Thank you for choosing this Mitsubishi AC servo. This installation guide gives handling information and precautions for using the servo amplifier and motor. Incorrect handling may cause an unexpected fault. Before using the servo amplifier and servo motor, please read this installation guide carefully to use the equipment to its optimum.
Please forward this installation guide to the end user.

### Safety Instructions

<table>
<thead>
<tr>
<th>WARNING</th>
<th>CAUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indicates that incorrect handling may cause hazardous conditions, resulting in death or severe injury.</td>
<td></td>
</tr>
<tr>
<td>Indicates that incorrect handling may cause hazardous conditions, resulting in medium or slight injury to personnel or may cause physical damage.</td>
<td></td>
</tr>
</tbody>
</table>

Note that the CAUTION level may lead to a serious consequence according to conditions. Please follow the instructions of both levels because they are important to personnel safety.

What must not be done and what must be done are indicated by the following diagrammatic symbols:

- : Indicates what must not be done. For example, "No Fire" is indicated by .
- : Indicates what must be done. For example, grounding is indicated by .

After reading this Installation guide, always keep it accessible to the operator.

In this Installation guide, instructions at a lower level than the above, instructions for other functions, and so on are classified into "NOTICE", "INFORMATION" and "MEMORANDUM".

- **NOTICE**: Indicates that incorrect handling may cause the servo amplifier to be faulty and may not lead to physical damage.
- **INFORMATION**: Indicates that parameter setting change, etc. will provide another function or there are other usages.
- **MEMORANDUM**: Indicates information needed for use of this equipment.
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INTRODUCTION

This installation guide describes how to handle the MELSERVO-J2-A servo when using it as an absolute position detection system. For specifications and detailed design other than those of the absolute position detection system, refer to the MR-J2-A Specifications and Installation Guide IB(NA)67296.
1. SPECIFICATIONS OF ABSOLUTE POSITION DETECTION SYSTEM (ABS)

An absolute position detection system is configured by using a general purpose programmable controller in conjunction with the MELSERVO-J2 series AC servo. The absolute position detection system eliminates the need for the home position return operation usually required after the power goes off - for example as a result of an instantaneous power failure or emergency stop - and this simplifies the processing for restarting operation.

1.1 Configuration of absolute position detection system and preparation

(1) Configuration

![Diagram of configuration]

(2) Preparation

Take the following items into consideration when configuring the absolute position detection system.

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Servo amplifier</td>
<td>Use the standard models.</td>
</tr>
<tr>
<td>Servo motor</td>
<td>MR-BAT or A6BAT.</td>
</tr>
<tr>
<td>Battery</td>
<td>Use the standard model.</td>
</tr>
<tr>
<td>Encoder cable</td>
<td>Refer to (2), Section 6-1-2 in the MR-J2-A Specifications and Installation Guide.</td>
</tr>
<tr>
<td>General-purpose programmable controller</td>
<td>An I/O module (3 input and 2 output points) is used for sending and receiving the detected absolute position data. The programmable controller must have the following functions:</td>
</tr>
<tr>
<td></td>
<td>1) 32-bit data register function</td>
</tr>
<tr>
<td></td>
<td>2) Masking (AND and WAND instructions) capability for data registers</td>
</tr>
<tr>
<td></td>
<td>3) 2-bit data shift capability for data registers</td>
</tr>
<tr>
<td></td>
<td>4) Function that allows changing of the current position data</td>
</tr>
</tbody>
</table>
1. SPECIFICATIONS OF ABSOLUTE POSITION DETECTION SYSTEM (ABS)

1.2 Absolute position encoder specifications

(1) Specifications

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Electronic type, battery-backed</td>
</tr>
<tr>
<td>Battery</td>
<td>Lithium battery (primary battery, nominal +3.6V) x 1 pc. Model: MR-BAT or A6BAT</td>
</tr>
<tr>
<td>Encoder resolution</td>
<td>HC-MF/HA-FF: 8192 pulses/rev</td>
</tr>
<tr>
<td></td>
<td>HC-SF/RP: 16384 pulses/rev</td>
</tr>
<tr>
<td>Max. number of revolutions</td>
<td>± 32767 revolutions from zero point</td>
</tr>
<tr>
<td>Max. speed at power failure (Note 1)</td>
<td>500rpm/min</td>
</tr>
<tr>
<td>Battery back-up time (Note 2)</td>
<td>About 10,000 hours (battery life when no power is supplied)</td>
</tr>
<tr>
<td>Accumulative revolution counter data retention time (Note 3)</td>
<td>2 hours when delivered</td>
</tr>
<tr>
<td></td>
<td>1 hour when 5 years have passed after delivery</td>
</tr>
<tr>
<td>Battery storage period</td>
<td>For 5 years from date of manufacture</td>
</tr>
</tbody>
</table>

Note: 1. Indicates the maximum speed at which the shaft is rotated by external force when power failure or the like occurs.
2. Indicates the length of time when data can be retained by the battery with the power off.
3. Indicates the length of time when data can be retained by the super capacitor built in the encoder, after power is switched off with the battery voltage low or the battery removed. Charge the battery within this period.

(2) Cautions on configuring the absolute position detection system

The absolute position detection system cannot be configured under the following conditions.

1) If operation is performed in the speed control mode or torque control mode.
2) If the control loop is switched (position control ↔ speed control, position control ↔ torque control).
3) If the system uses a coordinate system with an infinite stroke length, such as a rotary axis, or system for positioning over infinite distances.
4) If alarm code output is used.

Note: When performing test operation (jog, positioning) using the Set-Up Software, set "0000 (absolute position detection system invalid)" in parameter No. 1.

(3) Adaptable modules

<table>
<thead>
<tr>
<th>Positioning module</th>
<th>I/O module (transistor output type)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AD71, AD71S2, SD71S7</td>
<td>AX40, 41</td>
</tr>
<tr>
<td>A1SD71S2, A1SD71S7</td>
<td>AX40, 41</td>
</tr>
<tr>
<td>AD75□</td>
<td>AY40, 41</td>
</tr>
<tr>
<td>A1SD75□</td>
<td></td>
</tr>
<tr>
<td>FX-1PG, E20</td>
<td>FX2-32MT</td>
</tr>
</tbody>
</table>

Note: A0J2CPU cannot be used.
1. SPECIFICATIONS OF ABSOLUTE POSITION DETECTION SYSTEM (ABS)

1.3 Outline of absolute position data communications

(1) System block diagram

As illustrated in the block diagram below, the position detector consists of an encoder which detects the position within one revolution and the A, B, and Z phase signals (for position control during normal operation), and an accumulative revolution counter which detects the number of revolutions.

The absolute position detection system detects the absolute position of the machine and by means of a back-up battery retains the absolute position data even if the power supply to the general purpose programmable controller is switched off. Thanks to this feature, the zero point (home position) only needs to be set once, during installation of the machine; the home position return operation is not necessary each time power is switched on. It is also easy to restart operation after it has been interrupted by a power failure or machine malfunction.

The absolute position data is retained by the super capacitor in the position detector for the period stated in the specification table (accumulative revolution counter data retention time) if the cable is disconnected or broken.
Note: 1. Connect the diode in the correct direction. If it is connected reversely, the servo amplifier will be faulty and will not output signals, disabling the emergency stop and other protective circuits.

2. The emergency stop switch must be installed.

NOTICE
Note: 3. The sum of currents that flow in the external relays should be 80mA max. If it exceeds 80mA, supply interface power from external.

INFORMATION
Note: 4. When using the torque limit signal (TL), set □□□4 in parameter No. 46 to assign TL to pin CN1B-7.

MEMORANDUM
Note: 5. When starting operation, always connect the external emergency stop signal (EMG) and forward/reverse rotation stroke end signal (LSN/LSP) with SG. (Normally closed contacts)
6. The pins with the same signal name are connected in the servo amplifier.
2. WIRING AND TERMINALS

2.2 Terminals

(1) Connector pins
The following table describes the functions of the pins in the "absolute position detection system" setting. For the functions when the ABS transfer mode is off or for the functions of the other pins not listed below, refer to Chapter 3 of the MR-J2-A Specifications and Installation Guide.

<table>
<thead>
<tr>
<th>Signal name</th>
<th>Symbol</th>
<th>Connector pin No.</th>
<th>Function and application</th>
<th>I/O (Note 1)</th>
<th>Control mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABS transfer mode</td>
<td>ABM</td>
<td>CN1B 8</td>
<td>ABS transfer mode terminal. When this pin is connected with SG, the servo amplifier enters the ABS transfer mode, in which ZSP, TLC and DO1 have the functions described in this table.</td>
<td>DI-1</td>
<td>P (Position control)</td>
</tr>
<tr>
<td>ABS request</td>
<td>ABR</td>
<td>CN1B 9</td>
<td>To be shorted to request the ABS data in the ABS transfer mode.</td>
<td>DI-1</td>
<td></td>
</tr>
<tr>
<td>ABS bit 0</td>
<td>DO1</td>
<td>CN1B 4</td>
<td>Indicates the lower bit of the ABS data (2 bits) which is sent from the servo to the programmable controller in the ABS transfer mode. If there is a signal, the circuit between PF and SG is closed.</td>
<td>DO-1</td>
<td></td>
</tr>
<tr>
<td>ABS bit 1</td>
<td>ZSP</td>
<td>CN1B 10</td>
<td>Indicates the upper bit of the ABS data (2 bits) which is sent from the servo to the programmable controller in the ABS transfer mode. If there is a signal, the circuit between ZSP and SG is closed.</td>
<td>DO-1</td>
<td></td>
</tr>
<tr>
<td>Send data ready</td>
<td>TLC</td>
<td>CN1B 6</td>
<td>Indicates that the data to be sent is being prepared in the ABS transfer mode. At the completion of the ready state, the circuit between TLC and SG is closed.</td>
<td>DO-1</td>
<td></td>
</tr>
<tr>
<td>Clear (zero point set)</td>
<td>CR</td>
<td>CN1A 8</td>
<td>If this is shorted with SG, the position control counter is cleared and the zero point data is stored in the nonvolatile memory (backed up by battery).</td>
<td>DI-1</td>
<td></td>
</tr>
</tbody>
</table>

Note: For the I/O interface, refer to Chapter 3 of MR-J2-A SPECIFICATION AND INSTRUCTION MANUAL.

(2) Fitting the battery for retaining absolute position data

⚠️ WARNING
Before starting maintenance and inspection, make sure that the charge lamp is off more than 10 minutes after power-off, then confirm the voltage with a tester or the like. Otherwise, you may get an electric shock.

NOTICE
The internal circuits of the servo amplifier may be damaged by static electricity. Always take the following precautions:
1. Ground human body and work bench.
2. Do not touch the conductive areas, such as connector pins and electrical parts, directly by hand.

1) Open the operation window.
2) Install the battery in the battery holder.
3) Insert the battery connector into CON1 until it clicks.
3. ABSOLUTE POSITION DATA TRANSMISSION SEQUENCE

3.1 Absolute position data transmission sequence

Each time the SON signal is turned ON (when the power is switched ON for example), the programmable controller reads the position data (present position) of the servo amplifier.

- Write the sequence program to execute the data transmission diagrammed below, referring to the program examples in Chapter 6.

![Data Transmission Diagram]

**Note:** Time-out monitoring is performed by the programmable controller.
3. ABSOLUTE POSITION DATA TRANSMISSION SEQUENCE

3.2 Data transmission method

The sequence in which the base circuit is turned ON (servo ON) when it is in the OFF state due to the servo ON (SON) signal going OFF, an emergency stop, or alarm, is explained below.
To turn ON the base circuit, the ABS transfer mode signal (ABSM) must be turned ON. Unless the ABS transfer mode signal (ABSM) is turned ON, the base circuit cannot be turned ON.

3.2.1 Absolute position data transmission sequence at power ON

(1) Timing chart - power ON
3. ABSOLUTE POSITION DATA TRANSMISSION SEQUENCE

Explanation of the timing chart

1) The ready signal (RD) is turned ON when the ABS transfer mode signal (ABSM) is turned OFF after transmission of the ABS data.

2) Even if the servo ON (SON) signal is turned ON before the ABS transfer mode signal (ABSM) is turned ON, the base circuit is not turned ON until the ABS transfer mode signal (ABSM) is turned ON.

3) If a servo alarm has occurred, the ABS transfer mode signal (ABSM) is not received.

4) The ABS transfer mode signal (ABSM) can be transmitted while a servo warning, such as an over-regeneration warning, is effective.

5) If the ABS transfer mode signal (ABSM) is turned OFF during the ABS transfer mode, the ABS transfer mode is interrupted and the time-out error (A.E5) occurs.

6) The functions of output signals such as ZSP, TLC, and PF change depending on the ON/OFF state of the ABS transfer mode signal (ABSM).

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Ptn No.</th>
<th>Output Signal</th>
</tr>
</thead>
<tbody>
<tr>
<td>DO1 (Note)</td>
<td>CN1B-4</td>
<td>Positioning completion</td>
</tr>
<tr>
<td>ZSP</td>
<td>CN1B-19</td>
<td>Zero speed</td>
</tr>
<tr>
<td>TLC</td>
<td>CN1B-6</td>
<td>Limiting torque</td>
</tr>
<tr>
<td>INP (Note)</td>
<td>CN1A-18</td>
<td>Positioning completion</td>
</tr>
</tbody>
</table>

Note: CN1B-4 and CN1A-18 output the same signals. (To enter the positioning completion signal into INPS of the AD75, connect CN1A-18.)

7) If the ABS transfer mode signal (ABSM) is turned ON for a purpose other than transmission of the ABS data, the output signals will nevertheless be assigned the functions for ABS data transmission. Therefore, do not turn the ABS transfer mode signal (ABSM) ON unless ABS data transmission is required.

8) ABS transfer mode signal (ABSM) input is not accepted while the ready signal (RD) is ON.
3. ABSOLUTE POSITION DATA TRANSMISSION SEQUENCE

(2) Timing chart - absolute position data transmission

Note: If the servo ON (SON) signal is not turned ON within 1 second after the ABS transfer mode signal (ABSM) is turned ON, an SON time-out warning (A.EA) occurs. This warning, however, does not interrupt data transmission. It is automatically cleared when the servo ON (SON) signal is turned ON.

(Explanations)

1) The programmable controller turns ON the ABS transfer mode signal (ABSM) and servo ON (SON) signals at the leading edge of the internal servo ON signal. (1)

2) On receiving the ABS transfer mode signal, the servo detects and calculates the absolute position and turns ON the ready to send (TLC) signal as the response, which notifies the programmable controller that the servo is ready for transmission of the ABS data. (2)

3) After acknowledging that the ready to send (TLC) signal has been turned ON, the programmable controller turns ABS request (ABSR) ON. (3)

4) In response to ABS request (ABSR), the servo outputs the lower 2 bits of the ABS data and the ready to send (TLC) signal in the OFF state. (4)
5) After acknowledging that the ready to send (TLC) signal has been turned OFF, which implies that 2 bits of the ABS data have been transmitted, the programmable controller reads the lower 2 bits of the ABS data and then turns OFF the ABS request (ABSR). (5)

6) The servo turns ON the ready to send (TLC) so that it can respond to the next request. (6) Steps 3) to 6) are repeated until 32-bit data and the 6-bit check sum have been transmitted.

7) After receiving of the check sum, the programmable controller turns the ABS transfer mode signal (ABSM) OFF. (8)

8) If the ABS transfer mode signal (ABSM) is turned OFF during data transmission, the ABS transfer mode is interrupted.

(3) Calculating the check sum

The check sum is the code which is used by the programmable controller to check for errors in the received ABS data. The 6-bit check sum is transmitted following the 32-bit ABS data.

At the programmable controller, calculate the sum of the received ABS data using the ladder program and compare it with the check sum code sent from the servo.

Calculating the check sum

Every time the programmable controller receives 2 bits of ABS data, it adds the data to obtain the sum of the received data. The check sum is 6-bit data.

Example: ABS data: -10 (FFFFFFF6H)

```
+ 1
101101b
```

Therefore, the check sum of "-10" (ABS data) is "2Dh".
(4) Transmission error

(4-1) Time-out warning (A,E5)

In the ABS transfer mode, the time-out processing shown below is executed at the servo. If a time-out error occurs, an ABS time-out warning (A,E5) is output.

1) ABS request OFF-time time-out check (applied to 32-bit ABS data in 2-bit units + check sum)

If the ABS request signal is not turned ON by the programmable controller within 5 seconds after the send data ready signal is turned ON, this is regarded as a transmission error and the ABS time-out warning (A,E5) is output.

2) ABS request ON-time time-out check (applied to 32-bit ABS data in 2-bit units + check sum)

If the ABS request signal is not turned OFF by the programmable controller within 5 seconds after the send data ready signal is turned OFF, this is regarded as the transmission error and the ABS time-out warning (A,E5) is output.
3. ABSOLUTE POSITION DATA TRANSMISSION SEQUENCE

3) ABS transfer mode finish-time time-out check

If the ABS transfer mode signal is not turned OFF within 5 seconds after the last ready to send signal (19th signal for ABS data transmission) is turned ON, it is regarded as the transmission error and the ABS time-out warning (A,E5) is output.

Note 1: The ABS time-out warning (A,E5) is cleared when the ABSM transfer mode signal (ABSM) changes from OFF to ON.

Note 2: For the processing after the output of the ABS time-out warning (A,E5), refer to Section 8.1.

4) When test operation is performed with "absolute position detection system" valid

An error will occur if operation is performed with "1□□□□" (absolute position detection system valid) set in parameter No. 3. When performing test operation, always set "0□□□□" in parameter No. 3 to make the absolute position detection system invalid.

(4-2) Check sum error

If the check sum error occurs, the programmable controller should retry transmission of the ABS data.

Using the ladder check program, turn OFF the ABS transfer mode (ABSM) and serve ON (SON) signals once. Turn them ON again after an OFF time of longer than 20 milliseconds.

If the ABS data transmission fails to end normally even after retry, regard this situation as an ABS check sum error and execute error processing.

Example: To retry ABS data transmission 3 times

Note: The start command for positioning, which cannot be executed when an ABS check sum error has occurred, must be interlocked with the ABS data ready signal.
3. ABSOLUTE POSITION DATA TRANSMISSION SEQUENCE

3.2.2 Absolute position data transmission sequence when the alarm is reset

![Diagram of absolute position data transmission sequence]

Note 1: If an alarm occurs, turn OFF the servo ON (SON) signal by detecting the alarm output (ALM).

2: If an alarm has occurred, the ABS transfer mode signal (ABSM) cannot be accepted. After eliminating the cause of the alarm, clear the alarm output with the reset (RES) signal.

3: In the reset state, the ABS transfer mode signal (ABSM) can be input.

4: The present position data is updated during the alarm state, so that the machine motion during the alarm state causes droop. If the alarm state is reset and the base circuit is turned ON in this condition, the motor will operate to return the machine by the distance that it moved during the alarm state at high speed. To avoid this problem, read the ABS data again as indicated in the chart above.
3. ABSOLUTE POSITION DATA TRANSMISSION SEQUENCE

3.2.3 Absolute position data transmission sequence when the emergency stop state is reset

(1) If the power is switched ON in the emergency stop state

Power supply
ON
OFF

Serve ON (SON)
ON
OFF

Emergency stop (EMG)
ON
OFF

ABS transfer mode (ABSM)
ON
OFF

During transfer of ABS

ABS request (ABSR)
ON
OFF

Send data ready (TLC)
ON
OFF

Send (ABS) data

ABS data

80 [msec]

Base circuit
ON
OFF

10 [msec]

Ready (RD)
ON
OFF

Operation enabled

Note 1: The emergency stop state can be reset while the ABS data is being transferred. If the emergency stop state is reset while the ABS data is transmitted, the base circuit is turned ON 80 [msec] after resetting. If the ABS transfer mode signal (ABSM) is OFF when the base circuit is turned ON, the ready signal (RD) is turned ON 10 [msec] after the turning ON of the base circuit. If the ABS transfer mode signal (ABSM) is ON when the base circuit is turned ON, it is turned OFF and then the ready signal (RD) is turned ON.

2: The ABS data can be transmitted after the emergency stop state is reset. Turn ON the ABS transfer signal (ABSM) after resetting the emergency stop state.

3: The present position data is updated during the emergency stop state, so that the machine motion during the emergency stop state causes droop. If the emergency stop state is reset and the base circuit is turned ON in this condition, the motor will operate to return the machine by the distance that it moved during the emergency stop state at high speed. To avoid this problem, read the ABS data again as indicated in the chart above.
3. ABSOLUTE POSITION DATA TRANSMISSION SEQUENCE

(2) If emergency stop is activated during servo ON

Servo ON (SON)
ON
OFF

Emergency stop (EMG)
ON
OFF

Note 1)

ABS transfer mode (ABSM)
ON
OFF

During transmission of ABS

ABS request (ABSR)
ON
OFF

Send data ready (TLC)
ON
OFF

Send (ABS) data

ABS data

80 [msec]

Base circuit
ON
OFF

Ready (RD)
ON
OFF

Operation enabled

Note 1: The ABS transfer mode signal (ABSM) is permissible while in the emergency stop state. In this case, the base circuit and the ready signal (RD) are turned ON after the emergency stop state is reset.

2: The present position data is updated during the emergency stop state, so that the machine motion during the emergency stop state causes droop. If the emergency stop state is reset and the base circuit is turned ON in this condition, the motor will operate to return the machine by the distance that it moved during the emergency stop state at high speed. To avoid this problem, read the ABS data again as indicated in the chart above.
4. HOME POSITION SETTING

4.1 Dog type home position setting

Note 1: The programmable controller sets an appropriate creep speed so as not to impart a shock to the machine when it is stopped. When the programmable controller detects the zero-pulse, it outputs the clear (CR) signal to update the present position data.

2: The servo amplifier clears droop from OFF to ON of the clear signal and stops immediately. It backs up the home position ABS data in the nonvolatile memory when the following conditions are satisfied.

- [Home position ABS data update conditions - servo amplifier]
  1) The clear (CR) signal changes from OFF to ON.
  2) The completion of positioning (INP) signal is ON.

If the conditions indicated above are not satisfied, the home position set error warning (A.98) occurs. This warning is, however, automatically cleared when the conditions indicated above are satisfied by repeating the home position setting.

3: The number of home position setting is limited to 100,000 times.
4. HOME POSITION SETTING

4.2 Data set type home position setting

The home position can be set at any required position if the data set type home position setting method is used.

Note 1: Move the machine to the position where the home position is to be set by manually operating the machine; in this positioning, the motor shaft must turn through more than one revolution.

2: At the position where the home position is to be set, the programmable controller outputs the clear signal (CR) for more than 20 [msec] and, at the same time, it updates the present position data.

3: The servo amplifier clears the droop pulses in response to the clear signal (CR) ON and stops the motor.

It backs up the home position ABS data in the nonvolatile memory when the following conditions are satisfied.

- Home position ABS data update conditions - servo amplifier
  1) The clear (CR) signal changes from OFF to ON.
  2) The completion of positioning (INP) signal is ON.

If the conditions indicated above are not satisfied, the home position set error warning (A.96) occurs. This warning is, however, automatically cleared when the conditions indicated above are satisfied by repeating the home position setting.

4: The number of home position setting is limited to 100,000 times.
5. TRANSMISSION OF ABSOLUTE POSITION DATA WHEN THE MOTOR WITH ELECTROMAGNETIC BRAKE IS USED

- Power ON/OFF and Servo ON/OFF Timing Chart

Power supply
ON
OFF

Servo ON (SON)
ON
OFF

ABS transfer mode (ABSM)
ON
OFF

During transmission of ABS

During transmission of ABS

ABS request (ABSR)
ON
OFF

Send data ready (TLC)
ON
OFF

ABS data

ABS data

Send (ABS) data

60 [msec]

80 [msec]

Base circuit
ON
OFF

10 [msec]

Ready (RD)
ON
OFF

Tb

Tb

Electromagnetic brake (CN1B-19) Note 1
ON
OFF

Electromagnetic brake torque
ON
OFF

Note 1: The ZSP functions as the electromagnetic brake timing output in accordance with a parameter setting.

2: The timer (Tb) for the electromagnetic brake is set in the servo parameters.

3: When the ABS transfer mode is on, the electromagnetic brake output (CN1B-19) serves as ABS data bit 1. Therefore, configure the sequence externally using the ABS mode (ABSM) and electromagnetic brake output (CN1B-19) so that the electromagnetic brake torque can be generated as indicated above.
6. CONNECTION OF ABSOLUTE POSITION DETECTION SYSTEM AND TYPICAL SEQUENCE PROGRAMS

6.1 Connection example - MR-J2-A servo amplifier and MELSEC-A1S (A1SD71)

6.1.1 Connection diagram

---

Note 1: For dog type home position setting.

2: For data set type home position return. Connection in Note 1 should not be made.

3: This circuit is for your reference.

4: The electromagnetic brake output should be controlled via a relay connected to the programmable controller output.

---

20
6.1.2 Cautions on handling the absolute position detection system

Take the following factors into consideration when performing absolute position detection with an A1SD71 (AD71).

**IMPORTANT**

The absolute coordinate system (programmable controller coordinate system) of the A1SD71 (AD71) only covers the range in which the address increases (positive coordinate values) on moving away from the machine home position (the position reached in the home position return operation). Therefore, if the motor enters the range where the coordinate value is negative due to the load torque or a fall on a vertical axis when the power is turned ON/OFF at a point near the machine home position, the system fails to detect the absolute position. To prevent this problem, it is necessary to set the home position (operation origin) for positioning in addition to the machine home position.

1) The home position should be set in the direction in which the position address of the programmable controller coordinate system increases on moving away from machine home position, as illustrated in Fig. 6-1. Note that the home position for positioning must be more than one revolution of the servo motor shaft from the machine home position.

If the address of the machine home position is changed to any value other than "0", the home position should be set in the direction in which the position address increases on moving away from the machine home position (machine home position after changing the home position address) and at a point removed from the machine home position by more than one revolution of the motor shaft.

![Fig. 6-1 Machine Home Position and Home Position](image)

**Fig. 6-1 Machine Home Position and Home Position**
2) In the address decreasing range which starts at the machine home position, do not turn on or off power to the programmable controller or servo amplifier, the servo ON pushbutton switch or the PC-RESET switch. (See Fig. 6-2.) If any of these operations is performed, the absolute position cannot be detected, resulting in the output of the ABS coordinate error (Y4B).

If the home position address is changed to other than 0, the programmable controller coordinate system will be as illustrated in Fig. 6-3.

Power should be switched on/off in the address increasing range which starts at the positioning home position.

---

**Fig. 6-2 Detection Range for Absolute Position Data**

- **a)** If Pr.14 (revolution direction parameter) = 0
- **b)** If Pr.14 (revolution direction parameter) = 1

---

**Fig. 6-3 Detection Range for Absolute Position Data after Changing the Home Position Address**

- **a)** If Pr.14 (revolution direction parameter) = 0
- **b)** If Pr.14 (revolution direction parameter) = 1
3) In a positioning program, the address of the positioning point should be determined by adding the home position address to the target position address.

Example) To execute positioning at (1), (2), and (3).

(1) Positioning at position address 80000.

(2) Positioning at position address 130000.

(3) Positioning at position address 0.

Fig. 6-4 Determining the Address for Positioning

The sequence programs presented in this chapter show I/O numbers (X, Y) assuming the arrangement of modules on the main base unit is as illustrated below. A1SD71 is mounted at I/O slots 0 and 1, a 16-point input module at slot 2, and 16-point output module at slot 3. If the actual arrangement of the modules differs from this arrangement, change the X and Y numbers accordingly.

Example arrangement of modules
The numbers of the devices (M, D, T, etc.) used in the program can be changed as required.

**POINTS**

(1) The A1SD71 has 48 I/O points and occupies 2 slots. For I/O allocation using the GPP function, follow the instructions given below.

First slot: Vacant slot 16 points
Second slot: Special function module 32 points

(2) To execute the FROM/TO instruction for the A1SD71, use the head I/O number of the second slot.

X30~X3F  Y40~Y4F

Therefore, the I/O number to be set with the FROM/TO instruction is "head I/O number allocated to the A1SD71 + 010H".

(3) By setting "0 point of vacant slot" for the first slot of the A1SD71 in the "I/O allocation" of the GPP function, the 16 points in the first slot can be saved.
In this case, the I/O number to be set with the FROM/TO instruction is the same number as the head I/O number allocated to the A1SD71.
6. CONNECTION OF ABSOLUTE POSITION SYSTEM AND TYPICAL SEQUENCE PROGRAMS

6.1.3 ABS sequence program example

[Example]
To transmit the ABS data using the OFF-to-ON change of the servo ON signal as the trigger.

[Conditions]
(1) When the servo ON signal and the GND of the power supply are shorted, the ABS data is transmitted when the power to the servo amplifier power is turned ON, or at the leading edge of the RUN signal after a PC reset operation (PC-RESET). The ABS data is also transmitted when an alarm is reset, or when the emergency stop state is reset.

(2) If a check sum discrepancy is detected in the transmitted data, ABS data transmission is retried up to three times. If the check sum discrepancy is still detected after retrying, the ABS check sum error is generated (Y4A ON).

(3) The following time periods are measured and if the ON/OFF state does not change within the specified time, the ABS communication error is generated (Y4A ON).
ON period of ABS transfer mode (Y41)
ON period of ABS request (Y42)
OFF period of ready to send ABS data (X32).

(4) If the relationship between the polarity (±) of the received ABS data and the setting value for parameter No. 14 (rotating direction) of A1SD71 (AD71) involves negative coordinate values, which cannot be handled by the A1SD71 (AD71), the ABS coordinate error is generated (Y4B ON).

| List of devices used in X-axis ABS sequence program |

<table>
<thead>
<tr>
<th>X input contact</th>
<th>Y output contact</th>
</tr>
</thead>
<tbody>
<tr>
<td>X30</td>
<td>ABS bit 0 / completion of positioning</td>
</tr>
<tr>
<td>X31</td>
<td>ABS bit 1 / zero speed</td>
</tr>
<tr>
<td>X32</td>
<td>Send ABS data ready / torque limit control</td>
</tr>
<tr>
<td>X33</td>
<td>Servo alarm</td>
</tr>
<tr>
<td>X34</td>
<td>Error reset</td>
</tr>
<tr>
<td>X35</td>
<td>Servo emergency stop</td>
</tr>
<tr>
<td>X36</td>
<td>Servo ON</td>
</tr>
<tr>
<td>X37</td>
<td>Home position return start</td>
</tr>
<tr>
<td>X38</td>
<td>Operation mode 1</td>
</tr>
<tr>
<td>X39</td>
<td>Operation mode 2</td>
</tr>
<tr>
<td>X40</td>
<td>Y40 Servo ON</td>
</tr>
<tr>
<td>X41</td>
<td>Y41 ABS transfer mode</td>
</tr>
<tr>
<td>X42</td>
<td>Y42 ABS request</td>
</tr>
<tr>
<td>X43</td>
<td>Y43 Alarm reset</td>
</tr>
<tr>
<td>X44</td>
<td>Y44 Note2 Electromagnetic brake output</td>
</tr>
<tr>
<td>X45</td>
<td>Y45 Note3 Clear</td>
</tr>
<tr>
<td>X46</td>
<td>Y46 Servo alarm</td>
</tr>
<tr>
<td>X47</td>
<td>Y47 ABS communication error</td>
</tr>
<tr>
<td>X48</td>
<td>Y48 ABS check sum error</td>
</tr>
<tr>
<td>X49</td>
<td>Y49 ABS coordinate error</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>D register</th>
<th>M contact</th>
</tr>
</thead>
<tbody>
<tr>
<td>D0</td>
<td>ABS data transmission counter</td>
</tr>
<tr>
<td>D1</td>
<td>Check sum transmission counter</td>
</tr>
<tr>
<td>D2</td>
<td>Check sum addition counter</td>
</tr>
<tr>
<td>D3</td>
<td>ABS data: Lower 16 bits</td>
</tr>
<tr>
<td>D4</td>
<td>ABS data: Upper 16 bits</td>
</tr>
<tr>
<td>D5</td>
<td>ABS data 2-bit receiving buffer</td>
</tr>
<tr>
<td>D6</td>
<td>Check data in case of check sum error</td>
</tr>
<tr>
<td>D7</td>
<td>Retry frequency</td>
</tr>
<tr>
<td>D8</td>
<td>Forward rotation direction</td>
</tr>
<tr>
<td>D9</td>
<td>Home position address: Lower 16 bits</td>
</tr>
<tr>
<td>D10</td>
<td>Home position address: Upper 16 bits</td>
</tr>
<tr>
<td>D100</td>
<td>Received shift data: Lower 16 bits</td>
</tr>
<tr>
<td>D101</td>
<td>Received shift data: Upper 16 bits</td>
</tr>
<tr>
<td>M0</td>
<td>ABS data transmission start</td>
</tr>
<tr>
<td>M1</td>
<td>Sum check completion</td>
</tr>
<tr>
<td>M2</td>
<td>Sum check discrepancy</td>
</tr>
<tr>
<td>M3</td>
<td>ABS data ready</td>
</tr>
<tr>
<td>M4</td>
<td>Transmission data read enabled</td>
</tr>
<tr>
<td>M5</td>
<td>Check sum 2 bits read completion</td>
</tr>
<tr>
<td>M6</td>
<td>ABS 2 bits read completion</td>
</tr>
<tr>
<td>M7</td>
<td>ABS 2 bits request</td>
</tr>
<tr>
<td>M8</td>
<td>Servo ON request</td>
</tr>
<tr>
<td>M9</td>
<td>Servo alarm</td>
</tr>
<tr>
<td>M10</td>
<td>ABS data transmission retry start pulse</td>
</tr>
<tr>
<td>M11</td>
<td>Retry flag setting</td>
</tr>
<tr>
<td>M12</td>
<td>Retry flag reset</td>
</tr>
<tr>
<td>M13</td>
<td>ABS coordinate (-)</td>
</tr>
<tr>
<td>M14</td>
<td>ABS coordinate (+)</td>
</tr>
<tr>
<td>M20 Note1</td>
<td>Clear signal ON timer request</td>
</tr>
<tr>
<td>M21 Note2</td>
<td>Data set type home position return request</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>T counter</th>
<th>C counter</th>
</tr>
</thead>
<tbody>
<tr>
<td>T0</td>
<td>ABS transfer mode timer</td>
</tr>
<tr>
<td>T1</td>
<td>ABS request response timer</td>
</tr>
<tr>
<td>T2</td>
<td>Retry wait timer</td>
</tr>
<tr>
<td>T3</td>
<td>Ready to send response timer</td>
</tr>
<tr>
<td>T10 Note1</td>
<td>Clear signal ON timer</td>
</tr>
<tr>
<td>T200</td>
<td>Transmitted data read 10ms delay timer</td>
</tr>
</tbody>
</table>

Note 1: Necessary when data set type home position return is executed.
2: Necessary in the event of electromagnetic brake output.
6. CONNECTION OF ABSOLUTE POSITION SYSTEM AND TYPICAL SEQUENCE PROGRAMS

[ABS sequence program example]

This sequence program example assumes the following conditions:
- Parameters of the A1SD71-S2 (AD71) positioning module
  1) Unit setting : 3=pulse (PLS)
  2) Travel per pulse : 1=1 pulse

To select the unit other than the pulse, conversion into the unit of the feed command value per pulse is required. Hence, add the following program to the area marked Note 1 in the sequence program.

<table>
<thead>
<tr>
<th>Item</th>
<th>mm</th>
<th>Inch</th>
<th>degree</th>
<th>PULS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit setting</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Travel per pulse</td>
<td>0.1-1</td>
<td>1.0-10</td>
<td>0.00001-</td>
<td>0.001</td>
</tr>
<tr>
<td>Unit of travel</td>
<td>μm/PLS</td>
<td>inch/PLS or degree/PLS</td>
<td>PLS</td>
<td></td>
</tr>
<tr>
<td>Constant K for conversion into unit of travel</td>
<td>1-100</td>
<td>1-10</td>
<td>1-100</td>
<td>None</td>
</tr>
</tbody>
</table>

Reference
- For 1μm/PLS, set constant K to 10
- For 5μm/PLS, set constant K to 50
- When the unit setting is PULS, the additional program is not required.

M9038
Initial pulse ON

M9039
PC RUN

X36
Servo ON PB

X36
Servo ON PB

M8
M9
M11
Servo ON request
Flag
Retry flag setting

Y46
Servo ON output

M8
\[PLS M9\]
Setting retry flag

M12
\[RST C2\]
Reseting retry counter

A1SD71 error reset
Setting retry count (3 times)

Loading received shift data

Initial setting

Reseting ready to send
Reseting servo ON request
Reseting ABS transfer counter at servo OFF
Reseting check sum transfer counter at servo OFF

ABSD data transmission retry control

ABS I/F start

(to be continued)
6. CONNECTION OF ABSOLUTE POSITION SYSTEM AND TYPICAL SEQUENCE PROGRAMS

X34 M9
Error reset PB Error flag
Y43
Alarm reset

X35
Emergency stop PB
X33
Servo alarm

M0
ABS data transmission start
DMOV K16 D0
MOV K3 D1
MOV K0 D2
MOV K0 D5
MOV K9 D0
MOV K9 A0
RST Y48
RST C0
RST C1

ABS transfer mode
ABS transfer mode control

ABS data transmission start
Y41 C1
ABS transfer mode
Check sum counter

C0 C1 Y41
DMOV A0 D1
DMOV V0 A0
FROPH 0001 K7872 V6 X1
VANG 0004 V8
VANG 0000 A1
PLS M10

Counter Check sum transfer counter mode

M13 Rotating direction judgment
ABS coordinate (-)

= D8 K4
NEG D0
- D1
NEG D3
K0 D3
+ K1 D4

Reversing polarity of upper 16 bits
Subtraction for upper 16 bits
Reversing polarity of lower 16 bits
Lower 16 bits = 0 \rightarrow D4 = 1 = D4

Servo alarm detection, alarm reset control

(to be cont'd)
When the unit setting parameter value of the A1SĐT1 positioning module is changed from 3 (PULS) to 0 (mm), the unit is 0.1µm. To set the unit to 1µm, for example, add the program enclosed in the broken line above to multiply the feed command value by 10.
Note: When absolute position data is received at power ON, for example, if a negative coordinate position which cannot be handled by the A1SD71 is detected, the ABS coordinate error (Y48 ON) is generated. If this error is generated, move the axis into the positive coordinate zone in JOG operation. Then, turn OFF the servo ON pushbutton switch and turn it ON again.
6. CONNECTION OF ABSOLUTE POSITION SYSTEM AND TYPICAL SEQUENCE PROGRAMS

- **X-axis control program example**

  **Note:** This precludes execution of the X-axis start program while M3 (ready to send the ABS data) is OFF.

- **Program for data set type home position return operation**
  
  **[Example]**
  After jogging the machine to the position where the home position is to be set, select the home position return mode and press the home position return start pushbutton switch to set the home position. The home position address should be "500".

  **[Conditions]**
  After turning ON the power, the motor must rotate more than one revolution before executing home position return.

  - M9039: Home position return mode
  - PC RUN
  - CLEAR
  - Y41, X30, X37, M20: Clear signal ON timer request
  - K1: Clear signal 100 msec ON timer
  - SET M21: Setting data set type home position return
  - T10: Resetting data set type home position return
  - CLEAR: Clear signal ON
  - M21: Data set type home position return request
  - CLEAR: Clear signal ON
  - M20: Home position return mode
  - CLEAR: Clear signal ON

  **Note 1:** Do not turn ON the clear signal (Y45) for an operation other than home position return. Turning it ON in other circumstances will cause position shift.

  **Note 2:** If data of the home position address parameter is not written by using an AGGPP programming tool, etc. before starting a program for data set type home position return, the circuit indicated in Note 2 is necessary and the circuit indicated in Note 3 is not necessary.

  **Note 3:** Contrary to Note 2 above, if the home position address is written in the home position address parameter, the circuit indicated in Note 2 is not necessary and the circuit indicated in Note 3 is necessary.
6. CONNECTION OF ABSOLUTE POSITION SYSTEM
AND TYPICAL SEQUENCE PROGRAMS

■ Electromagnetic brake output program

[Example]
To create the electromagnetic brake signal

[Conditions]
(1) While the ABS data is being transmitted (for several seconds after the servo ON signal has changed from OFF to ON), the motor is assumed to be stopped.

(2) "1 □ 1 □" (electromagnetic brake output selection) is set for servo amplifier parameter No. 03.

■ Positioning completion program

[Example]
To create the status information for servo positioning completion

[Conditions]
While the ABS data is being transmitted (for several seconds after the servo ON signal has changed from OFF to ON), the motor is assumed to be stopped.

■ Zero speed program

[Example]
To create the status information for servo zero speed

[Conditions]
While the ABS data is being transmitted (for several seconds after the servo ON signal has changed from OFF to ON), the motor is assumed to be stopped.
6. CONNECTION OF ABSOLUTE POSITION SYSTEM
AND TYPICAL SEQUENCE PROGRAMS

- Torque limiting mode program
  [Example]
  To create the status information for the servo torque limiting mode
  [Conditions]
  While the ABS data is being transmitted (for several seconds after the
  servo ON signal has changed from OFF to ON), the torque limiting mode
  is assumed to be OFF.

- ABS transfer mode
- Torque limiting mode

6.1.4 ABS sequence program example - 2-axis control

The example programs presented in the previous section are for 1-axis con-
trol (X-axis).

The ABS sequence program for the second axis (Y-axis) when one A1SD71
unit is used for X and Y axes is described below. The program can be writ-
ten in the same manner for the third and later axes.

- ABS sequence program for Y-axis
  [Procedure]
  It is advisable to write the Y-axis program by referring to the program for
  X-axis.

  (1) Allocate the X inputs, Y outputs, D registers, M contacts, T timers,
  and C counters for the Y-axis so that they will not overlap the
  allocations for the X-axis.

  (2) The A1SD71 has different buffer memory addresses for the X-axis
  and Y-axis. Change the program for X-axis as indicated below to
  write the program for Y-axis.

  [FROMP H0001 K7872 D6 K1] → [FROMP H0001 K7892 D8 K1]
  [DFROP H0001 K7912 D9 K1] → [DFROP H0001 K7922 D9 K1]
  [DTOP H0001 K41 D3 K1] → [DTOP H0001 K341 D3 K1]

[ Program configuration ]

X-axis ABS sequence program
(program in the previous section)

Y-axis ABS sequence program
(to be written by referring to the program for X-axis)
Data set type home position return program for Y-axis

[Example]
Arrange the data set type home position return program written for the X-axis in series to control two axes.

[Procedure]
It is advisable to write the data set type home position return program for the Y-axis by referring to the program for X-axis.

1. Allocate the X inputs, Y outputs, D registers, M contacts, and T timers for the Y-axis so that they will not overlap the allocations for the X-axis.

2. The A1SD71 has different buffer memory addresses for the X-axis and Y-axis. Change the program for the X-axis as indicated below to write the program for the Y-axis.

[DTOP H0001 K7912 D9 K1] → [DTOP H0001 K7922 D9 K1]
[DTOP H0001 K41 D9 K1] → [DTOP H0001 K341 D9 K1]

[Program configuration]

Data set type home position return program for the X-axis
(program in the previous section)

Data set type home position return program for the Y-axis
(to be written by referring to the program for the X-axis)
6. CONNECTION OF ABSOLUTE POSITION SYSTEM AND TYPICAL SEQUENCE PROGRAMS

6.2 Connection example - MR-J2-A servo amplifier and MELSEC FX2-32MT (FX-1PG)

6.2.1 Connection diagram

---

Note 1: To be connected for dog type home position setting.
Note 2: To be connected for data set type home position setting.
Note 3: The electromagnetic brake output should be controlled by connecting the programmable controller output to a relay.
Note 4: To be shorted if a servo ON switch is not used.

---
6. CONNECTION OF ABSOLUTE POSITION SYSTEM AND TYPICAL SEQUENCE PROGRAMS

6.2.2 ABS sequence program example

[Example]
- To transmit the ABS data using the OFF-to-ON change of the servo ON signal as the trigger
- After the completion of ABS data transmission, positioning is possible in the following operation patterns
  1) Positioning from the position where the absolute position is detected to address 300000
  2) Positioning from address 300000 to address −250000
  3) Positioning from address −250000 to address 0
- After the completion of ABS data transmission, JOG operation is possible using the JOG+ or JOG− pushbutton switch.
- After the completion of ABS data transmission, dog type home position return is possible using the home position return pushbutton switch.

```
-300000
(4)
0
(2)
1
300000
```

Note: The FX-1PG buffer memory allocations are indicated below.

<table>
<thead>
<tr>
<th>BMF No.</th>
<th>Upper 16 bits</th>
<th>Lower 16 bits</th>
<th>Name and symbol</th>
<th>Set value</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>#0</td>
<td>#0</td>
<td>Pulse rate</td>
<td>A</td>
<td>2000</td>
<td></td>
</tr>
<tr>
<td>#1</td>
<td>#1</td>
<td>Feed rate</td>
<td>B</td>
<td>1000</td>
<td></td>
</tr>
<tr>
<td>#2</td>
<td>#2</td>
<td>Parameter</td>
<td>C</td>
<td>0</td>
<td>PPS</td>
</tr>
<tr>
<td>#3</td>
<td>#3</td>
<td>Bias speed</td>
<td>Vbias</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>#4</td>
<td>#4</td>
<td>Max. speed</td>
<td>Vmax</td>
<td>1000000PPS</td>
<td></td>
</tr>
<tr>
<td>#5</td>
<td>#5</td>
<td>JOG operation</td>
<td>Vjog</td>
<td>10000PPS</td>
<td></td>
</tr>
<tr>
<td>#6</td>
<td>#6</td>
<td>JOG operation</td>
<td>Vjog</td>
<td>10000PPS</td>
<td></td>
</tr>
<tr>
<td>#7</td>
<td>#7</td>
<td>JOG operation</td>
<td>Vjog</td>
<td>10000PPS</td>
<td></td>
</tr>
<tr>
<td>#8</td>
<td>#8</td>
<td>JOG operation</td>
<td>Vjog</td>
<td>10000PPS</td>
<td></td>
</tr>
<tr>
<td>#9</td>
<td>#9</td>
<td>Home position return speed (high speed)</td>
<td>Vr</td>
<td>50000PPS</td>
<td>Initial value: 10</td>
</tr>
<tr>
<td>#10</td>
<td>#10</td>
<td>Home position return speed (creep)</td>
<td>Vc</td>
<td>1000PPS</td>
<td>Initial value: 10</td>
</tr>
<tr>
<td>#11</td>
<td>#11</td>
<td>Home position return zero-point signal count</td>
<td>N</td>
<td>2 pulses</td>
<td></td>
</tr>
<tr>
<td>#12</td>
<td>#12</td>
<td>Home position return zero-point signal count</td>
<td>N</td>
<td>2 pulses</td>
<td>Initial value: 10</td>
</tr>
<tr>
<td>#13</td>
<td>#13</td>
<td>Home position address</td>
<td>HP</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>#14</td>
<td>#14</td>
<td>Acceleration/Deceleration time</td>
<td>Ta</td>
<td>200msec</td>
<td>Initial value: 100</td>
</tr>
<tr>
<td>#15</td>
<td>#15</td>
<td>Acceleration/Deceleration time</td>
<td>Ta</td>
<td>200msec</td>
<td>Initial value: 100</td>
</tr>
<tr>
<td>#16</td>
<td>#16</td>
<td>Not usable</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>#17</td>
<td>#17</td>
<td>Target address (I)</td>
<td>P(I)</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>#18</td>
<td>#18</td>
<td>Target address (II)</td>
<td>P(II)</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>#19</td>
<td>#19</td>
<td>Operation speed (I)</td>
<td>V(I)</td>
<td>100000</td>
<td>Initial value: 10</td>
</tr>
<tr>
<td>#20</td>
<td>#20</td>
<td>Operation speed (II)</td>
<td>V(II)</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>#21</td>
<td>#21</td>
<td>Target address (II)</td>
<td>P(II)</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>#22</td>
<td>#22</td>
<td>Target address (II)</td>
<td>P(II)</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>#23</td>
<td>#23</td>
<td>Operation speed (II)</td>
<td>V(II)</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>#24</td>
<td>#24</td>
<td>Operation command</td>
<td></td>
<td>H0000</td>
<td></td>
</tr>
</tbody>
</table>

Note: BMF No.: For BMF numbers after #26, refer to the User’s Manual for the FX-1PG.

[Conditions]
(1) When the servo ON pushbutton switch and the GND of the power supply are shorted, the ABS data is transmitted when the servo amplifier power is turned ON, or at the leading edge of the RUN signal after a PC reset operation (PC-RESET). The ABS data is also transmitted when an alarm is reset, or when the emergency stop state is reset.
(2) If check sum discrepancy is detected in the transmitted data, the ABS data transmission is retried up to three times. If the check sum discrepancy is still detected after retrying, the ABS check sum error is generated (Y12 ON).
(3) The following time periods are measured and if the ON/OFF state does not change within the specified time, the ABS communication error is generated (Y11 ON).
  ON period of ABS transfer mode (Y1)
  OFF period of ABS request (Y2)
  OFF period of ready to send the ABS data (X2).
6. CONNECTION OF ABSOLUTE POSITION SYSTEM
AND TYPICAL SEQUENCE PROGRAMS

List of devices used in X-axis ABS sequence program

<table>
<thead>
<tr>
<th>X input contact</th>
<th>Y output contact</th>
</tr>
</thead>
<tbody>
<tr>
<td>X0</td>
<td>Y0</td>
</tr>
<tr>
<td>X1</td>
<td>Y1</td>
</tr>
<tr>
<td>X2</td>
<td>Y2</td>
</tr>
<tr>
<td>X3</td>
<td>Y3</td>
</tr>
<tr>
<td>X4</td>
<td>Y4</td>
</tr>
<tr>
<td>X5</td>
<td>Y5</td>
</tr>
<tr>
<td>X6</td>
<td>Y6</td>
</tr>
<tr>
<td>X7</td>
<td>Y7</td>
</tr>
<tr>
<td>X10</td>
<td>Y10</td>
</tr>
<tr>
<td>X11</td>
<td>Y11</td>
</tr>
<tr>
<td>X12</td>
<td>Y12</td>
</tr>
<tr>
<td>X13</td>
<td></td>
</tr>
<tr>
<td>X14</td>
<td></td>
</tr>
<tr>
<td>X15</td>
<td></td>
</tr>
</tbody>
</table>

D register

| D0          | M0               |
| D1          | M1               |
| D2          | M2               |
| D3          | M3               |
| D4          | M4               |
| D24         | M5               |
| D25         | M6               |
| D106        | M10              |
| D107        |                  |

M contact

| M1           |                  |
| M2           |                  |
| M3           |                  |
| M4           |                  |
| M5           |                  |
| M6           |                  |
| M10          |                  |
| M11          |                  |
| M12          |                  |
| M13          |                  |
| M20          |                  |
| M51          |                  |
| M52          |                  |

T timer

| T200         |                  |
| T201         |                  |
| T202         |                  |
| T203         |                  |
| T210         |                  |

C counter

| C0           |                  |
| C1           |                  |
| C2           |                  |

Note 1: Necessary when data set type home position return is executed.
2: Necessary in the event of electromagnetic brake output.
6. CONNECTION OF ABSOLUTE POSITION SYSTEM AND TYPICAL SEQUENCE PROGRAMS

(to be cont'd)
6. CONNECTION OF ABSOLUTE POSITION SYSTEM
AND TYPICAL SEQUENCE PROGRAMS

Note: The program example above is for dog type home position return operation. For a program for a data set type home position return operation, refer to the following program example.
Program for data set type home position return operation

[Example]
After jogging the machine to the position where the home position is to be set, select the home position return mode and press the home position return start pushbutton switch to set the home position. The home position address should be "500".

[Conditions]
After turning ON the power, the motor must rotate more than one revolution.

Note: Do not turn ON the clear signal (Y45) for an operation other than home position return. Turning it ON in other circumstances will cause position shift.

Electromagnetic brake output program

[Example]
To create the electromagnetic brake signal

[Conditions]
(1) While the ABS data is being transmitted (for several seconds after the servo ON signal has changed from OFF to ON), the motor is assumed to be stopped.
(2) "1 0 1 0" (electromagnetic brake output selection) is set for servo amplifier parameter No. 01.
6. CONNECTION OF ABSOLUTE POSITION SYSTEM
AND TYPICAL SEQUENCE PROGRAMS

■ Positioning completion program
   [Example]
   To create the status information for servo positioning completion
   [Conditions]
   While the ABS data is being transmitted (for several seconds after the
   servo ON signal has changed from OFF to ON), the motor is assumed to
   be stopped.

■ Zero speed program
   [Example]
   To create the status information for servo zero speed
   [Conditions]
   While the ABS data is being transmitted (for several seconds after the
   servo ON signal has changed from OFF to ON), the motor is assumed to
   be stopped.

■ Torque limiting mode program
   [Example]
   To create the status information for the servo torque limiting mode
   [Conditions]
   While the ABS data is being transmitted (for several seconds after the
   servo ON signal has changed from OFF to ON), the torque limiting mode
   is assumed to be off.
6. CONNECTION OF ABSOLUTE POSITION SYSTEM AND TYPICAL SEQUENCE PROGRAMS

6.3 Connection example - MR-J2-A servo amplifier and MELSEC-A1SD75 (AD75)

6.3.1 Connection diagram

---

Note 1: For dog type home position return. Do not connect when home position return is of the data set type.
2: If the servo motor provided with the zero point signal is started, the A1SD75 (AD75) will not put the deviation counter clear signal. Therefore, do not connect the clear signal of the MR-J2-A to the A1SD75 (AD75) but connect it to the output module of the programmable controller.
3: This circuit is for your reference.
4: The electromagnetic brake output should be controlled via a relay connected to the programmable controller output.
5: Use the differential line driver system for pulse input. Do not use the open collector system.
6: To reinforce noise suppression, connect LG and pulse output COM.
6. CONNECTION OF ABSOLUTE POSITION SYSTEM AND TYPICAL SEQUENCE PROGRAMS

6.3.2 ABS sequence program example

[Example]
To transmit the ABS data on the leading edge of the servo ON signal.

[Conditions]
(1) When the servo ON signal and GND of the power supply are shorted, the ABS data is transmitted at power-on of the servo amplifier or on the leading edge of the RUN signal after a PC reset operation (PC-RESET). The ABS data is also transmitted when an alarm is reset or when the emergency stop state is reset.

(2) If a checksum mismatch is detected in the transmitted data, ABS data transmission is retried up to three times. If the checksum mismatch still persists after the retries, the ABS checksum error occurs (Y3A ON).

(3) The following time periods are measured and if the ON/OFF state does not change within the specified time, the ABS communication error occurs (Y3A ON): ON period of ABS transfer mode (Y31)
OFF period of readying to send ABS data (X22)

<table>
<thead>
<tr>
<th>List of devices used in X-axis ABS sequence program</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>X input contact</th>
<th>Y output contact</th>
</tr>
</thead>
<tbody>
<tr>
<td>X29: ABS bit 0/positioning completion</td>
<td>Y30: Servo ON</td>
</tr>
<tr>
<td>X21: ABS bit 1/zero speed</td>
<td>Y31: ABS transfer mode</td>
</tr>
<tr>
<td>X22: Ready to send ABS data/limiting torque</td>
<td>Y32: ABS request</td>
</tr>
<tr>
<td>X23: Servo alarm</td>
<td>Y33: Alarm reset</td>
</tr>
<tr>
<td>X24: Alarm reset</td>
<td>Y34: Electromagnetic brake output</td>
</tr>
<tr>
<td>X25: Servo emergency stop</td>
<td>Y35: Clear</td>
</tr>
<tr>
<td>X26: Servo ON</td>
<td>Y36: Servo alarm</td>
</tr>
<tr>
<td>X27: Home position return start</td>
<td>Y39: ABS communication error</td>
</tr>
<tr>
<td>X28: Operation mode I</td>
<td>Y3A: ABS checksum error</td>
</tr>
<tr>
<td>X29: Operation mode II</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>D register</th>
<th>M contact</th>
</tr>
</thead>
<tbody>
<tr>
<td>D0: ABS data transmission counter</td>
<td>M5: ABS data transmission start</td>
</tr>
<tr>
<td>D1: Checksum transmission counter</td>
<td>M6: Sum checksum completion</td>
</tr>
<tr>
<td>D2: Checksum addition register</td>
<td>M7: Sum checksum mismatch</td>
</tr>
<tr>
<td>D3: ABS data: Lower 16 bits</td>
<td>M8: ABS data ready</td>
</tr>
<tr>
<td>D4: ABS data: Upper 16 bits</td>
<td>M9: Transmission data read enabled</td>
</tr>
<tr>
<td>D5: ABS data 2-bit receiving buffer</td>
<td>M10: Checksum 2 bits read completion</td>
</tr>
<tr>
<td>D6: Check data in case of checksum error</td>
<td>M11: ABS 2 bits read completion</td>
</tr>
<tr>
<td>D7: Number of retries</td>
<td>M12: ABS 2 bit request</td>
</tr>
<tr>
<td>D8: Forward rotation direction</td>
<td>M13: Servo ON request</td>
</tr>
<tr>
<td>D9: Home position address: Lower 16 bits</td>
<td>M14: Servo alarm</td>
</tr>
<tr>
<td>D10: Home position address: Upper 16 bits</td>
<td>M15: ABS data transmission retry start pulse</td>
</tr>
<tr>
<td>D11: Drive unit ready data</td>
<td>M16: Retry flag set</td>
</tr>
<tr>
<td>D12: Home position return completion data</td>
<td>M17: Retry flag reset</td>
</tr>
<tr>
<td>D110: Received shift data: Lower 16 bits</td>
<td>M18: PLS processing command</td>
</tr>
<tr>
<td>D111: Received shift data: Upper 16 bits</td>
<td>M20: Clear signal ON timer request</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>T timer</th>
<th>C counter</th>
</tr>
</thead>
<tbody>
<tr>
<td>T0: ABS transmission mode timer</td>
<td>C0: ABS data receive times counter</td>
</tr>
<tr>
<td>T1: ABS request response timer</td>
<td>C1: Checksum receive times counter</td>
</tr>
<tr>
<td>T2: Retry wait timer</td>
<td>C2: Retry counter</td>
</tr>
<tr>
<td>T3: ABS data send readying response timer</td>
<td></td>
</tr>
<tr>
<td>T10: Clear signal ON timer</td>
<td></td>
</tr>
<tr>
<td>T200: Transmitted data read 10ms delay timer</td>
<td></td>
</tr>
</tbody>
</table>

Note 1: Required for data set type home position return. 2: Required for electromagnetic brake output.
6. CONNECTION OF ABSOLUTE POSITION SYSTEM AND TYPICAL SEQUENCE PROGRAMS

[ABS sequence program example]

This sequence program example assumes the following conditions:
- Parameters of the A1SD75-P1 (AD75-P1) positioning module
  1) Unit setting: 3=pulse (PLS)
  2) Travel per pulse: 1=1 pulse

To select the unit other than the pulse, conversion into the unit of the feed value per pulse is required. Hence, add the following program to the area marked (Note 1) in the sequence program:

<table>
<thead>
<tr>
<th>Item</th>
<th>mm</th>
<th>inch</th>
<th>degree</th>
<th>PULS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit setting</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Travel per pulse</td>
<td>0.1</td>
<td>1</td>
<td>10</td>
<td>100</td>
</tr>
<tr>
<td>Unit of travel</td>
<td>μm/PLS</td>
<td>inch/PLS or degree/PLS</td>
<td>PLS</td>
<td></td>
</tr>
<tr>
<td>Constant K for conversion into unit of travel</td>
<td>1-10</td>
<td>100-1000</td>
<td>1-10</td>
<td>100-1000</td>
</tr>
</tbody>
</table>

Reference
- For 1μm/PLS, set constant K to 10.
- For 5μm/PLS, set constant K to 50.
- The additional program is not required for the unit setting of PLS.

---

(To be continued)

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6. CONNECTION OF ABSOLUTE POSITION SYSTEM AND TYPICAL SEQUENCE PROGRAMS

(Continued from preceding page)

1

M13
Servo ON request

M17

RST C2
Resetting retry counter

X24
M14

(Y33)
Alarm reset output

Error reset PB

Y33
Alarm reset

X25
M14

(M14)
Error flag output

(RST M8)
Resetting ready

(RST M13)
Resetting servo ON request

(Servo alarm)

X32
Emergency stop PB

X32
Servo alarm

M5
ABS data transfer start

[MOV K16 D0]
Initializing ABS data transmission counter

[MOV K3 D1]
Initializing checksum transmission counter

[MOV K0 D2]
Initializing checksum register

[MOV K9 D5]
Initializing ABS data register

[DMOV K3 D9]
Initializing ABS data register

[DMOV K0 A0]
Initializing ABS data register

(RST Y38)
Resetting ABS coordinate error

(RST C0)
Resetting ABS transmission counter

(RST C1)
Resetting checksum transmission counter

M5
ABS data transfer start

(Y31)
ABS transfer mode

Y31
C1
ABS transfer mode

C0
C1
Y31
Counter
Sum counter
ABS transfer mode

DMOV A0 D3
Saving ABS 32 bit data

MOV A0
Cleaning register

FROMK H0000 K5 D4 K1
*1: Reading X-axis rotation direction parameter

WAND H001 D8
Masking rotation direction parameter

WAND H000 A1
Masking ABS data sign

PLS M18
PLS processing command

(To be continued)
Note: When the unit setting parameter value of the AD75 positioning module is changed from 3 (PULS) to 0 (mm), the unit is 0.1μm. To set the unit to 1μm, for example, add the program enclosed in the broken line (Note) above to multiple the feed command value by 10.

**X-axis start program example**

When "M8" (ready to send ABS data) switches on, the X-axis start program is executed by the X-axis start command.

Note: Do not execute the X-axis start program while "M8" (ready to send ABS data) is off.

**Dog type home position return program**

Refer to the home position return program in the A1SD75 User’s Manual.

This program requires a program which outputs the clear signal (Y35) after completion of home position return. Add the following program:

Reading 1-axis home position return completion signal
Masking home position return completion
Home position return processing instruction
Switching clear signal on
6. CONNECTION OF ABSOLUTE POSITION SYSTEM AND TYPICAL SEQUENCE PROGRAMS

Data set type home position return program for X axis

[Example]
After jogging the machine to the position where the home position is to be set, select the home position return mode and press the home position return start pushbutton switch to set the home position. The home position address should be "500".
- Switch power on, then perform jog operation or the like to run the motor more than one revolution before starting home position return.

Note 1: Do not switch on the clear signal (Y35) for any other operation than home position return. To do so will cause a position shift.
2: If the data of the home position address parameter is not written from the A7PHP programming tool or the like before starting the data set type home position return program, the ladder (Note 2) is required and the ladder (Note 3) is not required.
3: Continue to above 2, if the home position address is written in the home position address parameter, the ladder (Note 2) is not required but the ladder (Note 3) is required.
6. CONNECTION OF ABSOLUTE POSITION SYSTEM
AND TYPICAL SEQUENCE PROGRAMS

■ Electromagnetic brake output program

[Example]
To create the electromagnetic brake control signal.

[Conditions]
(1) While the ABS data is being transmitted (for several seconds after the servo-on signal has changed from OFF to ON), the motor should be at a stop.
(2) "Y34" (electromagnetic brake output selection) should be set in parameter No. 1 of the servo amplifier.

■ Positioning completion program

[Example]
To create the status information for servo positioning completion.

[Condition]
While the ABS data is being transmitted (for several seconds after the servo-on signal has changed from OFF to ON), the motor should be at a stop.

■ Zero speed program

[Example]
To create the status information for servo zero speed.

[Condition]
While the ABS data is being transmitted (for several seconds after the servo-on signal has changed from OFF to ON), the motor should be at a stop.
6. CONNECTION OF ABSOLUTE POSITION SYSTEM AND TYPICAL SEQUENCE PROGRAMS

■ Torque limiting mode program

[Example]
To create the status information for the servo torque limiting mode.

[Condition]
While the ABS data is being transmitted (for several seconds after the servo-on signal has changed from OFF to ON), the torque limiting mode should be off.

■ ABS sequence program example - 2-axis control

■ ABS sequence program for Y axis

[Example]
Correct the X-axis ABS sequence program given in the preceding section, and arrange the X- and Y-axis programs in series for use as a program for 2-axis control.

[Procedure]
Make corrections to the X-axis ABS sequence program to create a Y-axis program.

(1) Reallocate the X input contacts and Y output coils to match the Y axis.

(2) Allocate the D registers, M contacts, T timers and C counters so that those of the X axis are not repeated.

(3) Change the instructions marked *1 (A1SD75P2 buffer memory addresses) in the program of the preceding section (X-axis program) as indicated below to use the program for the Y axis.

[FROMP H0000 K5 D8 K1] → [FROMP H0000 K155 D8 K1]
[DFROP H0000 K72 D9 K1] → [DFROP H0000 K222 D9 K1]
[DTOP H0000 K1154 D3 K1] → [DTOP H0000 K1264 D3 K1]
[TO H0000 K1150 K9003 K1] → [TO H0000 K1260 K9003 K1]

[Program configuration]
6. CONNECTION OF ABSOLUTE POSITION SYSTEM AND TYPICAL SEQUENCE PROGRAMS

Data set type home position return program for Y axis

[Example]
Correct the X-axis data set type home position return program given in the preceding section, and arrange the X- and Y-axis programs in series for use as a program for 2-axis control.

[Procedure]
Make corrections to the X-axis data set type home position return program to create a Y-axis program.

1. Reallocate the X input contacts and Y output coils to match the Y axis.

2. Allocate the D registers, M contacts and T timers so that those of the X axis are not repeated.

3. Change the instructions marked *1 (A1SD71 buffer memory addresses) in the program of the preceding section (X-axis data set type home position return program) as indicated below to use the program for the Y axis.

\[
\begin{align*}
&\text{[DTOP]} \ H0000 \ K72 \ D9 \ K1 \rightarrow \text{[DTOP]} \ H0000 \ K222 \ D9 \ K1 \\
&\text{[DTOP]} \ H0000 \ K1154 \ D9 \ K1 \rightarrow \text{[DTOP]} \ H0000 \ K1204 \ D9 \ K1 \\
&\text{[TO]} \ H0000 \ K1150 \ K9003 \ K1 \rightarrow \text{[TO]} \ H0000 \ K1200 \ K9003 \ K1
\end{align*}
\]

[Program configuration]

- X-axis data set type home position return program (Program in the preceding section)
- Y-axis data set type home position return program (Write by referring to the X-axis program)
7. START-UP/MAINTENANCE

7.1 Parameter setting for the absolute position detection system

<table>
<thead>
<tr>
<th>Category</th>
<th>No.</th>
<th>Symbol</th>
<th>Name and function</th>
<th>Control Mode</th>
<th>Initial value</th>
<th>Unit</th>
<th>Setting range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic parameter</td>
<td>1</td>
<td>*OP1</td>
<td>Function selection 1: Select the servo type option.</td>
<td>0000</td>
<td></td>
<td></td>
<td>0000 to 1012</td>
</tr>
</tbody>
</table>

Absolute position selection
0: Invalid
1: Valid

For the setting of the other parameters, refer to the MR-J2-A Specifications and Installation Guide EB(NA)67286.
7. START-UP/MAINTENANCE

7.2 Checking the absolute position data

The absolute position data can be checked by using the Set-Up Software (MRZJW3-SETUP31E or later) in the following procedure:

Operation procedure
(1) Select "(D) Diagnostic" to display the sub menu.

(2) Select "ABS data display (B)" in the sub menu to call the ABS data display window.

(3) Press the END button to terminate the ABS data display window.
7. START-UP/MAINTENANCE

7.3 Start-up procedure for absolute position detection system

1) Installing the battery
   Refer to Section 2.2, item (2) Battery for retaining absolute position data.

2) Setting the parameters
   Set "1" at the leftmost digit of servo amplifier parameter No. 1 (1□□□□: absolute position detection valid). After that turn OFF the power and then turn it back ON.

3) Clearing the absolute position lost alarm (A.25)
   When the power is first turned ON after connecting the encoder cable, the absolute position lost alarm (A.25) is generated. Leave the system in this state for several minutes and then turn OFF the power. Turn ON the power again; the alarm state will be cleared.

4) Checking the transmission of absolute position data
   When the servo ON pushbutton switch is pressed, the absolute position data is transmitted to the programmable controller. Use the following procedure to check whether the absolute position data has been transmitted correctly or not.
   If the ABS data is transmitted correctly,
   1) The ready signal (RD) comes ON,
   2) At the programmable controller, the "ready to send" contact (M3 of A1SD71, M99 for 1PG) is turned ON,
   3) The value shown on the ABS data display window of the Set-Up Software (refer to Section 7.2) matches the value in the ABS data registers (D3 and D4 for the A1SD71, D106 and D107 for the 1PG) of the programmable controller. (When the home position address is 0.)

   If the ABS time-out warning (A.E5) or other data transfer error is generated in the programmable controller, take appropriate corrective action by referring to Section 8.2.

5) Setting the home position
   With the absolute position detection system, the coordinate system used for determining the position data is established when the home position is set in the system set-up operation. If positioning is executed before the home position has been set the motor will run uncontrollably and this will be dangerous. Always set the home position before starting operation. Home position setting is necessary in the following cases as well as when setting up the system.

<table>
<thead>
<tr>
<th>Cases in which home position setting is necessary</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Setting up the system</td>
</tr>
<tr>
<td>• When the control PCB in the servo amplifier is replaced or the servo amplifier is replaced.</td>
</tr>
<tr>
<td>• When the motor or the ABS encoder is replaced.</td>
</tr>
<tr>
<td>• When the absolute position lost alarm (AL25) is occurred.</td>
</tr>
</tbody>
</table>

For details of the methods for setting the home position, refer to Chapter 4.
7. START-UP/MAINTENANCE

7.4 Maintenance and inspection

(1) Battery maintenance
The service life of the battery is 5 years or longer. However, it is advisable to replace the battery every 3 or 4 years. If the battery alarm (A.9F) occurs, replace the battery immediately.

(2) Replacing the battery

1) Turn OFF the power supply to the amplifier.
2) Remove the battery. Follow the procedure described in Section 2.2, item (2) Battery for retaining absolute position data, in reverse order.
3) Install a new battery. Install the new battery within 1 hour after removal of the old one.
4) Turn ON the power to the servo amplifier and check if the absolute position lost alarm (A.25) has occurred. If the alarm has occurred, clear it and set the home position.
# 8. TROUBLESHOOTING

## 8. TROUBLESHOOTING

When the absolute position detection function is used, the following alarm and warning codes are added to those provided for the standard functions.

### 8.1 ABS error

<table>
<thead>
<tr>
<th>Display</th>
<th>Alarm code screen</th>
<th>Name</th>
<th>Definition</th>
<th>Cause</th>
<th>Corrective action</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.25</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>Absolute position lost</td>
<td>Absolute position data in error</td>
</tr>
<tr>
<td>A.92</td>
<td>Battery cable breakage warning</td>
<td>Voltage of absolute position detection system battery dropped.</td>
<td>1. Battery cable is broken.</td>
<td>Repair cable or change battery.</td>
<td></td>
</tr>
<tr>
<td>A.95</td>
<td>Home position setting error warning</td>
<td>Home position return could not be made.</td>
<td>1. Command pulses were entered after droop pulse clearance. 2. Reduce creep speed for home position return operation.</td>
<td>1. Make provisions so that command pulses are not entered after clearance. 2. The number of remaining droop pulses is larger than the in-position range set value.</td>
<td></td>
</tr>
<tr>
<td>A.9F</td>
<td>Battery warning</td>
<td>Voltage of absolute position detection system battery dropped.</td>
<td>Battery voltage dropped to 3.2V or less.</td>
<td>Change battery.</td>
<td></td>
</tr>
<tr>
<td>A.E3</td>
<td>Absolute position counter warning</td>
<td>Pulses of absolute position encoder are faulty</td>
<td>1. Noise entered encoder. 2. Encoder is faulty.</td>
<td>Take action against noise. Change servo motor.</td>
<td></td>
</tr>
<tr>
<td>A.E5</td>
<td>ABS time-out warning</td>
<td>Absolute position data transfer fault</td>
<td>1. PLC ladder program error 2. Mis-wiring of pin CN1B-9/CN1B-6</td>
<td>Correct program. Connect correctly.</td>
<td></td>
</tr>
<tr>
<td>A.EA</td>
<td>ABS servo ON warning</td>
<td>Servo ON (SON) signal was switched on within 1 sec. after system had gone into absolute position data transfer mode.</td>
<td>1. PLC ladder program error 2. SON signal mis-wiring</td>
<td>Correct program. Connect correctly.</td>
<td></td>
</tr>
</tbody>
</table>
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8.2 ABS data transfer error

The error check of the PC ladder program operates in the following conditions. If an error is detected, check the nature of the error, locate the cause and take appropriate action.

<table>
<thead>
<tr>
<th>Cause of ABS data transfer error and corrective action</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Error Item</strong></td>
</tr>
<tr>
<td>---------------</td>
</tr>
<tr>
<td>ABS communciation error</td>
</tr>
<tr>
<td>ABS data check sum error</td>
</tr>
<tr>
<td>ABS coordinate error</td>
</tr>
<tr>
<td>Servo alarm</td>
</tr>
</tbody>
</table>

Note: The output coil numbers and input contact numbers indicated in ( ) above correspond to the numbers for A1SD71 (AD71).
## Error clearing conditions

<table>
<thead>
<tr>
<th>Error</th>
<th>Output coil</th>
<th>Cause of actuation</th>
<th>Error clearing conditions</th>
<th>Servo operating conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABS communication error</td>
<td>Y49, Y11</td>
<td>• The ABS data transfer mode signal (Y41) is not completed within 5 seconds.</td>
<td>Turn OFF the servo ON PB signal (X36).</td>
<td>Ready signal (RD) is OFF.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• The send data ready signal (X32) is not turned OFF within 1 second after the ABS data request signal (Y42) is turned ON.</td>
<td></td>
<td>Note 1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• The ready to send signal (X32) remains OFF for longer than 1 second.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ABS check sum error</td>
<td>Y4A, Y12</td>
<td>• Discrepancy in sum check occurred four times consecutively.</td>
<td>AD71: The error state is cleared when the servo ON PB signal (X36) changes from OFF to ON.</td>
<td>Ready signal (RD) is ON.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1PC: The error status is cleared when the servo ON PB signal is turned OFF.</td>
<td></td>
</tr>
<tr>
<td>ABS coordinate error</td>
<td>Y4B, –</td>
<td>• The motor position is in the negative coordinate value range when the servo is turned ON or when the power supply is turned ON.</td>
<td>After moving the machine to positive coordinate value position in the JOG operation, turn OFF the servo ON signal and then turn it ON again.</td>
<td>Ready signal (RD) is ON.</td>
</tr>
<tr>
<td>Servo alarm</td>
<td>Y4B, Y10</td>
<td>Alarms relating to the servo amplifier</td>
<td>The error status is cleared when the alarm reset pushbutton switch is pressed or the power supply is turned OFF and then back ON.</td>
<td>Ready signal (RD) is OFF.</td>
</tr>
</tbody>
</table>

Note 1: To move the machine to a safe position before recovering machine operation, change the parameter setting for the absolute position detection mode (servo parameter No. 1) from "1□□□□" (valid) to "0□□□□". In this setting, move the machine in the JOG mode.

2: Details of the ABS communication alarm are given below.

1) The OFF period of the send data ready signal output from the servo amplifier is checked. If the OFF period is 1 second or longer, this is regarded as a transfer fault and the ABS communication error is generated. This error is generated if the ABS time-out warning (A,E5) is generated at the servo amplifier due to an ABS request time-out.

### Diagram:

ABS transfer mode

- ON
- OFF

ABS request

- ON
- OFF

Send data ready

- ON
- OFF

ABS communication error

- The signal does not come ON
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- Error clearing conditions

2) The time required for the ABS transfer mode signal to go OFF after it has been turned ON (ABS transfer time) is checked. If the ABS transfer time is longer than 5 seconds, this is regarded as a transfer fault and the ABS communication error is generated. This error is generated if the ABS time-out warning (A.E5) is generated at the servo amplifier due to an ABS transfer mode completion time time-out.

3) To detect the ABS time-out warning (A.E5) at the servo amplifier, the time required for the ABS request signal to go OFF after it has been turned ON (ABS request time) is checked. If the ABS request remains ON for longer than 1 second, it is regarded that an fault relating to the ABS request signal or the send data ready signal has occurred, and the ABS communication error is generated. This error is generated if the ABS time-out warning (A.E5) is generated at the servo amplifier due to an ABS request OFF time time-out.

8.3 Processing of absolute position data at detection of forward/reverse rotation stroke end

When a stroke end (LSP or LSN) is detected, the MR-J2 amplifier used with the A1SD71 (AD71) positioning module stops accepting the command pulse, and at the same time, clears the deviation counter value (droop) to zero to bring the servo motor shaft to an immediate stop. At this time, the programmable controller keeps outputting the command pulse. Since this causes a discrepancy between the absolute position data of the servo amplifier and the programmable controller, a difference will occur between the position data of the servo amplifier and that of the programmable controller. To prevent this difference in position data from occurring, do as described below. When the servo amplifier has detected the stroke end, perform jog operation or the like to clear the stroke end. After that, switch the servo ON signal off once, then on again, or switch the power off once, then on again. This causes the absolute position data of the servo amplifier to be transferred to the programmable controller, restoring the normal data.
<table>
<thead>
<tr>
<th>Print Date</th>
<th>*Manual Number</th>
<th>Revision</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sep., 1996</td>
<td>IB (NA) 67309-A</td>
<td>First edition Translated from IB-67308-A</td>
</tr>
<tr>
<td>Sep., 1997</td>
<td>IB (NA) 67309-B</td>
<td>Section 4-1: Note 3 changed. Section 4-2: Note 4 changed. Section 6-1-1: Connection diagram changed. &quot;COM1&quot; and &quot;COM2&quot; of A1SY40 connected to &quot;+24V&quot;. Section 6-3-3: Y-axis data setting type home position return program changed. Revised to conform to IB-67308-B.</td>
</tr>
<tr>
<td>Nov., 1997</td>
<td>IB (NA) 67309-C</td>
<td>Section 6-2-2: MR-J2-A clear signal (CR) pin number corrected. Section 6-3-2: Dog type home position return program corrected. Translated from IB-67308-D</td>
</tr>
</tbody>
</table>