out wiring to the PC correctly, checking the rated voltage and terminal arrangement of the product.
  Using a power supply that does not conform to the rated voltage, or carrying out wiring incorrectly, will cause fire or failure.
- Outputs from multiple power supply modules should not be connected in parallel. Failure to do so could cause the power supply module to overheat, resulting in a fire or module failure.
- Tighten the terminal screws to the stipulated torque.
  Loose screws will cause short circuits, fire, or malfunctions.
- Make sure that no foreign matter such as chips or wiring offcuts gets inside the module. It will cause fire, failure or malfunction.
- Connectors for external connections should be crimped, pressure welded, or soldered in the correct manner using the correct tools.
  For details regarding crimping and pressure welding tools, refer to the input/output module user's manual.
  A poor connection could cause shorts, fire, and erroneous operation.

[Starting and Maintenance Precautions]

⚠ DANGER

- Do not touch terminals while the power is ON.
  This will cause malfunctions.
- Make sure that the battery is connected properly. Do not attempt to charge or disassemble the battery, do not heat the battery or place it in a flame, and do not short or solder the battery.
  Incorrect handling of the battery can cause battery heat generation and ruptures which could result in fire or injury.
- Be sure to shut off all phases of the external power supply used by the system before cleaning or retightening the terminal screws.
  Not doing so can cause the module to fail or malfunction.

⚠ CAUTION

- In order to ensure safe operation, read the manual carefully to acquaint yourself with procedures for program changes, forced outputs, RUN, STOP, and PAUSE operations, etc., while operation is in progress. Incorrect operation could result in machine failure and injury.
- Do not disassemble or modify any module.
  This will cause failure, malfunction, injuries, or fire.
- Be sure to shut off all phases of the external power supply used by the system before mounting or removing the module.
  Not doing so may cause damage to the module.
- When replacing fuses, be sure to use the prescribed fuse.
  A fuse of the wrong capacity could cause a fire.
- Before handling the module, always touch grounded metal, etc. to discharge static electricity from the human body.
  Failure to do so may cause the module to fail or malfunction.

[Disposal Precautions]

⚠ CAUTION

- Dispose of this product as industrial waste.

REVISIONS

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

Print Date	※Manual Number	Revision
Jan., 1989	IB (NA) 66177-A	First edition
Apr., 2001	IB (NA) 66177-B	Addition SAFETY PRECAUTIONS, WARRANTY Correction Chapter 1, Section 2.2, 2.3, 3.1, 3.2.1, 4.1, 4.2.1, 4.3.2, 5.1, 5.2.3
Sep., 2005	IB (NA) 66177-C	Addition Conformance to the EMC Directive/ Low Voltage Directive Correction SAFETY PRECAUTIONS, Section 2.2, 4.2.1, 5.1

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.

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External View APP-1

Conformance to the EMC Directive/Low Voltage Directive

When incorporating the Mitsubishi PLC into other machinery or equipment and keeping compliance with the EMC and low voltage directives, refer to Chapter 3, "EMC Directives and Low Voltage Directives" of the User's Manual (Hardware) included with the CPU module or base unit used.
The CE logo is printed on the rating plate on the main body of the PLC that conforms to the EMC directive and low voltage instruction.
By making this product conform to the EMC directive and low voltage instruction, it is not necessary to make those steps individually.

1. GENERAL DESCRIPTION
2. SYSTEM CONFIGURATION
3. SPECIFICATIONS
4. HANDLING
5. PROGRAMMING
6. TEST OPERATION AND ADJUSTMENTS
7. TROUBLESHOOTING
APPENDIX

1. GENERAL DESCRIPTION

This User's Manual describes the specifications, handling, programming procedures, etc. of the A62DA-S1 digital-analog converter module (hereinafter referred to as "A62DA-S1") which is used in combination with the MELSEC-A series CPU module.
The A62DA-S1 is higher in resolution than the A62DA as indicated below:

<table>
<tr><th colspan="2">Item \ Type</th><th>A62DA-S1</th><th>A62DA</th></tr>
<tr><td colspan="2">Digital input</td><td>0 to +4000</td><td>0 to ±2000</td></tr>
<tr><td colspan="2">Analog output</td><td>Voltage: 0 to +10V DC
Current: 0 to +20mA DC</td><td>Voltage: −10 to 0 to +10V DC
Current: −20 to 0 to +20mA DC</td></tr>
<tr><td rowspan="2">Resolution</td><td>Voltage</td><td>1 to 5V: 1mV
0 to 5V: 1.25mV
0 to 10V: 2.5mV</td><td>1 to 5V: 5mV
0 to 5V: 5mV
0 to 10V: 5mV</td></tr>
<tr><td>Current</td><td>4 to 20mA: 4 μA
0 to 20mA: 5 μA</td><td>4 to 20mA: 20 μA
0 to 20mA: 20 μA</td></tr>
<tr><td colspan="2">I/O characteristics</td><td>
<table>
<tr><th>Digital Input</th><th>Analog Output</th></tr>
<tr><td>+4000</td><td>+10V</td></tr>
<tr><td>0</td><td>0</td></tr>
<tr><td>+4000</td><td>+5V or +20mA</td></tr>
<tr><td>0</td><td>0V or 0mA</td></tr>
<tr><td>+4000</td><td>+5V or +20mA</td></tr>
<tr><td>0</td><td>+1V or +4mA</td></tr>
</table>
</td><td>
<table>
<tr><th>Digital Input</th><th>Analog Output</th></tr>
<tr><td>+2000</td><td>+10V</td></tr>
<tr><td>+1000</td><td>+5V or +20mA</td></tr>
<tr><td>0</td><td>0V or 0mA</td></tr>
<tr><td>−1000</td><td>−5V or −20mA</td></tr>
<tr><td>−2000</td><td>−10V</td></tr>
</table>
</td></tr>
<tr><td colspan="2">Function</td><td>*Output clear or hold may be selected at PLC stop.</td><td>Cannot be selected.</td></tr>
</table>

*: For full information, see Section 4.2.2.

Various manuals are available for use of the A62DA-S1.
In this manual, the CPU types are generally referred to as follows:

(1) Building block type CPU

A1CPU(P21/R21)	A2UCPU
A2CPU(P21/R21)	A2UCPU-S1
A2CPU-S1(P21/R21)	A3UCPU
A3CPU(P21/R21)	A4UCPU
A1NCPU(P21/R21)	A73CPU(P21/R21)
A2NCPU(P21/R21)	A3MCPU(P21/R21)
A2NCPU-S1(P21/R21)	A81CPU
A3NCPU(P21/R21)	Q2ACPU
A3HCPU(P21/R21)	Q2ACPU-S1
A2ACPU(P21/R21)	Q3ACPU
A2ACPU-S1(P21/R21)	Q4ACPU
A3ACPU(P21/R21)	Q4ARCPU

(2) Small-type building block type CPU

A1SCPU	A2SCPU
A1SJCPU(S3)	A2SHCPU
A2USCPU	A2USHCPU-S1
A1SJHCPU	Q2ASCPU(S1)
A1SCPUC24-R2	Q2ASHCPU(S1)
A1SHCPU	

(3) Compact-type CPU

A0J2CPU(P23/R23)
A0J2HCPU(P21/R21)
A52GCPU(T21B)

POINT

In this manual, the I/O assignment numbers of the A62DA-S1 with respect to the PLC CPU assume that the A62DA-S1 is loaded on slot 0 of the main base unit used with a building block type CPU.
When the A62DA-S1 is loaded onto any other slot or a compact type CPU is used, determine the assignment numbers in accordance with the I/O assignment method given in the programming manual.

2. SYSTEM CONFIGURATION

2.1 Overall Configuration

The A62DA-S1 may be used with the building block type and compact type CPUs in the following configurations:

(1) Building block type CPU

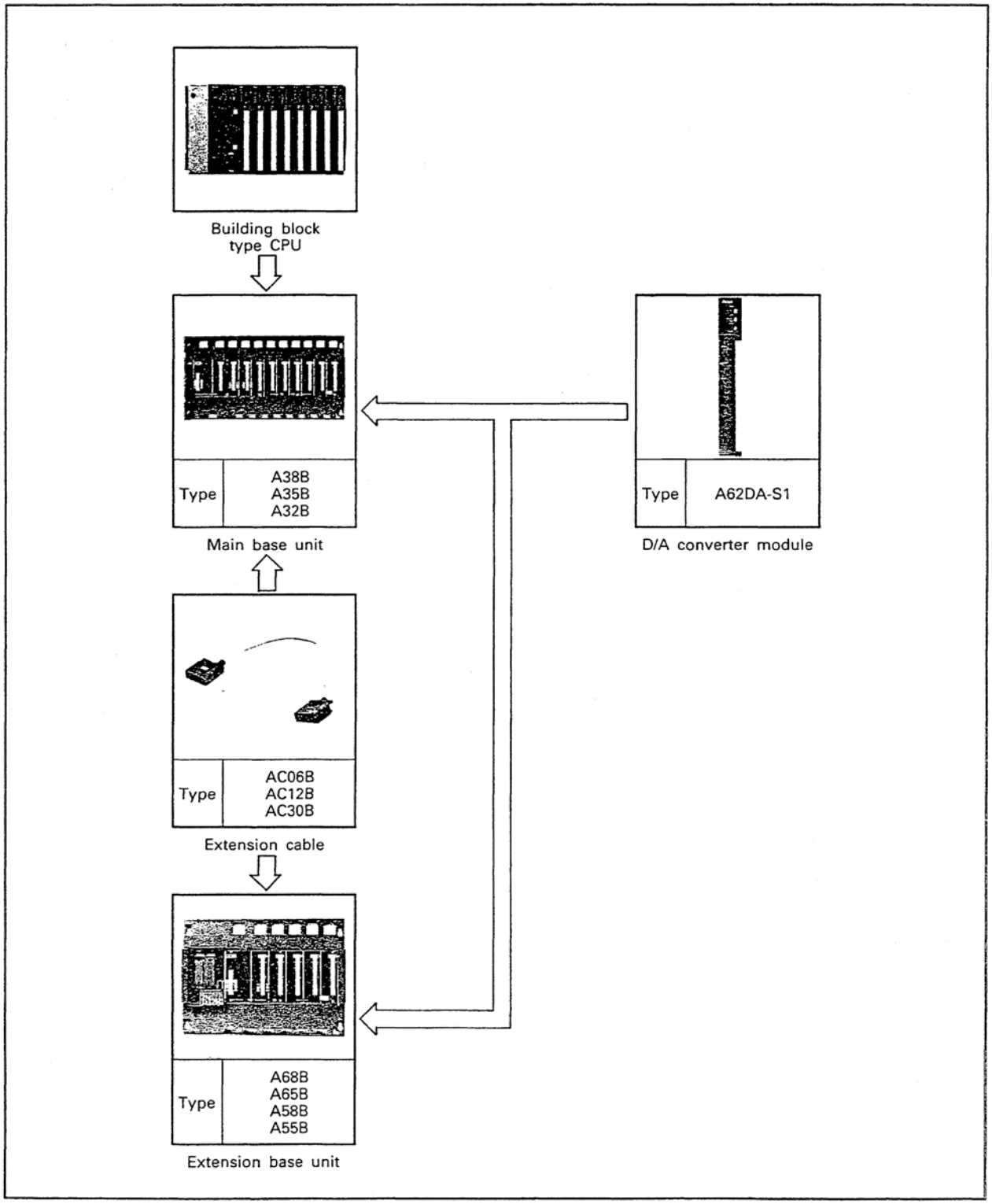


Fig. 2.1 Overall Configuration for Building Block Type CPU

(2) Compact type CPU

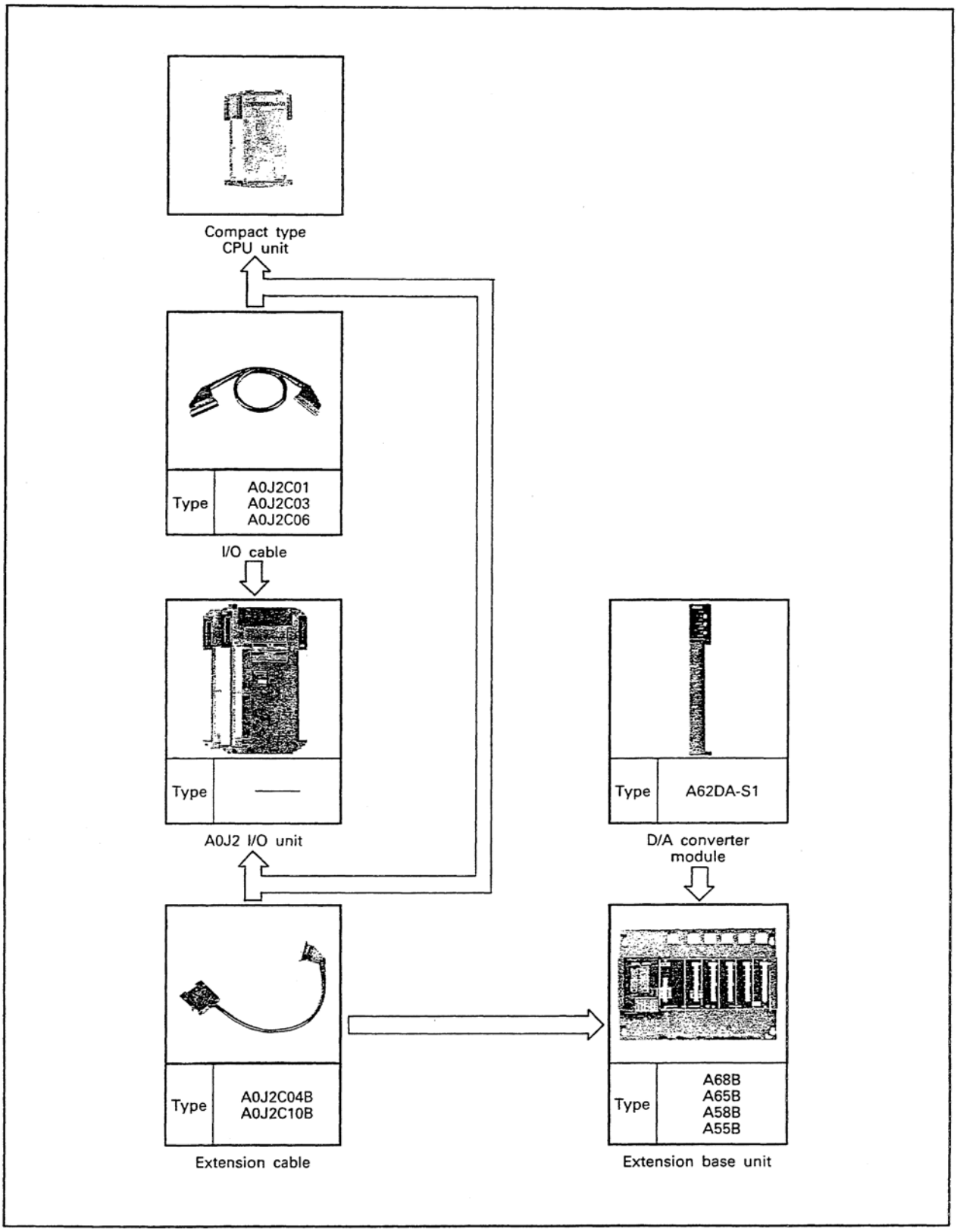


Fig. 2.2 Overall Configuration for Compact Type CPU

2.2 Applicable System

The A62DA-S1 can be used for the following CPU modules:

A0J2CPU	A3UCPU	A1SJCPU(S3)
A0J2HCPU	A4UCPU	A1SJHCPU
A1NCPU	A73CPU	A1SCPU
A2NCPU	A81CPU	A1SCPUC24-R2
A2NCPU-S1	A1CPU	A1SHCPU
A3NCPU	A2CPU	A2SCPU
A3HCPU	A2CPU-S1	A2SHCPU
A3MCPU	A3CPU	A2USCPU(S1)
A2ACPU	Q2ACPU	A2USHCPU-S1
A2ACPU-S1	Q2ACPU-S1	Q2ASCPU(S1)
A3ACPU	Q3ACPU	Q2ASHCPU(S1)
A2UCPU	Q4ACPU	A52GCPU
A2UCPU-S1	Q4ARCPU	Q02CPU-A
		Q02HCPU-A
		Q06HCPU-A

The A62DA-S1 can be loaded into any slot of the base unit except in the following cases:

(1) Avoid loading the A62DA-S1 into an extension base (Type A5 ⬚ extension base unit) without a power supply unit because power capacity may become insufficient. If the A62DA-S1 is loaded onto such an extension base, select the power supply module and extension cable in accordance with the corresponding CPU User's Manual.

(2) **Any of the following can be connected with the data link: master station, local station, remote I/O station.**
Refer to the MELSECNET、MELSECNET/B data link system reference manual for examples of programs for remote I/O stations.

(3) When the A3(E)CPU(P21/R21) is used, the A62DA-S1 cannot be loaded on the final slot of extension stage 7.
These restrictions do not apply to A3NCPU, A3HCPU, A3MCPU, A73CPU, A3ACPU.

The processing time (read, write) with the A62DA-S1 in a data link system is given in the Data Link System User's Manual.

2.3 Channel Isolation Method

The output terminals are photocoupler isolated from the PLC power supply. Since the analog output ground is connected in the A62DA-S1, "—V" and "—1" of each channel are on the same level.

POINT

The A62DA-S1 cannot be used in an A0J2P25/R25 (remote I/O station)

3. SPECIFICATIONS

3.1 General Specifications

The general specifications of A62DA-S1 are indicated in Table 3.1.

Item	Specifications				
Operating ambient temperature	0 to 55℃				
Storage ambient temperature	−20 to 75℃				
Operating ambient humidity	10 to 90%RH, no condensation				
Storage ambient humidity	10 to 90%RH, no condensation				
Vibration resistance	Conforms to *1JIS C 0911	**Frequency**	**Acceleration**	**Amplitude**	**Sweep Count**
		10 to 55Hz	——	0.075mm	10 times
		55 to 150Hz	**9.8m/S²**	——	*(1 octave/minute)
Shock resistance	**Conforming to JIS C 0912 (98m/S²×3 times in 3 directions)**				
Noise durability	By noise simulator 1500Vpp noise voltage, 1μs noise width and 25 to 60Hz noise frequency				
Dielectric withstand voltage	500V AC for 1 minute across analog output terminals and ground 250V AC for 1 minute across 24V DC input terminals and ground				
Insulation resistance	5MΩ or larger by 500V DC insulation resistance tester across analog output terminals and ground 5MΩ or larger by 250V DC insulation resistance tester across 24V DC input terminals and ground				
Operating ambience	To be free from corrosive gases. Dust should be minimal.				
Cooling method	Self-cooling				

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.

*1JIS: Japanese Industrial Standard.

3.2 Performance Specifications

3.2.1 Performance specifications

The performance specifications of A62DA-S1 are indicated in Table 3.2.

<table>
<tr><th colspan="2">Item</th><th>Specifications</th></tr>
<tr><td colspan="2">Digital input</td><td>0 to +4000
For data configuration and setting procedure, refer to Section 3.4.2.</td></tr>
<tr><td colspan="2">Analog output</td><td>Voltage : −0 to +10V DC
(External load resistance : 500Ω to 1MΩ)
Current : +4 to +20mA DC
(External load resistance : 0Ω to 600Ω)
Selectively used depending on output terminals.
0 to +20mA can also be used for current output.</td></tr>
<tr><td colspan="2">I/O characteristics</td><td>
<table>
<tr><th>Output Range</th><th>Digital Input</th><th>Analog Output</th></tr>
<tr><td rowspan="2">0 to 10V</td><td>+4000</td><td>+10V</td></tr>
<tr><td>0</td><td>0V</td></tr>
<tr><td rowspan="2">0 to 5V
0 to 20mA</td><td>+4000</td><td>+5V or +20mA</td></tr>
<tr><td>0</td><td>0V or 0mA</td></tr>
<tr><td rowspan="2">1 to 5V
4 to 20mA</td><td>+4000</td><td>+5V or +20mA</td></tr>
<tr><td>0</td><td>+1V or +4mA</td></tr>
</table>
For details, refer to Section 3.2.2.
</td></tr>
<tr><td rowspan="2">Maximum resolution</td><td>Voltage</td><td>1 to 5V: 1mV (1/4000)
0 to 5V: 1.25mV (1/4000)
0 to 10V: 2.5mV (1/4000)</td></tr>
<tr><td>Current</td><td>4 to 20mA: 4μA (1/4000)
0 to 20mA: 5μA (1/4000)</td></tr>
<tr><td colspan="2">Overall accuracy *1
(Accuracy for max. value)</td><td>
<table>
<tr><th>Output Range / Temperature Range</th><th>1 to 5V</th><th>0 to 5V</th><th>0 to 50V</th><th>4 to 20mA</th><th>0 to 20mA</th></tr>
<tr><td>25℃ (within ±0.5%)</td><td>±25mV</td><td>±25mV</td><td>±50mV</td><td>±0.1mA</td><td>±0.1mA</td></tr>
<tr><td>0 to 55℃ (within ±1.0%)</td><td>±50mV</td><td>±50mV</td><td>±100mV</td><td>±0.2mA</td><td>±0.2mA</td></tr>
</table>
</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 period between digital input write and specified analog voltage (current) reached.</td></tr>
<tr><td colspan="2">Absolute maximum output</td><td>Voltage: 0 to +12V
Current: 0 to +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 PLC 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(18 to 14 AWG) (Applicable tightening torque: 39~59N-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 (5VDC)</td><td>0.6A</td></tr>
<tr><td rowspan="2">External supply power</td><td>Voltage</td><td>21.6 to 26.4V DC</td></tr>
<tr><td>Current consumption</td><td>0.35A (at 24V DC)</td></tr>
<tr><td colspan="2">Penetration current</td><td>2.4A</td></tr>
<tr><td colspan="2">Weight</td><td>0.5kg</td></tr>
</table>

*1 Accuracy against maximum analog value.

Table 3.2 Performance Specifications

POINT

The analog output range for maximum resolution or maximum overall accuracy is 0 to +10V or 0 to 20mA.

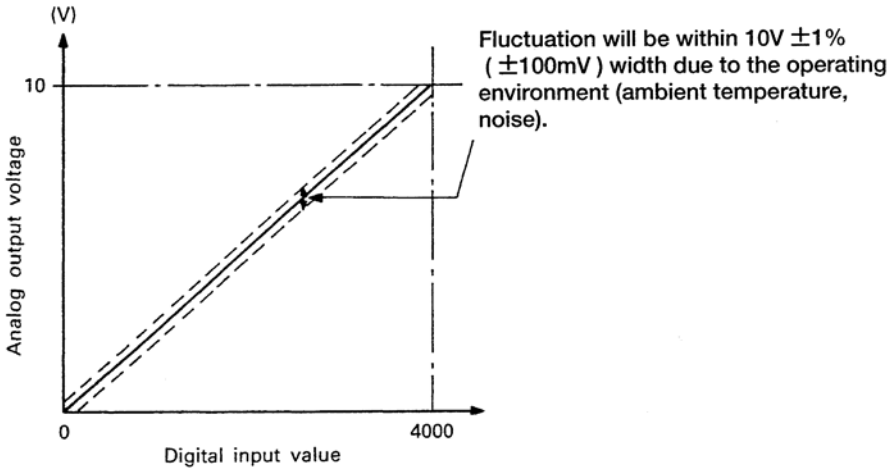
REMARKS

(1) Maximum resolution

Indicates the minimum analog value output in accordance with the change of a digital input value and determined by the setting of the output range setting jumper (Section 4.2.3).
For example, the maximum resolution is 2.5mV at the output range of 0 to 10V and remains unchanged if the gain value is changed to 8V. (See Fig. 3.6.)

(2) Overall accuracy

Indicates the accuracy for the maximum value of the output range. The following graph assumes that the output range is 0 to 10V and temperature is 0 to 55°C.



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.

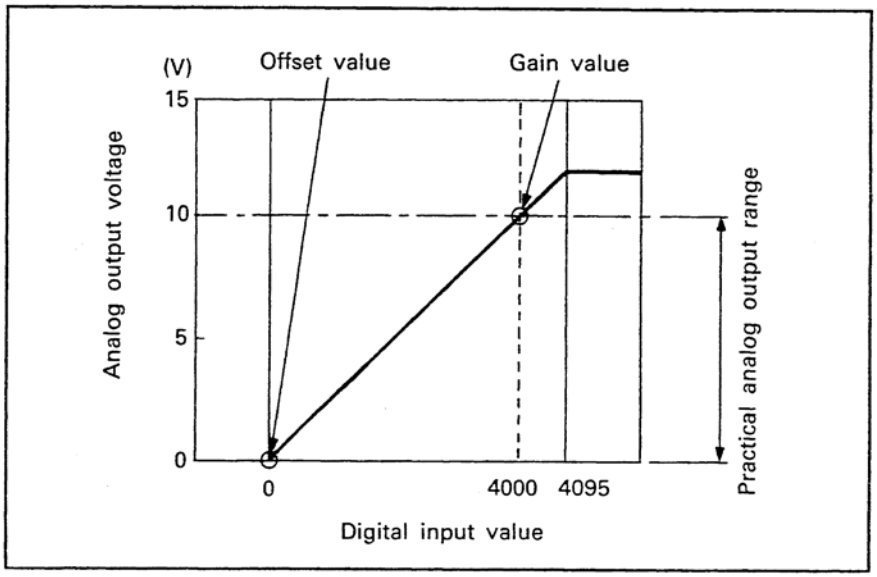


Fig. 3.1 I/O Conversion Characteristics

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 4000. Set the gain value in test mode.

3. Relation between mode and output range (Mode switched by jumper)

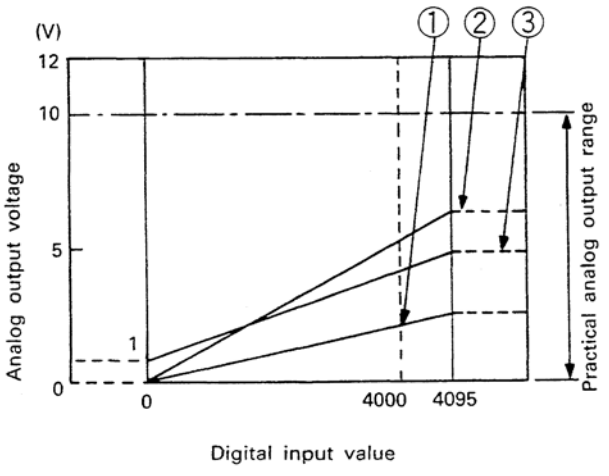
Mode	Output Range
1	1 to 5V
2	0 to 5V
3	0 to 10V
4	4 to 20mA
5	0 to 20mA

(For more information, see Section 4.2.3.)

(1) Voltage output characteristics

Fig.s 3.2 and 3.3 show voltage output characteristic examples for several offset/gain settings.

Mode 2 Example



The offset/gain setting in the figure on the left is as follows:

(1) When the offset value is 0V and the gain value is 2V, the characteristic is as indicated by ①.

Example: When the digital input value is 800, the analog output value is 0.4V.

(2) When the offset value is 0V and the gain value is 5V, the characteristic is as indicated by ②.

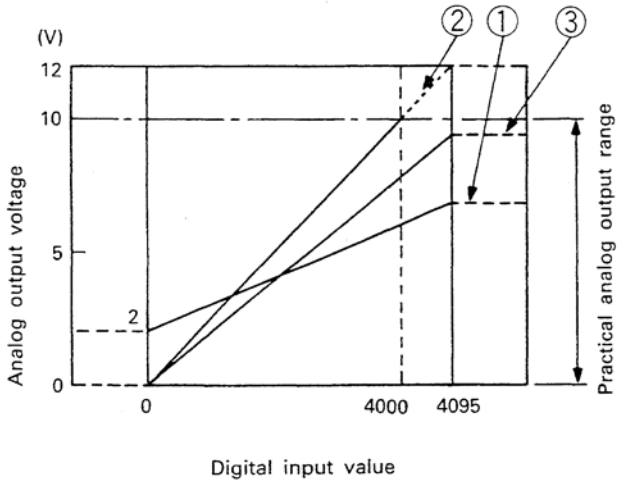
Example: When the digital input value is 800, the analog output value is 1.0V.

(3) When the offset value is 1V and the gain value is 4V, the characteristic is as indicated by ③.

Example: When the digital input value is 800, the analog output value is 1.6V.

Fig. 3.2 Voltage Output Characteristic

Mode 3 Example



The offset/gain setting in the figure on the left is as follows:

(1) When the offset value is 2V and the gain value is 6V, the characteristic is as indicated by ①.

Example: When the digital input value is 800, the analog output value is 2.8V.

(2) When the offset value is 0V and the gain value is 10V, the characteristic is as indicated by ②.

Example: When the digital input value is 800, the analog output value is 2V.

(3) When the offset value is 0V and the gain value is 8V, the characteristic is as indicated by ③.

Example: When the digital input value is 800, the analog output value is 1.6V.

Fig. 3.3 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 0 to +10V. Avoid use outside the above indicated range (dotted line on the voltage output characteristic graph in Fig. 3.2 and 3.3).
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 unit.
2) Accuracy may not be within the range of performance specifications.

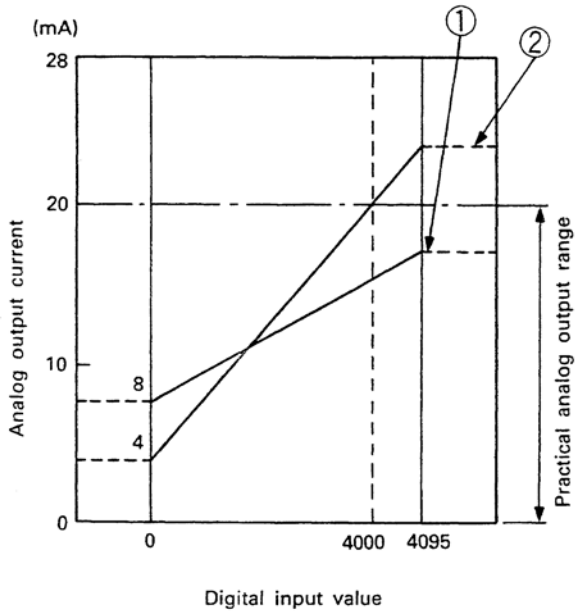
(2) When the digital input value has been set to less than 0 or more than +4095, analog output is provided with the digital input value regarded as 0 or +4095.

(3) The A62DA-S1 limits the maximum output voltage to 0 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. 3.4 shows a current output characteristic graph for several offset/gain settings.

Mode 4 Example



The offset/gain setting in the figure on the left is as follows:

(1) When the offset value is 8mA and the gain value is 16mA, the characteristic is as indicated by ①.

Example: When the digital input value is 800, the analog output is 9.6mA.

(2) When the offset value is 4mA and the gain value is 20mA, the characteristic is as indicated by ②.

Example: When the digital input value is 800, the analog output is 7.2mA.

Fig. 3.4 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 0 to +20mA. Avoid use outside the above indicated range (dotted line on the current output characteristic graph in Fig. 3.4).
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 unit.
2) Accuracy may not be within the range of performance specifications.

(2) When the digital input value has been set to less than 0 or more than +4095, analog output is provided with the digital input value regarded as 0 or +4095.

(3) The A62DA-S1 limits the maximum output current to 0 or +28mA to protect against short circuit 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-S1 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.

$$(\text{Resolution}) = \frac{(\text{gain value}) - (\text{offset value})}{4000}$$

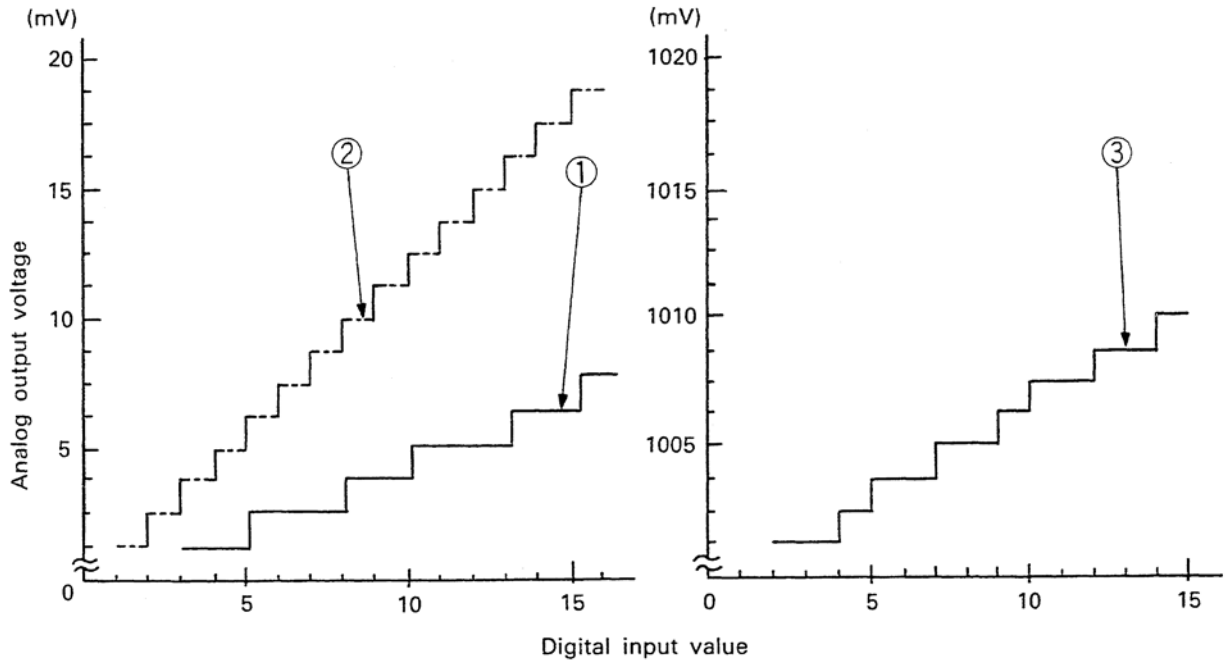
$$(\text{Analog output}) = \frac{(\text{gain value}) - (\text{offset value})}{4000} \times (\text{digital input value}) + (\text{offset value})$$

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

If the resolution is in units of 1.25mV (0 to 5V), 1mV (1 to 5V), 2.5mV (0 to 10V) or 5 μA (0 to 20mA), 4 μA (4 to 20mA), 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. 3.5 to 3.7 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 to 3.4.

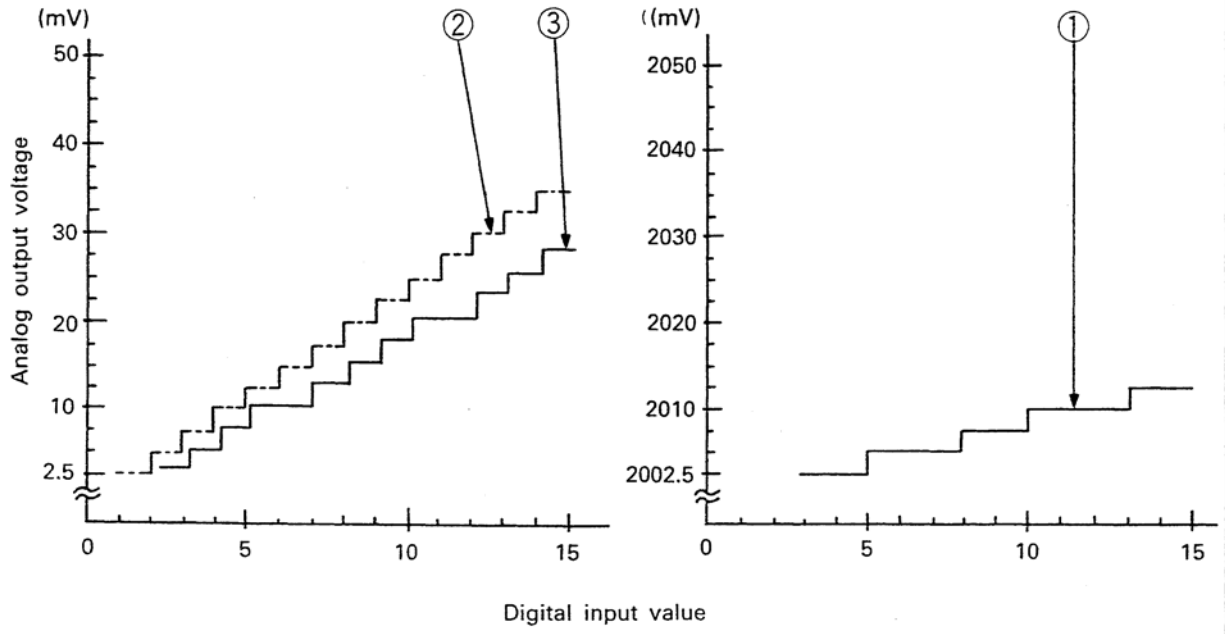
Mode 2 Example (Fig. 3.2)



*: As for ① and ③, the resolution is less than 1.25mV. When the digital input value is incremented or decremented 1, the analog output value increases or decreases 0 or 1.25mV.

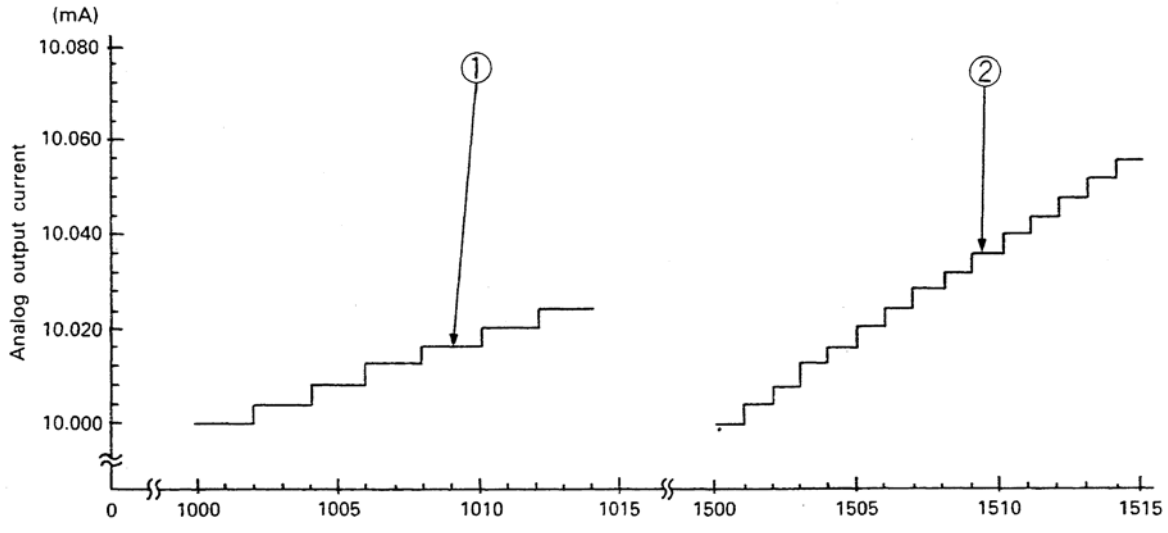
Fig. 3.5 Digital Input Value and Voltage Output

Mode 3 Example (Fig. 3.3)



*: As for ① and ③, the resolution is less than 2.5mV. When the digital input value is incremented or decremented 1, the analog output value increases or decreases 0 or 2.5mV.

Fig. 3.6 Digital Input Value and Voltage Output



*: As for ①, the resolution is less than 4 μ A. When the digital input value is incremented or decremented 1, the analog output value increases or decreases 0 or 4 μ A.

Fig. 3.7 Digital Input Value and Current Output

3.3 I/O List with Respect to Programmable Controller CPU

The I/O signals for the A62DA-S1 with respect to the programmable controller CPU are as indicated below. The I/O numbers indicated below assume that the A62DA-S1 is loaded on slot 0 of the main base unit used with the A series building block type CPU.

3.3.1 I/O list

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

Input Signal	Description
X0	Watch dog timer error Turns on if a watch dog timer error occurs in the A62DA-S1.
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 change to test mode. (2) Used as an interlock when read or write is performed from the programmable controller CPU to the A62DA-S1.
X2 to X1F	Not used

(2) Outputs for programmable controller CPU: X0 to X1F (32 points).

Output Signal	Description
Y0 to Y1A	Reserved
Y1B	Output enable Used for channels 1 and 2. Analog output depends on the signal status. (1) Off Output hold or clear is selected by the jumper. (See Section 4.2.2.) 1) HOLD position Retains the value on the trailing edge of the output enable signal. 2) CLEAR position Outputs the offset value as an analog value. (2) On Outputs the analog value converted from the digital value.
Y1C to Y1F	Reserved

IMPORTANT

Do not use devices Y0 to 1A and Y1C to 1F in the normal sequence program.
Note, however that if the A62DA-S1 is used in a remote I/O system, resetting Y0E and Y0F is permitted. For details, refer to the Data Link System 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	HOLD position: Value on the trailing edge of output enable	CLEAR position: Offset value	0V	The digital value written from the programmable controller CPU, is converted into an analog value which is output.
Remarks		Output hold or clear is selected by the jumper. (See Section 4.2.2.)			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	Offset value	Offset value	Offset value	Offset value
SET				
GAIN	Gain value			Gain value

3.4 Buffer Memory

The A62DA-S1 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 5.

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	Upper limit check code of CH1	
3	Lower limit check code of CH1	
4	Upper limit check code of CH2	
5	Lower limit check code of CH2	

*Each data consists of 16 bits.

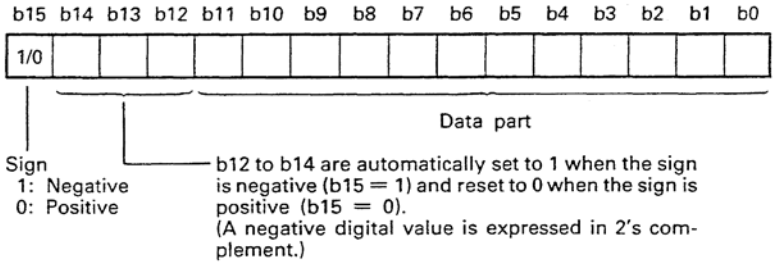
3.4.2 Contents and data configuration of buffer memory

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 D/A conversion ready signal is on, the digital value is 0 at the time of power-on or reset.

b) Set a digital value of 0 to 4095 in 16-bit signed binary.



POINT

Any digital value specified outside its range is regarded as the usable maximum value or minimum value for D/A conversion.

Example: The specified value of −6000 is treated as 0 and +6000 as +4095.

(2) Upper limit check (CH1, CH2)

When the digital value specified is +4001 or greater, the following check code is set to the corresponding channel.

Check Code	Description
000F	The digital value set is +4001 or greater.

*Check code in hexadecimal.

(3) Lower limit check (CH1, CH2)

When the digital value specified is negative, the following check code is set to the corresponding channel.

Check Code	Description
000F	The digital value set is negative.

*Check code in hexadecimal.

POINT

Reset the check codes in the PLC CPU sequence program. For full information, see Section 5.

3.5 Function Block Diagram

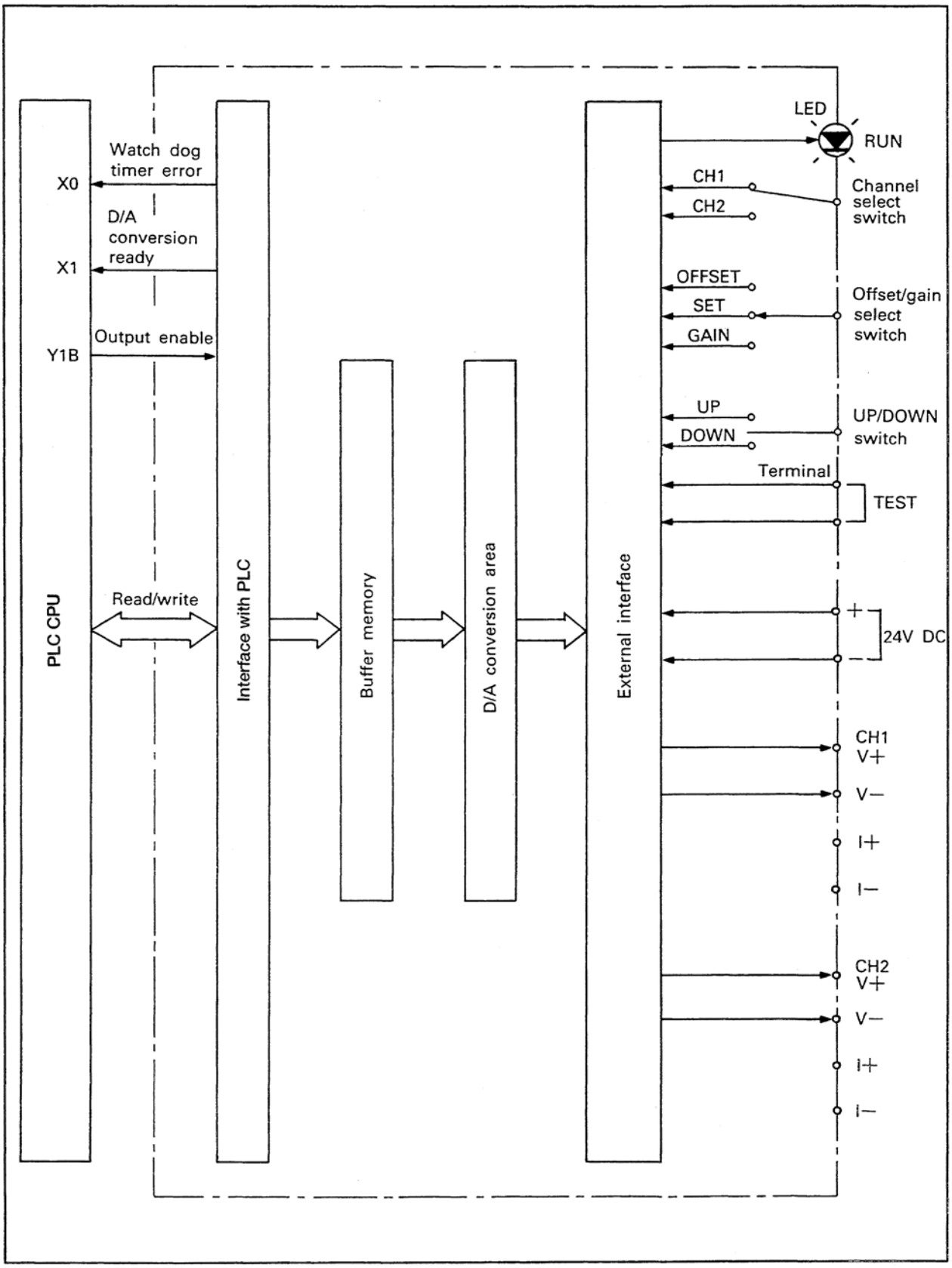


Fig. 3.8 Function Block Diagram

4. HANDLING

This chapter describes the handling instructions, nomenclature, maintenance, and inspection of the A62DA-S1.

4.1 Handling Instructions

(1) Protect the A62DA-S1 and its terminal block from impact.

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

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

(4) Tighten terminal screws as specified below.

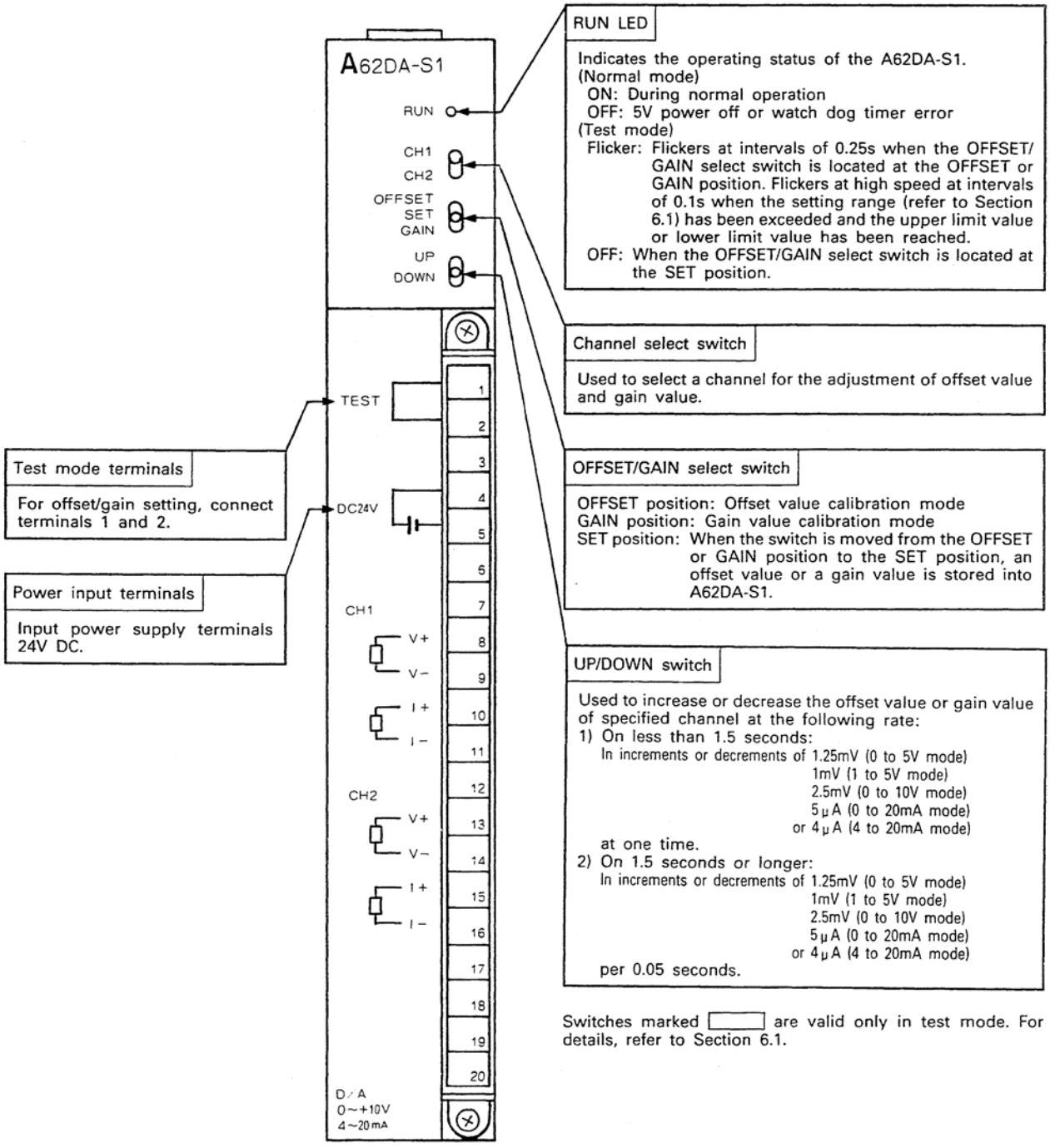
Screw	Tightening Torque Range N·cm
I/O terminal block terminal screw (M3 screw)	39 to 59
I/O terminal block mounting screw (M4 screw)	78 to 118

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

4.2 Nomenclature and Settings

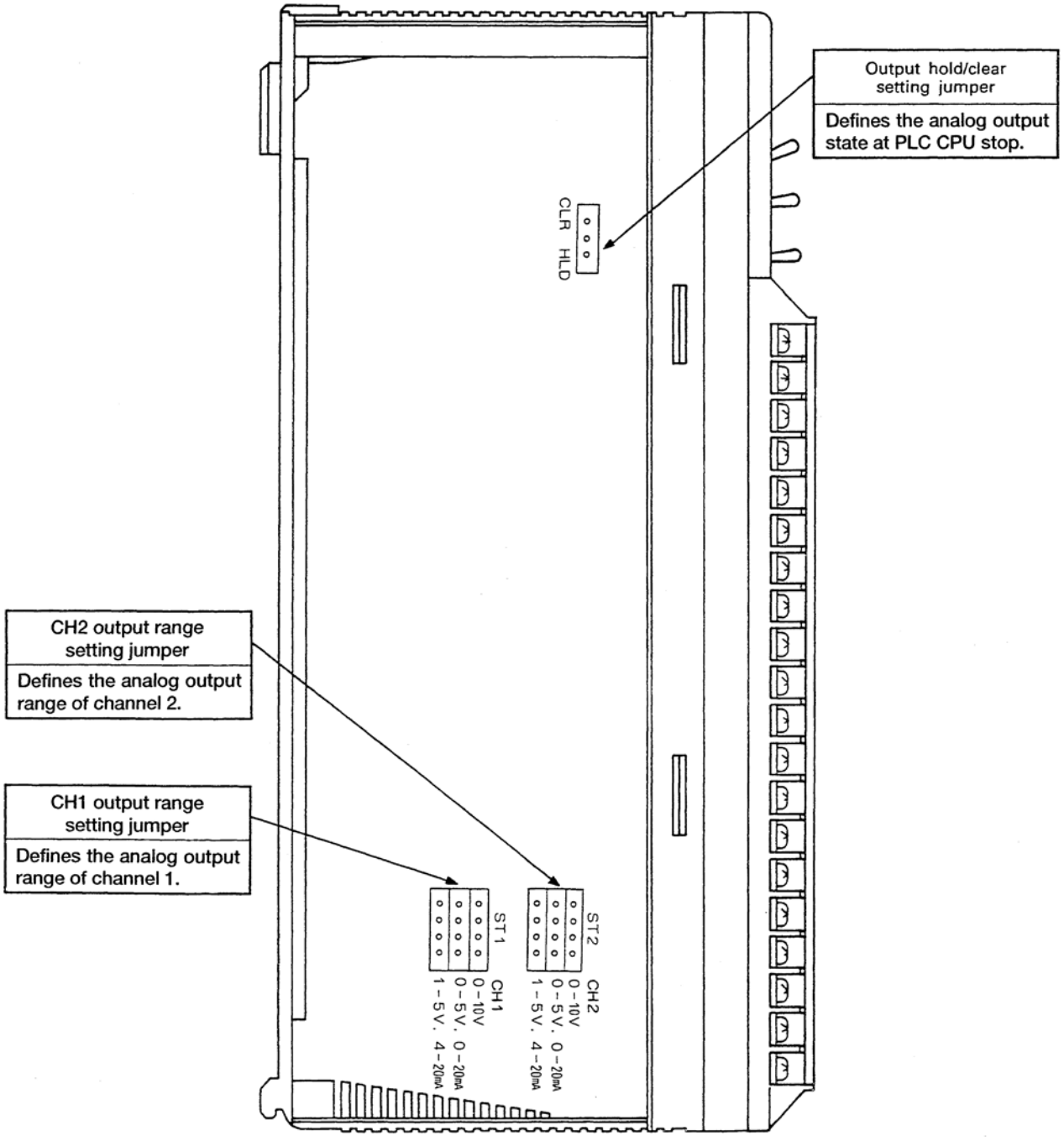
4.2.1 Nomenclature

(1) Front view



Switches marked [ ] are valid only in test mode. For details, refer to Section 6.1.

(2) Internal view



4.2.2 Output hold/clear switching

Fig. 4.1 indicates the relation between the jumper position and analog output state when the output enable signal is off in normal mode.

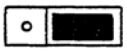
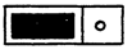
Function	Jumper Position	Analog Output
Hold	 CLR HLD	Retains the value on the trailing edge of the output enable signal.
Clear	 CLR HLD	Outputs the offset value.

Fig. 4.1 Output Hold/Clear Switching

POINT

When the jumper is in the HOLD position, the analog output is reset by the output enable signal from the PLC CPU.

4.2.3 Output range setting jumper

Fig.s 4.2 and 4.3 indicate the relation between the voltage/current output range and jumper position.

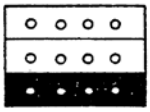
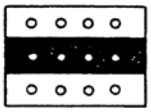
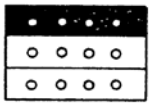
Mode	Output Range	Resolution	Jumper Position
1	1 to 5V	1mV	 0 — 10V 0 — 5V, 0 — 20mA 1 — 5V, 4 — 20mA
2	0 to 5V	1.25mV	 0 — 10V 0 — 5V, 0 — 20mA 1 — 5V, 4 — 20mA
3	0 to 10V	2.5mV	 0 — 10V 0 — 5V, 0 — 20mA 1 — 5V, 4 — 20mA

Fig. 4.2 Voltage Output Ranges and Jumper Positions

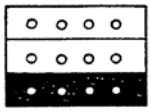
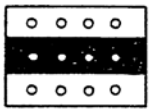
Mode	Output Range	Resolution	Jumper Position
4	4 to 20mA	4μA	 0 — 10V 0 — 5V, 0 — 20mA 1 — 5V, 4 — 20mA
5	0 to 20mA	5μA	 0 — 10V 0 — 5V, 0 — 20mA 1 — 5V, 4 — 20mA

Fig. 4.3 Current Output Ranges and Jumper Positions

4.3 Wiring

4.3.1 Wiring instructions

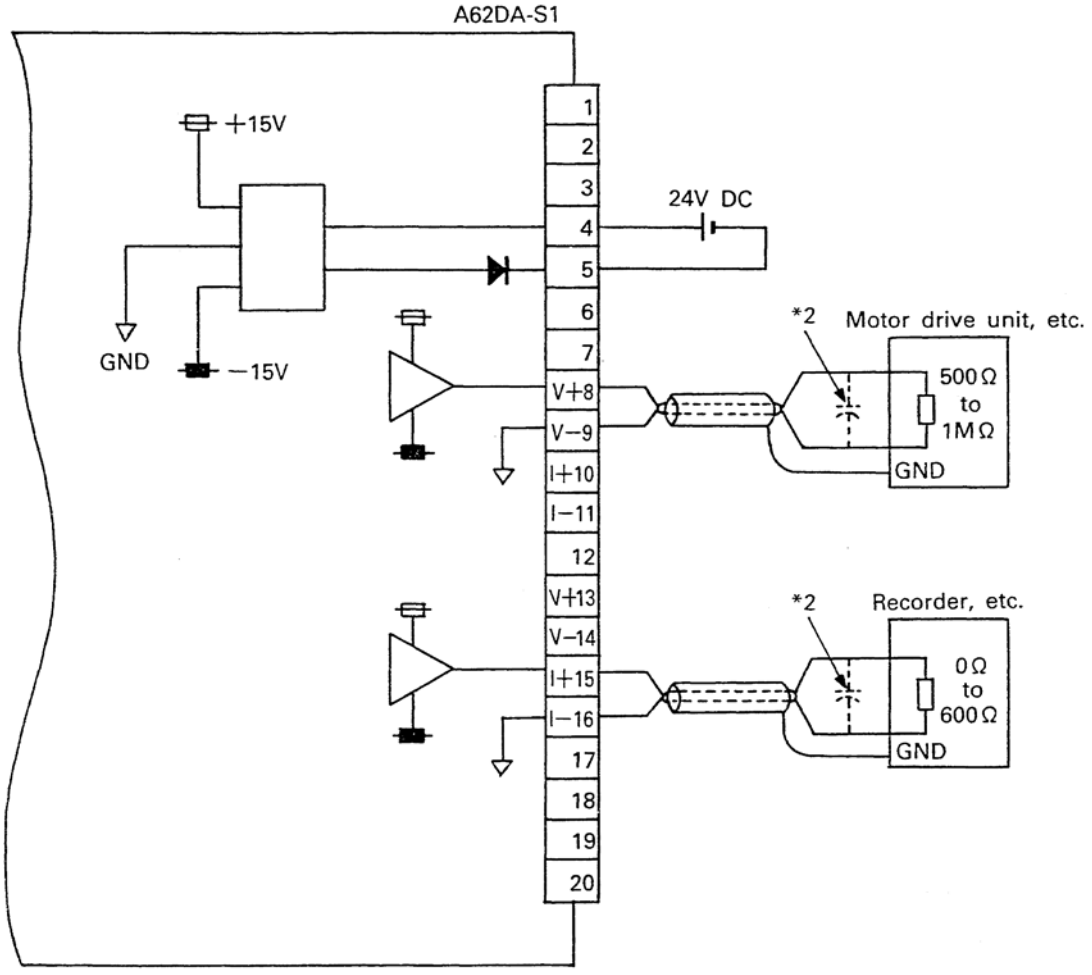
Protect external wiring against noise with the following precautions:

(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 Module 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 0.47 μF (25V or more voltage resistance parts) capacitor to the input terminal of the external equipment.

IMPORTANT

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

4.4 Maintenance and Inspection

No special maintenance requirements apply to the A62DA-S1. For general maintenance refer to the CPU User's Manual.

5. PROGRAMMING

5.1 Initial Setting

This section describes a programming procedure for using the A62DA-S1.
When utilizing the program example introduced in this chapter for an actual system, fully verify that there are no problems in controllability in the target system.
Perform the initial setting of A62DA-S1 from the programmable controller CPU in the procedure shown in Fig. 5.1.

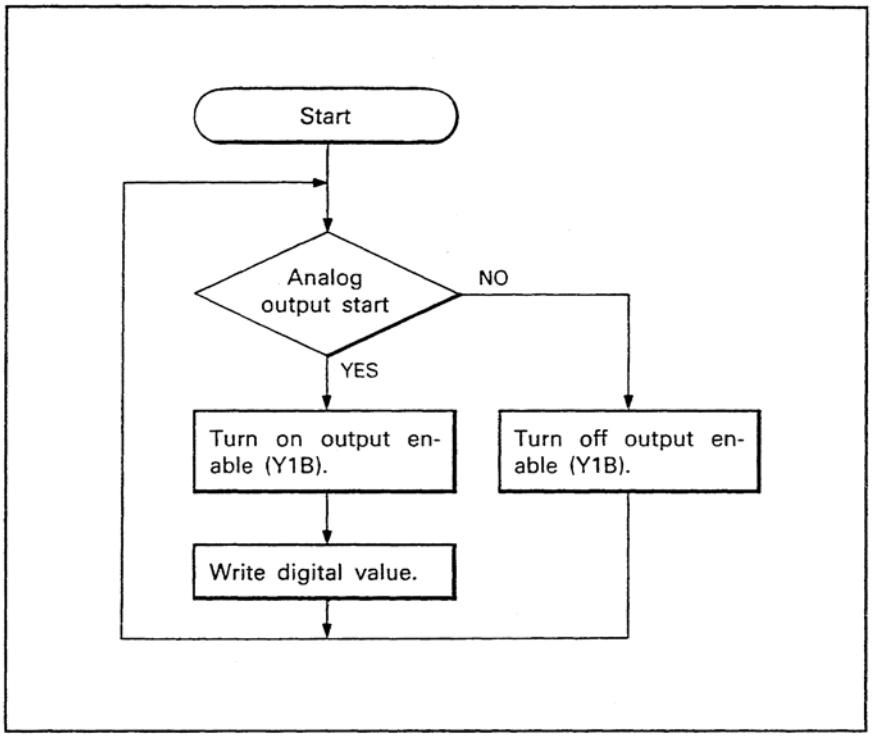


Fig. 5.1 Initial Setting Procedure

I/O numbers shown below are applicable when the A62DA-S1 is loaded on slot 0 of the main base unit used with the ACPU, unless otherwise specified. For I/O numbers with respect to the programmable controller CPU and the assignment of buffer memory, refer to Chapter 3.

POINT

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

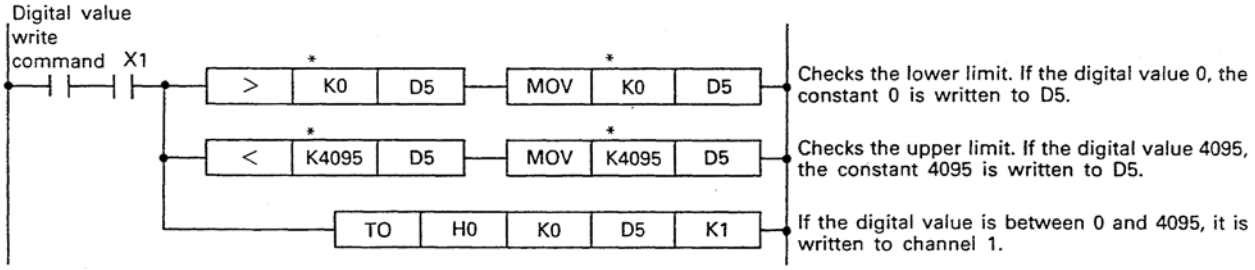
(2) During each of the processes of the special function module, access from the PLC CPU will have priority. Accordingly, if frequent access to the buffer memory of the special function module made from the PLC CPU, it will not only extend the scan time of the PLC CPU, delays in each of the processes of the special function module will occur.
Only use the FROM/TO and other such commands to access the buffer memory from the PLC CPU when necessary.

5.2 Programs

For more information, see the ACPU Programming Manual. When the A62DA-S1 is used with a remote I/O station, see the Data Link System User's Manual.

5.2.1 Write of digital value

Writing the contents of data register D5 to channel 1.

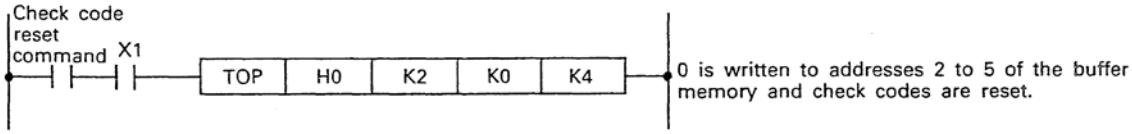


POINT

It is suggested that the upper and lower digital values written be checked in the sequence program.
Change the upper and lower values marked * as appropriate.

5.2.2 Reset of check codes

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

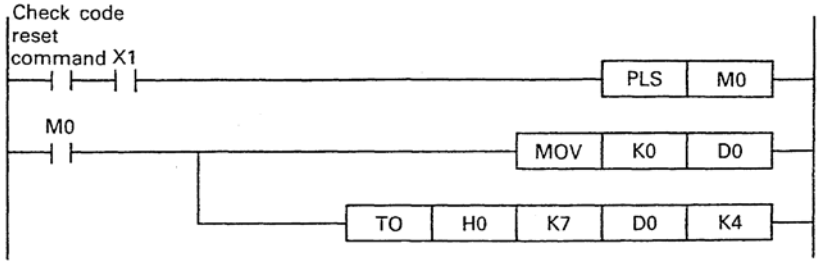


REMARKS

When the A0J2CPU is used, note the following:

(1) The check code reset command should be pulsed by using the internal relay (M) because the FROMP, DFROP, TOP and DTOP instructions are not available.

(2) The constant (K, H) cannot be used for the write data of the TO and DTOP instructions. Use the data register (D) for the write data to execute the TO or DTO instruction.

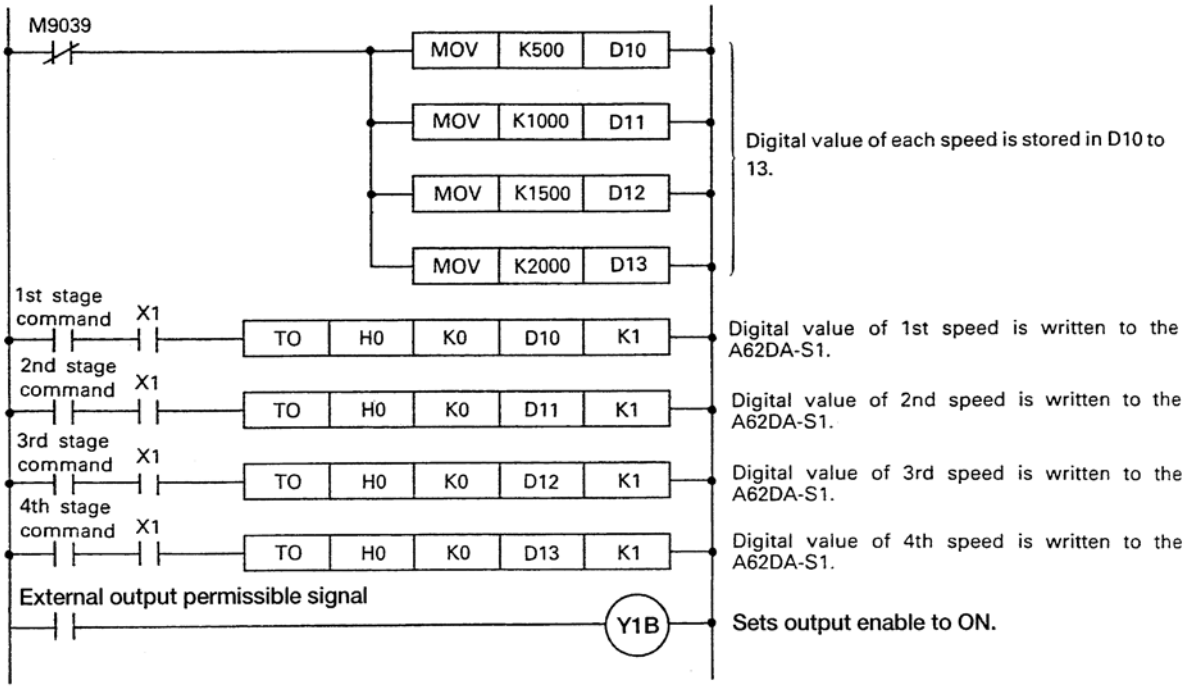


5.2.3 Application circuit examples

POINT

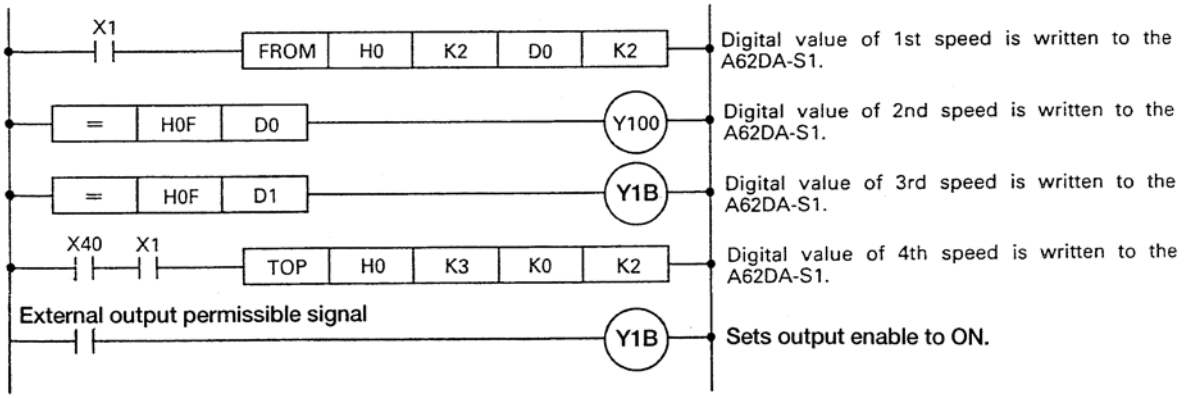
Since the example for the response circuit is a basic circuit, investigate with the system used in regards to the interlock conditions.

(1) Program giving a voltage analog output from A62DA-S1 channel 1 to an inverter for control of 4 set speeds.



(2) The following example provides output to Y100 and Y101 when a digital value setting error occurs during analog output from channel 1, and resets the upper and lower limit check codes of channel 1 when X10 is switched on.

Error Definition	Y100	Y101
Specified value is +4001 or greater.	ON	OFF
Specified value is negative.	OFF	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.
The A62DA-S1 is factory-set to mode 3 (output range 0 to 10V), offset value of 0V, and gain value of 10V.

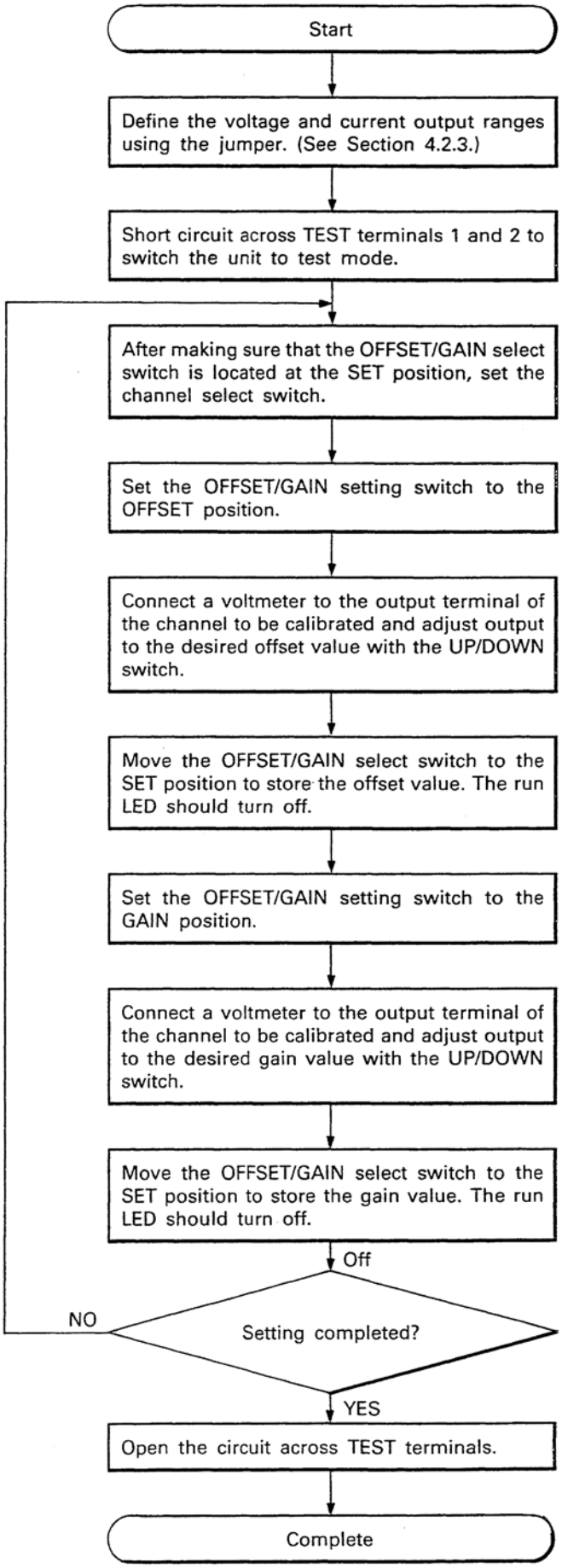
Output Range	Offset/Gain Value	Voltage (V)	Current (mA)
0 to 5V	Offset value	−0.25 to 2	———
	Gain value	3 to 5.25	———
1 to 5V	Offset value	0.8 to 2.6	———
	Gain value	3.5 to 5.25	———
0 to 10V	Offset value	−0.5 to 4	———
	Gain value	6 to 10.5	———
0 to 20mA	Offset value	———	−1 to 8
	Gain value	———	12 to 21
4 to 20mA	Offset value	———	3.1 to 10.4
	Gain value	———	14 to 21

Table 6.1 Offset/Gain Setting Range

POINT

(1) The RUN LED flickers faster (at intervals of 0.1 seconds) to indicate that offset (or gain) adjustment is taken outside the range indicated in Table 6.1.

(2) The offset and gain values are stored in the A62DA-S1 and are not cleared at power off.


Start
Define the voltage and current output ranges using the jumper. (See Section 4.2.3.)
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-S1 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-S1 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.

(2) Set the offset/gain value within the range 0 to +10V DC or from 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 (at intervals of 0.1 seconds) when the offset/gain setting range has been exceeded, this excessive value cannot be set into the A62DA-S1 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 set values.

6.2 Check Points before Start of Operation

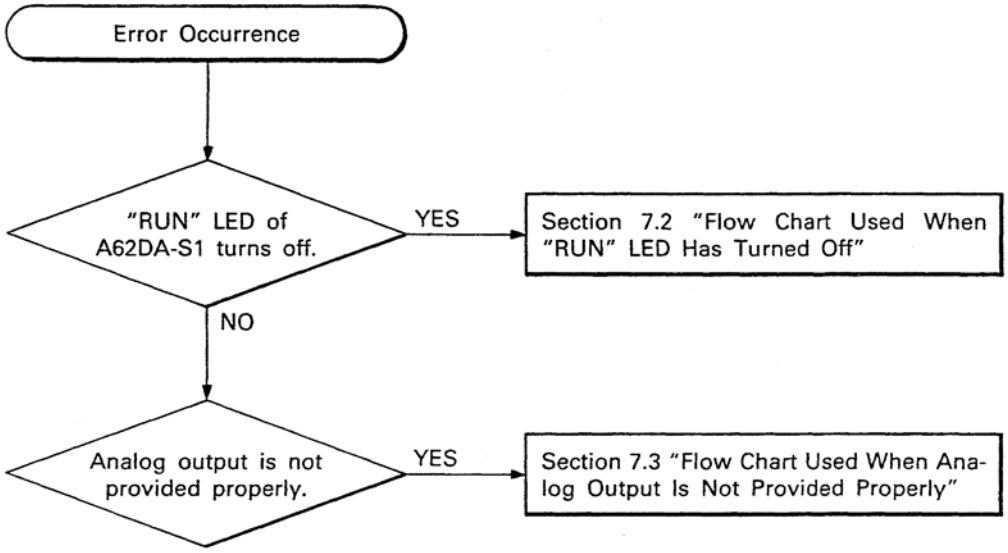
Number	Checking Point	Description	Check
1	Loading of unit	Is the I/O assignment for the A62DA-S1 slot correct?	
2	Voltage/current output range setting	Check that the used voltage/current output range setting jumper positions are correct.	
3	Offset/gain setting	Has offset/gain setting been performed for all channels used?	
		Check for setting errors.	
		Has the unit been returned to normal mode by opening the circuit across TEST terminals?	
4	Connection to A62DA-S1	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 6.2 Check Points

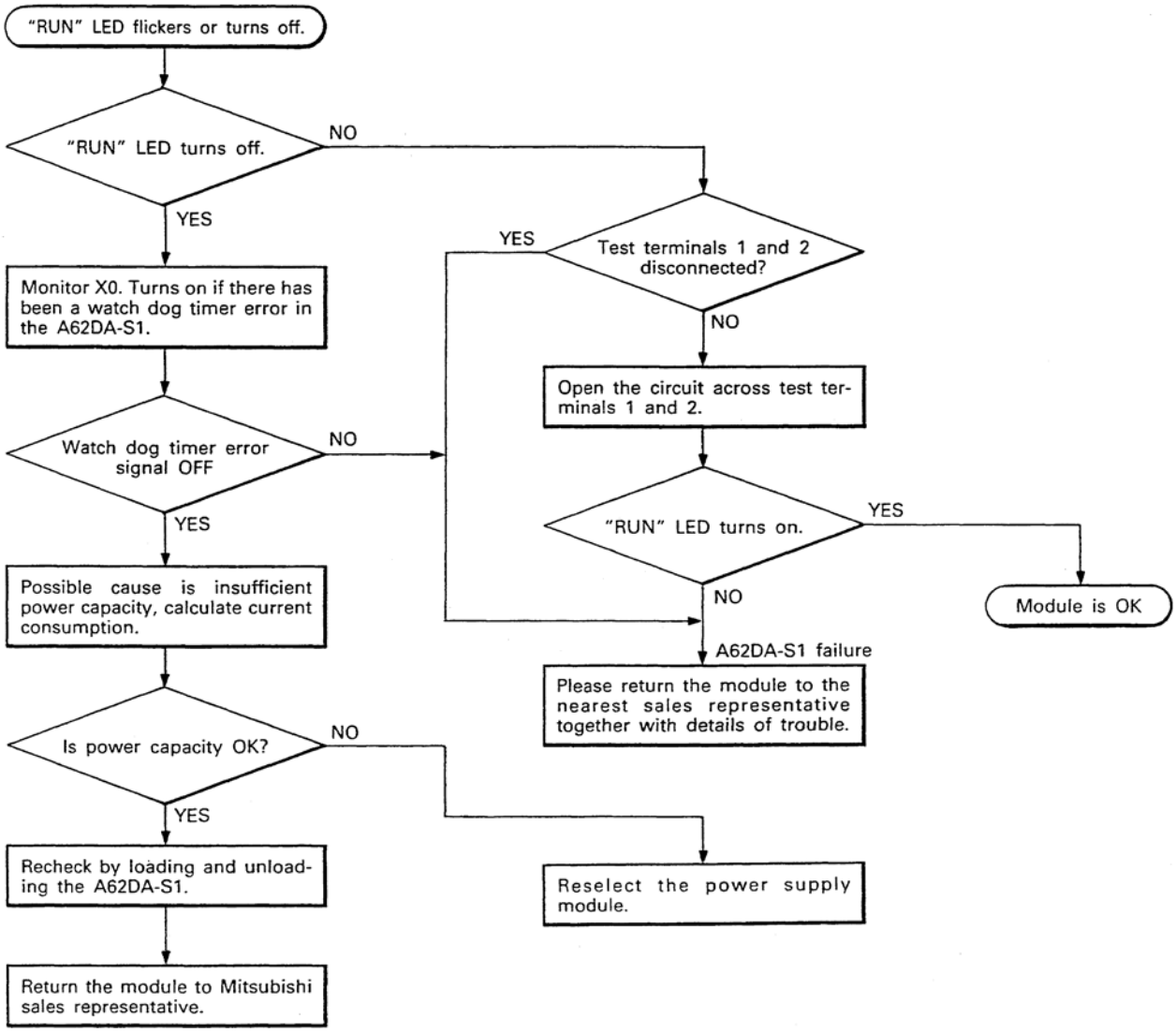
7. TROUBLESHOOTING

This chapter describes simple troubleshooting procedures for the A62DA-S1. For the CPU unit, refer to the CPU User's Manual.

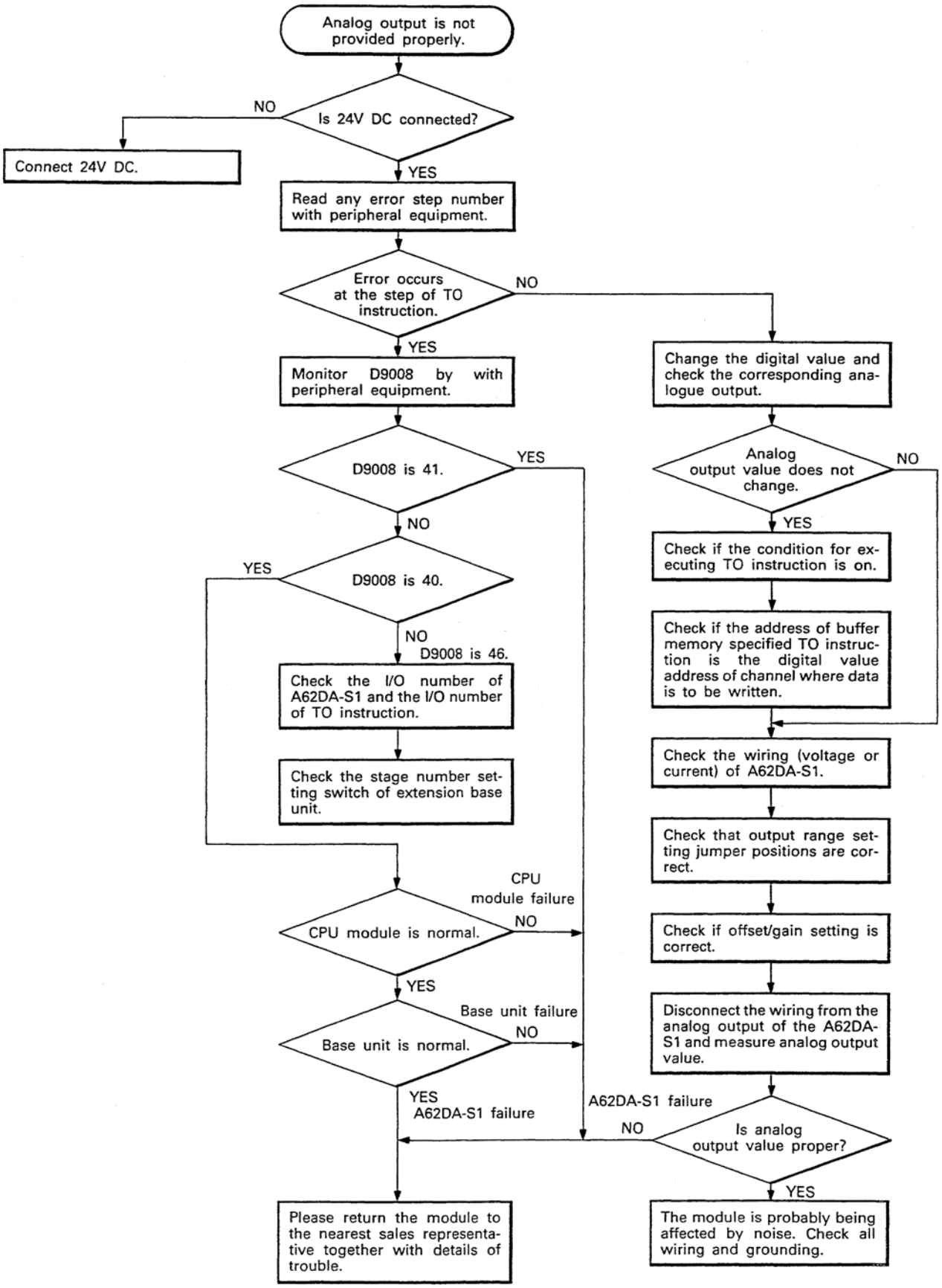
7.1 Troubleshooting Flow Chart



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



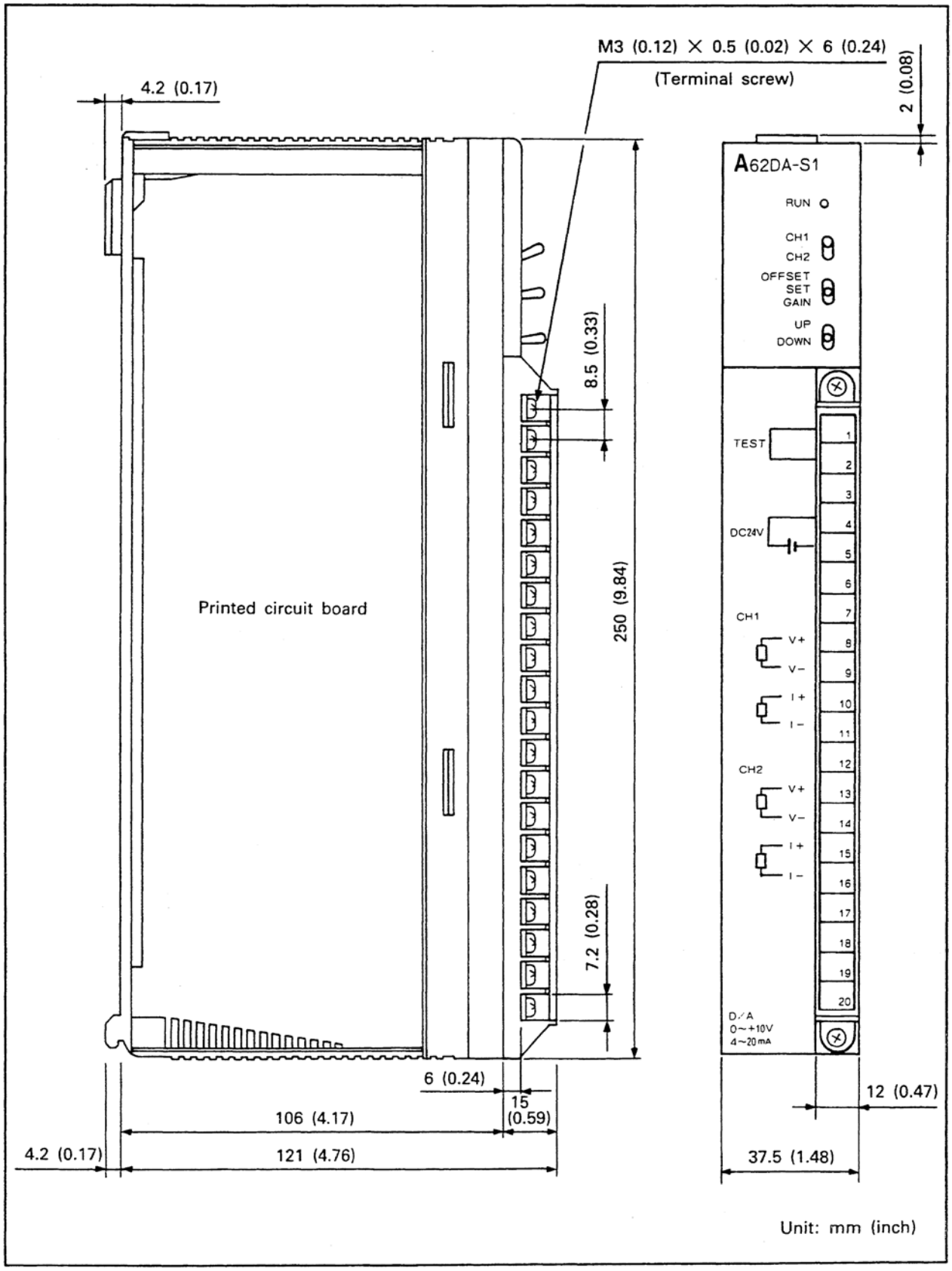
REMARKS

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	Error Message	CPU Status	Error and Cause
40	CONTROL —BUS ERR	Stop	FROM and TO instructions cannot be executed. Hardware failure of A62DA-S1 (special function module), CPU unit, or base unit.
41	S.P UNIT DOWN	Stop	When the FROM or TO instruction has been executed, access has been made to the special function module but no answer is returned. The accessed A62DA-S1 (special function module) has failed.
46	S.P UNIT ERROR	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-S1 (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 using this product.

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 sales representative or Mitsubishi Service Company.
However, if repairs are required onsite at domestic or overseas location, expenses to send an engineer will be solely at the customer's discretion. Mitsubishi shall not be held responsible for any re-commissioning, maintenance, or testing on-site that involves replacement of the failed module.

[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 not to be the responsibility of Mitsubishi or that admitted not to be so by 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 available 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 loss in opportunity and secondary loss from warranty liability

Regardless of the gratis warranty term, Mitsubishi shall not be liable for compensation of damages caused by any cause found not to be the responsibility of Mitsubishi, loss in opportunity, lost profits incurred to the user by Failures of Mitsubishi products, special damages and secondary damages whether foreseeable or not , compensation for accidents, and compensation for damages to products other than Mitsubishi products, replacement by the user, maintenance of on-site equipment, start-up test run and other tasks.

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 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 Railway companies or Public service purposes shall be excluded from the programmable logic controller applications.
In addition, applications in which human life or property that could be greatly affected, such as in aircraft, medical applications, incineration and fuel devices, manned transportation, equipment for recreation and amusement, and safety devices, shall also be excluded from the programmable logic controller range of applications.
However, in certain cases, some applications may be possible, providing the user consults their local Mitsubishi representative outlining the special requirements of the project, and providing that all parties concerned agree to the special circumstances, solely at the users discretion.

D/A Converter Module Type A62DA-S1

User's Manual

MODEL	A62DA-S1-USERS-E
MODEL CODE	13J648
IB(NA)-66177-C(0509)MEE	

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