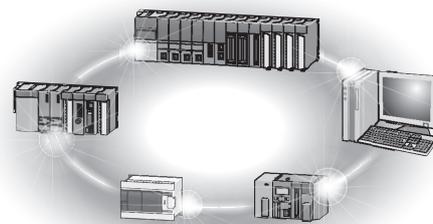




Analog-Digital Converter Module User's Manual

-CL2AD4-B



CC-Link/LT

• SAFETY PRECAUTIONS •

(Read these precautions before using this product.)

Before using this product, please read this manual and the relevant manuals carefully and pay full attention to safety to handle the product correctly.

These precautions apply only to Mitsubishi equipment. Refer to the CPU module user's manual for a description of the programmable controller system safety precautions.

In this manual, the safety precautions are classified into two levels: "⚠ WARNING" and "⚠ CAUTION".

 **WARNING**

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 minor or moderate injury or property damage.

Under some circumstances, failure to observe the precautions given under "⚠ CAUTION" may lead to serious consequences.

Make sure that the end users read this manual and then keep the manual in a safe place for future reference.

[Design Precautions]

WARNING

- When there are communication problems with the data link, the data for the master module will be held.
Configure an interlocking circuit in a sequence program so that the safety of the overall system is always maintained.

CAUTION

- Do not install the control lines or communication cables together with the main circuit lines or power cables.
Keep a distance of 100mm (3.94 inches) or more between them.
Failure to do so may result in malfunction due to noise.

[Installation Precautions]

CAUTION

- Use the programmable controller in the environment that meets the general specifications contained in this manual.
Using the programmable controller outside the range of the general specifications may result in electric shock, fire or malfunction, or may damage or degrade the module.
- Do not directly touch any conductive part of the module.
Doing so can cause malfunction or failure of the module.
- Securely fix the module to a DIN rail or with mounting screws, and securely tighten the mounting screws within the specified torque range.
Undertightening can cause a drop or malfunction.
Overtightening can cause a drop or malfunction due to damage of the screws or module.

[Wiring Precautions]

WARNING

- Shut off the external power supply for the system in all phases before wiring. Failure to do so may result in electric shock or damage to the product.

CAUTION

- Terminal screws which are not to be used must be tightened always.
Otherwise there will be a danger of short circuit against the bare solderless terminals.
- Wire the module correctly after confirming the rated voltage and terminal layout of the product.
Not doing so can cause a fire or failure.
- Tighten the terminal screws within the specified torque range.
Undertightening can cause a short circuit or malfunction.
Overtightening can cause a short circuit or malfunction due to damage of the screws or module.
- Ensure that no foreign matter such as chips and wire-offcuts enter the module.
Foreign matter can cause a fire, failure or malfunction.
- Do not install the control lines or communication cables together with the main circuit lines or power cables. Failure to do so may result in malfunction due to noise.

[Starting and Maintenance Precautions]

WARNING

- Do not touch the terminals while power is on.
Doing so could cause shock or erroneous operation.
- 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

- Do not disassemble or modify the modules.
Doing so may cause failure, malfunction, injury, or a fire.
- Do not drop or apply strong shock to the module.
Doing so may damage the module.
- Be sure to shut off all phases of the external power supply used by the system before mounting or dismounting the module to or from the panel.
Not doing so can cause the module to fail or malfunction.
- Before handling the module, always touch grounded metal, etc. to discharge static electricity from the human body.
Failure to do so can cause the module to fail or malfunction.

[Disposal Precautions]

CAUTION

- When disposing of this product, treat it as industrial waste.

• CONDITIONS OF USE FOR THE PRODUCT •

- (1) Mitsubishi programmable controller ("the PRODUCT") shall be used in conditions;
 - i) where any problem, fault or failure occurring in the PRODUCT, if any, shall not lead to any major or serious accident; and
 - ii) where the backup and fail-safe function are systematically or automatically provided outside of the PRODUCT for the case of any problem, fault or failure occurring in the PRODUCT.

- (2) The PRODUCT has been designed and manufactured for the purpose of being used in general industries.

MITSUBISHI SHALL HAVE NO RESPONSIBILITY OR LIABILITY (INCLUDING, BUT NOT LIMITED TO ANY AND ALL RESPONSIBILITY OR LIABILITY BASED ON CONTRACT, WARRANTY, TORT, PRODUCT LIABILITY) FOR ANY INJURY OR DEATH TO PERSONS OR LOSS OR DAMAGE TO PROPERTY CAUSED BY the PRODUCT THAT ARE OPERATED OR USED IN APPLICATION NOT INTENDED OR EXCLUDED BY INSTRUCTIONS, PRECAUTIONS, OR WARNING CONTAINED IN MITSUBISHI'S USER, INSTRUCTION AND/OR SAFETY MANUALS, TECHNICAL BULLETINS AND GUIDELINES FOR the PRODUCT.

("Prohibited Application")

Prohibited Applications include, but not limited to, the use of the PRODUCT in;

- Nuclear Power Plants and any other power plants operated by Power companies, and/or any other cases in which the public could be affected if any problem or fault occurs in the PRODUCT.
- Railway companies or Public service purposes, and/or any other cases in which establishment of a special quality assurance system is required by the Purchaser or End User.
- Aircraft or Aerospace, Medical applications, Train equipment, transport equipment such as Elevator and Escalator, Incineration and Fuel devices, Vehicles, Manned transportation, Equipment for Recreation and Amusement, and Safety devices, handling of Nuclear or Hazardous Materials or Chemicals, Mining and Drilling, and/or other applications where there is a significant risk of injury to the public or property.

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REVISIONS

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

| Print Date | * Manual Number | Revision |
|------------|------------------|---|
| Jan., 2005 | SH(NA)-080417E-A | First edition |
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| | | |

Japanese Manual Version SH-080415-E

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INTRODUCTION

Thank you for purchasing the CC-Link/LT system remote module.
Before using the equipment, please read this manual carefully to develop full familiarity with the functions and performance of the CC-Link/LT system remote module you have purchased, so as to ensure correct use.

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About Manuals

The following manuals are related to this product.
Referring to this list, please request the necessary manuals.

Relevant Manuals

| Manual Name | Manual Number (Model Code) |
|---|-------------------------------|
| CC-Link/LT Master Module User's Manual QJ61CL12 Explains the system configuration, performance specifications, functions, handling, wiring and troubleshooting of the QJ61CL12. (Sold separately) | SH-080351E (13JR62) |
| MELSEC-L CC-Link/LT Master Module User's Manual Explains the system configuration, performance specifications, functions, handling, wiring and troubleshooting of the LJ61CL12. (Sold separately) | SH-081012ENG (13JZ65) |
| CC-Link - CC-Link/LT Bridge Module Type AJ65SBT-CLB User's Manual Explains the system configuration, performance specifications, functions, handling, wiring and troubleshooting of the AJ65SBT-CLB. (Sold separately) | SH-080362E (13JR63) |
| CL2TE-5 Common Terminal Block User's Manual Explains the performance, handling and wiring of the CL2TE-5. (Included with product) | IB-0800264 (13JP32) |

Compliance with the EMC Directive and the Low Voltage Directives

(1) Method of ensuring compliance

To ensure that Mitsubishi programmable controllers maintain EMC and Low Voltage Directives when incorporated into other machinery or equipment, certain measures may be necessary. Please refer to one of the following manuals.

- User's manual for the CPU module or head module used
- Safety Guidelines

(This manual is included with the CPU module, base unit, or head module.)

The CE mark on the side of the programmable controller indicates compliance with EMC and Low Voltage Directives.

(2) Additional measures

To ensure that this product maintains EMC and Low Voltage Directives, please refer to one of the manuals listed under (1).

About the Generic Terms and Abbreviations

Unless otherwise specified, the following generic terms and abbreviations are used in this manual to describe Type CL2AD4-B analog-digital converter module.

| Generic Term/Abbreviation | Description |
|---------------------------|---|
| CL2AD4-B | Abbreviation for type CL2AD4-B analog-digital converter module. |
| QJ61CL12 | Abbreviation for type QJ61CL12 CC-Link/LT master module. |
| AJ65SBT-CLB | Abbreviation for type AJ65SBT-CLB CC-Link - CC-Link/LT bridge module. |
| CC-Link/LT master module | Generic term for QJ61CL12 and LJ61CL12 when they are used as a master station. |
| CC-Link master module | Generic term for modules that can be used as the master station. |
| Remote I/O station | Remote station that handles bit information only. (inputs/outputs data to/from external devices.) |
| Remote device station | Remote station that handles bit unit and word unit data only. (Performs input and output with external devices, and analog data exchange.) |
| Remote station | Generic term for remote I/O station and remote device station. |
| Remote I/O module | Remote station that handles bit unit data only. (Performs input and output with external devices.) |
| Remote device module | Remote module that handles bit unit and word unit data only. (Perform input and output with external devices, and analog data conversion.) |
| Remote module | Generic term for remote I/O module and remote device module. |
| ACPU | Generic term for A0J2HCPU, A1SCPU, A1SCPUC24-R2, A1SHCPU, A1SJCPU, A1SJCPU-S3, A1SJHCPU, A1NCP, A2NCP, A2NCP-S1, A3NCP, A2SCPU, A2SHCPU, A2ACPU, A2ACPU-S1, A3ACPU, A2UCPU, A2UCPU-S1, A2USCPU, A2USCHPU-S1, A2USHCPU-S1, A3UCPU and A4UCPU. |
| QnACPU | Generic term for Q2ACPU, Q2ACPU-S1, Q2ASCPU, Q2ASCPU-S1, Q2ASHCPU, Q2ASHCPU-S1, Q3ACPU, Q4ACPU, Q4ARCPU. |
| QCPU (Q mode) | Generic term for Q00JCPU, Q00UJCPU, Q00CPU, Q00UCPU, Q01CPU, Q01UCPU, Q02CPU, Q02HCPU, Q02PHCPU, Q02UCPU, Q03UDCPU, Q03UDECPU, Q03UDVCPU, Q04UDHCPU, Q04UDEHCPU, Q04UDVCPU, Q06HCPU, Q06PHCPU, Q06UDHCPU, Q06UDEHCPU, Q06UDVCPU, Q10UDHCPU, Q10UDEHCPU, Q12HCPU, Q12PHCPU, Q12PRHCPU, Q13UDHCPU, Q13UDEHCPU, Q13UDVCPU, Q20UDHCPU, Q20UDEHCPU, Q25HCPU, Q25PHCPU, Q25PRHCPU, Q26UDHCPU, Q26UDEHCPU, Q26UDVCPU, Q50UDEHCPU, Q100UDEHCPU. |
| QCPU (A mode) | Generic term for Q02CPU-A, Q02HCPU-A, Q06HCPU-A. |
| LCPU | Generic term for L02SCPU, L02SCPU-P, L02CPU, L02CPU-P, L06CPU, L06CPU-P, L26CPU, L26CPU-P, L26CPU-BT, L26CPU-PBT. |
| GX Developer | Product name of the software package for the MELSEC programmable controllers. |
| GX Works2 | |
| Dedicated power supply | Module connected for power supply to CC-Link/LT system. |
| Power supply adapter | At least one power supply adapter is required for a system. |

Packing List

The following gives the packing list of the CL2AD4-B.

| Product name | Quantity |
|--------------|----------|
| CL2AD4-B | 1 |

1 OVERVIEW

1

This user's manual explains the specifications, handling, programming methods and others of Type CL2AD4-B analog-digital converter module (hereafter abbreviated to the "CL2AD4-B") which is used as a remote device station of a CC-Link/LT system. The CL2AD4-B converts the analog signals (voltage or current input) from the PLC's external source to a 15-bit signed binary data digital value.

1.1 Features

This section gives the features of the CL2AD4-B.

- (1) **Smaller than CC-Link A/D converter module**
Being the same size as the terminal block type CC-Link/LT remote I/O module (CL2X8-D1B2, CL2Y8-TP1B2), the CL2AD4-B is 55.7% less in volume than the CC-Link A/D converter module (AJ65SBT-64AD).
- (2) **Input range selectable per channel**
You can choose the analog input range per channel to change the I/O conversion characteristics.
- (3) **A/D conversion method**
There are the following four A/D conversion methods.
 - (a) **Averaging processing**
 - 1) **Moving average**
The latest eight A/D conversion values are averaged every 200 μ s, and the average is output as a digital output value.
 - 2) **Count averaging**
A/D conversion is performed 10 times, and the average of the conversion values is output as a digital output value.
 - (b) **Primary delay filter**
A digital output value is smoothed according to the preset time constant.
 - (c) **Fast response processing**
Analog input values are converted into digital output values one by one and output at every conversion.
- (4) **Number of occupied I/O points (number of occupied stations) changeable**
The number of occupied I/O points (number of occupied stations) can be saved since it changes depending on the last conversion-enabled channel. When only Channel 1 is enabled for conversion, the number of occupied I/O points is 16 (one station occupied).
- (5) **Improved operability and maintainability**
The station number setting switches and analog input setting switches are placed on the module front to improve operability and maintainability.

(6) Simple dustproof shape for improved reliability

The casing has a simple dustproof shape without any heat-releasing slits to prevent wiring chips, dust and others from entering the module.

(7) Six facing directions available for module installation

The CL2AD4-B can be installed in any of six different orientations using a DIN rail or module installation screws.

(There are no restrictions on the facing directions. refer to section 4.5.)

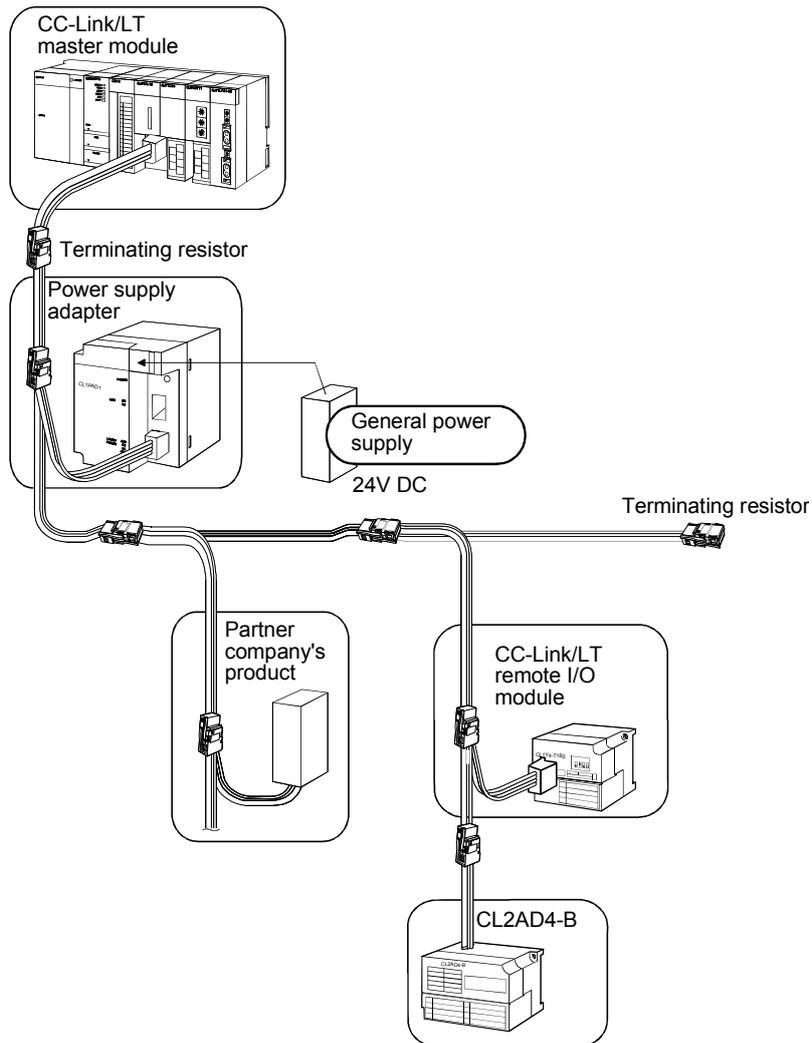
2 SYSTEM CONFIGURATION

This chapter describes the system configuration for use of the CL2AD4-B.

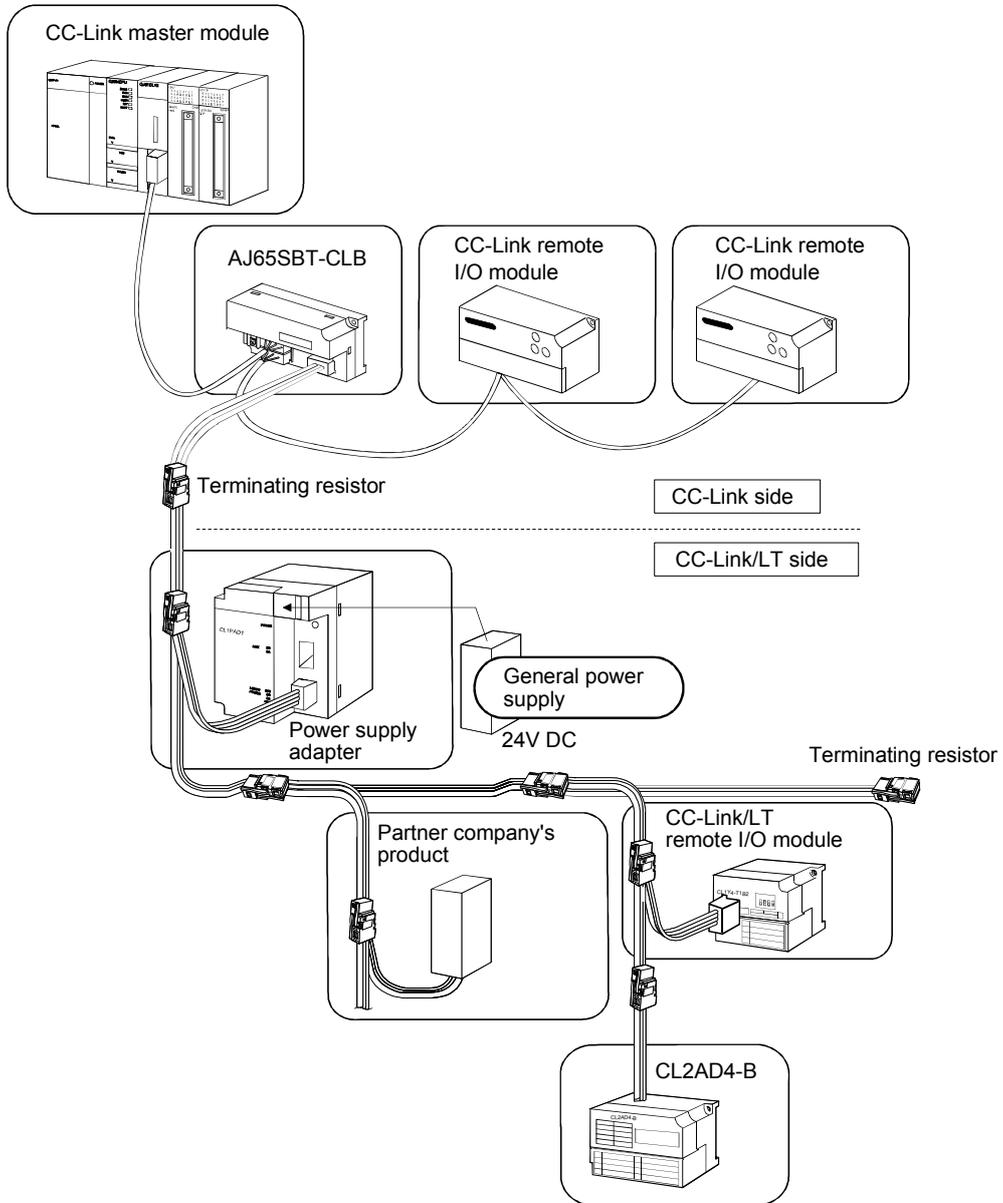
2.1 Overall Configuration

The overall configuration for use of the CL2AD4-B is shown below.

(1) When connected to the CC-Link/LT master module



(2) When connected to the AJ65SBT-CLB



2.2 Applicable Module

For available master modules, visit the CC-Link Partner Association (CLPA) website at:
www.cc-link.org

| |
|---------------|
| REMARK |
|---------------|

Check the specifications of the master module before use.

2.3 Notes on the System Configuration

This section explains the notes on the system configuration for use of the CL2AD4-B.

(1) Point mode setting

Set the point mode of the CC-Link/LT master module or AJ65SBT-CLB to the 16-point mode.

Any other mode setting will result in an error, causing the CC-Link/LT master module or AJ65SBT-CLB to turn on (flash if all stations are faulty) the "L ERR." LED, and the CL2AD4-B to turn off the "L RUN" LED and turn on the "L ERR." LED.

Using a remote module of less than 16 occupied I/O points in the 16-point mode will produce unassigned points.

For the concept of the point mode setting and occupied I/O point setting, refer to the user's manual of the used CC-Link/LT master module or AJ65SBT-CLB.

(2) Maximum number of connected stations

The CL2AD4-B can be connected within the occupied I/O point range of the CC-Link/LT master module or AJ65SBT-CLB.

The maximum number of connected modules varies depending on the number of occupied I/O points (number of occupied stations) of the CL2AD4-B.

Refer to Section 3.4 for the number of occupied I/O points (number of occupied stations).

(a) Maximum number of modules when connected to CC-Link/LT master module

| Number of occupied I/O points of CC-Link/LT master module | | 16 points | 32 points | 48 points | 64 points | 128 points | 256 points | 512 points | 1024 points |
|--|------------------------------------|--------------|--------------|--------------|--------------|---------------|---------------|---------------|----------------|
| Number of occupied I/O points of CL2AD4-B (Number of occupied stations) | 16 points (Occupies 1 station) | 1 | 2 | 3 | 4 | 8 | 16 | 32 | 64 |
| | 32 points (Occupies 2 stations) | — | 1 | 1 | 2 | 4 | 8 | 16 | 32 |
| | 48 points (Occupies 3 stations) | — | — | 1 | 1 | 2 | 5 | 10 | 21 |
| | 64 points (Occupies 4 stations) | — | — | — | 1 | 2 | 4 | 8 | 16 |

(b) Maximum number of modules when connected to AJ65SBT-CLB

| Number of occupied I/O points of AJ65SBT-CLB | | 48 points | 112 points | 224 points |
|--|------------------------------------|-----------|------------|------------|
| Number of occupied I/O points of CL2AD4-B (Number of occupied stations) | 16 points (Occupies 1 station) | 3 | 7 | 14 |
| | 32 points (Occupies 2 stations) | 1 | 3 | 7 |
| | 48 points (Occupies 3 stations) | 1 | 2 | 4 |
| | 64 points (Occupies 4 stations) | — | 1 | 3 |

| |
|--|
| POINT |
| <p>The maximum number of connected modules changes depending on the capacity of the dedicated power supply or power supply adapter. For details, refer to the user's manual for the dedicated power supply (CL1PSU-2A) or power supply adapter (CL1PAD1).</p> |

(3) Grounding of shield wires or shield cables

It is recommended to ground the shield wires or shield cables using the optional CL2TE-5 common terminal block.
 For details of the CL2TE-5, refer to the CL2TE-5 Common Terminal Block User's Manual.

3 SPECIFICATIONS

This chapter provides the specifications of the CL2AD4-B.

3.1 General Specifications

Table 3.1 indicates general specifications of the CL2AD4-B.

Table 3.1 General Specifications

| Item | Specifications | | | | | |
|-------------------------------|--|------------------------------|--------------|---------------------|-----------|---|
| Operating ambient temperature | 0 to 55°C | | | | | |
| Storage ambient temperature | -25 to 75°C | | | | | |
| Operating ambient humidity | 5 to 95%RH, non-condensing | | | | | |
| Storage ambient humidity | | | | | | |
| Vibration resistance | Compliant with JIS B 3502 and IEC 61131-2 | Under intermittent vibration | Frequency | Acceleration | Amplitude | Sweep count |
| | | | 5 to 8.4Hz | — | 3.5mm | 10 times each in X, Y, and Z directions |
| | | Under continuous vibration | 8.4 to 150Hz | 9.8m/s ² | — | |
| | | | 5 to 8.4Hz | — | 1.75mm | — |
| 8.4 to 150Hz | 4.9m/s ² | — | — | | | |
| Shock resistance | Compliant with JIS B 3502 and IEC 61131-2 (147m/s ² , 3 times each in X, Y, and Z directions) | | | | | |
| Operating atmosphere | No corrosive gases | | | | | |
| Operating altitude * 1 | 0 to 2000m | | | | | |
| Installation location | Inside a control panel * 2 | | | | | |
| Overvoltage category * 3 | II or less | | | | | |
| Pollution degree * 4 | 2 or less | | | | | |

*1: Do not use or store the programmable controller under pressure higher than the atmospheric pressure of altitude 0m.

Doing so may cause malfunction. When using the programmable controller under pressure, please consult your local Mitsubishi representative.

*2: The programmable controller can also be used in an environment other than on a control panel if the conditions such as operating ambient temperature and humidity are satisfied.

*3: This indicates the section of the power supply to which the equipment is assumed to be connected between the public electrical power distribution network and the machinery within premises.

Category II applies to equipment for which electrical power is supplied from fixed facilities. The surge voltage withstand level for up to the rated voltage of 300V is 2500V.

*4: This index indicates the degree to which conductive material is generated in terms of the environment in which the equipment is used.

Pollution degree 2 is when only non-conductive pollution occurs. A temporary conductivity caused by condensing must be expected occasionally.

3.2 Performance Specifications

Table 3.2 indicates performance specifications of the CL2AD4-B.

Table 3.2 Performance Specifications

| Item | | Specifications | | | | | | |
|---|---------------------|---|--------------------|-----------------------------|-------------------------------|-------------------------------|----------------------------|--------------------|
| Analog input | Voltage | -10 to 10V DC (input resistance 1MΩ) | | | | | | |
| | Current | 0 to 20mA DC (input resistance 250Ω) | | | | | | |
| Digital output | | 15-bit signed binary (-4096 to 4095) | | | | | | |
| I/O characteristics, maximum resolution, accuracy (accuracy relative to maximum value of digital output value) *1 | | | Analog input range | Digital output value | Accuracy | | | Maximum resolution |
| | | | | | Ambient temperature 25±5°C *2 | Ambient temperature 0 to 55°C | Temperature coefficient *4 | |
| | | Voltage | -10 to 10V | -4000 to 4000 | ±0.2% (±8 digit *3) | ±0.4% (±16 digit *3) | ±80ppm/°C (±0.0080%/°C) | 2.5mV |
| | | | 0 to 10V | 0 to 4000 | | | | 1.25mV |
| | | | 0 to 5V | | | | | 1.0mV |
| | | Current | 0 to 20mA | 0 to 4000 | ±0.2% (±8 digit *3) | ±0.4% (±16 digit *3) | ±80ppm/°C (±0.0080%/°C) | 5μA |
| | | | 4 to 20mA | | | | | 4μA |
| Conversion speed | | 200μs/4 channels *5 | | | | | | |
| Absolute maximum input | | Voltage: ±15 V, current: ±30mA *6 | | | | | | |
| Number of analog input channels | | 4 channels/1 module | | | | | | |
| CC-Link/LT station type | | Remote device station | | | | | | |
| Number of occupied stations | | 4 stations in 16-point mode *7 | | | | | | |
| Insulation | | Insulated area | | Insulation method | Dielectric withstand voltage | Insulation resistance | | |
| | | Between communication system and analog inputs | | Photocoupler Transformer | 500V AC for 1 minute | 500V DC 10MΩ or more | | |
| | | Between power supply system and analog inputs | | | | | | |
| | | Between communication system and power supply system | | | | | | |
| | | Between channels | | Non-insulation | — | — | | |
| External interface | | Direct type 14-point terminal block (M3 screw) | | | | | | |
| Applicable wire size | | 0.3 to 1.25mm ² | | | | | | |
| Applicable crimping terminal | | RAV1.25-3 (in conformance with JIS C 2805), V1.25-3 (Japan Solderless Terminal Mfg. Co., Ltd.), 1.25-3, TG1.25-3(NICHIFU TERMINAL INDUSTRIES Co., Ltd.) | | | | | | |
| Module installation method | | DIN rail installation, mounted by screws of type M4 × 0.7 mm × 16 mm or larger Can be installed in six directions | | | | | | |
| Applicable DIN rail | | TH35-7.5Fe, TH35-7.5Al, (in conformance with IEC 60715) | | | | | | |
| Module power supply *8 | Voltage | 24V DC (20.4V DC to 28.8V DC, ripple ratio: within 5%) | | | | | | |
| | Current consumption | 70mA | | | | | | |
| | Current on startup | 570mA | | | | | | |
| Protection class | | IP2X | | | | | | |
| Weight | | 0.15kg | | | | | | |

- * 1: For the details of the I/O conversion characteristic, refer to Section 3.3.
- * 2: Reference accuracy. (Refer to section 3.3.3)
- * 3: "digit" indicates a digital output value.
- * 4: Accuracy per temperature change of 1°C. (Refer to section 3.3.3)
- * 5: When a primary delay filter is used, the conversion speed of the primary delay filter channel is 400μs.
- * 6: Current value indicates value of instant input current that does not break module inner electrical resistance.
- * 7: The number of occupied I/O points (number of occupied stations) varies depending on the last conversion-enabled channel. (Refer to section 3.4)
- * 8: Module power is supplied via the dedicated power supply/power supply adapter.
Use the dedicated power supply (CL1PSU-2A) or power supply adapter (CL1PAD1).

3.3 I/O Conversion Characteristics

The I/O characteristics is the slope created by connecting the offset and gain values, with a straight line when converting the analog signals (voltage or current input) from an external source of the programmable controller to digital values.

The offset value is an analog input value (voltage or current) at which the digital output value is 0.

The gain value is an analog input value (voltage or current) at which the digital output value is 4000.

3.3.1 Voltage input characteristics

The voltage input characteristic graph is shown below.

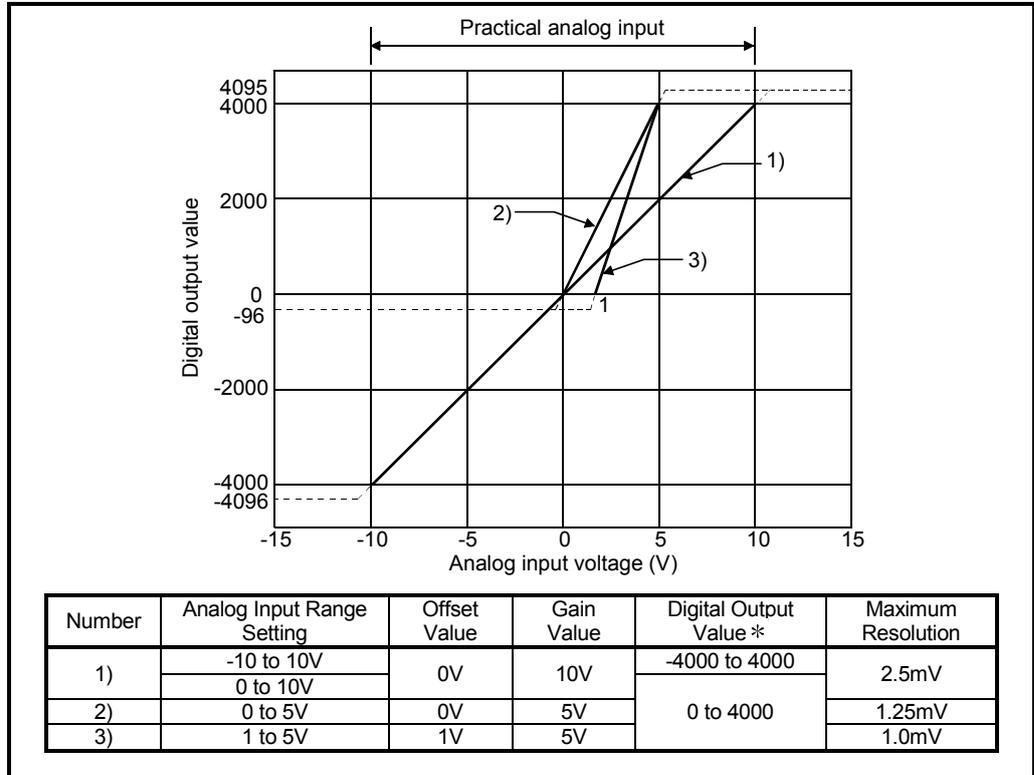


Fig. 3.1 Voltage Input Characteristics

| POINT |
|---|
| (1) Do not input more than $\pm 15V$. The element may be damaged. |
| (2) If the analog input provided corresponds to the digital output value* beyond its range, the digital output value is fixed to the maximum or minimum. <ul style="list-style-type: none"> • For 0 to 4000, the digital output value is within a range of -96 to 4095. • For -4000 to 4000, the digital output value is within a range of -4096 to 4095. |
| (3) Within the analog input and digital output scopes of each input range, the maximum resolution and accuracy are within the performance specification range. Outside those scopes, however, they may not fall within the performance specification range. (Avoid using the dotted line part in Fig. 3.1.) |

3.3.2 Current input characteristics

The current input characteristic graph is shown below.

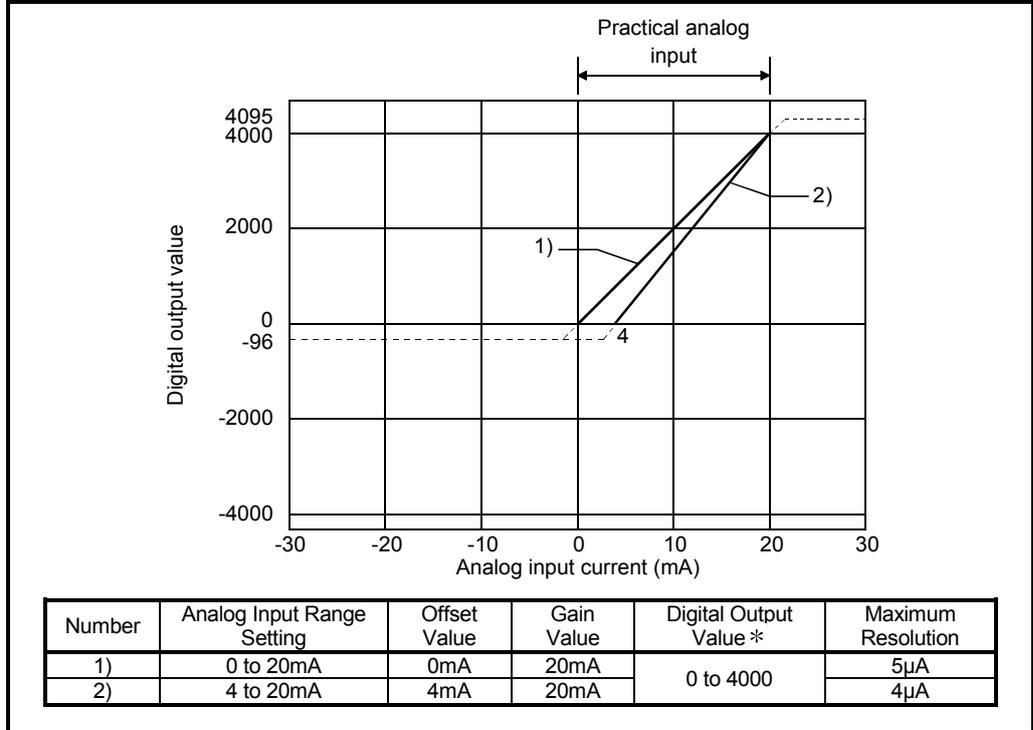


Fig. 3.2 Current Input Characteristics

| POINT |
|---|
| (1) Do not input more than ±30mA. A breakdown may result due to heat increase. |
| (2) If the analog input provided corresponds to the digital output value* beyond its range, the digital output value is fixed to the maximum or minimum. • For 0 to 4000, the digital output value is within a range of -96 to 4095. |
| (3) Within the analog input and digital output scopes of each input range, the maximum resolution and accuracy are within the performance specification range. Outside those scopes, however, they may not fall within the performance specification range. (Avoid using the dotted line part in Fig. 3.2.) |

3.3.3 Accuracy

Accuracy is relative to the maximum value of the digital output value. Even if you change the input range to change the input characteristic, accuracy does not change and is held within the range indicated in the performance specifications. Accuracy is within $\pm 0.2\%$ (± 8 digit) at the operating ambient temperature of $25 \pm 5^\circ\text{C}$ or within $\pm 0.4\%$ (± 16 digit) at the operating ambient temperature of 0 to 55°C .

Calculate the accuracy in the following method.

$$(\text{Accuracy}) = (\text{Reference accuracy}) + (\text{Temperature coefficient}) \\ \times (\text{Operating ambient temperature change})$$

Reference accuracy:

Accuracy at operating ambient temperature of $25 \pm 5^\circ\text{C}$ ($\pm 0.2\%$)

Temperature coefficient:

Accuracy for every 1°C change in temperature ($\pm 80\text{ppm}/^\circ\text{C}$ ($\pm 0.0080\%/^\circ\text{C}$))

Operating ambient temperature change:

Difference between the operating ambient temperature outside the range $25 \pm 5^\circ\text{C}$ and the minimum/maximum range value

Example) Accuracy at operating ambient temperature of 35°C
 $(\pm 0.2\%) + (\pm 0.0080\%/^\circ\text{C}) \times (35^\circ\text{C} - 30^\circ\text{C}) = \pm 0.24\%$

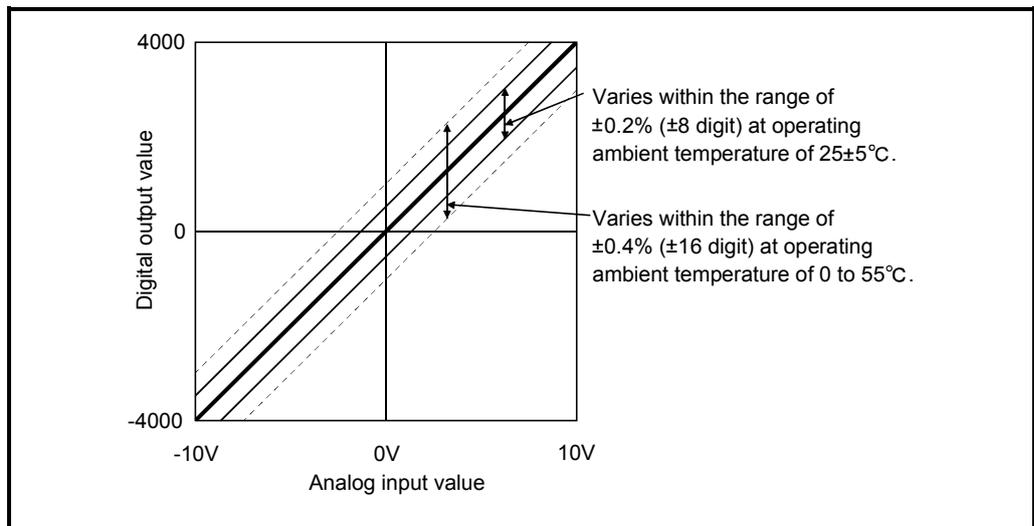


Fig. 3.3 Voltage Input Characteristic Accuracy

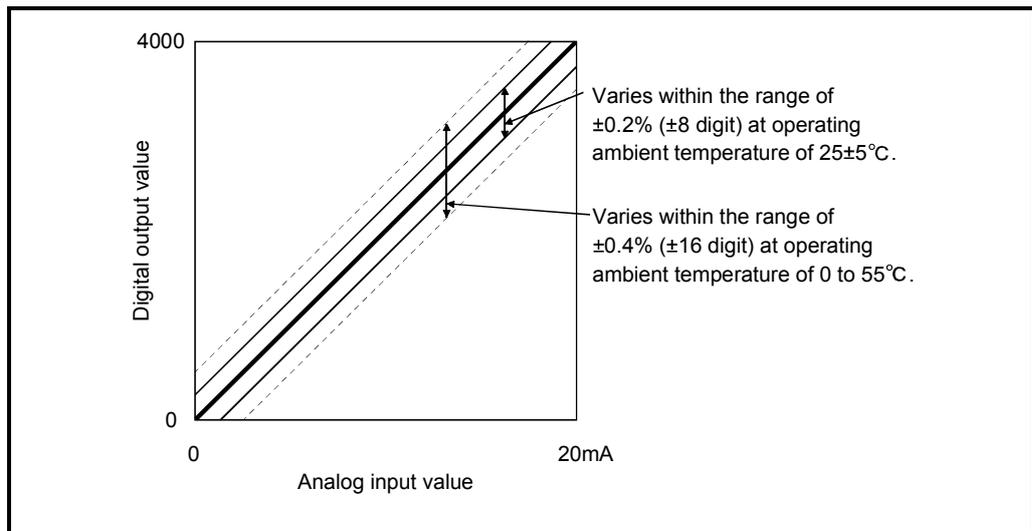


Fig. 3.4 Current Input Characteristic Accuracy

3.3.4 Conversion speed

This section explains the conversion speed of the CL2AD4-B.

The conversion speed depends on whether a primary delay filter is used or not.

(1) When using primary delay filter

The conversion speed of the channel that uses a primary delay filter is 400 μ s.

(2) When not using primary delay filter

The conversion speed of the channel that does not use a primary delay filter is 200 μ s.

3.3.5 Input response time of remote station

This section explains the input response time of the CL2AD4-B as a remote station.

The remote station input response time is used in the calculation of the transmission delay time.

The remote station input response time changes depending on whether a primary delay filter is used or not.

(1) When using primary delay filter

The remote station input response time of the channel that uses a primary delay filter is 0.8ms including the internal processing time.

$$0.4\text{ms (conversion speed)} \times 2 = 0.8\text{ms}$$

(2) When not using primary delay filter

The remote station input response time of the channel that does not use a primary delay filter is 0.4ms including the internal processing time.

$$0.2\text{ms (conversion speed)} \times 2 = 0.4\text{ms}$$

[Transmission delay time]

The transmission delay time is the time from when an analog value is input to the CL2AD4-B until the value is reflected on the device (X) of the programmable controller CPU.

For how to calculate the link scan time, refer to the user's manual of the CC-Link/LT master module or AJ65SBT-CLB.

$SM \times 2 + (2 - n) * 1 \times LS + \text{Input response time of remote station [ms]}$

SM: Sequence program scan time of master station

LS : Link scan time

n : Values of (SM/LS) after omitting figures below decimal point

*1 : 0 if the value is 0 or less

Example) When the module is connected to the QJ61CL12, with the transmission speed of 625kbps, the last station No. 10, the master station's sequence scan time of 5ms, the link scan time of 1.2ms, and the remote station input response time of 0.4ms

$$= 5 \times 2 + (2 - 4) \times 1.2 + 0.4$$

$$= 11.6\text{ms}$$

3.4 Function

The CL2AD4-B function list is shown in table 3.3.

Table 3.3 CL2AD4-B function list

| Item | Description | Reference section |
|--|---|-------------------|
| A/D conversion enable/disable function | (1) Specifies whether to enable or disable the A/D conversion for each channel. (2) The number of occupied I/O points (number of occupied stations) changes depending on the last conversion-enabled channel. For example, when only Channel 3 is set to conversion enabled, the number of occupied I/O points is 48 (3 stations occupied). (3) Set this function using the analog input setting switches. (Refer to section 4.3) | — |
| Input range changing function | (1) Can set the analog input range per channel to change the I/O conversion characteristics. (2) Set this function using the analog input setting switches. (Refer to section 4.3) | — |
| A/D conversion method | (1) The A/D conversion method is described below. (a) Averaging processing 1) Moving average The latest eight A/D conversion values are averaged every 200μs, and the average is stored into the remote input signal (X). 2) Count averaging A/D conversion is performed 10 times, the sum of the conversion values except the maximum and minimum values is averaged, and the average is stored into the remote input signal (X). (b) Primary delay filter A digital output value is smoothed with the preset time constant and stored into the remote input signal (X). (c) Fast response processing Analog input values are converted into digital values every 200μs, and the digital output value is stored into the remote input signal (X) at every conversion. (2) Set the A/D conversion method using CH□ A/D conversion method setting (Yn0 to Yn2). (Refer to section 3.5.2) | Section 3.4.1 |

3.4.1 A/D conversion method

Set the A/D conversion method using CH□ A/D conversion method setting (Yn0 to Yn2). (Refer to section 3.5.2)

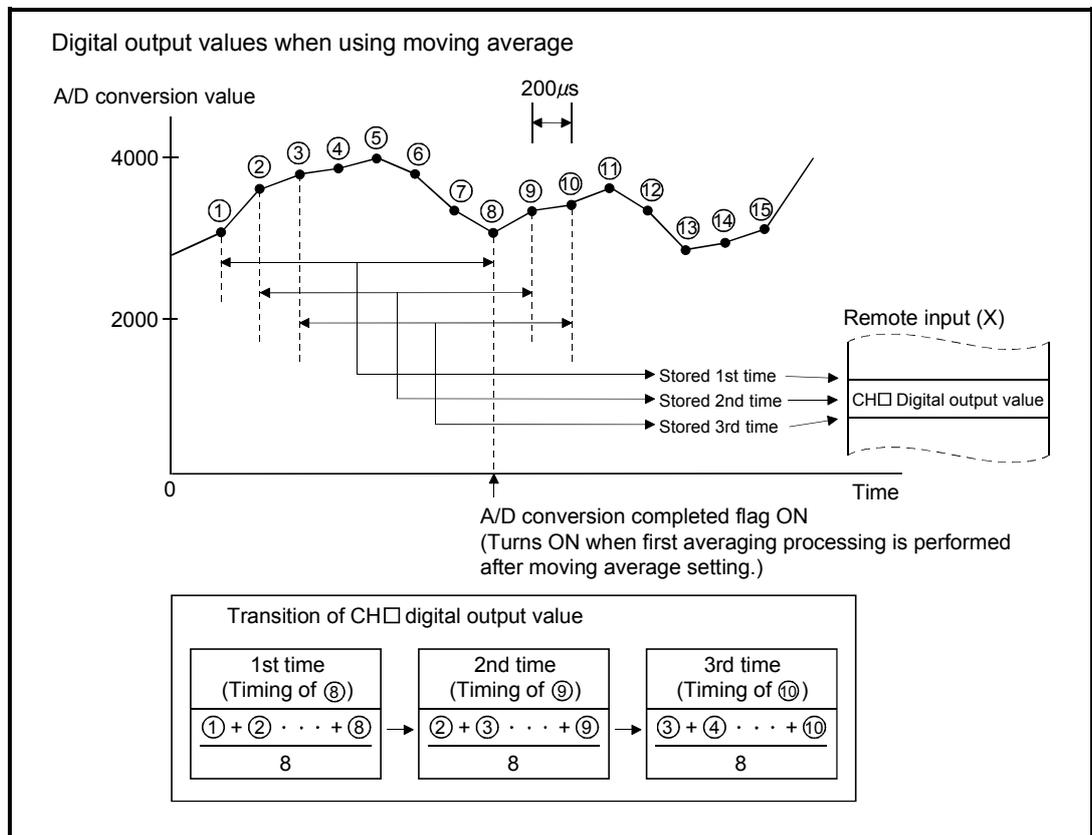
(1) Averaging processing
(a) Moving average

The latest eight sampled A/D conversion values are averaged every 200μs, and the average is stored into the remote input signal (X).

Since averaging processing is performed with data shifted for every sampling, the most recent digital output value is available.

For the 1st to 7th samplings after moving average setting, the digital output values are not stored.

On completion of the 8th sampling, the averaged value is stored and the A/D conversion completed flag (XnF) turns ON.



(b) Count averaging

A/D conversion is performed 10 times, the sum of the conversion values except the maximum and minimum values is averaged, and the average is stored into the remote input signal (X).

The digital output value is updated every 2ms (10 (times) × 0.2 (ms)).

The A/D conversion completed flag (XnF) turns ON when the first count averaging is performed after the count averaging setting and the first digital output value is stored.

(2) Primary delay filter

A digital output value with excessive noise smoothed with the preset time constant is stored into the remote input signal (X).

The A/D conversion time of the primary delay filter channel is 400 μ s.

The degree of smoothing varies with the time constant setting.

Any of three different time constants, 800 μ s, 10ms and 50ms, can be set.

The relational expression of the time constant and digital output value is indicated below.

[If $n = 1$]

$$Y_n = 0$$

[If $n = 2$]

$$Y_n = y_{n-1} + \frac{\Delta t}{\Delta t + TA} (y_n - y_{n-1})$$

[If $n \geq 3$]

$$Y_n = Y_{n-1} + \frac{\Delta t}{\Delta t + TA} (y_n - Y_{n-1})$$

Y_n : Current digital output value

y_n : Pre-smoothing digital output value

Y_{n-1} : Immediately preceding digital output value

y_{n-1} : Immediately preceding, pre-smoothing digital output value

n : Sampling count

Δt : A/D conversion time (400 μ s)

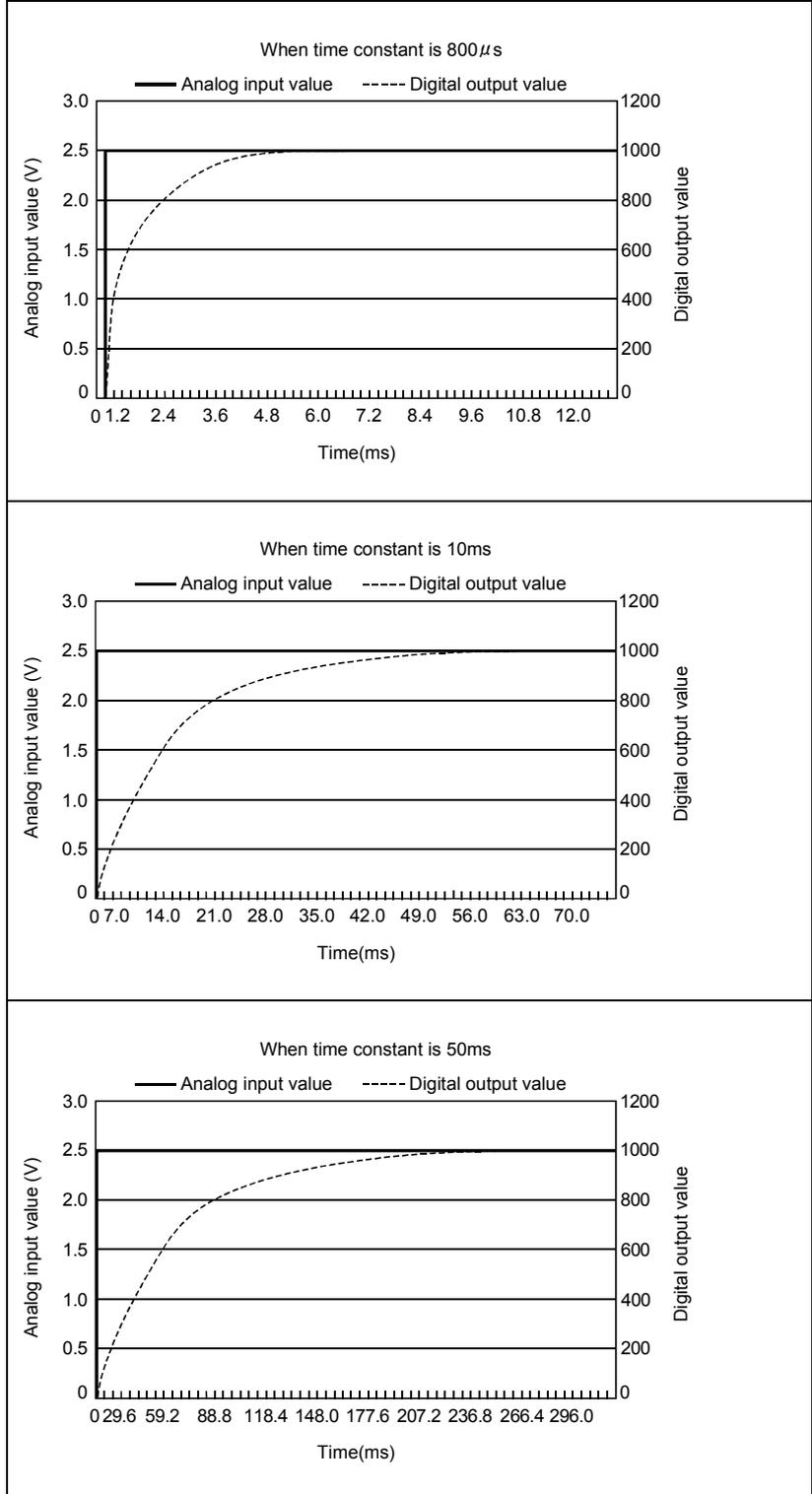
TA : Time constant * (μ s)

*Set any of 800 μ s, 10ms and 50ms as the time constant.

*The A/D conversion completed flag turns ON when $n \geq 2$.

[Example] Digital output value when the analog input value varied from 0 to 2.5V

The digital output value varies by each time constant as shown below.



(3) Fast response processing

Analog input values are converted into digital values every 200 μ s, and the digital output value is stored into the remote input signal (X) at every conversion.

| |
|-------|
| POINT |
|-------|

| |
|---|
| When the fast response processing has been selected, the module becomes sensitive to noise. Therefore, make sure of the operating environment before use. |
|---|

3.5 Remote I/O Signal

This section describes the assignment and functions of the remote I/O signals.

3.5.1 Remote I/O signal list

The remote input (X) means the input signal from the CL2AD4-B to the CC-link/LT master module/AJ65SBT-CLB, and the remote output (Y) means the output signal from the CC-link/LT master module/AJ65SBT-CLB to the CL2AD4-B.

The points of remote input (X) and remote output (Y) varies depending on the number of occupied stations in the CL2AD4-B.

| | |
|------------------------------|--------------------------|
| When 1 station is occupied | : X00 to X0F, Y00 to Y0F |
| When 2 stations are occupied | : X00 to X1F, Y00 to Y1F |
| When 3 stations are occupied | : X00 to X2F, Y00 to Y2F |
| When 4 stations are occupied | : X00 to X3F, Y00 to Y3F |

The remote I/O numbers (X/Y) change depending on the following conditions.

When connected to CC-Link/LT master module

- Start I/O numbers of CC-Link/LT master module
- Station number of CL2AD4-B

When connected to AJ65SBT-CLB

- Station number of AJ65SBT-CLB
- Station number of CL2AD4-B

The remote I/O numbers (X/Y) in this chapter and later are indicated under the following conditions.

- Start I/O number of CC-Link/LT master module: 0
- Station number of CL2AD4-B: 1

Table 3.4 indicates the assignment and names of the remote I/O signals.

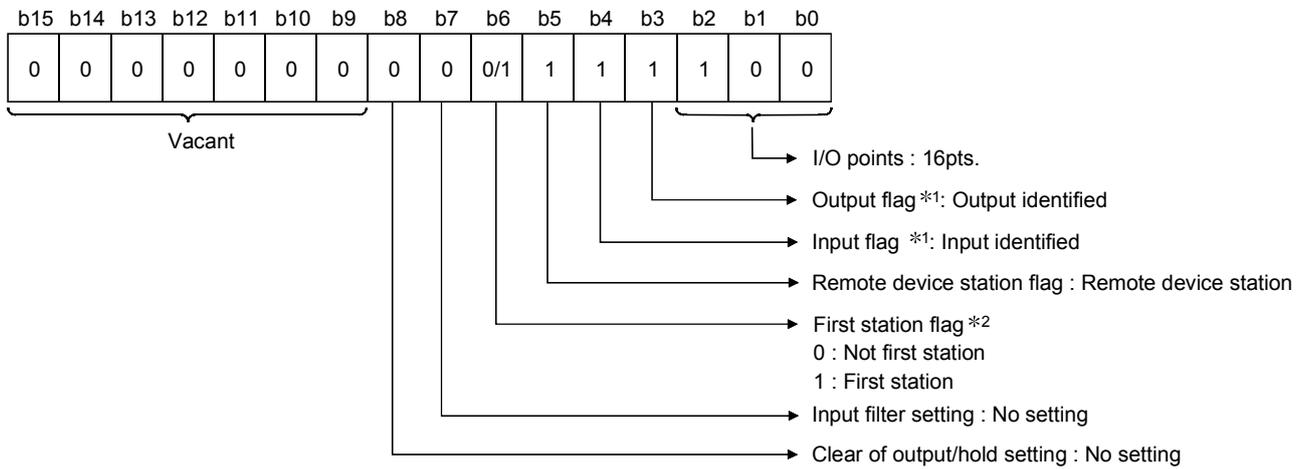
Table 3.4 Remote I/O Signals List

| Signal direction: CL2AD4-B → CC-Link/LT master module/AJ65SBT-CLB | | Signal direction: CC-Link/LT master module/ AJ65SBT-CLB → CL2AD4-B | | Remote I/O point | | | |
|--|--------------------------------------|---|--------------------------------------|---------------------------------------|--|--|--|
| Remote input(X) | Signal name | Remote output(Y) | Signal name | | | | |
| X00 to X0E | CH1 digital output value | Y00 to Y02 | CH1 A/D conversion method setting | 16 points (Occupies 1 station) | | | |
| | | Y03 to Y0F | Use prohibited (fixed to 0) | | | | |
| X0F | CH1 A/D conversion completed flag | | | | | | |
| X10 to X1E | CH2 digital output value | Y10 to Y12 | CH2 A/D conversion method setting | 32 points (Occupies 2 stations) | | | |
| | | Y13 to Y1F | Use prohibited (fixed to 0) | | | | |
| X1F | CH2 A/D conversion completed flag | | | | | | |
| X20 to X2E | CH3 digital output value | Y20 to Y22 | CH3 A/D conversion method setting | 48 points (Occupies 3 stations) | | | |
| | | Y23 to Y2F | Use prohibited (fixed to 0) | | | | |
| X2F | CH3 A/D conversion completed flag | | | | | | |
| X30 to X3E | CH4 digital output value | Y30 to Y32 | CH4 A/D conversion method setting | 64 points (Occupies 4 stations) | | | |
| | | Y33 to Y3F | Use prohibited (fixed to 0) | | | | |
| X3F | CH4 A/D conversion completed flag | | | | | | |

| |
|---|
| POINT |
| <p>The reserved devices given in Table 3.4 are used by the system and cannot be used by the user.</p> <p>If the user has used (turned on) any of them, we cannot guarantee the functions of the CL2AD4-B.</p> |

REMARK

When the CL2AD4-B is connected to the QJ61CL12, the following information is stored in the detailed remote station information area (buffer memory address 32 to 95: Un\G32 to Un\G95).



*1 In the case of the CL2AD4-B, 11 are stored to b4, b3.

*2 For a module that has 2 or more occupied stations, only the bit of the first station will turn on (1).

3.5.2 Functions of the remote I/O signals

Table 3.5 explains the functions of the remote I/O signals of the CL2AD4-B.
The value "n" in the table is determined by the channel, start I/O number and station number.

Table 3.5 Remote I/O Signal Details (1/2)

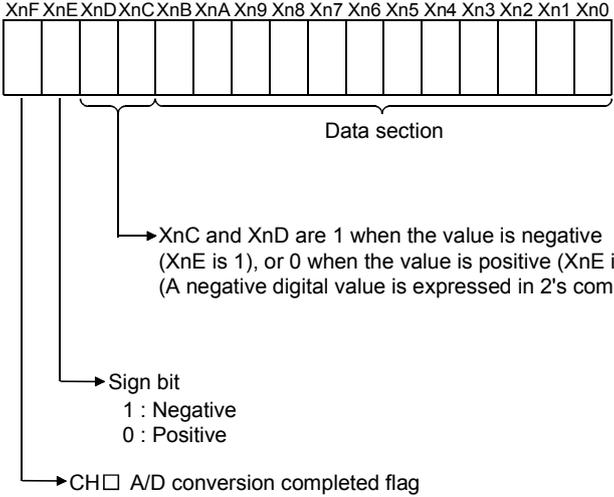
| Device No. | Signal Name | Description |
|------------------|-----------------------------------|---|
| Xn0 to XnE | CH□ digital output value | <p>(1) The digital value converted from analog is stored into Xn0 to XnE for each channel. (2) The digital output value is expressed in a 15-bit signed binary.</p>  <p>(3) When the CH□ A/D conversion method setting (Yn0 to Yn2) is changed, the CH□ digital output value is cleared.</p> |
| XnF | CH□ A/D conversion completed flag | <p>(1) The CH□ A/D conversion completed flag turns ON when the A/D conversion of the A/D conversion enabled channel is completed. 1: A/D conversion completed 2: A/D conversion not completed</p> <p>(2) In the case of the count averaging or moving average, the flag turns ON when the digital output value is stored after completion of the averaging processing.</p> <p>(3) In the case of the primary delay filter, the flag turns ON at the point of the second sampling. (Refer to section 3.4.1 (2))</p> <p>(4) When the A/D conversion method setting is changed, the digital output value is cleared to 0 and this flag turns OFF. The flag turns ON again when the A/D conversion by the changed method is completed and the digital output value is stored.</p> |

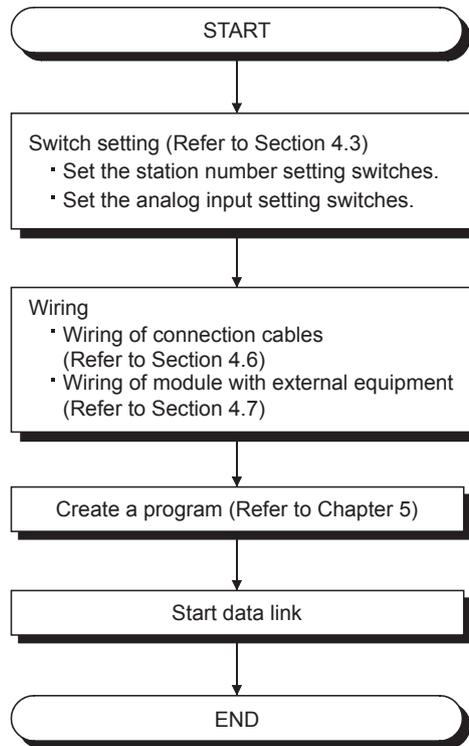
Table 3.5 Remote I/O Signal Details (2/2)

| Device No. | Signal Name | Description | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|--------------------------------------|---|-----------------------|---------------|-----|-----|-----|----------------|----|-----|-----|----|-----------------|----|-----|----|-----|--|----|-----|----|----|---|----|----|-----|-----|---|----|----|-----|----|--------------------------|----|----|----|-----|----|----|----|----|
| Yn0 to Yn2 | CH□ A/D conversion method setting | <p>(1) When selecting the moving average, count averaging, primary delay filter or fast response processing, set the A/D conversion method to Yn0 to Yn2 for each channel.</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | <table border="1"> <thead> <tr> <th data-bbox="639 456 1034 517">A/D conversion method</th> <th data-bbox="1034 456 1134 517">Setting value</th> <th data-bbox="1134 456 1235 517">Yn2</th> <th data-bbox="1235 456 1335 517">Yn1</th> <th data-bbox="1335 456 1444 517">Yn0</th> </tr> </thead> <tbody> <tr> <td data-bbox="639 517 1034 555">Moving average</td> <td data-bbox="1034 517 1134 555">1H</td> <td data-bbox="1134 517 1235 555">OFF</td> <td data-bbox="1235 517 1335 555">OFF</td> <td data-bbox="1335 517 1444 555">ON</td> </tr> <tr> <td data-bbox="639 555 1034 593">Count averaging</td> <td data-bbox="1034 555 1134 593">2H</td> <td data-bbox="1134 555 1235 593">OFF</td> <td data-bbox="1235 555 1335 593">ON</td> <td data-bbox="1335 555 1444 593">OFF</td> </tr> <tr> <td data-bbox="639 593 1034 631">Primary delay filter (time constant 800μs)</td> <td data-bbox="1034 593 1134 631">3H</td> <td data-bbox="1134 593 1235 631">OFF</td> <td data-bbox="1235 593 1335 631">ON</td> <td data-bbox="1335 593 1444 631">ON</td> </tr> <tr> <td data-bbox="639 631 1034 669">Primary delay filter (time constant 10ms)</td> <td data-bbox="1034 631 1134 669">4H</td> <td data-bbox="1134 631 1235 669">ON</td> <td data-bbox="1235 631 1335 669">OFF</td> <td data-bbox="1335 631 1444 669">OFF</td> </tr> <tr> <td data-bbox="639 669 1034 707">Primary delay filter (time constant 50ms)</td> <td data-bbox="1034 669 1134 707">5H</td> <td data-bbox="1134 669 1235 707">ON</td> <td data-bbox="1235 669 1335 707">OFF</td> <td data-bbox="1335 669 1444 707">ON</td> </tr> <tr> <td data-bbox="639 707 1034 745" rowspan="2">Fast response processing</td> <td data-bbox="1034 707 1134 745">6H</td> <td data-bbox="1134 707 1235 745">ON</td> <td data-bbox="1235 707 1335 745">ON</td> <td data-bbox="1335 707 1444 745">OFF</td> </tr> <tr> <td data-bbox="1034 745 1134 784">7H</td> <td data-bbox="1134 745 1235 784">ON</td> <td data-bbox="1235 745 1335 784">ON</td> <td data-bbox="1335 745 1444 784">ON</td> </tr> </tbody> </table> | A/D conversion method | Setting value | Yn2 | Yn1 | Yn0 | Moving average | 1H | OFF | OFF | ON | Count averaging | 2H | OFF | ON | OFF | Primary delay filter (time constant 800μs) | 3H | OFF | ON | ON | Primary delay filter (time constant 10ms) | 4H | ON | OFF | OFF | Primary delay filter (time constant 50ms) | 5H | ON | OFF | ON | Fast response processing | 6H | ON | ON | OFF | 7H | ON | ON | ON |
| | | A/D conversion method | Setting value | Yn2 | Yn1 | Yn0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Moving average | 1H | OFF | OFF | ON | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Count averaging | 2H | OFF | ON | OFF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Primary delay filter (time constant 800μs) | 3H | OFF | ON | ON | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Primary delay filter (time constant 10ms) | 4H | ON | OFF | OFF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Primary delay filter (time constant 50ms) | 5H | ON | OFF | ON | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Fast response processing | 6H | ON | ON | OFF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | 7H | ON | ON | ON | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <p>(2) When any value other than 0_H is set to Yn0 to Yn2 in the sequence program after power-on, A/D conversion starts.</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <p>(3) If a value other than 0_H was set to Yn0 to Yn2 in the sequence program and it changes to 0_H for such a reason as programmable controller CPU STOP during execution of A/D conversion, A/D conversion continues at the setting before the change of the value in Yn0 to Yn2.</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

4 SETUP AND PROCEDURES BEFORE OPERATION

4.1 Pre-Operation Procedure

This section explains the preparatory procedure for operating the CL2AD4-B.



4.2 Precautions When Handling

The precautions when handling the CL2AD4-B are described below:

- ⚠ WARNING**
- Be sure to shut off all phases of the external power supply used by the system before installation or wiring.
Not completely turning off all power could result in electric shock or damage to the product.
 - Do not touch the terminals while power is on.
Doing so could cause shock or erroneous operation.
 - 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**
- Ensure that no foreign matter such as chips and wire-offcuts enter the module.
Foreign matter can cause a fire, failure or malfunction.
 - Do not disassemble or modify the modules.
Doing so may cause failure, malfunction, injury, or a fire.
 - Do not directly touch the module's conductive parts or electronic components.
Doing so may cause malfunctions or failure of the module.

| | |
|--|--|
|  CAUTION | <ul style="list-style-type: none"> • When disposing of this product, treat it as industrial waste. • Use the programmable controller in the environment that meets the general specifications contained in this Manual. Using the programmable controller outside the range of the general specifications may result in electric shock, fire or malfunction, or may damage or degrade the module. • Securely fix the module to a DIN rail or with mounting screws, and securely tighten the mounting screws within the specified torque range. Undertightening can cause a drop or malfunction. Overtightening can cause a drop or malfunction due to damage of the screws or module. • Be sure to shut off all phases of the external power supply used by the system before mounting or dismantling the module to or from the panel. Not doing so can cause the module to fail or malfunction. • Before handling the module, always touch grounded metal, etc. to discharge static electricity from the human body. Failure to do so can cause the module to fail or malfunction. |
|--|--|

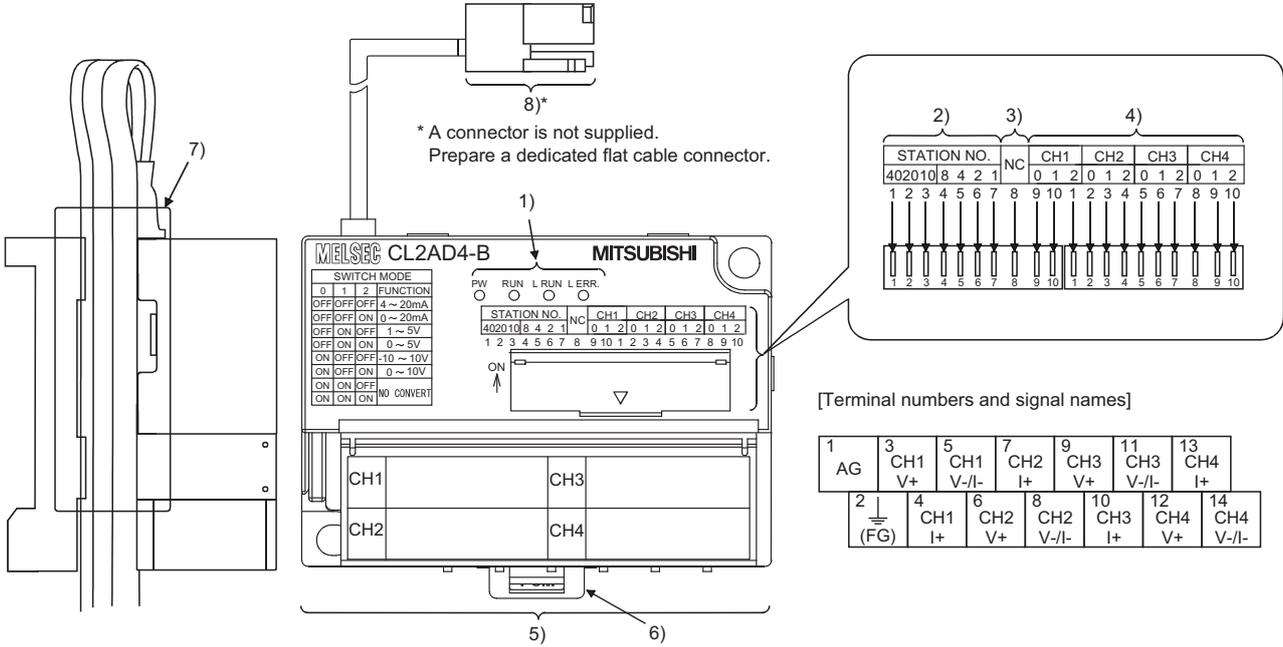
- (1) Tighten the screws such as module fixing screws within the following ranges.

| Screw location | Clamping torque range |
|--|-----------------------|
| Module mounting screw (M4 screw) | 0.78 to 1.08N · m |
| Terminal block terminal screw (M3 screw) | 0.42 to 0.58N · m |

- (2) When using a DIN rail, attach the DIN rail after taking the following items into consideration:
- (a) Applicable DIN rail types (conform to IEC 60715)
 - TH35-7.5Fe
 - TH35-7.5Al
 - (b) Interval between the DIN rail's installation screws
 - Tighten the screws using a pitch of 200mm (7.87in.) or less when attaching a DIN rail.
- (3) To attach the CL2AD4-B to the DIN rail, press the centerline area of the DIN rail hook beneath the module until a click is heard.
- (4) Maintain some distance between the module and other components and parts, 10 mm (0.39 in.) from the top and 60 mm (2.36 in.) from the bottom of the module, in order to improve ventilation and to make replacement of the module easy if a CL2AD4-B is installed on a board.
- (5) Install the CL2AD4-B on a level surface. If the surface is uneven, unnecessary force is applied to the printed circuit board, causing malfunctions.

4.3 Part Identification Nomenclature

The name of each part in the CL2AD4-B is listed below.



| Number | Name | Description |
|--------|------------------------------|--|
| 1) | Operation status display LED | PW LED ON : Power supply on OFF : The power supply is turned off The voltage drop is too large |
| | | RUN LED ON : Normal operation Flickering : When the analog input setting switches are set to disable the conversion of all channels When the analog input switch setting was changed during operation When the NC switch is ON OFF : Watchdog timer error Fault in hardware |
| | | L RUN LED ON : Normal communication OFF : Communication cut off (timeout error) |
| | | L ERR. LED ON : When a communication data error occurred When the station number switch setting is outside the valid range When other than the 16-point mode is set Communication cut off (timeout error) When the analog input setting switches are set to disable the conversion of all channels Flickering at fixed intervals (0.4s intervals): When the station number setting switch was changed from the power-on setting. Flickering at irregular intervals: When the terminating resistor was not installed When the module or connection cable is affected by noise OFF : Indicates normal communications |

| Number | Name | Description | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------------------|--------------------------------|---|----------------|------------------|-----|-----|-------------|---|---|-------------------|-----------|-----|-----|-----|-----------|-----|-----|----|---------|-----|-----|-----|---------|-----|----|----|------------|-----|-----|-----|----------|----|-----|----|--------------------|-----|-----|-----|-----|----|----|----|-----|-----|-----|-----|----|-----|-----|---|---|---|---|---|---|---|---|----|-----|-----|----|-----|-----|-----|-----|----|-----|-----|----|-----|-----|-----|----|---|---|---|---|---|---|---|---|----|----|----|-----|-----|----|-----|-----|----------------|-------------|--|--|-------------|--|--|--|----|----|----|---|---|---|---|----|-----|----|----|-----|-----|----|-----|
| 2) | Station number setting switch | <p>Select "10", "20" or "40" to set the ten's place of the station number. Select "1", "2", "4" or "8" to set the one's place of the station number. Always set the station number within the range of 1 to 64. Setting of other than 1 to 64 will result in an error, turning ON the "L ERR." LED. The same station number cannot be used more than once.</p> <p style="text-align: right;">(Factory default: All OFF)</p> <table border="1"> <thead> <tr> <th rowspan="2">Station number</th> <th colspan="3">Ten's place</th> <th colspan="4">One's place</th> </tr> <tr> <th>40</th> <th>20</th> <th>10</th> <th>8</th> <th>4</th> <th>2</th> <th>1</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>OFF</td> <td>OFF</td> <td>OFF</td> <td>OFF</td> <td>OFF</td> <td>OFF</td> <td>ON</td> </tr> <tr> <td>2</td> <td>OFF</td> <td>OFF</td> <td>OFF</td> <td>OFF</td> <td>OFF</td> <td>ON</td> <td>OFF</td> </tr> <tr> <td>3</td> <td>OFF</td> <td>OFF</td> <td>OFF</td> <td>OFF</td> <td>OFF</td> <td>ON</td> <td>ON</td> </tr> <tr> <td>4</td> <td>OFF</td> <td>OFF</td> <td>OFF</td> <td>OFF</td> <td>ON</td> <td>OFF</td> <td>OFF</td> </tr> <tr> <td>:</td> <td>:</td> <td>:</td> <td>:</td> <td>:</td> <td>:</td> <td>:</td> <td>:</td> </tr> <tr> <td>10</td> <td>OFF</td> <td>OFF</td> <td>ON</td> <td>OFF</td> <td>OFF</td> <td>OFF</td> <td>OFF</td> </tr> <tr> <td>11</td> <td>OFF</td> <td>OFF</td> <td>ON</td> <td>OFF</td> <td>OFF</td> <td>OFF</td> <td>ON</td> </tr> <tr> <td>:</td> <td>:</td> <td>:</td> <td>:</td> <td>:</td> <td>:</td> <td>:</td> <td>:</td> </tr> <tr> <td>64</td> <td>ON</td> <td>ON</td> <td>OFF</td> <td>OFF</td> <td>ON</td> <td>OFF</td> <td>OFF</td> </tr> </tbody> </table> <p>(Example) Set the switches as below when setting the station number to 32:</p> <table border="1"> <thead> <tr> <th rowspan="2">Station number</th> <th colspan="3">Ten's place</th> <th colspan="4">One's place</th> </tr> <tr> <th>40</th> <th>20</th> <th>10</th> <th>8</th> <th>4</th> <th>2</th> <th>1</th> </tr> </thead> <tbody> <tr> <td>32</td> <td>OFF</td> <td>ON</td> <td>ON</td> <td>OFF</td> <td>OFF</td> <td>ON</td> <td>OFF</td> </tr> </tbody> </table> | Station number | Ten's place | | | One's place | | | | 40 | 20 | 10 | 8 | 4 | 2 | 1 | 1 | OFF | OFF | OFF | OFF | OFF | OFF | ON | 2 | OFF | OFF | OFF | OFF | OFF | ON | OFF | 3 | OFF | OFF | OFF | OFF | OFF | ON | ON | 4 | OFF | OFF | OFF | OFF | ON | OFF | OFF | : | : | : | : | : | : | : | : | 10 | OFF | OFF | ON | OFF | OFF | OFF | OFF | 11 | OFF | OFF | ON | OFF | OFF | OFF | ON | : | : | : | : | : | : | : | : | 64 | ON | ON | OFF | OFF | ON | OFF | OFF | Station number | Ten's place | | | One's place | | | | 40 | 20 | 10 | 8 | 4 | 2 | 1 | 32 | OFF | ON | ON | OFF | OFF | ON | OFF |
| Station number | Ten's place | | | One's place | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 40 | 20 | 10 | 8 | 4 | 2 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | OFF | OFF | OFF | OFF | OFF | OFF | ON | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | OFF | OFF | OFF | OFF | OFF | ON | OFF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | OFF | OFF | OFF | OFF | OFF | ON | ON | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | OFF | OFF | OFF | OFF | ON | OFF | OFF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| : | : | : | : | : | : | : | : | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10 | OFF | OFF | ON | OFF | OFF | OFF | OFF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 11 | OFF | OFF | ON | OFF | OFF | OFF | ON | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| : | : | : | : | : | : | : | : | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 64 | ON | ON | OFF | OFF | ON | OFF | OFF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Station number | Ten's place | | | One's place | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 40 | 20 | 10 | 8 | 4 | 2 | 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 32 | OFF | ON | ON | OFF | OFF | ON | OFF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3) | NC | Must not be used. (Used by the system and unavailable for the user. Keep this switch OFF. If it is turned ON, the RUN LED flickers.) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4) | Analog input setting switch | <p>Set the A/D conversion enable/disable selection and input range for each channel. Set unused channels to be conversion-disabled.</p> <table border="1"> <thead> <tr> <th rowspan="2">Input range</th> <th colspan="3">Setting switches</th> </tr> <tr> <th>0</th> <th>1</th> <th>2</th> </tr> </thead> <tbody> <tr> <td rowspan="6">Conversion enable</td> <td>4 to 20mA</td> <td>OFF</td> <td>OFF</td> <td>OFF</td> </tr> <tr> <td>0 to 20mA</td> <td>OFF</td> <td>OFF</td> <td>ON</td> </tr> <tr> <td>1 to 5V</td> <td>OFF</td> <td>ON</td> <td>OFF</td> </tr> <tr> <td>0 to 5V</td> <td>OFF</td> <td>ON</td> <td>ON</td> </tr> <tr> <td>-10 to 10V</td> <td>ON</td> <td>OFF</td> <td>OFF</td> </tr> <tr> <td>0 to 10V</td> <td>ON</td> <td>OFF</td> <td>ON</td> </tr> <tr> <td rowspan="2">Conversion disable</td> <td></td> <td>ON</td> <td>ON</td> <td>OFF</td> </tr> <tr> <td></td> <td>ON</td> <td>ON</td> <td>ON</td> </tr> </tbody> </table> <p style="text-align: right;">(Factory default: All OFF (4 to 20mA))</p> | Input range | Setting switches | | | 0 | 1 | 2 | Conversion enable | 4 to 20mA | OFF | OFF | OFF | 0 to 20mA | OFF | OFF | ON | 1 to 5V | OFF | ON | OFF | 0 to 5V | OFF | ON | ON | -10 to 10V | ON | OFF | OFF | 0 to 10V | ON | OFF | ON | Conversion disable | | ON | ON | OFF | | ON | ON | ON | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Input range | Setting switches | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 0 | 1 | 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Conversion enable | 4 to 20mA | OFF | OFF | OFF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 0 to 20mA | OFF | OFF | ON | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 1 to 5V | OFF | ON | OFF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 0 to 5V | OFF | ON | ON | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | -10 to 10V | ON | OFF | OFF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 0 to 10V | ON | OFF | ON | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Conversion disable | | ON | ON | OFF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | ON | ON | ON | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5) | Terminal block | Terminal block for connection of the I/O signals. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6) | DIN rail hook | Used to mount the module to the DIN rail. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7) | Cable guide | Guide used when wiring the CC-Link/LT dedicated flat cable of the CL2AD4-B downward. (Refer to section 4.6) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 8) | CC-Link/LT interface connector | Connector for connection of the CC-Link/LT communication line or module power supply (Sold separately). | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

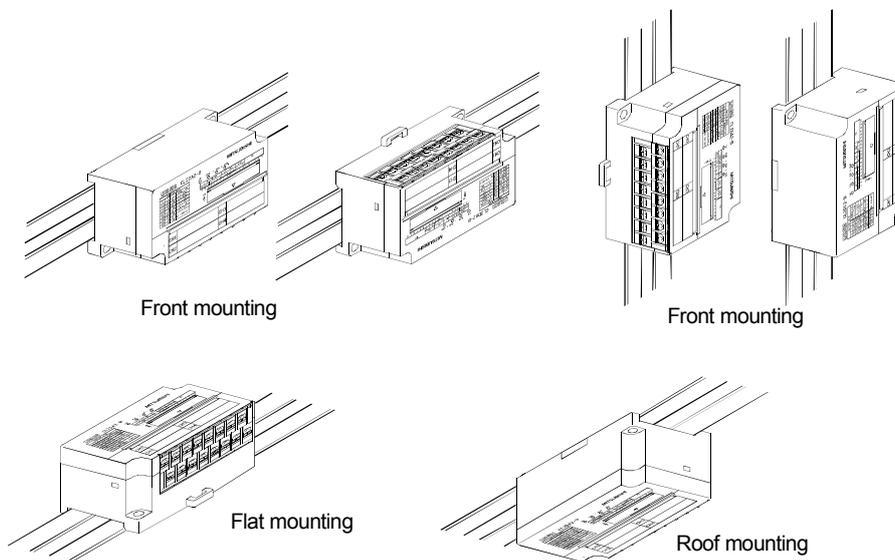
4.4 Station Number Setting

The remote I/O signals (X/Y) are determined by the station number setting of the CL2AD4-B.

For details, refer to the user's manual of the used CC-Link/LT master module or AJ65SBT-CLB.

4.5 Facing Direction of the Module Installation

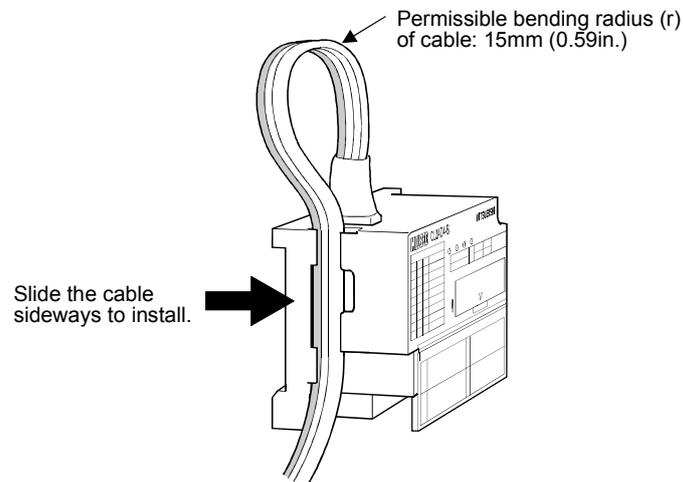
The CL2AD4-B may be installed in any of six directions.
(There are no restrictions on the facing directions.)



4.6 Connection Modules with Cable

For the wiring of the connection cable for the CL2AD4-B and CC-Link/LT master module/AJ65SBT-CLB, refer to the relevant user's manual.

- (1) When the CL2AD4-B is connected to the VCTF or high flexible cable drop line, the CC-Link/LT dedicated flat cable of the CL2AD4-B must be fabricated to 20cm (7.87 in.) or less.
- (2) The CC-Link/LT dedicated flat cable of the CL2AD4-B can be wired downward by use of the cable guide. The permissible bending radius (r) of the CC-Link/LT dedicated flat cable of the CL2AD4-B is 15mm (0.59 in.).



4.7 Wiring

This section provides the precautions for wiring the CL2AD4-B and its wiring with external equipment.

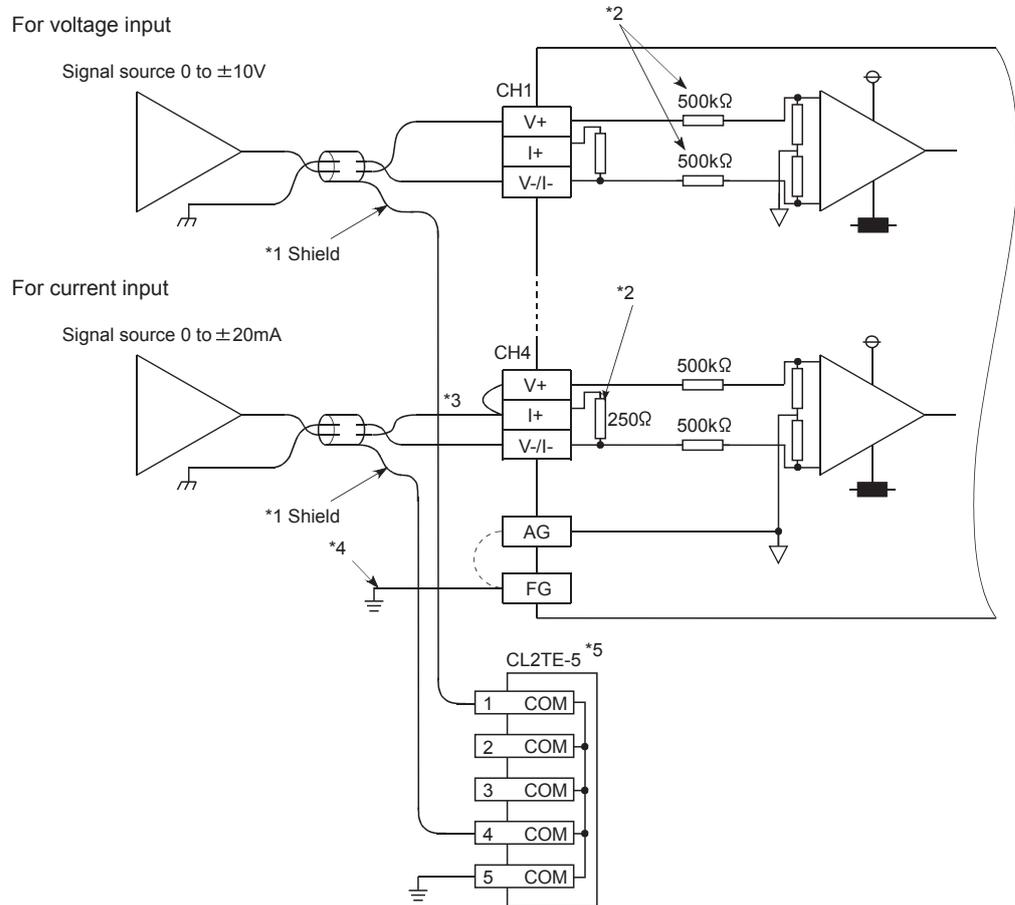
4.7.1 Wiring precautions

To obtain maximum performance from the functions of CL2AD4-B and improve the system reliability, an external wiring with high durability against noise is required. The precautions when performing external wiring are as follows:

- (1) Use separate cables for the AC and CL2AD4-B external input signals, in order not to be affected by the AC side surge or conductivity.
- (2) Do not bundle or place with load carrying wires other than the main circuit line, high voltage line or programmable controller. Noises, surges, or conductivity may affect the system.
- (3) Ground the shield wires or shield cables at the end on the module side.
It is recommended to ground the shield wires or shield cables using the optional CL2TE-5 common terminal block.
For details of the CL2TE-5, refer to the CL2TE-5 Common Terminal Block User's Manual.

4.7.2 Wiring of module with external equipment

(1) When using CL2TE-5 common terminal block



*1 Use a two-core twisted shield line for the power cable.

*2 Indicates the CL2AD4-B input resistor.

*3 For the current input, be sure to connect the (V+) and (I+) terminals.

*4 Always perform grounding for FG. When there is a lot of noise, it may be better ground AG as well.

*5 Using the CL2TE-5 allows grounding of the shield wires all at once.

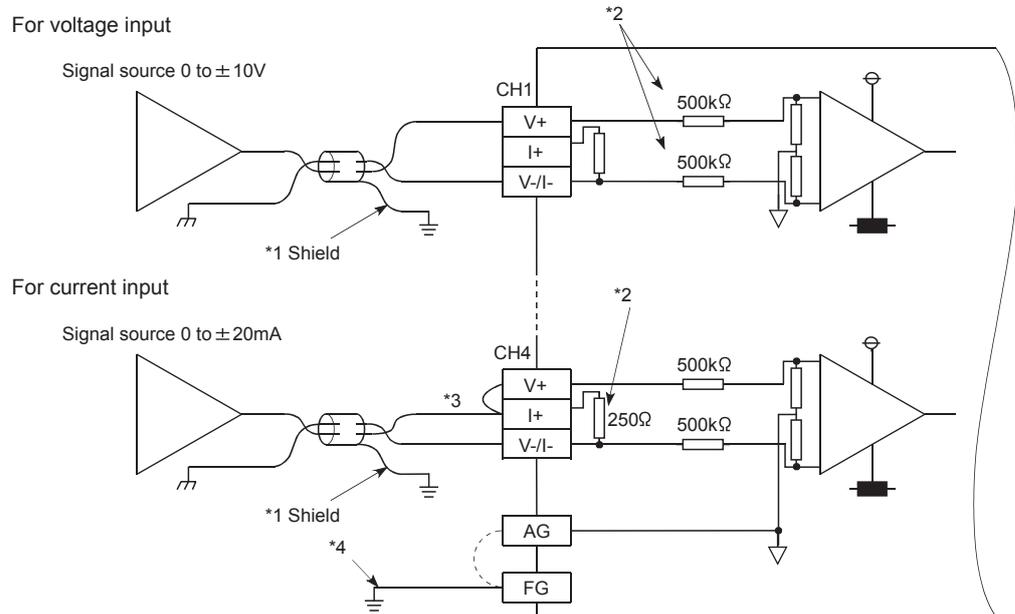
POINT

In an unused channel, if terminals remain open, an erratic digital value may be output.

To prevent this, take any of the following measures.

1. Select "Conversion disable" in the Analog input setting switch for the unused channel.
2. Short-circuit the input terminals (V+ and V-/I-) of the unused channel.
3. Connect the AG terminal to the GND terminal of the external device.

(2) When not using CL2TE-5 common terminal block



*1 Use a two-core twisted shield line for the power cable.

*2 Indicates the CL2AD4-B input resistor.

*3 For the current input, be sure to connect the (V+) and (I+) terminals.

*4 Always perform grounding for FG. When there is a lot of noise, it may be better ground AG as well.

POINT

In an unused channel, if terminals remain open, an erratic digital value may be output.

To prevent this, take any of the following measures.

1. Select "Conversion disable" in the Analog input setting switch for the unused channel.
2. Short-circuit the input terminals (V+ and V-/I-) of the unused channel.
3. Connect the AG terminal to the GND terminal of the external device.

4.8 Check of Wiring

Using the program in Chapter 5, check the wiring.

4.9 Maintenance and Inspection

There are no special inspection items for the CL2AD4-B module, but follow the inspections items describes in the programmable controller CPU User's Manual so that the system can always be used in the best condition.

5 PROGRAMMING

This chapter describes the programming of the CL2AD4-B.

When applying any of the program examples introduced in this chapter to the actual system, make sure to examine the applicability and confirm that no problems will occur in the system control.

Refer to the user's manual of the used CC-Link/LT master module or AJ65SBT-CLB for the CC-Link/LT master module/AJ65SBT-CLB, and refer to the AnSHCPU/AnACPU/AnUCPU/QCPU-A (A Mode) Programming Manual (Dedicated Instructions) for details of the dedicated instructions.

5.1 Precautions on Programming

The following explains precautions on the creation of a program:

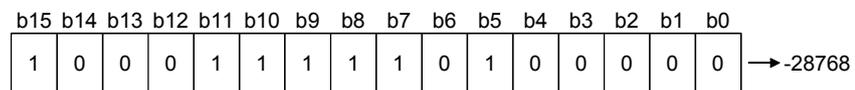
(1) How to read the digital output value

When data are stored into word devices for each channel, b15 corresponding to the CH□ A/D conversion completed flag turns ON (1). Hence, the digital output value is always handled as a negative value.

When the digital output value is 0 or more, therefore, it must be stored into the digital output value calculating data register once and b15 must be turned OFF (0) to return the digital output value to the original value.

Example) When the digital output value is 4000

[Digital output value calculating data register]

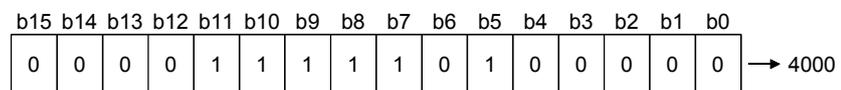


CH□ digital output value

→ ON (1) since b15 corresponds to the CH□ A/D conversion completed flag.

Turn OFF (0) b15

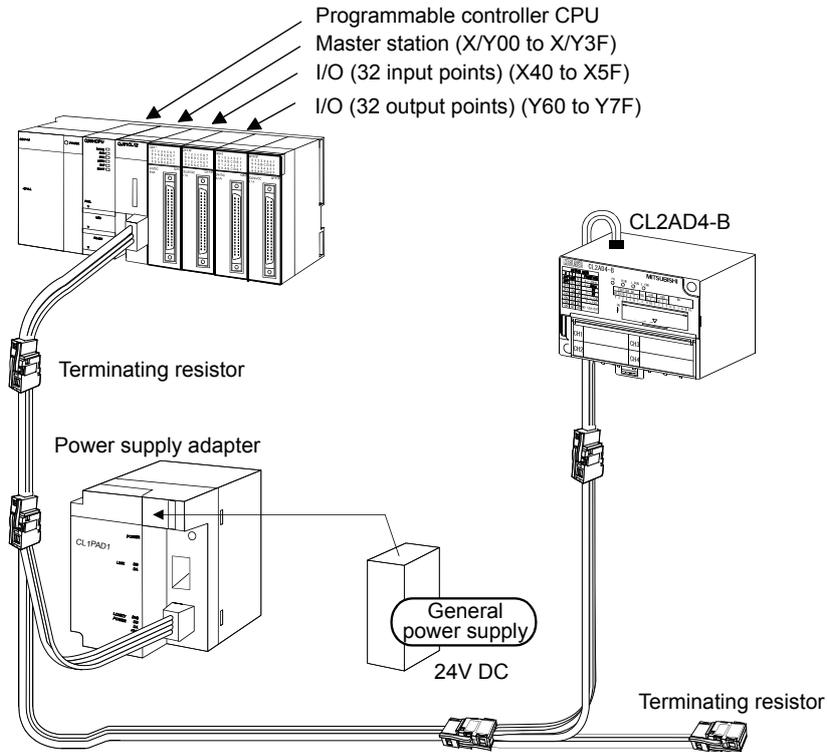
[Digital output value storing data register]



5.2 Conditions for Program Examples (When connected to QJ61CL12)

The program example of Section 5.2.1 is created under the following conditions.

(1) System configuration



(a) Master station settings

| Item | Settings |
|---------------------------------------|----------------------------|
| Number of occupied I/O points setting | 64 points (X/Y00 to X/Y3F) |
| Transmission rate setting | 2.5Mbps |
| Point mode setting | 16-point mode |
| Last station number setting | 4 |

(b) CL2AD4-B settings

| Item | Settings |
|-------------------------------------|--|
| Station number setting | Station number 1 |
| Number of occupied stations setting | Occupies 4 stations |
| CH1 input range setting | 1 to 5V |
| CH1 A/D conversion method setting | Moving average |
| CH2 input range setting | -10V to 10V |
| CH2 A/D conversion method setting | Count averaging |
| CH3 input range setting | 4 to 20mA |
| CH3 A/D conversion method setting | Primary delay filter (time constant 800μs) |
| CH4 input range setting | 0 to 20mA |
| CH4 A/D conversion method setting | Primary delay filter (time constant 10ms) |

(2) Device assignment to program examples

The devices used in the program example of Section 5.2.1 are shown below.

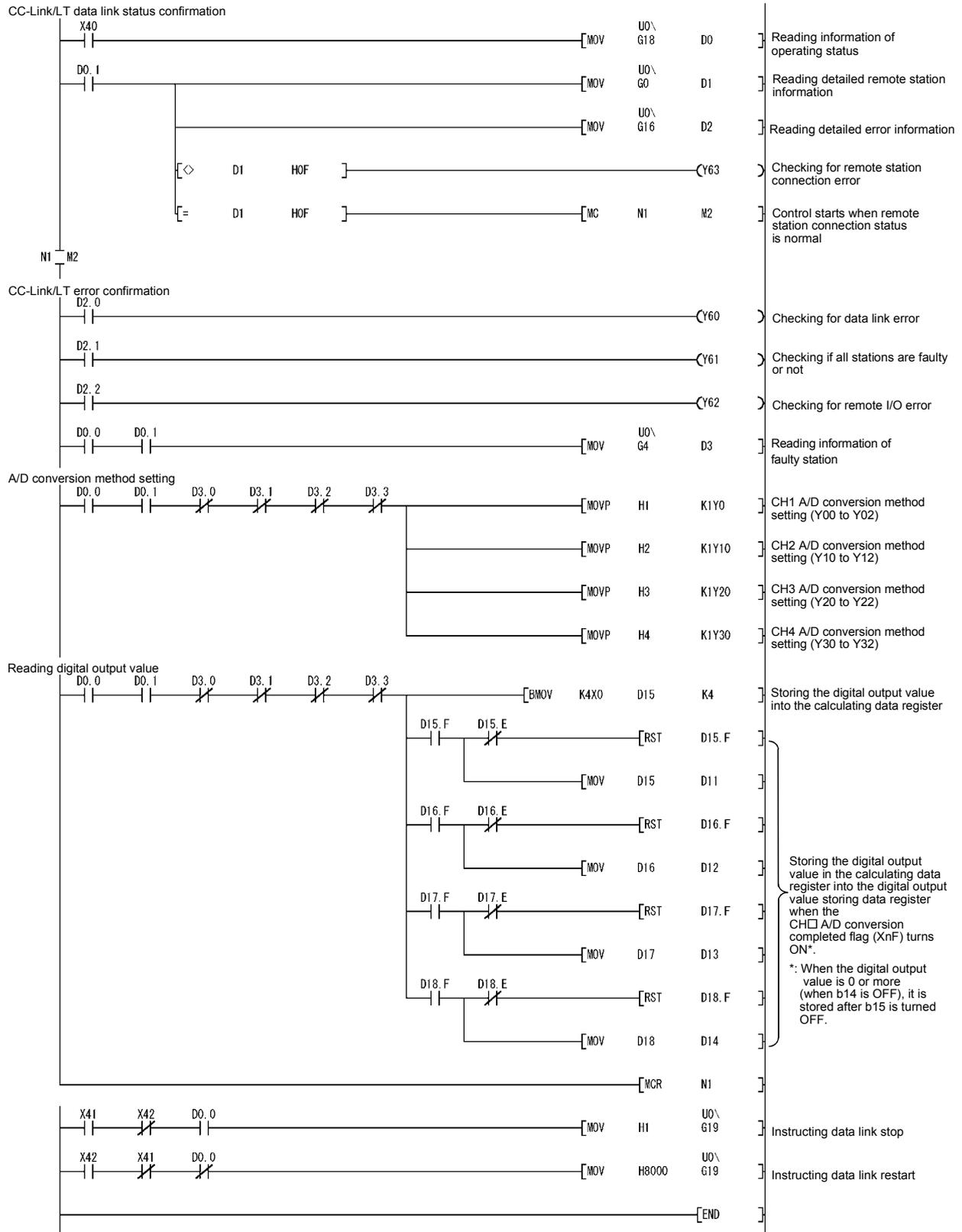
(a) Remote I/O (X/Y)

| Station No. | Model Name | Input | | Output | | Station No. | Model Name | Input | | Output | |
|-------------|-----------------------------------|-------|--------------------------|--------|-----------------------------------|-------------|-----------------------------------|-------|--------------------------|--------|-----------------------------------|
| 1 | CL2AD4-B (Occupies 4 stations) | X 00 | CH1 digital output value | Y 00 | CH1 A/D conversion method setting | 3 | CL2AD4-B (Occupies 4 stations) | X 20 | CH3 digital output value | Y 20 | CH3 A/D conversion method setting |
| | | X 01 | | Y 01 | | | | Y 21 | | | |
| | | X 02 | | Y 02 | | | | Y 22 | | | |
| | | X 03 | | Y 03 | Y 23 | | | | | | |
| | | X 04 | | Y 04 | Y 24 | | | | | | |
| | | X 05 | | Y 05 | Y 25 | | | | | | |
| | | X 06 | | Y 06 | Y 26 | | | | | | |
| | | X 07 | | Y 07 | Y 27 | | | | | | |
| | | X 08 | | Y 08 | Y 28 | | | | | | |
| | | X 09 | | Y 09 | Y 29 | | | | | | |
| | | X 0A | | Y 0A | Y 2A | | | | | | |
| | | X 0B | | Y 0B | Y 2B | | | | | | |
| | | X 0C | | Y 0C | Y 2C | | | | | | |
| | | X 0D | | Y 0D | Y 2D | | | | | | |
| | | X 0E | Y 0E | Y 2E | | | | | | | |
| X 0F | CH1 A/D conversion completed flag | Y 0F | | X 2F | CH3 A/D conversion completed flag | Y 2F | | | | | |
| 2 | CL2AD4-B (Occupies 4 stations) | X 10 | CH2 digital output value | Y 10 | CH2 A/D conversion method setting | 4 | CL2AD4-B (Occupies 4 stations) | X 30 | CH4 digital output value | Y 30 | CH4 A/D conversion method setting |
| | | X 11 | | Y 11 | | | | Y 31 | | | |
| | | X 12 | | Y 12 | | | | Y 32 | | | |
| | | X 13 | | Y 13 | Y 33 | | | | | | |
| | | X 14 | | Y 14 | Y 34 | | | | | | |
| | | X 15 | | Y 15 | Y 35 | | | | | | |
| | | X 16 | | Y 16 | Y 36 | | | | | | |
| | | X 17 | | Y 17 | Y 37 | | | | | | |
| | | X 18 | | Y 18 | Y 38 | | | | | | |
| | | X 19 | | Y 19 | Y 39 | | | | | | |
| | | X 1A | | Y 1A | Y 3A | | | | | | |
| | | X 1B | | Y 1B | Y 3B | | | | | | |
| | | X 1C | | Y 1C | Y 3C | | | | | | |
| | | X 1D | | Y 1D | Y 3D | | | | | | |
| | | X 1E | Y 1E | Y 3E | | | | | | | |
| X 1F | CH2 A/D conversion completed flag | Y 1F | | X 3F | CH4 A/D conversion completed flag | Y 3F | | | | | |

(b) Devices used by user

| Device | Application | Device | Application |
|--------|--|--------|---|
| X40 | CC-Link/LT control start signal | X42 | Data link restart instruction signal |
| X41 | Data link stop instruction signal | | — |
| Y60 | Data link error confirmation signal | Y62 | Remote I/O error confirmation signal |
| Y61 | All station fault confirmation signal | Y63 | Remote station connection error confirmation signal |
| M2 | Control start flag | | — |
| D0 | Data register for reading information of operating status | D13 | CH3 digital output value storing data register |
| D1 | Data register for reading information of remote station connection | D14 | CH4 digital output value storing data register |
| D2 | Data register for reading detailed error information | D15 | CH1 digital output value calculating data register |
| D3 | Data register for reading information of faulty station | D16 | CH2 digital output value calculating data register |
| D11 | CH1 digital output value storing data register | D17 | CH3 digital output value calculating data register |
| D12 | CH2 digital output value storing data register | D18 | CH4 digital output value calculating data register |

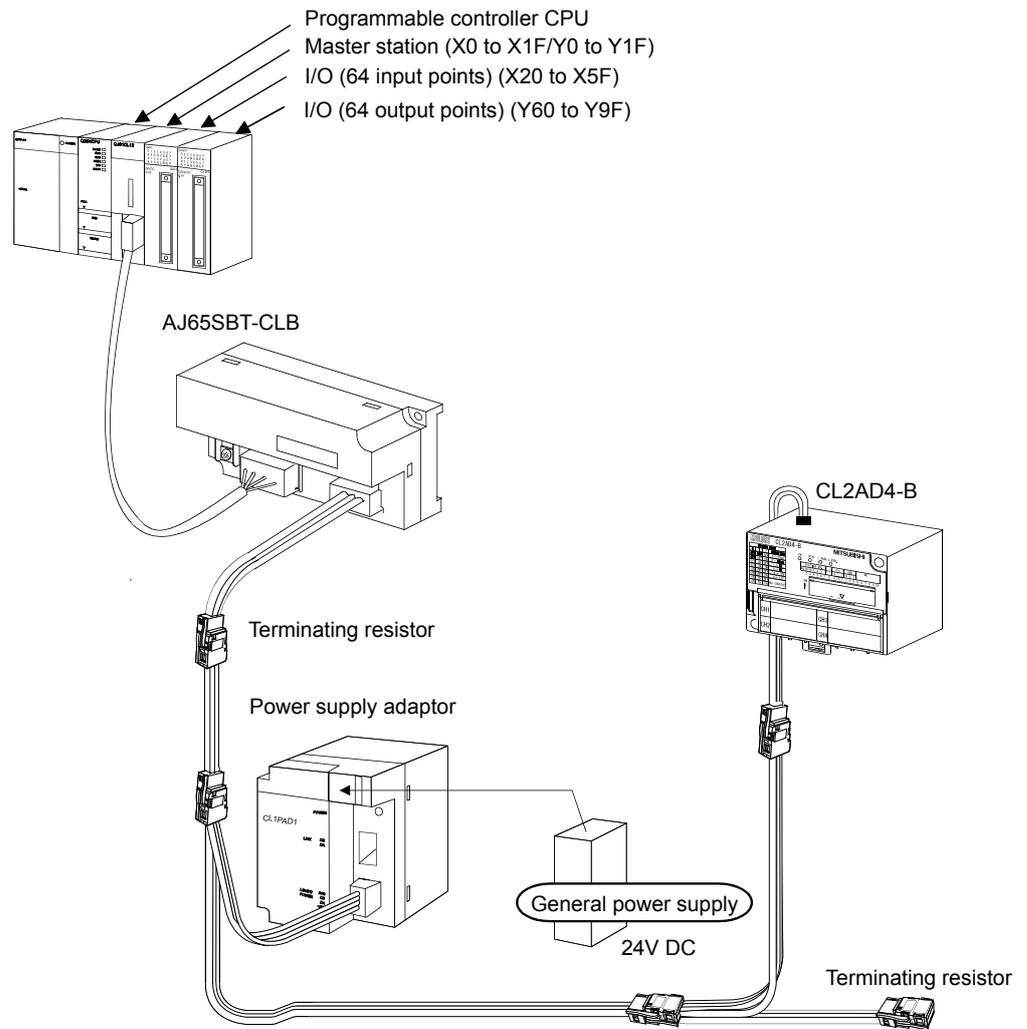
(3) Program example



5.3 Conditions of Program Examples (When connected to AJ65SBT-CLB)

The program examples of Sections 5.3.1 to 5.3.4 are created under the following conditions.

(1) System configuration



(a) Master station settings

| Item | Settings |
|---------------------------------------|----------------------------|
| Number of occupied I/O points setting | 32 points (X/Y00 to X/Y1F) |
| Transmission rate setting | 156 kbps |

(b) AJ65SBT-CLB settings

| Item | Settings |
|--|---------------------|
| Station number setting (CC-Link side) | Station number 1 |
| Number of occupied stations setting (CC-Link side) | Occupies 4 stations |
| Transmission rate setting (CC-Link side) | 156 kbps |
| Point mode setting (CC-Link/LT side) | 16-point mode |
| Transmission rate setting (CC-Link/LT side) | 156 kbps |
| Last station number setting (CC-Link/LT side) | 2 |

(c) CL2AD4-B settings

| Item | Settings |
|-------------------------------------|---------------------|
| Station number setting | Station number 1 |
| Number of occupied stations setting | Occupies 2 stations |
| CH1 input range setting | 1 to 5V |
| CH1 A/D conversion method setting | Moving average |
| CH2 input range setting | -10V to 10V |
| CH2 A/D conversion method setting | Count averaging |
| CH3 input range setting | Conversion disable |
| CH3 A/D conversion method setting | — |
| CH4 input range setting | Conversion disable |
| CH4 A/D conversion method setting | — |

(2) Device assignment to program examples

The devices used in the program example of Section 5.3.1 to 5.3.4 are shown below.

(a) Remote I/O (X/Y)

| Station No. | Model Name | Input | | Output | | Station No. | Model Name | Input | | Output | |
|-------------|-----------------------------------|-------|-----------------------------------|--------|-----------------------------------|-------------|------------|-------|-------|--------|--|
| 1 | CL2AD4-B (Occupies 2 stations) | X 400 | CH1 digital output value | Y 400 | CH1 A/D conversion method setting | 3 | | X 420 | | Y 420 | |
| | | X 401 | | Y 401 | | | | X 421 | | Y 421 | |
| | | X 402 | | Y 402 | | | | X 422 | | Y 422 | |
| | | X 403 | | Y 403 | X 423 | | | | Y 423 | | |
| | | X 404 | | Y 404 | X 424 | | | | Y 424 | | |
| | | X 405 | | Y 405 | X 425 | | | | Y 425 | | |
| | | X 406 | | Y 406 | X 426 | | | | Y 426 | | |
| | | X 407 | | Y 407 | X 427 | | | | Y 427 | | |
| | | X 408 | | Y 408 | X 428 | | | | Y 428 | | |
| | | X 409 | | Y 409 | X 429 | | | | Y 429 | | |
| | | X 40A | | Y 40A | X 42A | | | | Y 42A | | |
| | | X 40B | | Y 40B | X 42B | | | | Y 42B | | |
| | | X 40C | | Y 40C | X 42C | | | | Y 42C | | |
| | | X 40D | | Y 40D | X 42D | | | | Y 42D | | |
| | | X 40E | | Y 40E | X 42E | | | | Y 42E | | |
| | | X 40F | CH1 A/D conversion completed flag | Y 40F | | | | X 42F | | Y 42F | |
| 2 | CL2AD4-B (Occupies 2 stations) | X 410 | CH2 digital output value | Y 410 | CH2 A/D conversion method setting | 4 | | X 430 | | Y 430 | |
| | | X 411 | | Y 411 | | | | X 431 | | Y 431 | |
| | | X 412 | | Y 412 | | | | X 432 | | Y 432 | |
| | | X 413 | | Y 413 | X 433 | | | | Y 433 | | |
| | | X 414 | | Y 414 | X 434 | | | | Y 434 | | |
| | | X 415 | | Y 415 | X 435 | | | | Y 435 | | |
| | | X 416 | | Y 416 | X 436 | | | | Y 436 | | |
| | | X 417 | | Y 417 | X 437 | | | | Y 437 | | |
| | | X 418 | | Y 418 | X 438 | | | | Y 438 | | |
| | | X 419 | | Y 419 | X 439 | | | | Y 439 | | |
| | | X 41A | | Y 41A | X 43A | | | | Y 43A | | |
| | | X 41B | | Y 41B | X 43B | | | | Y 43B | | |
| | | X 41C | | Y 41C | X 43C | | | | Y 43C | | |
| | | X 41D | | Y 41D | X 43D | | | | Y 43D | | |
| | | X 41E | | Y 41E | X 43E | | | | Y 43E | | |
| | | X 41F | CH2 A/D conversion completed flag | Y 41F | | | | X 43F | | Y 43F | |

(b) Remote register (RWw)

| Device | Remote register (RWw) | | Device | Remote register (RWw) | |
|--------|-----------------------|-------------------------------------|--------|-----------------------|-------------------------|
| D200 | RWw0 | Last station number setting | D202 | RWw2 | Error status flag clear |
| D201 | RWw1 | Data link stop/restart instructions | — | | |

(c) Remote register (RWr)

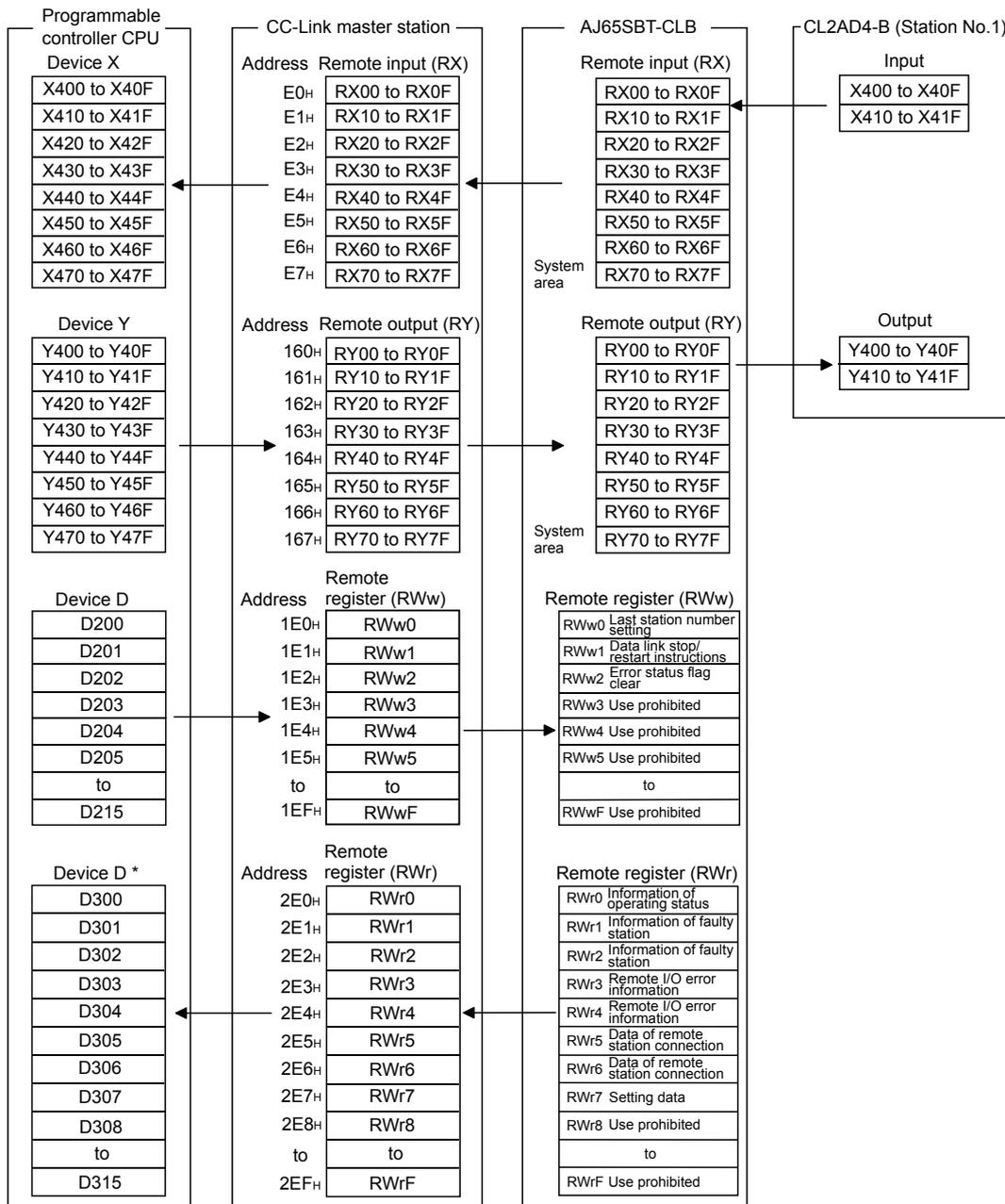
| Device* | Remote register (RWr) | | Device* | Remote register (RWr) | |
|------------|-----------------------|--|------------|-----------------------|-----------------------------------|
| D300(D456) | RWr0 | Information of operating status | D305(D461) | RWr5 | Data of remote station connection |
| D301(D457) | RWr1 | Information of faulty station: station number 1 to 28 | D306(D462) | RWr6 | |
| D302(D458) | RWr2 | | D307(D463) | RWr7 | Setting data |
| D303(D459) | RWr3 | Remote input error information: station number 1 to 28 | — | | |
| D304(D460) | RWr4 | | | | |

*In the program example (refer to Section 5.3.3) that uses the RRPA instruction (automatic refresh parameter setting) with the ACPU/QCPU (A mode), RWr0 to RWr7 are assigned to D456 to D463.

(d) Devices used by user

| Device | Application | Device | Application |
|--------|---|--------------|---|
| X21 | Data link stop instruction signal | X22 | Data link restart instruction signal |
| Y90 | CC-Link side data link error confirmation signal | Y93 | CC-Link/LT side all station fault confirmation signal |
| Y91 | CC-Link/LT side remote station connection error confirmation signal | Y94 | CC-Link/LT side remote I/O error confirmation signal |
| Y92 | CC-Link/LT side data link error confirmation signal | — | |
| M0 | CC-Link side data link status read flag | M101 | Control start flag |
| M10 | RLPA instruction execution flag | M200 to M215 | Reading information of operating status flag |
| M11 | RLPA instruction normally completed flag | M250 to M253 | Reading information of faulty station flag |
| M12 | RLPA instruction abnormally completed flag | M300 | Data link stop instruction flag |
| M13 | RRPA instruction execution flag | M315 | Data link restart instruction flag |
| M20 | Network parameter setting flag | M400 to M415 | CH1 digital output value calculating device |
| M100 | CC-Link side data link normal flag | M416 to M431 | CH2 digital output value calculating device |
| D11 | CH1 digital output value storing data register | D12 | CH2 digital output value storing data register |

(3) Relation between programmable controller CPU, CC-Link master station, AJ65SBT-CLB and CL2AD4-B



*In the program example (refer to Section 5.3.3) that uses the RRPA instruction (automatic refresh parameter setting) with the ACPU/QCPU (A mode), RWr0 to RWr7 are assigned to D456 to D463.

POINT

Depending on the CPU module, the devices used in the program examples of this chapter may be unusable. For the valid ranges of the devices, refer to the users' manual of the CPU module.

For example, when the A1SCPU is used, devices of X100, Y100 and later cannot be used. Use the devices such as B and M.

5.3.1 Program example for use of QCPU (Q Mode)

The network parameters and automatic refresh parameters are set using GX Developer.

(1) Parameter setting

(a) Network parameter setting

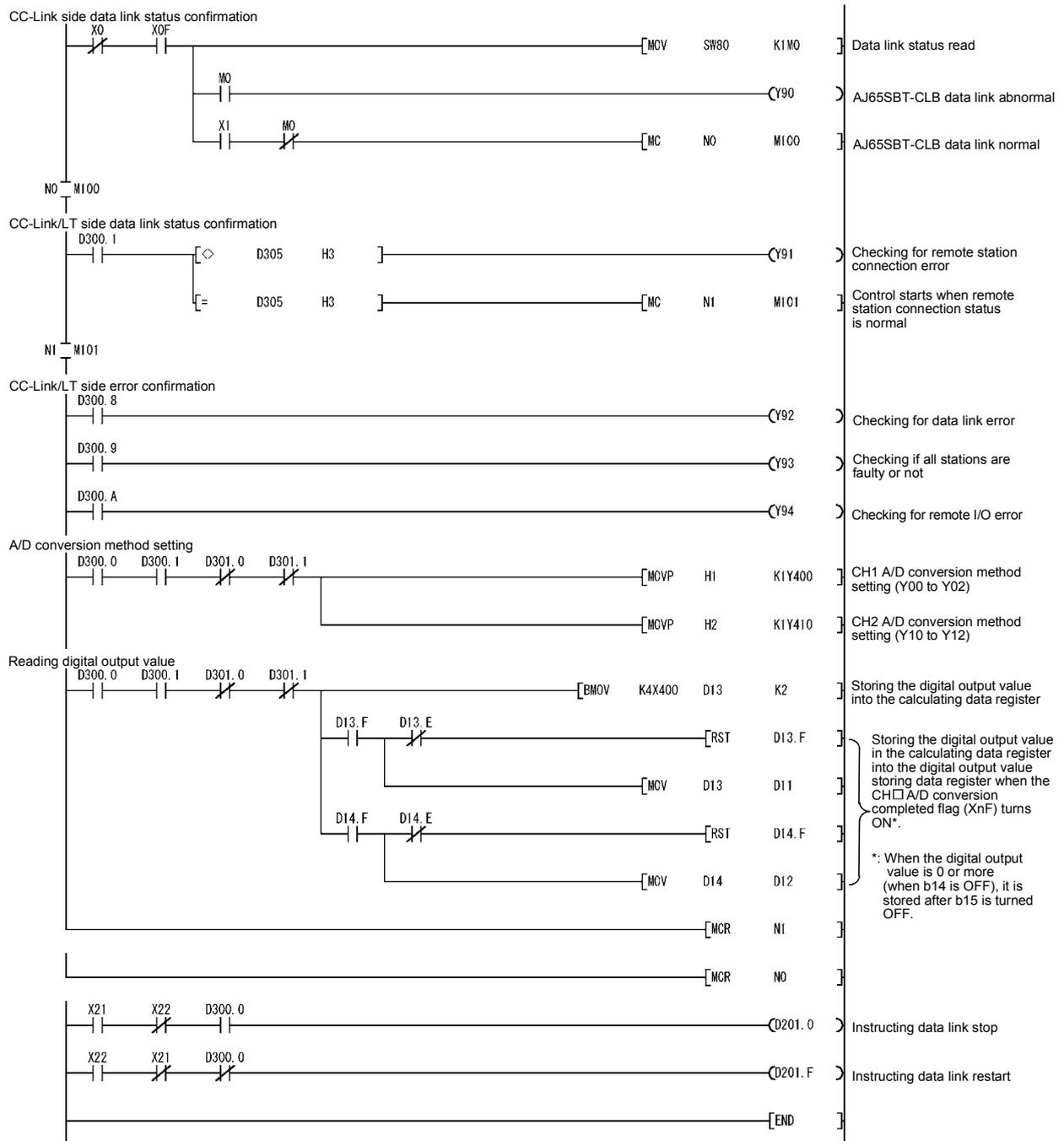
| | |
|---------------------------------------|--------------------------|
| 1 | |
| Start I/O No | 0000 |
| Operational setting | Operational settings |
| Type | Master station |
| Master station data link type | PLC parameter auto start |
| Mode | Remote net(Ver.1 mode) |
| All connect count | 1 |
| Remote input(RX) | |
| Remote output(RY) | |
| Remote register(RW/r) | |
| Remote register(RW/w) | |
| Ver.2 Remote input(RX) | |
| Ver.2 Remote output(RY) | |
| Ver.2 Remote register(RW/r) | |
| Ver.2 Remote register(RW/w) | |
| Special relay(SB) | |
| Special register(SW) | |
| Retry count | 3 |
| Automatic reconnection station count | 1 |
| Stand by master station No. | |
| PLC down select | Stop |
| Scan mode setting | Asynchronous |
| Delay information setting | 0 |
| Station information setting | Station information |
| Remote device station initial setting | Initial settings |
| Interrupt setting | Interrupt settings |

| Station No | Station type | Expanded cyclic setting | Exclusive station count | Remote station points | Reserve/invalid station select | Intelligent buffer select(word) | | |
|------------|-----------------------|-------------------------|-------------------------|-----------------------|--------------------------------|---------------------------------|---------|-----------|
| | | | | | | Send | Receive | Automatic |
| 1/1 | Remote device station | single | Exclusive station 4 | 128 points | No setting | | | |

(b) Automatic refresh parameter setting

| | |
|---------------------------------------|--------------------------|
| 1 | |
| Start I/O No | 0000 |
| Operational setting | Operational settings |
| Type | Master station |
| Master station data link type | PLC parameter auto start |
| Mode | Remote net(Ver.1 mode) |
| All connect count | 1 |
| Remote input(RX) | X400 |
| Remote output(RY) | Y400 |
| Remote register(RW/r) | D300 |
| Remote register(RW/w) | D200 |
| Ver.2 Remote input(RX) | |
| Ver.2 Remote output(RY) | |
| Ver.2 Remote register(RW/r) | |
| Ver.2 Remote register(RW/w) | |
| Special relay(SB) | SB0 |
| Special register(SW) | SW0 |
| Retry count | 3 |
| Automatic reconnection station count | 1 |
| Stand by master station No. | |
| PLC down select | Stop |
| Scan mode setting | Asynchronous |
| Delay information setting | 0 |
| Station information setting | Station information |
| Remote device station initial setting | Initial settings |
| Interrupt setting | Interrupt settings |

(2) Program example



5.3.2 Program example for use of QnACPU

The network parameters and automatic refresh parameters are set using GX Developer.

(1) Parameter setting

(a) Network parameter setting

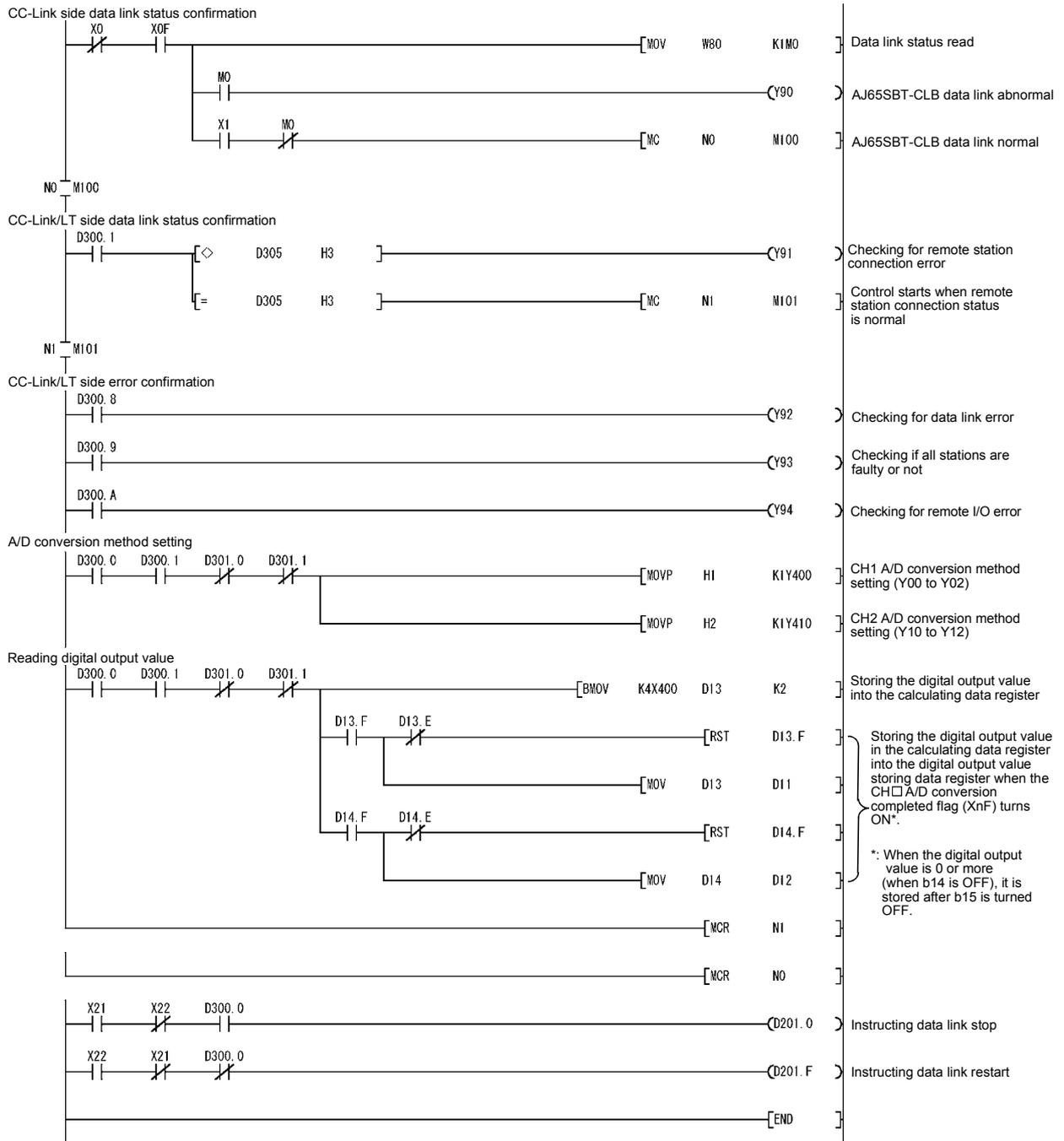
| | |
|--------------------------------------|---------------------|
| Start I/O No. | 1 |
| Type | Master station |
| All connect count | 1 |
| Remote input(RX) | |
| Remote output(RY) | |
| Remote register(RWr) | |
| Remote register(RWw) | |
| Special relay(SB) | |
| Special register(SW) | |
| Retry count | 3 |
| Automatic reconnection station count | 1 |
| Wait master station No. | 0 |
| PLC down select | Stop |
| Scan mode setting | Asynchronously |
| Delay information setting | 0 |
| Station information setting | Station information |

| StationNo. | Station type | Exclusive station count | Reserve/invalid station select | Intelligent buffer select(word) | | |
|------------|-----------------------|-------------------------|--------------------------------|---------------------------------|---------|-----------|
| | | | | Send | Receive | Automatic |
| 1/1 | Remote device station | Exclusive station 4 | No setting | | | |

(b) Automatic refresh parameter setting

| | |
|--------------------------------------|---------------------|
| Start I/O No. | 1 |
| Type | Master station |
| All connect count | 1 |
| Remote input(RX) | X400 |
| Remote output(RY) | Y400 |
| Remote register(RWr) | D300 |
| Remote register(RWw) | D200 |
| Special relay(SB) | B0 |
| Special register(SW) | W0 |
| Retry count | 3 |
| Automatic reconnection station count | 1 |
| Wait master station No. | 0 |
| PLC down select | Stop |
| Scan mode setting | Asynchronously |
| Delay information setting | 0 |
| Station information setting | Station information |

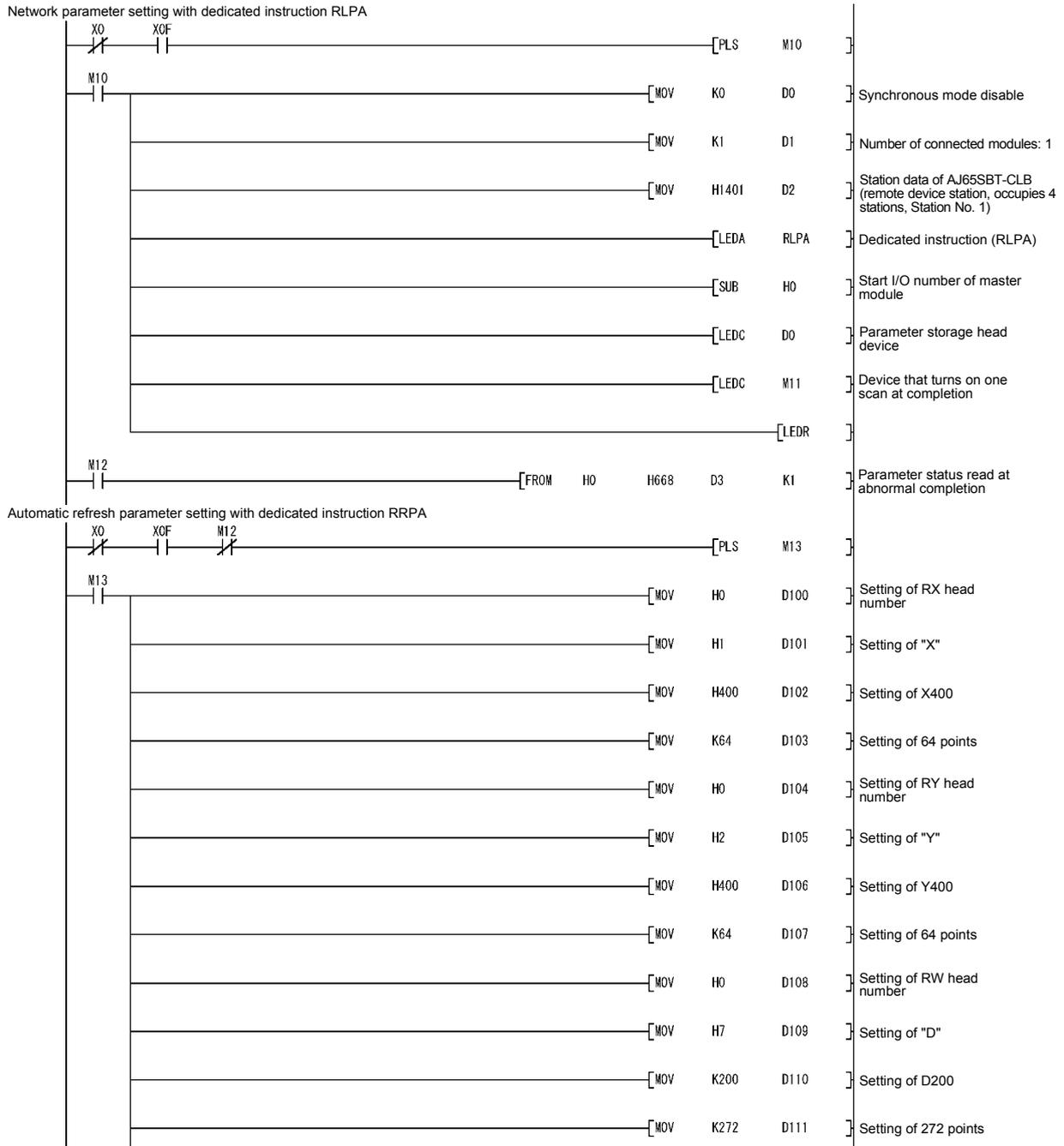
(2) Program example

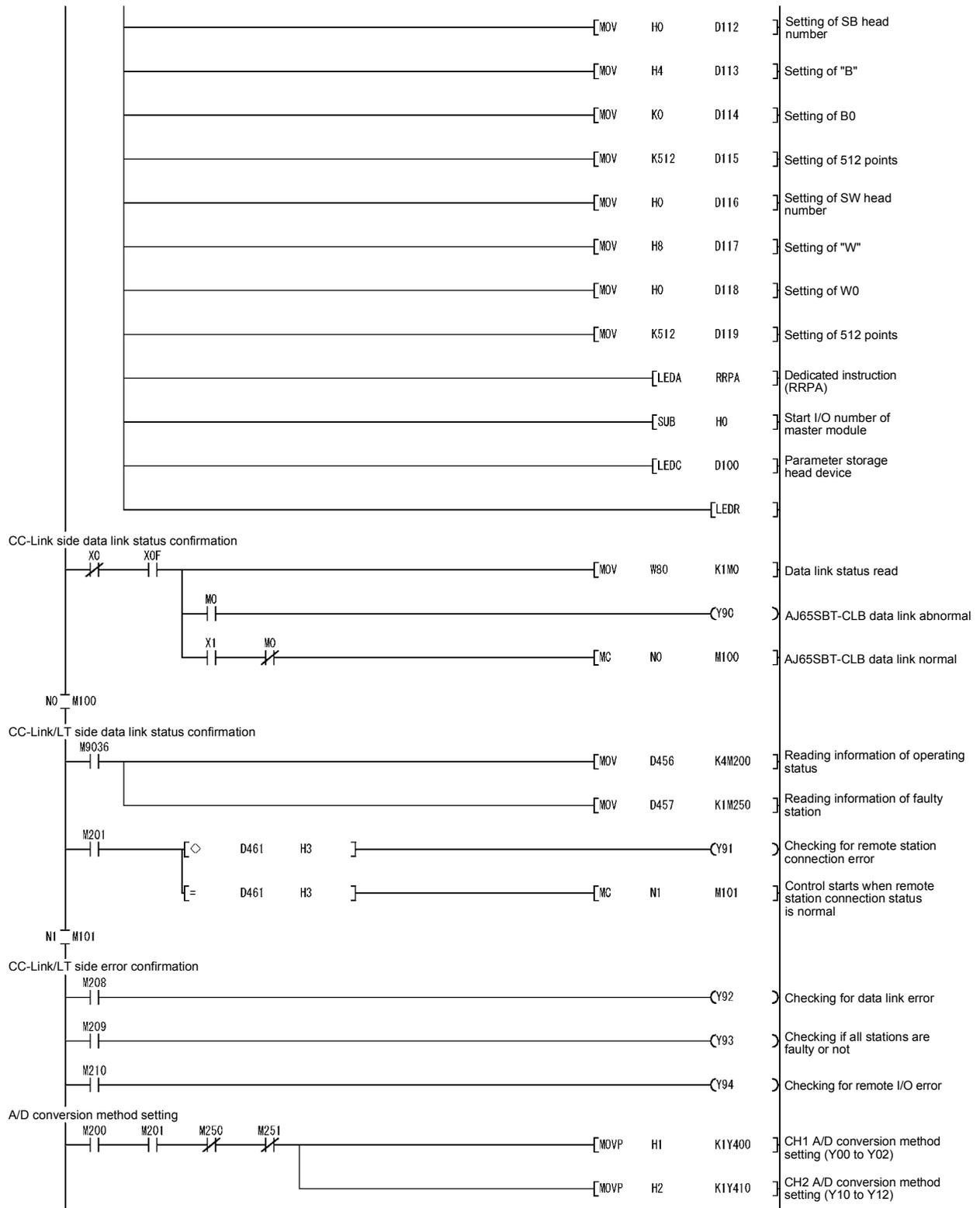


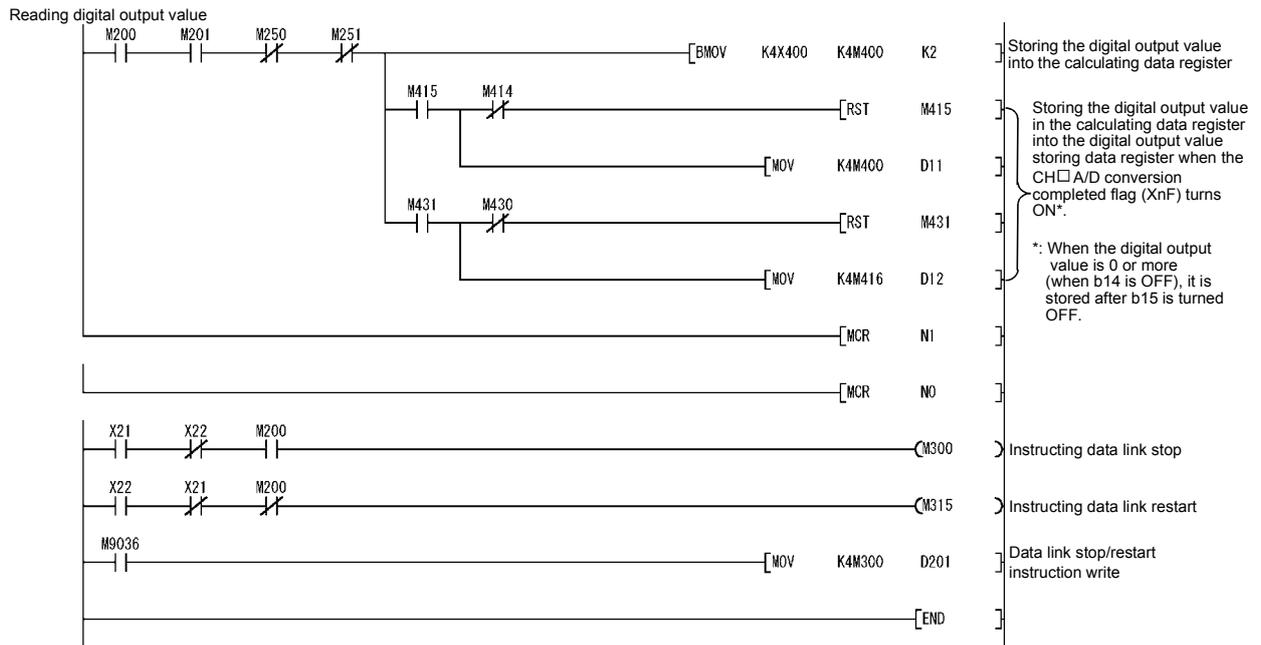
5.3.3 Program example for use of ACPU/QCPU (A Mode) (dedicated instructions)

A sequence program is used to set the network and automatic refresh parameters.

(1) Program example



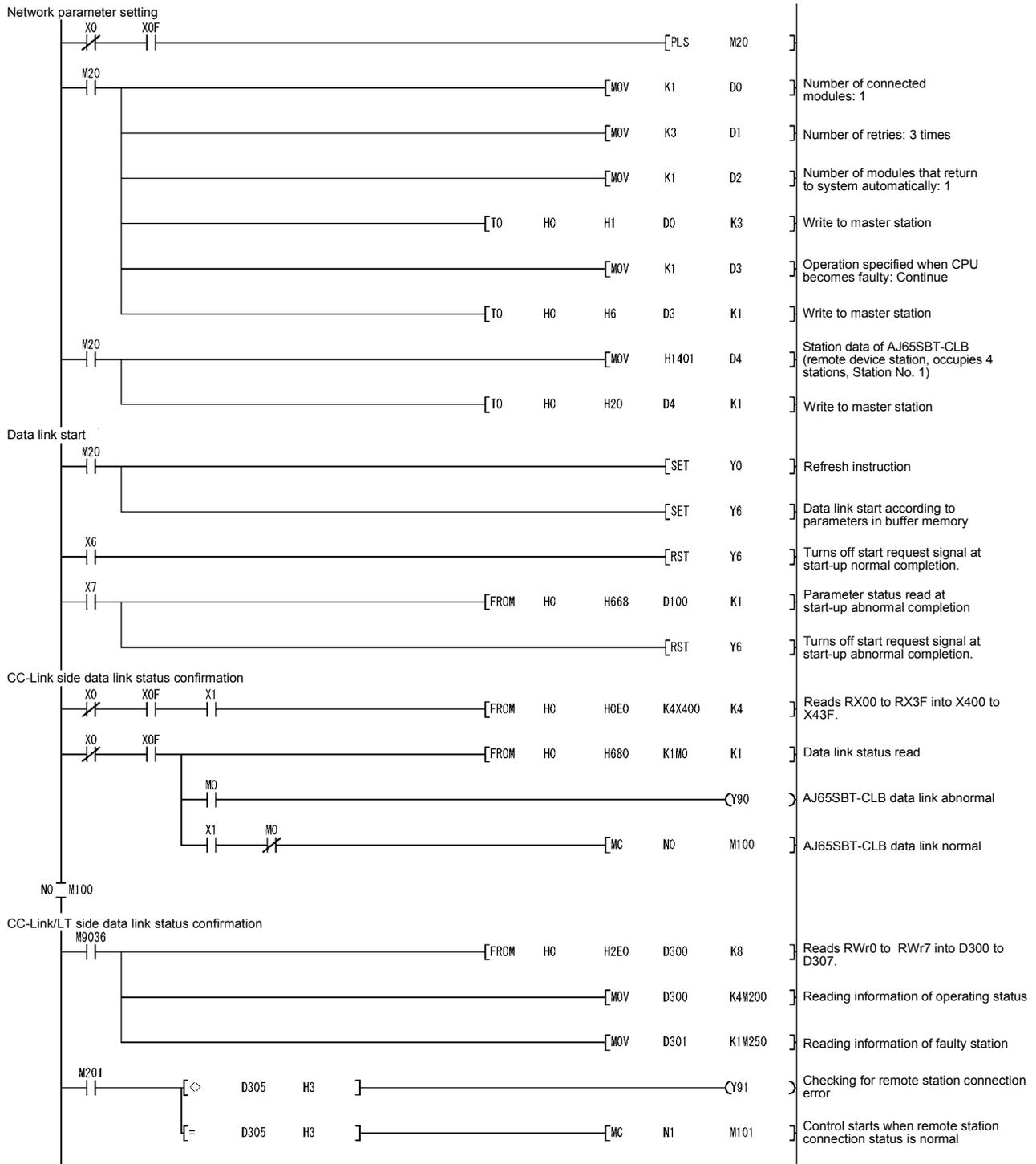


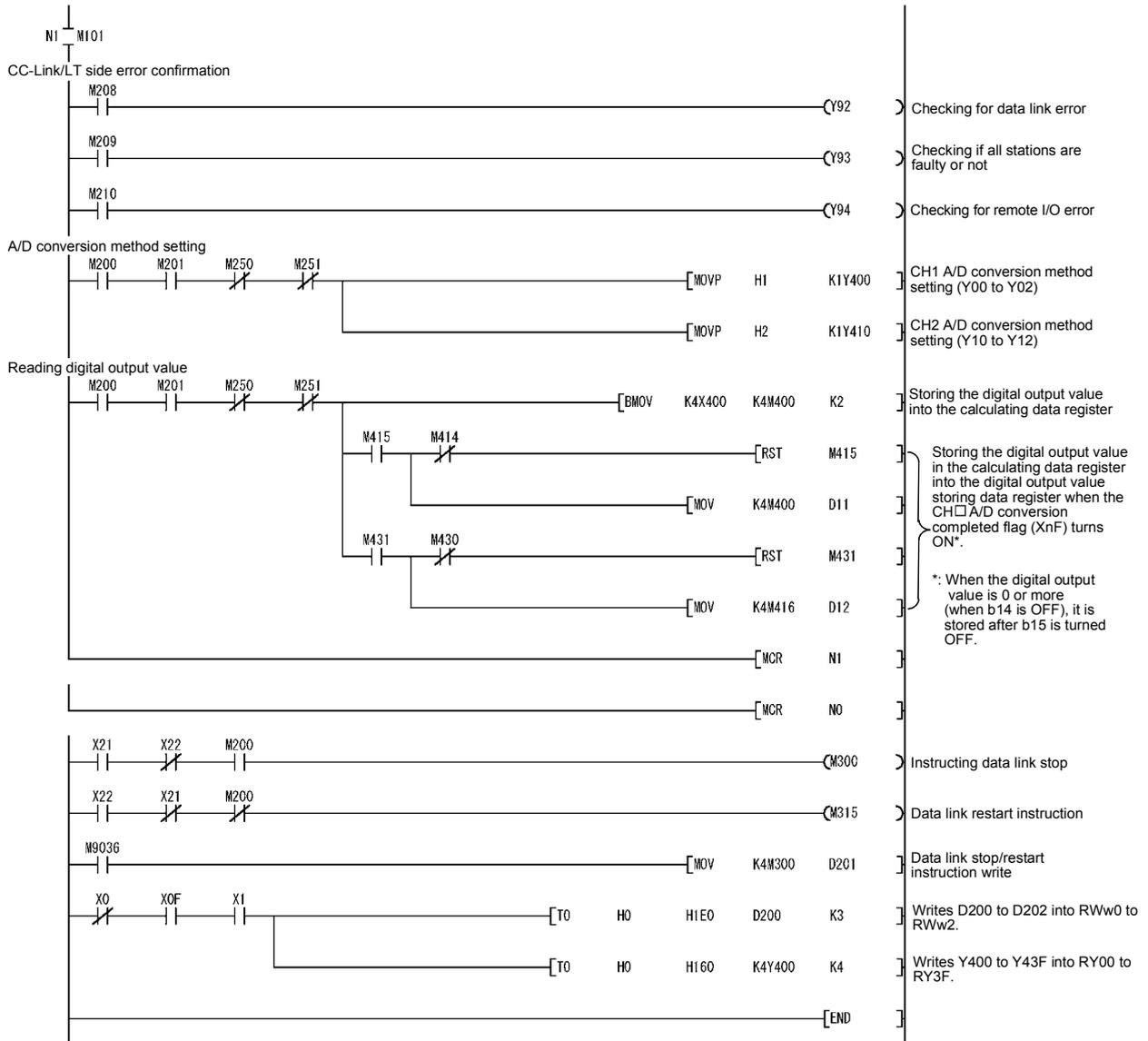


5.3.4 Program example for use of ACPU/QCPU (A Mode) (FROM/TO instructions)

A sequence program is used to set the network parameters.

(1) Program example





6 TROUBLESHOOTING

This chapter describes the details of the errors which may occur when using the CL2AD4-B and troubleshooting.

When a problem has occurred, first check the CC-Link/LT master module and AJ65SBT-CLB for any error.

When no error has identified in the CC-Link/LT master module and AJ65SBT-CLB, refer to Sections 6.1 to 6.3.

The module may be faulty if the digital output value cannot be read after the corrective action is taken according to the check item of this chapter. Please consult your local Mitsubishi representative, explaining a detailed description of the problem.

6.1 Using the LED Indications to Check Errors

This section explains how to check errors using the LED indications of the CL2AD4-B. Check in the following order, starting from (1).

(1) When the CL2AD4-B "PW" LED is off

| Check item | Corrective action |
|---|---|
| Is the wiring correct? | Check the wiring. |
| Is the supply voltage within the specified range? | Make the supply voltage within the specified range. |

(2) When the CL2AD4-B "RUN" LED is flickering

| Check item | Corrective action |
|--|---|
| Has the analog input switch setting been changed during operation? | Return the switch setting to the one set at power-on . |
| Are the analog input setting switches set to disable the conversion of all channels? | Check the analog input switch setting. |
| Is the NC switch ON? | After powering OFF the whole system (master and remote stations), turn OFF the NC switch and power ON the whole system again. |

(3) When the CL2AD4-B "RUN" LED is off

| Check item | Corrective action |
|---|--|
| Is the bit corresponding to the remote I/O error information of the CC-Link/LT master module or AJ65SBT-CLB ON? | Power ON the CL2AD4-B again. If the "RUN" LED does not turn ON after the CL2AD4-B has been powered ON again, the hardware may be faulty. Please consult your local Mitsubishi representative, explaining a detailed description of the problem. |

(4) When the CL2AD4-B "L RUN" LED is off

| Check item | Corrective action |
|--|---|
| Has the transmission rate setting of the CC-Link/LT master module or AJ65SBT-CLB been changed after data link communication? | Power OFF and then ON the whole system (master and remote stations). |
| Any line problem? *1 | Correct communication cable wiring. |
| Is the station number within the controllable range of the CC-Link/LT master module or AJ65SBT-CLB? *2 | Set the station number within the controllable range of the CC-Link/LT master module or AJ65SBT-CLB. *3 |
| Is the point mode setting correct? | Check the point mode setting. |

*1: Check for a short, reversed connection, wire breakage, insulation displacement status, terminating resistors, overall distance, drop line distance (overall drop line length, maximum drop line length) and peripheral environment (noise, etc).

*2: Check the following:

- The station number setting switches are not mistaken for the analog input setting switches.
- Last station number setting of CC-Link/LT master module/AJ65SBT-CLB
- All station numbers occupied by the local module are within the controllable range of the CC-Link/LT master module or AJ65SBT-CLB.

[Example of station number outside controllable range]

Master module: QJ61CL12

Start I/O number: X/Y00

Number of occupied I/O points setting: 64 points

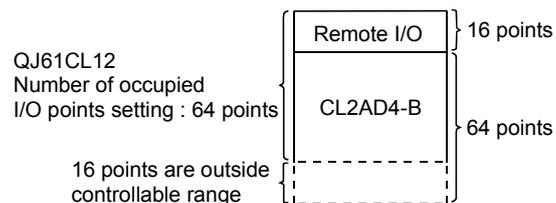
16-points mode

Station number 1: Remote I/O module

Remote I/O point: 16 points (Occupies 1 station)

Station number 2: CL2AD4-B

Remote I/O point: 64 points (Occupies 4 stations)



*3: After changing the station number setting, power OFF and then ON the whole system (master and remote stations).

(5) When the CL2AD4-B "L ERR." LED flickers at fixed intervals (0.4s intervals)

| Check item | Corrective action |
|---|---|
| Has the station number switch setting been changed during normal operation? | Correct the switch setting. |
| Are the station number setting switches faulty? | If the "L ERR." LED starts flickering at fixed intervals (0.4s intervals) although the switch setting has not been changed during operation, the hardware may be faulty. Please consult your local Mitsubishi representative, explaining a detailed description of the problem. |

(6) When the CL2AD4-B "L ERR." flickers at unfixed intervals

| Check item | Corrective action |
|--|--|
| Have you forgotten fitting terminating resistor? | Check whether the terminating resistor is fitted. If it is not connected, connect it and switch power on again. |
| Is the module or connection cable affected by noise? | Move the connection cable away from the noise source. Earth the FG terminal of the module without fail. When carrying out wiring in piping, earth the pipe without fail. |

(7) When the CL2AD4-B "L ERR." is on

| Check item | Corrective action |
|--|---------------------------------|
| Are the station number and point mode set correctly? | Take action as described in (4) |
| Any line problem? | |
| Are the analog input setting switches set to disable the conversion of all channels? | Take action as described in (2) |

6.2 When the Digital Output Value Cannot Be Read

| Check item | Corrective action |
|--|---|
| Is the "PW" LED off? | Take action as described in Section 6.1 (1). |
| Is the "RUN" flickering or off? | Take action as described in Section 6.1 (2), (3). |
| Is the "L RUN" LED off? | Take action as described in Section 6.1 (4). |
| Is the "L ERR." LED on? | Take action as described in Section 6.1 (7). |
| Has the A/D conversion method been set? | Check the CH□ A/D conversion method setting (Yn0 to Yn2) and check whether the CH□ A/D conversion completed flag (XnF) is ON. |
| Is there any fault with the analog signal lines such as broken or disconnected line? | Check the error area by checking the signal line visually or by conductive check. |
| Is the input range setting correct? | Check the analog input setting switches. (see section 4.3) If the input range setting is incorrect, change the analog input switch setting and then power OFF and then ON the whole system (master and remote stations). |
| Remove the CL2AD4-B analog input cable. Apply the test voltage (stable power supply or battery) to this module's terminal, and measure the output value. | If the CL2AD4-B digital output value is normal, the effects are being received by noise from an external wiring. So check the wiring and grounding method. Lift the CL2AD4-B from the system, and remove the grounding circuit. (Install to the DIN rail) |
| Are the station numbers overlapping? | Check that the station number is not the same as any of the other remote stations. |

6.3 When Only Negative Digital Output Value Can Be Read

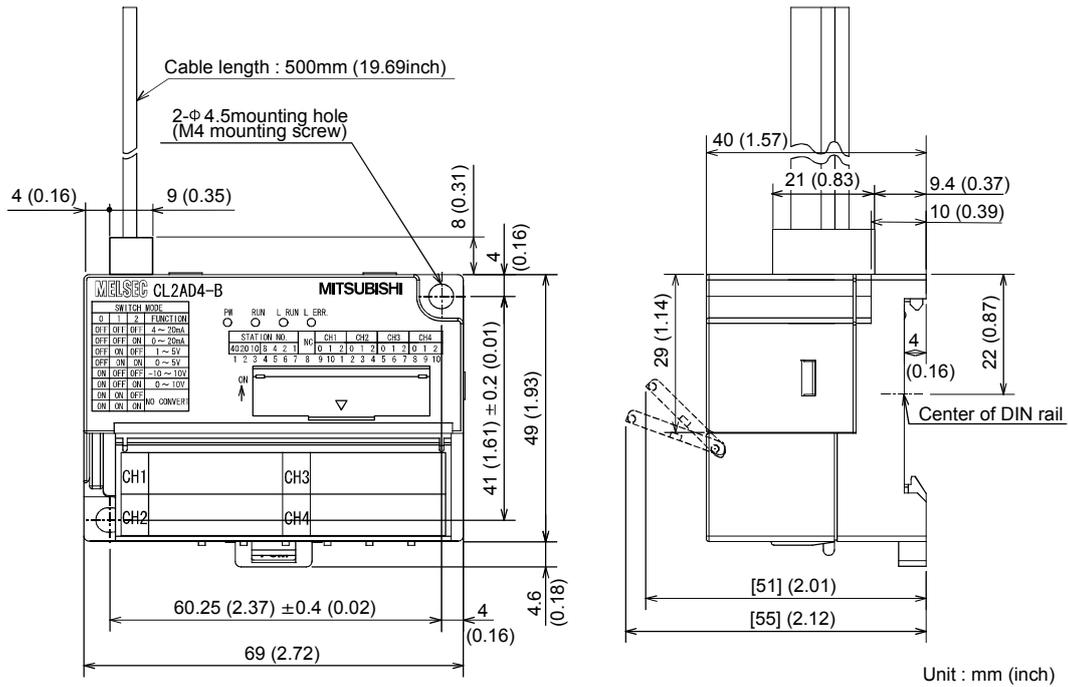
| Check item | Corrective action |
|-----------------------------|--|
| Check the sequence program. | Review the sequence program, referring to Chapter 5. |

APPENDICES

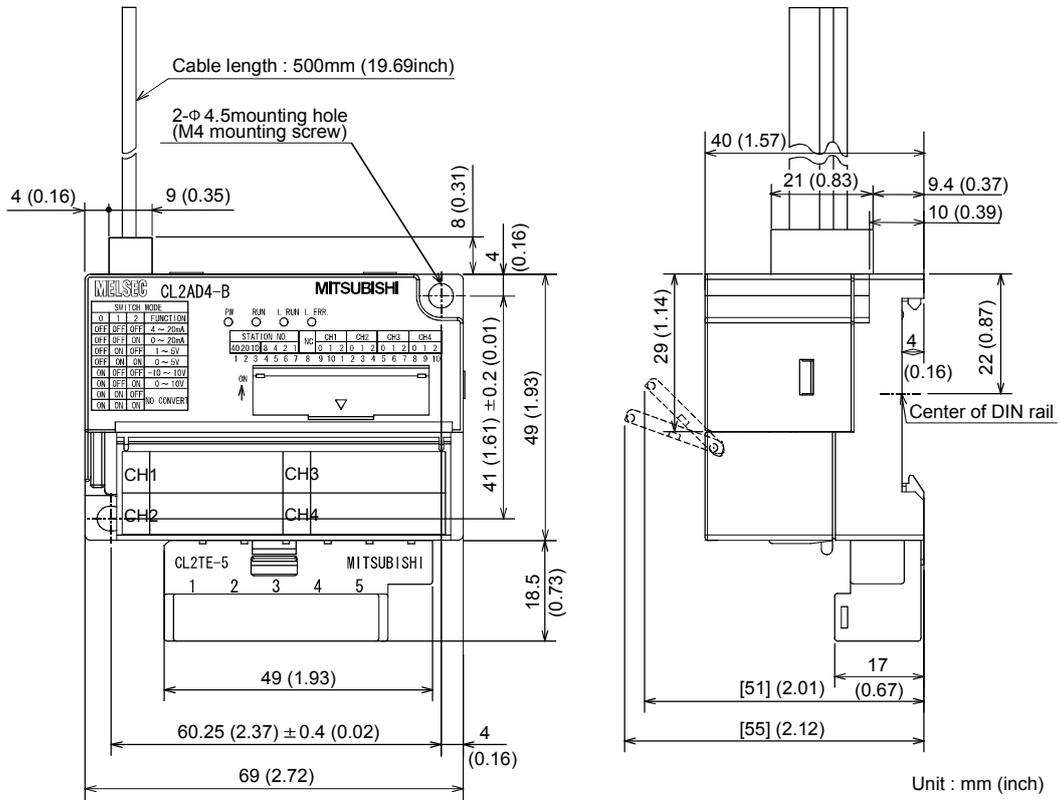
Appendix1 External Dimensions

The external dimensions of the CL2AD4-B are shown below.

(1) Standard



(2) When CL2TE-5 common terminal block is used



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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.

SH(NA)-080417E-E(1509)MEE

MODEL: CL2AD-U-SY-E

MODEL CODE: 13JP30

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