# MITSUBISHI ELECTRIC

Programmable Controller
MELSEC-F

## USER'S MANUAL

### FX2N-1RM-E-SET PROGRAMMABLE CAM SWITCH

# FX2N

**Foreword**

- This manual contains text, diagrams and explanations which will guide the reader in the correct installation and operation of the Programmable Cam Switch FX2N-1RM-E-SET. It should be read and understood before attempting to install or use the unit.

- For handling of the FX2N/FX2NC Series PLC main unit and FX2N Series extension blocks as well as details of instructions, refer to the corresponding Hardware manuals and programming manuals offered separately.

- If in doubt at any stage of the installation of Programmable Cam Switch FX2N-1RM-E-SET always consult a professional electrical engineer who is qualified and trained to the local and national standards that applies to the installation site.

- If in doubt about the operation or use of Programmable Cam Switch FX2N-1RM-E-SET please consult the nearest Mitsubishi Electric distributor.

- This manual is subject to change without notice.

# Programmable Cam Switch
# FX2N-1RM-E-SET

## USER'S MANUAL

Manual number : JY992D71101

Manual revision : N

Date : August 2018

### Guidelines for the safety of the user and protection of the Programmable Cam Switch FX2N-1RM-E-SET

This manual provides information for the use of the programmable cam switch FX2N-1RM-E-SET. The manual has been written to be used by trained and competent personnel. The definition of such a person or persons is as follows;

a) Any engineer who is responsible for the planning, design and construction of automatic equipment using the product associated with this manual should be of a competent nature, trained and qualified to the local and national standards required to fulfill that role. These engineers should be fully aware of all aspects of safety with regards to automated equipment.

b) Any commissioning or service engineer must be of a competent nature, trained and qualified to the local and national standards required to fulfill that job. These engineers should also be trained in the use and maintenance of the completed product. This includes being completely familiar with all associated documentation for the said product. All maintenance should be carried out in accordance with established safety practices.

c) All operators of the completed equipment (see Note) should be trained to use this product in a safe manner in compliance to established safety practices. The operators should also be familiar with documentation which is associated with the operation of the completed equipment.

Note : Note: the term 'completed equipment' refers to a third party constructed device which contains or uses the product associated with this manual.

### Notes on the Symbols Used in this Manual

At various times throughout this manual certain symbols will be used to highlight points of information which are intended to ensure the users personal safety and protect the integrity of equipment. Whenever any of the following symbols are encountered its associated note must be read and understood. Each of the symbols used will now be listed with a brief description of its meaning.

### Hardware Warnings

1) Indicates that the identified danger **WILL** cause physical and property damage.

2) Indicates that the identified danger could **POSSIBLY** cause physical and property damage.

3) Indicates a point of further interest or further explanation.

### Software Warnings

4) Indicates special care must be taken when using this element of software.

5) Indicates a special point which the user of the associate software element should be aware of.

6) Indicates a point of interest or further explanation.

- Under no circumstances will Mitsubishi Electric be liable responsible for any consequential damage that may arise as a result of the installation or use of this equipment.

- All examples and diagrams shown in this manual are intended only as an aid to understanding the text, not to guarantee operation. Mitsubishi Electric will accept no responsibility for actual use of the product based on these illustrative examples.

- Please contact a Mitsubishi Electric distributor for more information concerning applications in life critical situations or high reliability.

| 1 | Introduction |
|---|---|

| 2 | Installation |
|---|---|

| 3 | Specifications |
|---|---|

| 4 | External Wiring |
|---|---|

| 5 | Extension Block Specifications and External Wiring |
|---|---|

| 6 | Basic Setting |
|---|---|

| 7 | BFM Assignment |
|---|---|

| 8 | Program Operating Procedures |
|---|---|

| 9 | Monitor |
|---|---|

| 10 | Test |
|---|---|

| 11 | Diagnostics |
|---|---|

| | Appendix |
|---|---|

# 1.   Introduction

This section describes the outline of the programmable cam switch FX2N-1RM and introduces the peripheral equipment.

## 1.1   Outline of the product

The programmable cam switch FX2N-1RM (hereinafter referred to as FX2N-1RM or unit) detects the rotation angle of a machine using a brushless resolver, and turns on/off up to 48 points of transistor outputs at a programmed angle (position).
The basic function of the FX2N-1RM is equivalent to a mechanical cam switch shown in the figure on the next page. However, different from a mechanical cam switch, fine adjustment of the angle of many cam discs assembled in the mechanism and replacement of switches are not required in the FX2N-1RM.

## 1.2   Features

1 )   The angle can be detected with high precision even while a machine is rotating at high speed.

2 )   One FX2N-1RM unit can be used individually or up to three FX2N-1RM units can be connected at the end of the system and used as special units of an FX2N/FX3U/FX2NC/FX3UC programmable controller (hereinafter referred to as PLC).
(Refer to Paragraph 1.5 for details.)

3 )   When transistor output extension blocks for the FX2N are connected, up to 48 points of non-contact outputs are available. Up to 32 points can be turned on at one time. Up to 8 ON/OFF operations (STEP0 to STEP7) are enabled at each point.
(Maximum speed: 830 r/min during direct output)

4 )   Operation angle setting and monitor display can be performed from the dedicated data setting panel (integrated add-on type) or by FROM/TO instructions given by the PLC main unit.

5 )   An EEPROM (no battery) is built in. Up to 8 types of programs can be saved.

6 )   A bank can be switched, a program can be modified, and the automatic angle advance quantity can be modified while the program is running.

7 )   The ladder support software for personal computers in the PLC and the FX-20P-E (both of them are compatible with FX2N) can be used to save or transfer programs.

8 )   The cable of the brushless resolver assembled in the machine can be extended up to 100 m (3937 inch). (A relay cable of 5 m (196.85 inch) is offered as standard.)

9 )   The automatic angle advance function can compensate for the mechanical delay generated while a machine is rotating at a high speed.

< Mechanical cam-operated switch >

48-step cam disc (8 teeth maximum/disc)

48 limit switches (1 switch/disc)
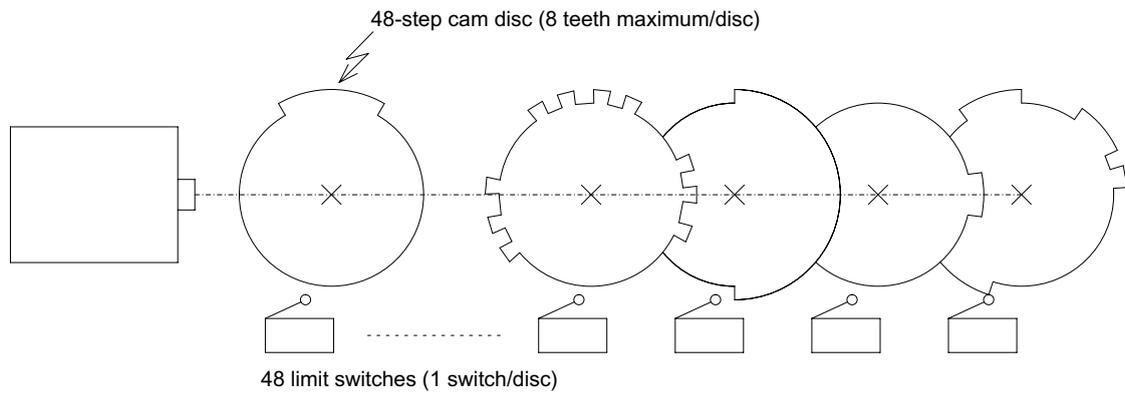
## 1.3 Product configuration

The FX2N-1RM package contains the following components.

- Programmable cam-operated switch FX2N-1RM (including data setting panel)
- Signal cable FX2N-RS-5CAB
- Resolver F2-720RSV
- Extension cable to connect PLC (55 mm(2.17 inch))

## 1.4 Outside dimensions and name of each part

Dimensions: mm (inch)
Weight: approx.0.5kg
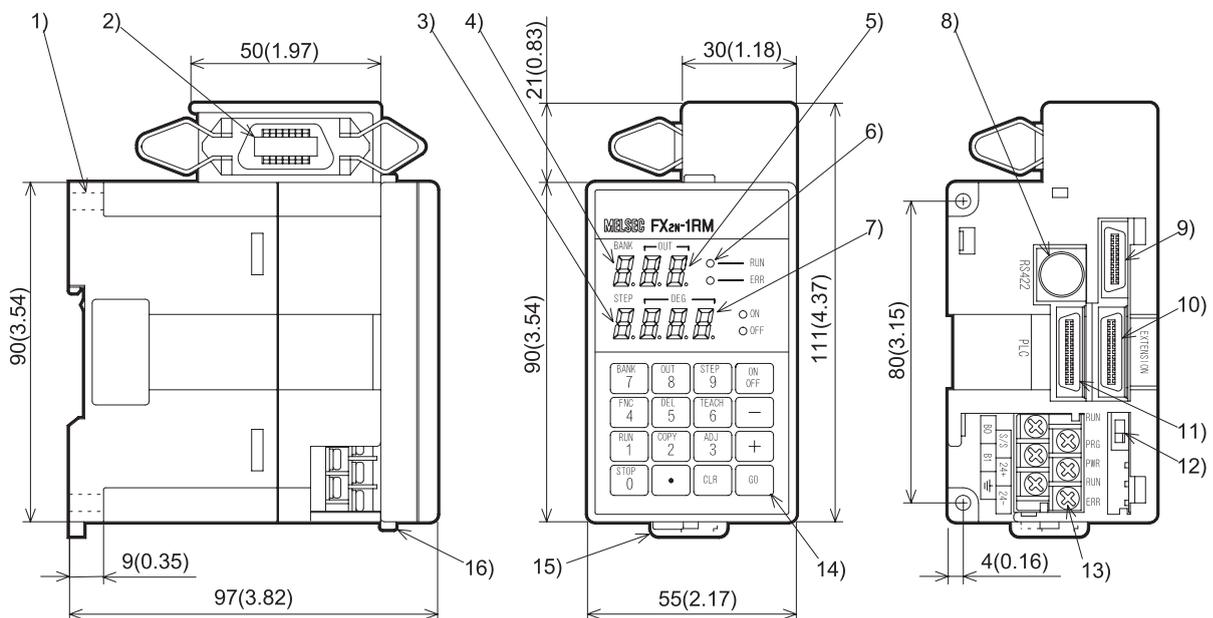


When the data setting panel is removed

1 ) Mounting hole in 2 positions (2-φ 4.5 (1.77))
2 ) Connector to connect resolver
3 ) STEP (output pattern) display
4 ) BANK (program No.) display
5 ) OUT (output No.) display
6 ) Operation display LED
    RUN: Operation status display
    ERR: Error display
    ON: ON output setting display (during setting)
    OFF: OFF output setting display (during setting)

7 ) DEG (angle) display
8 ) Connector to set personal computer or FX-20P-E
9 ) Connector to connect data setting panel
10) Connector to connect extension block
11) Connector to connect PLC
12) RUN/PRG selector switch
13) Power input/back change-over input terminal
    (terminal screw M3)
14) Sixteen keys for operation
15) Hook to attach DIN rail
16) Button to attach data setting panel

<Signal cable FX2N-RS-5CAB>                                    [Unit: mm (inch)]

<Relay cable F2-RS-5CAB> (option)

<Resolver F2-720RSV>

Mounting hole 4-φ4.5(0.18)

# 1.5 System configuration

## 1.5.1 Connecting the FX2N-1RM to PLC
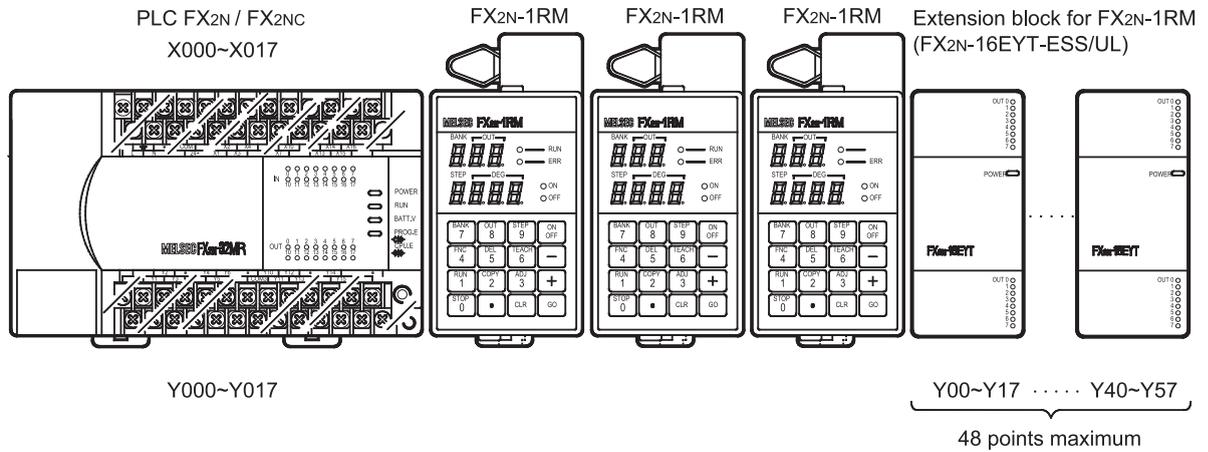


- The FX2N-1RM-SET can connect the following extension block.
  FX2N series extension block. (FX2N-16EYT-ESS/UL)
- Up to 3 FX2N-1RM units can be connected to the PLC main unit at the end of the system.
  The number of blocks that can be connected depends on the PLC main unit and version of the FX2N-1RM.

| Main unit | Version of FX2N-1RM | The number which can be connected | Note |
|---|---|---|---|
| FX2N | V1.00 (before 1998/2) | 1 | — |
| | V2.00 (from 1998/2) | 3 | — |
| FX2NC | From the first product | 1 | • FX2NC-CNV-IF is necessary for the connection.<br>• FX0N-30EC and FX0N-65EC cannot be used. |
| FX3U | From the first product | 3 | — |
| FX3UC | V1.00 (before 1998/2) | 1 | • FX2NC-CNV-IF is necessary for the connection.<br>• FX0N-30EC and FX0N-65EC cannot be used. |
| | V2.00 (from 1998/2) | 3 | |

- The FX2N-1RM units occupy 8 I/O points without regard to the number of units connected.
  (The ratio of input points and output points is arbitrary.)
- As shown in the diagram up to 48 points offered by output extension blocks can be connected to the FX2N-1RM unit at the end of the system.
  The extension blocks dedicated to outputs connected are treated as the outputs of the FX2N-1RM. They are not recognized by the PLC main unit, and not included in the number of I/O points (256 points maximum) of the PLC main unit.
- Octal numbers are assigned as output Nos. of the extension blocks connected to the FX2N-1RM from the extension block nearest to the FX2N-1RM (Y00 to Y07, U10 to Y17, . . . Y50 to Y57).

- Only output extension blocks are allowed to be connected to the FX2N-1RM.
  (Even if extension blocks dedicated to input are connected, no input can be received and input Nos. are not assigned.)
- Each data or bit information can be read and written between the PLC main unit and the FX2N-1RM using FROM/TO instructions.
  When two or more FX2N-1RM units are connected, data information and bit information can be read and written in only the FX2N-1RM unit nearest to the PLC main unit using FROM/TO instructions directly given by the PLC main unit.
  In the second and third FX2N-1RM units, data information and bit information are read and written from the PLC main unit via the unit nearest to the PLC main unit.
- All the FX2N-1RM units must be installed adjacent to each other.

### 1.5.2    Using the FX2N-1RM individually
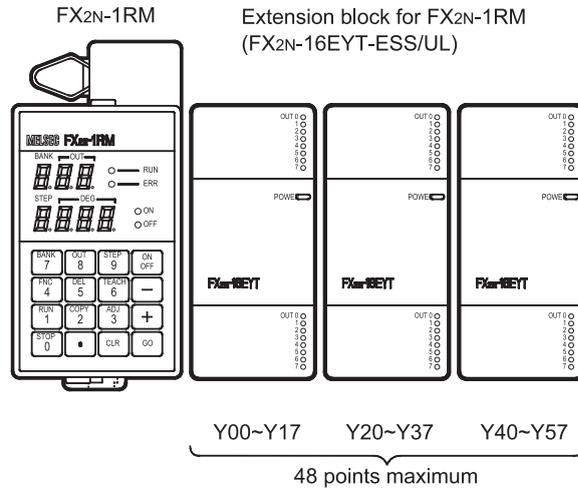


FX2N-1RM

Extension block for FX2N-1RM
(FX2N-16EYT-ESS/UL)

Y00~Y17    Y20~Y37    Y40~Y57

48 points maximum

- The FX2N-1RM-SET can connect the following extension block.
  FX2N series extension block. (FX2N-16EYT-ESS/UL)
- Up to 48 output points can be connected to the FX2N-1RM. Octal numbers are assigned as output Nos. from the extension block nearest to the FX2N-1RM (Y00 to Y07, Y10 to Y17, . . . Y50 to Y57).
- Only extension blocks with dedicated output are allowed to be connected to the FX2N-1RM. (If extension blocks with dedicated input are connected, no input can be received and input Nos. are not assigned.)
- Two or more FX2N-1RM cannot connected without connecting the PLC main unit.

### 1.5.3 CC-Link connection

<Using the FX2N-1RM individually>

**Composition**
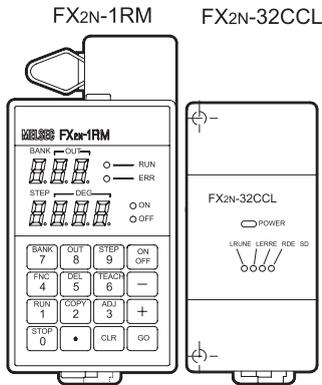
FX2N-1RM    FX2N-32CCL



- When one FX2N-1RM is used in CC-Link, FX2N-32CCL interface block (here in after referred to as FX2N-32CCL) is connected with the connector for the extension block connection FX2N-1RM.
- FX2N-32CCL can not be used together with the output extension blocks.
- Refer to FX2N-32CCL user's manual for power supply wiring of FX2N-32CCL and connection with master unit.

**Flow data**

| FX2N-1RM | | FX2N-32CCL | | Master unit |
|---|---|---|---|---|
| BFM#2(Bank specification) | ← | BFM#8(RWw0) | ← | Remote register RWw |
| BFM#3(Command) | ← | BFM#0(RY00~0F) | ← | Remote output RY |
| BFM#8(Present angle) | → | BFM#11(RWr3) | → | Remote register RWr |
| BFM#9(Rotational speed) | → | BFM#12(RWr4) | → | Remote register RWr |
| BFM#10~#12(State of output) | → | BFM#8~#10(RWr0~2) | → | Remote register RWr |
| BFM#28(Status) | → | BFM#0(RX00~0F) | → | Remote input RX |

Always    Link scanning
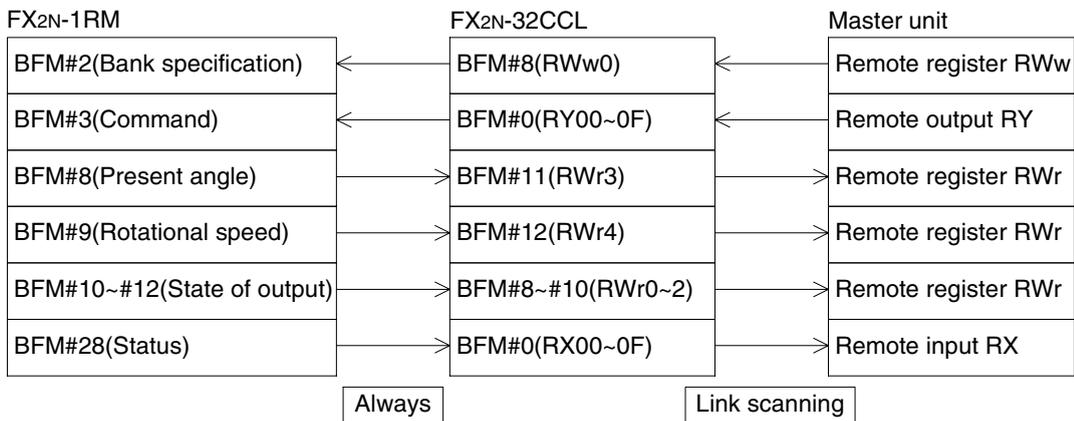
- The communication between FX2N-1RM and FX2N-32CCL is always done while energizing the power supply. The communication between FX2N-32CCL and master unit is done to the link scanning.
- When setting the number of occupied stations of FX2N-32CCL is 1, BFM#9 of FX2N-1RM (rotational speed) is not transmitted.
  Set the number of occupied stations in 2 when you transmit the rotational speed.
- When cc-link is connected, setting and the program for the communication are unnecessary in FX2N-1RM. Refer to each user's manual for setting the communication in FX2N-32CCL and master unit

<Two or more FX2N-1RM units are connected with PLC>

## Composition
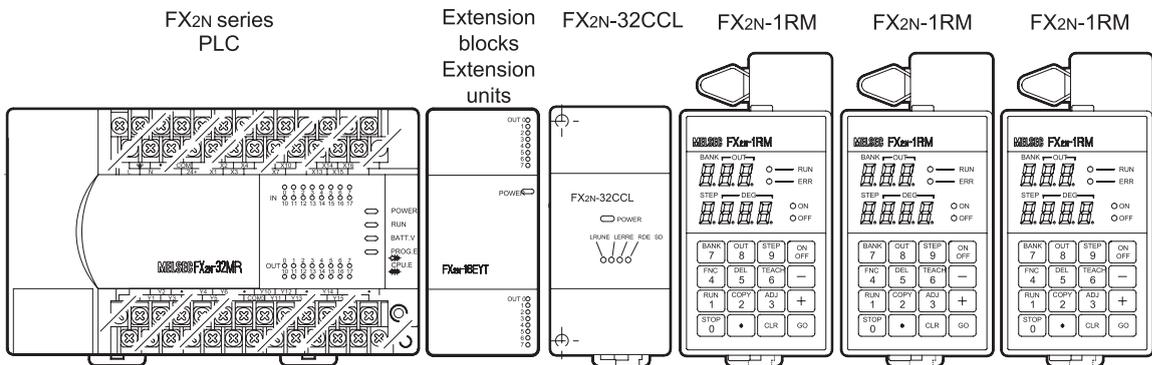


- When two or more FX2N-1RM units ate connected and used for PLC, FX2N-32CCL is connected at the right of the main unit of PLC and FX2N-1RM is connected at the end of the system.
- Connected number of FX2N-1RM and the limitation concerning the connection of the output extension block are the same as time when FX2N-32CCL is not connected. (Refer to paragraph 1.5.1)
- Refer to FX2N-32CCL user's manual for power supply wiring of FX2N-32CCL and connection with master unit.

## Flow of data
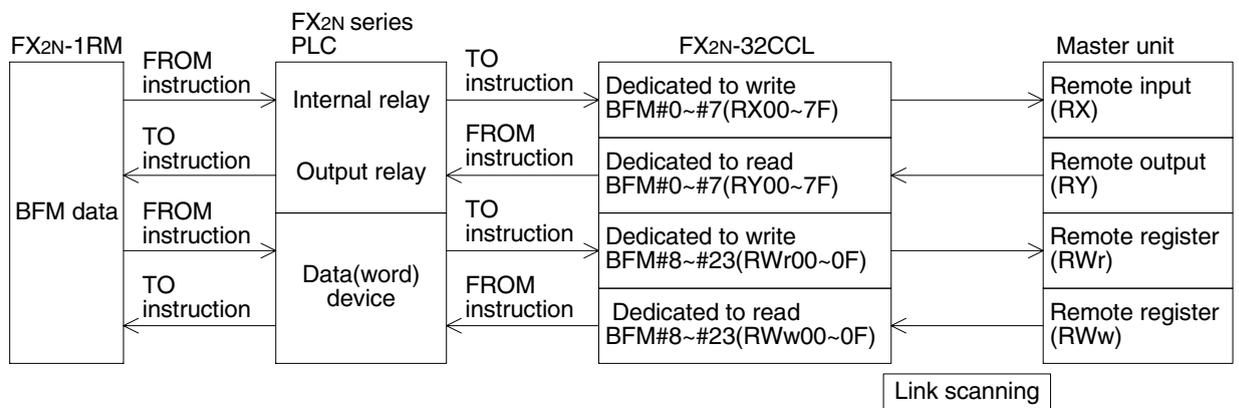


- Data is read/write by between FX2N-1RM, PLC and FX2N-32CCL.
  The communication between FX2N-32CCL and master unit is done to the link scanning.
- When cc-link is connected, setting and the program for the communication are unnecessary in FX2N-1RM. Refer to each user's manual for setting the communication in FX2N-32CCL and master unit

## 1.5.4    Resolver and connection cable
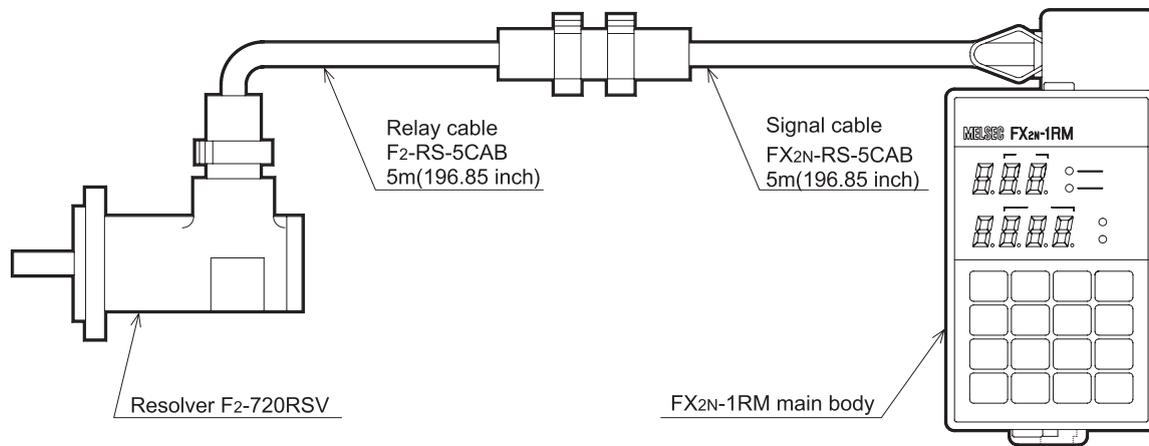
<Connection diagram>



When the signal cable is not long enough, relay cables can be connected for extension as shown in the figure above. Two or more relay cables can be used.
The maximum extension length is 100 m (3937 inch).

### 1.5.5    Connecting the peripheral equipment

< Data setting panel >
This panel allows data setting, data read, monitoring, copy between banks, teaching and fine adjustment in the RUN mode.

Data setting panel

When removing the data setting panel, press the attachment buttons provided at the top and the bottom of the data setting panel.

FX2N-1RM
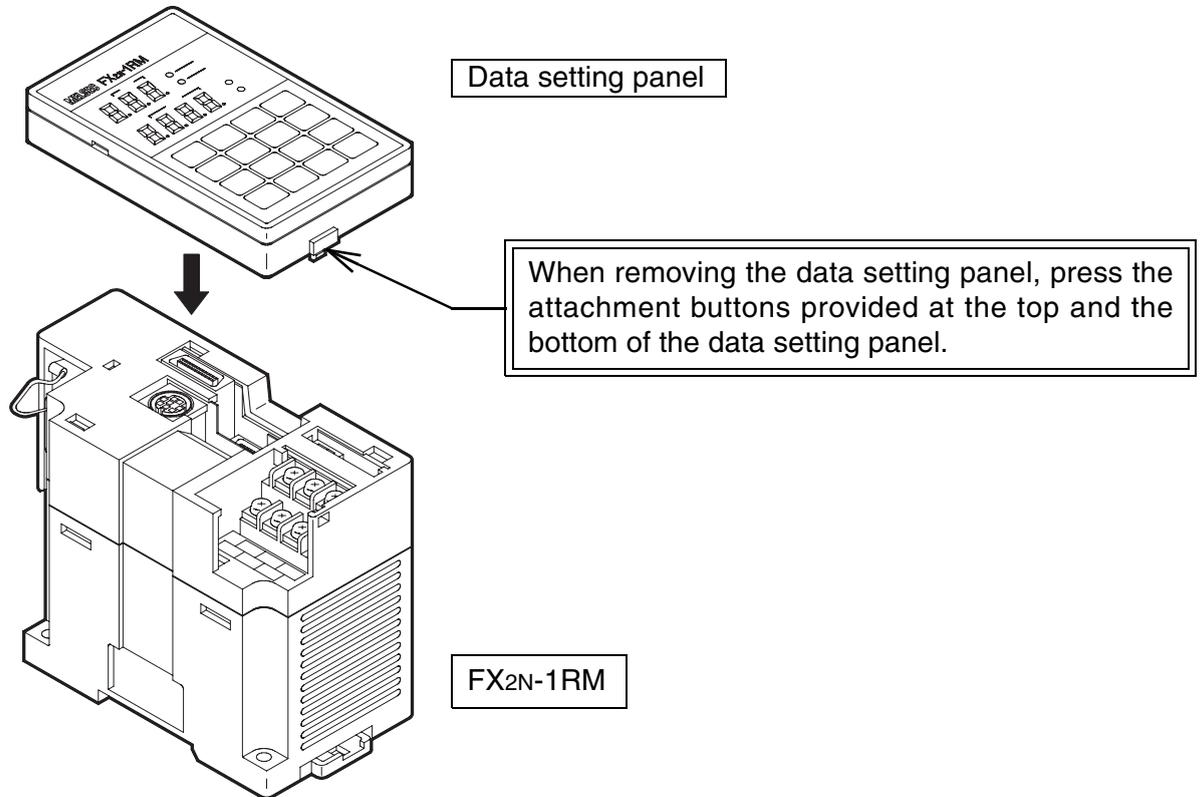
< Personal computer >
A personal computer allows save and transfer of programs.



FX-232AW
FX-232AWC
FX-232AWC-H

Applicable software
FX-PCS/WIN-E
GX Developer
(compatible with FX2N)

FX-422CAB0

F2-232CAB-1
(Use the D-sub 9pin as
the RS-232C connector
on the computer side)

FX2N-1RM
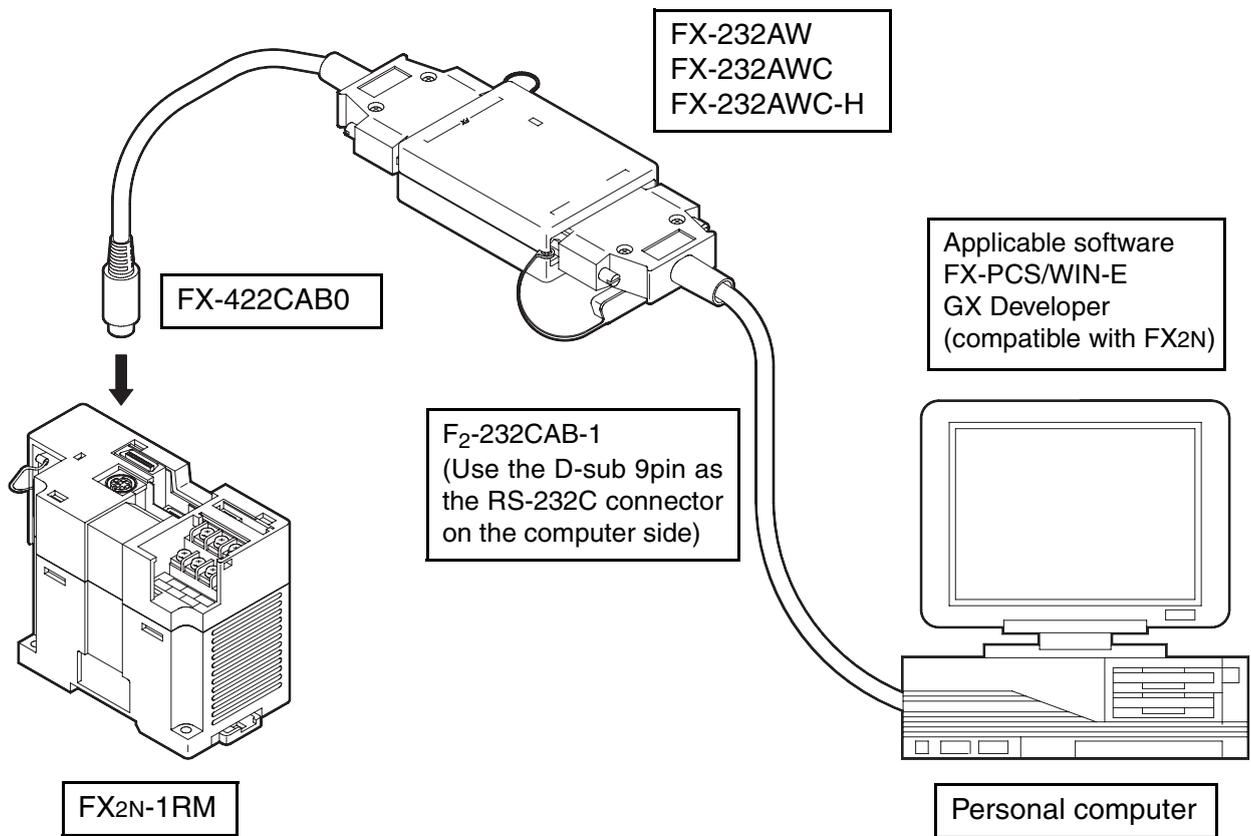
Personal computer

<FX-20P-E>
The FX-20P-E allows the save and transfer of programs.
Use the FX-20P-RWM and a memory cassette to save programs.

FX-EPROM-8
FX-EEPROM-8

FX-20P-RWM

FX-20P-E
(compatible with FX2N)

FX-20P-CAB0
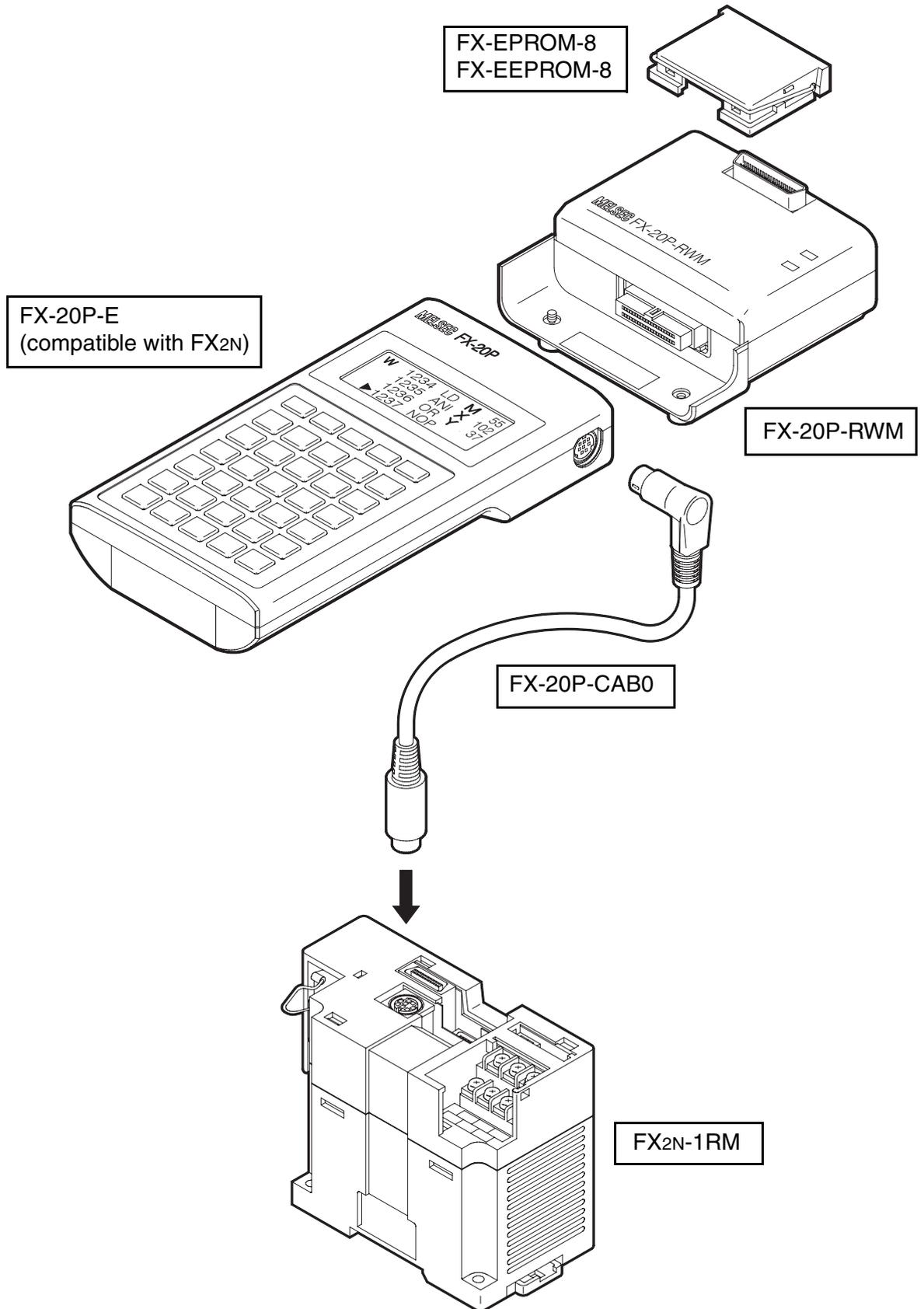
FX2N-1RM

**1.5.6    Cautions on use of a personal computer and the FX-20P-E**

- Only the program transfer function is available from a personal computer or the FX-20P-E to the FX2N-1RM. The monitor function, the test function, the current value change function, etc. are not available. (If such a function is used, a communication error occurs.)
  Set the parameter as shown in the table below when transferring programs.

| PLC model | FX2N | |
|---|---|---|
| Memory capacity | 8K step | |
| File register | 14 blocks (7,000 points) | |
| Comment | 0 block | |
| Latch range | M500~M1023 | Equivalent to values at time of shipment from plant |
| | S500~S999 | |
| | C100~C199 | |
| | C220~C255 | |
| | D200~D511 | |
| Program | All NOP (unattended) | |

If a program is transferred while the parameters are not set as shown above, a parameter mismatch error or program mismatch error occurs.

- Use a personal computer or the FX-20P-E only when FX2N-1RM is in PRG mode (halt condition). The following may occur if they are used in RUN mode:
  - FX2N-1RM is overloaded because the power is also supplies the peripheral equipment and the FX2N-1RM stops.
  - Communication between the peripheral equipment and FX2N-1RM becomes very slow and a communication error takes place.

- When a program is transferred from a personal computer or the FX-20P-E, D1000 to D7143 correspond to BFM #1000 to BFM #7143, D7144 to D7145 correspond to BFM #0 to BFM #1, and D7146 to D7159 correspond to BFM #13 to BFM #26.
  At this time, the angle data and FNC instructions (FNC70 to 75, 90) among D1000 to D7159 are fixed to a double value (720 degrees/rotation) without regard to the setting of the resolution (selected by the data setting panel or BFM #0 b6).
  D7144 (BFM #0), D7146 (BFM #13) and D7148 (BFM #15) are treated by one time value.

  Example

  ON/OFF angle
  At BFM #1000=100°, D1000 becomes 200.

  FNC

  When FNC 70 (BCD output) is set, D1000 becomes 2140. Continuing D1001 reaches twice value at strobing ON time.

  $$D1000 = ( \underline{1000} + \underline{70} ) \times 2 = \underline{2140}$$
  $$\quad\quad\quad\quad \text{fixed} \quad \text{FNC} \quad \text{value of}$$
  $$\quad\quad\quad\quad \text{value} \quad \text{number} \quad \text{D1000}$$

  When strobing ON time is 50ms, D1001 becomes 100.

  When individual automatic angle advance function is set, D6376 to D6393 reach the value twice the number of rotations, the turning ON angles, and the turning OFF angles of S0 to S6.

- The table below shows the applicable versions for personal computers and the FX-20P-E.

| Peripheral equipment | FX2N-1RM | |
| --- | --- | --- |
| | **V. 2.20 or earlier** | **V. 2.30 or later** |
| FX-PCS/WIN-E(V.1.00 to V.2.11) | applicable | |
| FX-PCS/WIN-E(V.3.00 or later) | not applicable | applicable |
| GX Developer | not applicable | applicable from SW2D5☐-GPPW-E |
| FX-20P-E | applicable from V. 3.00 | |

# Memo

| 1 | Introduction |
|---|---|

| 2 | Installation |
|---|---|

| 3 | Specifications |
|---|---|

| 4 | External Wiring |
|---|---|

| 5 | Extension Block Specifications and External Wiring |
|---|---|

| 6 | Basic Setting |
|---|---|

| 7 | BFM Assignment |
|---|---|

| 8 | Program Operating Procedures |
|---|---|

| 9 | Monitor |
|---|---|

| 10 | Test |
|---|---|

| 11 | Diagnostics |
|---|---|

| | Appendix |
|---|---|

# 2.    Installation

This section describes how to install the FX2N-1RM and the resolver.

## 2.1    Installation method

The FX2N-1RM can be mounted via a DIN rail or directly mounted with M4 screws.

**< When mounted via a DIN rail >**
The FX2N-1RM can be mounted to a DIN rail DIN 46277 (Width: 35 mm (1.38 inch)) without any modification.
When removing the FX2N-1RM, pull the DIN rail mounting hook downward.

**< When directly mounted >**
Mount the FX2N-1RM with M4 screws while referring to section 1.4 Outside dimensions and name of each part.
Assure clearance of 1 to 2 mm (0.04 to 0.08 inch) between units.

## 2.2    Wiring
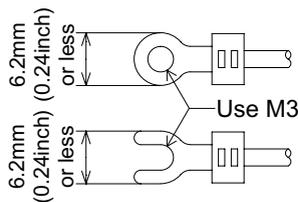
- Use crimp-style terminals of the size shown on the left.
- The terminal tightening torque should be 0.5 to 0.8 N·m. Tighten terminals securely so that malfunction cannot occur.

6.2mm (0.24inch) or less
Use M3
6.2mm (0.24inch) or less

**When arranged in 2 rows**

Main unit

Extension cable

FX2N-1RM

50 mm (1.97 inch) or more
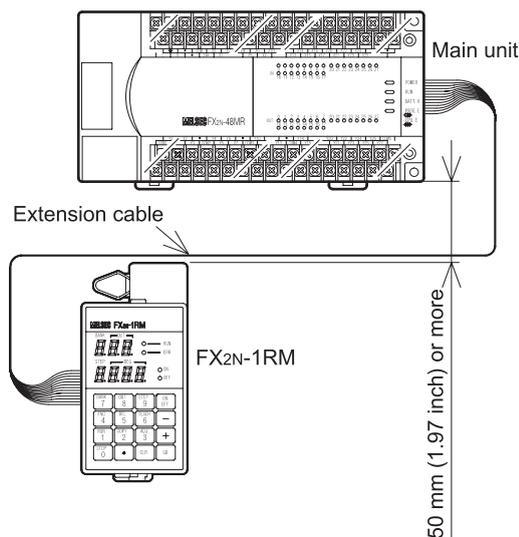
- An extension cable of 55 mm (2.17 inch) is offered as an accessory of the FX2N-1RM.
  An extension cable of FX0N-30EC(300mm,11.81 inch) and FX0N-65EC(650mm,25.59 inch) are offered as options.
  For 1-row arrangement: Cable of 55 mm(2.17 inch)
  For 2-row arrangement: Cable of  300mm(11.81 inch), 650 mm(25.59 inch) (option)
  (When FX2N-1RM is connected with an FX2NC/FX3UC series PLC, these extension cables cannot be used.)

- A cable is built in an extension block.

- When connecting an extension cable, fold it and accommodate it in the connector cover of the counterpart equipment as shown in the figure on the right.
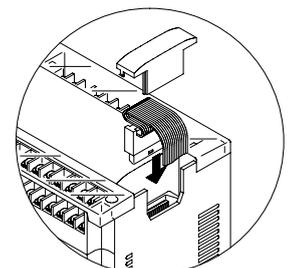
# 2.3  Installing the resolver

When installing a resolver, pay rigid attention to eccentricity of the rotation shaft and tilt of the shaft. Attach a resolver to a machine via an elastic coupling.

Example: NA-15 ($\phi$10 (0.39 inch) $\times$ $\phi$10 (0.39 inch)) manufactured by Nihon Miniature Coupling
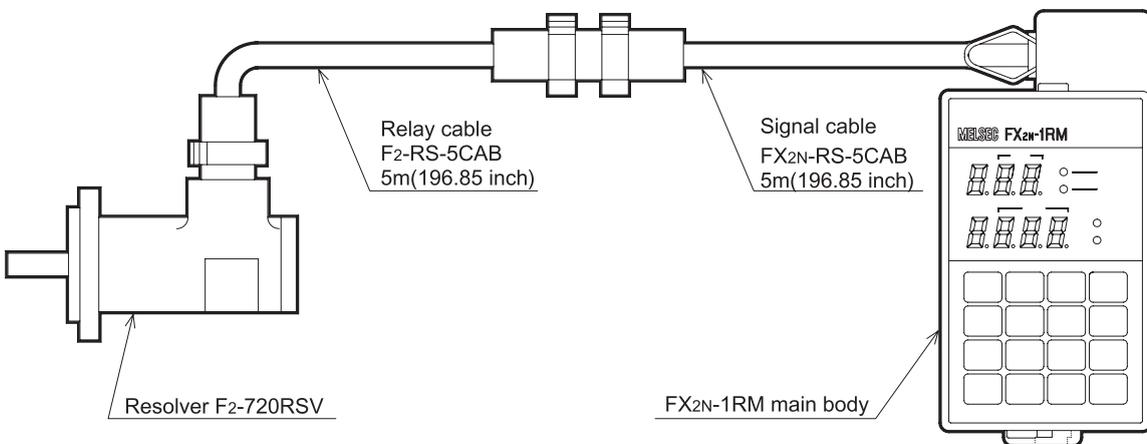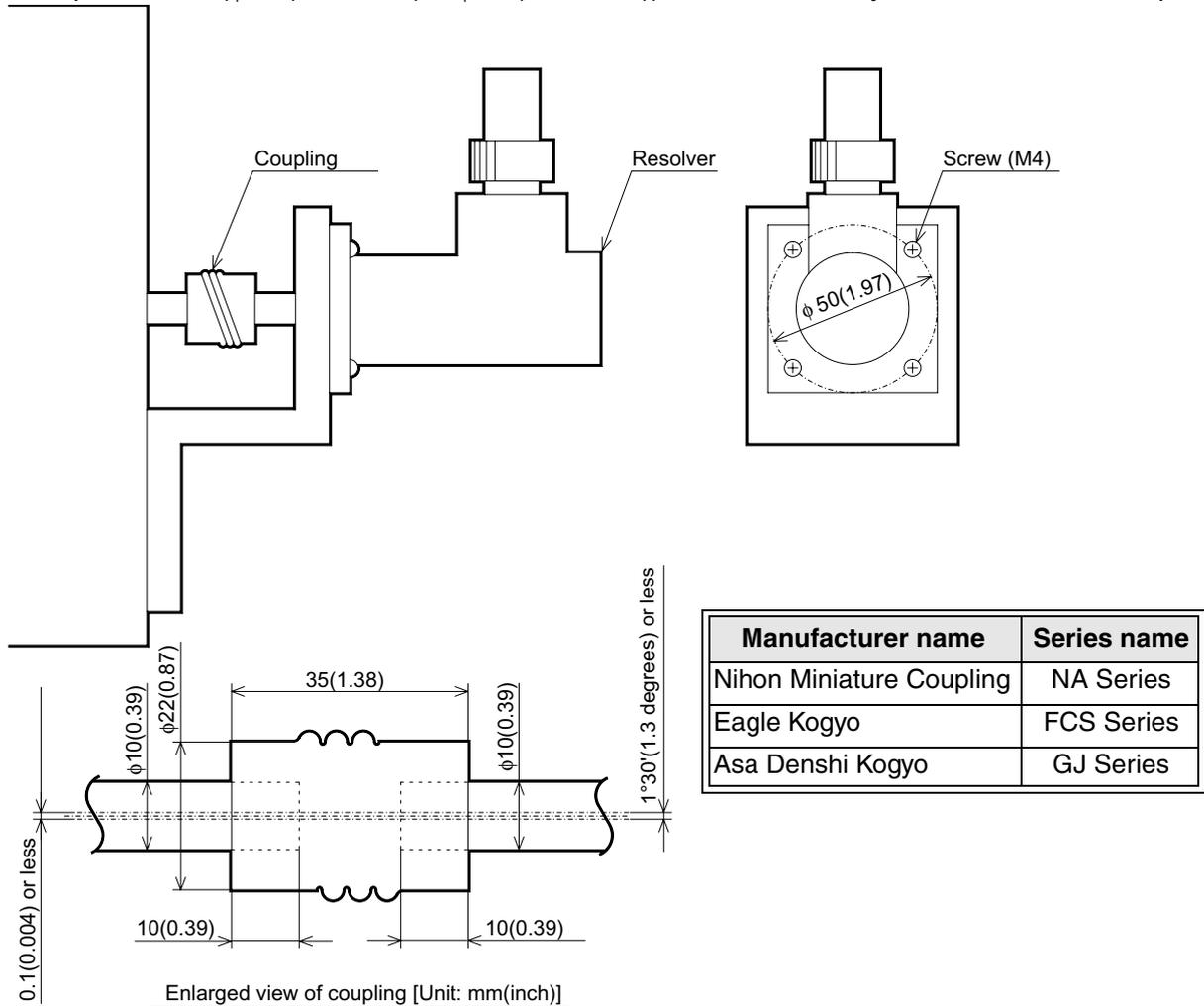
| Manufacturer name | Series name |
|---|---|
| Nihon Miniature Coupling | NA Series |
| Eagle Kogyo | FCS Series |
| Asa Denshi Kogyo | GJ Series |

Enlarged view of coupling [Unit: mm(inch)]

When the signal cable is not long enough, relay cables can be connected for extension as shown in the figure above.

**Cautions on installation**

- Use the unit in the environment in accordance with the environmental specifications described in Paragraph 3.1 in this manual.
  Do not use the unit in a place with dust, soot, conductive dust, corrosive gases (Salt air, $Cl_2$, $H_2S$, $SO_2$, $NO_2$, etc.) or flammable gases. Do not use in places exposed to high temperature, condensation, wind and rain, vibrations or possible impacts.
  If the unit is used in such a place, electrical shocks, fires, malfunction, damage to the unit or deterioration in the performance of the unit may occur.
- Do not drop cutting chips and electric wire chips into the ventilation window of the PLC while drilling screw holes or performing the wiring work.
  If such chips are dropped, fires, failures or malfunction may occur.
- When the installation work is completed, remove the dust preventive sheet attached to the ventilation window of the PLC.
  If the sheet is not removed, fires, failures or malfunction may occur.
- Connect cables such as extension cables and memory cassettes securely to the specified connectors respectively.
  If such cables and cassettes are not connected correctly, malfunction may occur caused by imperfect contact.

**Note**

- When a dust preventive sheet is provided on an extension block, adhere it on the ventilation window during the installation/wiring work.
- Never install the unit on the floor, on the ceiling or in the vertical direction. If the unit is installed in such a way, the temperature may become too high.
  Make sure to install the unit in the horizontal direction as shown in the figure on the right.
- Arrange extension cables so that connectors on the left side of extension units, extension blocks, and special units are connected on the side near the main unit.
- Assure clearance of 50 mm (1.97 inch) or more between the unit main unit and other equipment or structure. Keep a high voltage cable, high voltage equipment, and power equipment from the unit as much as possible.
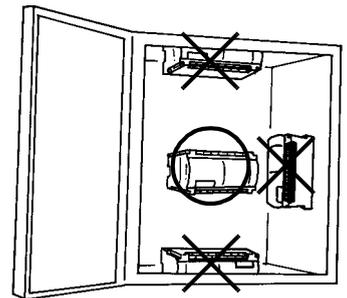
**Cautions on wiring**

- Make sure to shut down all the phases of the power supply outside the PLC before starting the installation/wiring work.
  If all the phases are not shut down, electrical shocks or damage to the product may occur.
- Make sure to attach the terminal covers offered as accessories before supplying the power and operating the product after the installation/wiring work has been finished.
  If the covers are not attached, electrical shocks may occur.

**Note**

- Never let the signal input line and the signal output line of the PLC go through the same cable.
- Never let the signal input line and the signal output line of the PLC go through the duct together with other power lines and output lines.
  Never bind the signal input line and the signal output line of the PLC together with other power lines and output lines.
- When the cautions above are observed, no problem should be expected with regard to noise even if the input/output wiring is extended to 50 to 100 m (1968.5 to 3937.0 inch). It is recommended, however, to set the wiring length to 20 m (787.4 inch) or less to assure safety.
- Extension cables are most susceptible to noise. When wiring them, keep them away from the output of the PLC and other power lines by at least 30 to 50 mm (1.18 to 1.97 inch).

# 3.   Specifications

This section describes the specifications of the FX2N-1RM and the resolver.

**Cautions on design**

- Provide a safety circuit outside the PLC so that the entire system can operate conservatively in any case even if an error has occurred in the external power supply or a failure has occurred in the PLC.
  If a safety circuit is not provided, an accident may occur caused by malfunction or erroneous output.

1 ) Make sure to construct a circuit outside the PLC as to an emergency stop circuit, a protection circuit, an interlock circuit for reverse operations such as normal rotation and reverse rotation and an interlock circuit to prevent mechanical damages such as for upper and lower limits for positioning.

2 ) When the PLC CPU has detected an abnormality by the self-diagnosis function such as a watchdog timer error, all the outputs are turned off. When an abnormality has occurred in the I/O control area, etc. which cannot be detected by the PLC CPU, the output control may be disabled.
  Design the external circuit and the mechanism so that the machine can operate conservatively in such cases.

3 ) The output current of the service power supply for the sensor varies depending on the model and existence of extension blocks. If overload has occurred, the voltage is automatically dropped, the input to the PLC is disabled, and all the outputs are turned off.
  Design the external circuit and the mechanism so that the machine can operate conservatively in such a case.

4 ) When a failure has occurred in a relay, transistor, TRIAC, etc. in the output unit, the output may be kept turned ON or OFF.
  Design the external circuit and the mechanism so that the machine can operate conservatively with regard to an output signal which may lead to a serious accident.

# 3.1 General specifications

| Ambient temperature | 0 to 55°C when operating and -20 to 70°C when stored | | | | |
|---|---|---|---|---|---|
| Ambient humidity | 35 to 85% RH (no condensation) when operating | | | | |
| **Vibration resistance** | | Frequency (Hz) | Acceleration (m/s$^2$) | Half amplitude (m/m) | Sweep Count for X, Y, Z: 10 times (80 min in each direction) |
| | When installed on DIN rail | 10 to 57 | – | 0.035 | |
| | | 57 to 150 | 4.9 | – | |
| | When installed directly | 10 to 57 | – | 0.5 (2G maximum) | |
| Impact resistance | 98 m/s$^2$ Acceleration, Action time: 11ms, 3 times by half-sine pulse in each direction X, Y, and Z | | | | |
| Noise resistance | By noise simulator at noise voltage of 1,000 Vp-p, noise width of 1 µs rise time of 1 ns and period of 30 to 100 Hz | | | | |
| Dielectric withstand voltage | 500 V AC for one minute | | Between all terminals as a whole and ground terminal | | |
| Insulation resistance | 5 MΩ or higher by 500 V DC insulation resistance tester | | Between all terminals as a whole and ground terminal | | |
| Grounding | Class D grounding (grounding resistance: 100 Ω or less) <Common grounding with a heavy electrical system is not allowed>[1] Ground the PLC independently or jointly. | | | | |
| Working atmosphere | Free from corrosive or flammable gas and excessive conductive dust | | | | |
| Working altitude | <2000m[2] | | | | |

[1]:



Dedicated grounding (best)      Common grounding (good)      Common grounding (not allowed)
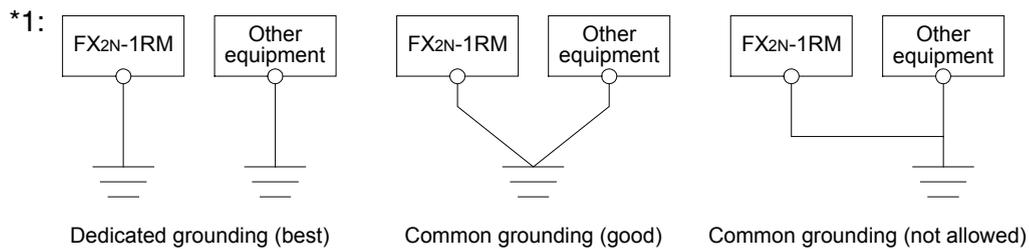
[2]: Do not use the PLC under pressure higher than the atmospheric pressure. Doing so may damage the PLC.

## 3.2    Performance specifications

| | |
|---|---|
| **Applicable PLC** | The bus of an FX2N, FX3U, FX2NC and FX3UC series PLC can be connected.<br>A single drive is also possible. (Refer to subsection 1.5.1.) |
| **Program memory** | Built-in EEPROM memory (no battery) |
| **Number of cam output points** | 48 internal output points. Data is read by PLC. In addition, 48 points can be connected when transistor output extension blocks or triac output extension blocks are connected. (When extension blocks are connected, up to 32 points can be turned on at a time.) |
| **Detector** | Brushless resolver (F2-720RSV for F2-32RM) |
| **Control resolution** | 720 divisions/rotation (0.5 degree) or 360 divisions/rotation (1 degree) |
| **Response speed** | 415 r/min/0.5 degree or 830 r/min/degree<br>When the current angle transfer function is used, response speed becomes 207r/min/0.5degree or 415r/min/degree. |
| **Number of program banks** | 8 banks (specified by PLC) or 4 banks (specified by external input) |
| **Setting unit** | Dedicated data setting unit (integrated add-on type)<br>Peripheral equipment for PLC via PLC (Sequence program is required.) |
| **Number of times of ON/OFF** | 8 times/cam output |
| **Input** | 2 bank input points (code input of 0 to 3), 24 VDC, 7 mA, response time 3 ms, photocoupler isolation |
| **Setting switch** | RUN/PRG selector switch and 16 keys (input from data setting panel) |
| **LED indication** | POWER, RUN, ERROR, 7-segment × 7 digits, LED × 4 |

## 3.3    Resolver specifications

| | |
|---|---|
| **Excitation method** | Two-phase excitation, 1-phase output (5 kHz) |
| **Mechanical allowable rotation speed** | 3000r/min |
| **Cable distance** | 100 m (3937 inch) maximum |
| **Vibration resistance** | 10 to 2000 kHz (15 G maximum), 2 hours in each of 3 directions |
| **Impact resistance** | 50 G, 11 ms, 3 times in each of 6 directions |
| **Abrasion torque** | 0.0118N·m or less |
| **Protection structure** | IP52 |
| **Ambient temperature** | -10 to +85°C |

## 3.4  Power supply specifications

| Rated voltage | 24 VDC+10%, -15% |
|---|---|
| Allowable instantaneous power interruption period | 5ms |
| Power consumption | 3 W (when operating individually), 5 W (at 32 points output ON) |

## 3.5  Input specifications

| Input signal voltage | 24 VDC ±10% |
|---|---|
| Input signal current | 7 mA/24 VDC |
| Input ON current | 4.5 mA or more |
| Input OFF current | 1.5 mA or less |
| Input response time | Approximately 3 ms |
| Input signal format | Contact input or NPN/PNP open collector |
| Circuit isolation | Photocoupler isolation |

| 1 | Introduction |
|---|---|

| 2 | Installation |
|---|---|

| 3 | Specifications |
|---|---|

| 4 | External Wiring |
|---|---|

| 5 | Extension Block Specifications and External Wiring |
|---|---|

| 6 | Basic Setting |
|---|---|

| 7 | BFM Assignment |
|---|---|

| 8 | Program Operating Procedures |
|---|---|

| 9 | Monitor |
|---|---|

| 10 | Test |
|---|---|

| 11 | Diagnostics |
|---|---|

| | Appendix |
|---|---|

# 4. External Wiring

This section describes wiring of the power supply and the input.

**Cautions on wiring**

- Do not connect the AC power supply to DC I/O terminals or DC power terminals.
  If such connection is performed, the FX2N-1RM may burned out.

- Do not perform wiring from the outside to an unused terminal [ · ] of the main unit or an extension block.
  If such wiring is performed, the unit may be damaged.

- Perform Class D grounding to the ground terminal in the FX2N-1RM or the main unit using an electric wire of 2 mm$^2$ or more.
  However, do not perform common grounding with a strong electric system.

**Note**

- Turn on or off simultaneously the power of the PLC and the power of the FX2N-1RM.

- Use an electric wire of 2 mm$^2$ or more as a power line so that voltage drop can be prevented.

- Even if an instantaneous power interruption of 5 ms or less has occurred, the FX2N-1RM continues its operation.
  If a considerably long power interruption or an abnormal voltage drop has occurred, the FX2N-1RM is stopped and the output is turned off. When the power is recovered, the FX2N-1RM automatically restarts operation
  (if the RUN/PRG selector switch is set to "RUN").

# 4.1　Wiring of the power supply and the input

<Sink input>



<Source input>



*1 It is recommended to use the 24V DC service power supply from the PLC main unit.
　 If two sources are required, follow the below guidelines:
　 - Supply power to the FX2N-1RM before or at the same time the PLC is powered.
　 - The power supplies may be cut the same time after ensuring system safety.
　 When using the service power supply of PLC as follows, do not power on the FX2N-1RM during the ON state of PLC power supply.
　 If the FX2N-1RM is powered on during the ON state of the PLC power supply, inrush current will power off the internal electrical power source of the PLC.



- For the capacity of the service power supply of the PLC main unit, refer to the Hardware Manual offered separately.

| 1 | Introduction |
| 2 | Installation |
| 3 | Specifications |
| 4 | External Wiring |
| 5 | Extension Block Specifications and External Wiring |
| 6 | Basic Setting |
| 7 | BFM Assignment |
| 8 | Program Operating Procedures |
| 9 | Monitor |
| 10 | Test |
| 11 | Diagnostics |
| | Appendix |

# 5. Extension Block Specifications and External Wiring

This section describes the specifications and the wiring of the FX2N-16EYT.
When other extension blocks dedicated to output are used, refer to the Hardware Manual of the FX2N Series PLC in accordance with the model used.

## 5.1 Extension block specifications (transistor output type)

| External power supply | | 5 to 30 VDC |
|---|---|---|
| Circuit isolation | | Photocoupler isolation |
| Maximum load | Resistance load | 0.5 A/point, 0.8 A/4 points common, 1.6 A/8 points common |
| | Inductive load | 12 W/24 VDC |
| | Ramp load | 1.5 W/24 VDC |
| Open circuit leak current | | 0.1 mA/30 VDC |
| Response time | OFF → ON | 0.2 ms or less (0.2 A or more) |
| | ON → OFF | 0.2 ms or less (0.2 A or more) |

- The general specifications are equivalent to those of the FX2N-1RM. (Refer to Paragraph 3.1.)

## 5.2 Output wiring (transistor output type)
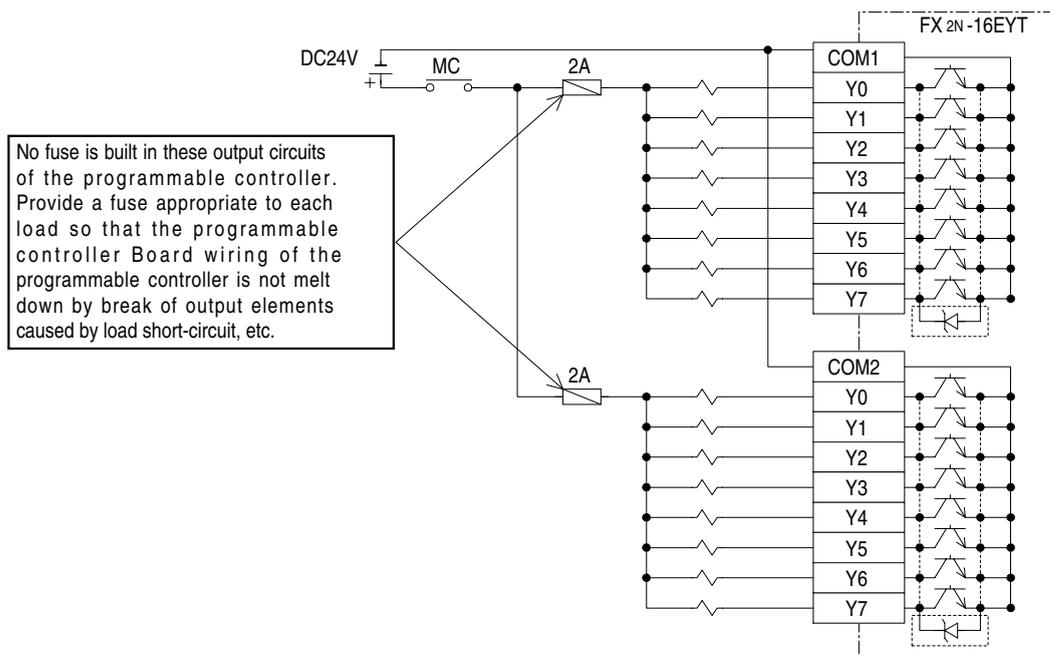


No fuse is built in these output circuits of the programmable controller. Provide a fuse appropriate to each load so that the programmable controller Board wiring of the programmable controller is not melt down by break of output elements caused by load short-circuit, etc.

**Cautions on wiring**

- Do not connect the AC power supply to DC I/O terminals or DC power terminals.
  If such connection is performed, the FX2N-1RM may burned out.

- Do not perform wiring from the outside to an unused terminal [ · ] of the main unit or an extension block.
  If such wiring is performed, the unit may be damaged.

| 1 | Introduction |
|---|---|
| 2 | Installation |
| 3 | Specifications |
| 4 | External Wiring |
| 5 | Extension Block Specifications and External Wiring |
| 6 | Basic Setting |
| 7 | BFM Assignment |
| 8 | Program Operating Procedures |
| 9 | Monitor |
| 10 | Test |
| 11 | Diagnostics |
| | Appendix |

# 6. Basic Setting

6-1

This section describes the basic setting of the FX2N-1RM including handling of the RUN and STOP modes, specification of the bank No., setting of the automatic angle advance function and setting of the reference angle.

**Cautions on start-up and maintenance**
- Do not touch any terminal while the power is supplied.
  If a terminal is touched, electrical shocks or malfunction may occur.
- Turn off the power before cleaning or tightening terminals.
  If cleaning or tightening is performed while the power is supplied, electrical shocks may occur.
- Read thoroughly the manual and confirm safety before modifying a program during operation, performing forced output, performing the RUN operation or performing the STOP operation.
  Erroneous operation may cause mechanical damages or accidents.

**Cautions on start-up and maintenance**
- Do not disassemble or modify the unit.
  Disassembly or modification may cause failures, malfunction or fires.
  * For repair, contact Mitsubishi Electric System Service
- Turn off the power before connecting or disconnecting connection cables such as extension cables.
  If such cables are connected or disconnected while the power is turned on, failures or malfunction may occur.

**Cautions on Disposal**
- Treat the unit as industrial waste when disposing of it.

# 6.1    Handling of the RUN and PRG modes

The FX2N-1RM offers two modes, RUN (operation) and PRG (program). These modes can be switched using the following procedure.
(In the PRG mode, the FX2N-1RM stops operation.)

### < Built-in RUN/PRG selector switch >

The RUN mode and the PRG mode can be switched by manipulating the RUN/PRG selector switch built in the main unit.
When the switch is set to the RUN side, operation is performed.
When the switch is set to the PRG mode, operation is stopped and the download of programs is enabled.
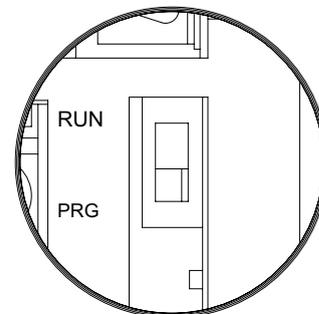
### < Changing over the RUN and PRG modes from the data setting panel >

The RUN mode and PRG mode can be switched by manipulating the keys provided on the data setting panel.
To select the RUN mode: [RUN] → [GO]
To select the PRG mode: [STOP] → [GO]
The RUN to PRG operation with data setting panel can be prohibited with BFM#0 b6 or the data setting panel.
This function is added from the product since V2.20.

### < Changing over the RUN and PRG modes from the PLC >

The RUN mode and PRG mode can be switched by giving a TO instruction from the PLC.
The RUN/PRG command write destination is provided in b0 and b1 of BFM #3.

> **BFM #3**
> b0: Selects the RUN mode when set to ON from OFF (when the rising edge is detected).
> b1: Selects the PRG mode when set to ON from OFF (when the rising edge is detected).
> * b0 and b1 should not be set to ON from OFF at the same time.

- Change in the status is detected in any procedure to change-over the RUN mode and the PRG mode.
- When the power is turned on, the mode is set in accordance with the setting of the RUN/PRG selector switch built in the FX2N-1RM.
- The RUN LEDs on the FX2N-1RM and the data setting panel are lit while the RUN mode is selected.
  The RUN LEDs on the FX2N-1RM and the data setting panel are extinguished while the PRG mode is selected.
- When switching from PRG to RUN, FX2N-1RM does not output by the position where the resolver is stopped occasionally. (Dead zone)
  When the resolver starts rotating, FX2N-1RM is normally output.
  When switching from PRG to RUN, the product since V2.20 is normally output wherever the resolver has stopped.

# 6.2  Specifying the bank

The FX2N-1RM can store two or more programs, and execute an arbitrary program in accordance with an external input to the FX2N-1RM or an instruction given by the PLC main unit.
Up to 4 banks are available for an external input. Up to 8 banks are available for an instruction by the PLC.

- **Setting the bank specification method**

  Set which one between the external input and the PLC is used to specify a bank.
  To select either one, give a TO instruction from the data setting panel or the PLC main unit.

  **< Setting by the data setting panel >**

  | FNC | 3 | GO | ⟶ | ON/OFF | ⟶ | GO |
  
  Select the bank specification method.　　Every time this key is pressed, the PLC (The OFF LED flashes.) or the external input (The ON LED flashes.) is selected alternately.　　Select the specification method based on flashing of the LED, and confirm it by pressing the [GO] key.
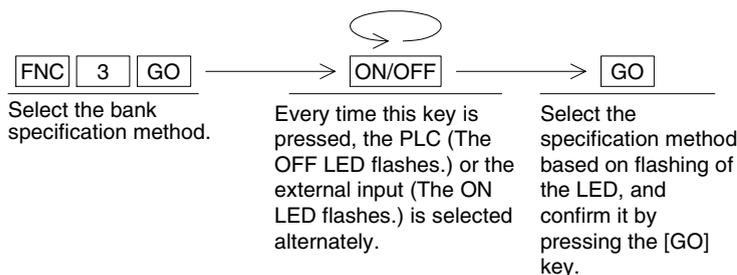
  **< Setting by the PLC >**

  The bank specification method write destination is provided in b3 of BFM #0.

  BFM #0
  b3:  OFF $\rightarrow$ A bank is specified by an external input.
  　　ON $\rightarrow$ A bank is specified by the PLC.

  Set to specify the Bank from the PLC without fail when you use the current angle transfer function.

- **Bank specification method**

  Specify the program No. to be executed using the method selected by the procedure described in "Setting the bank specification method" above (bank specification).

  **< Bank specification by the external input >**

  Specify an arbitrary program No. from the B0 and B1 terminals. (For the wiring, refer to "4.1 Power supply and input wiring".)
  To change-over the program No. to be executed while a program is running (RUN mode), use transistors.
  The input response time of the FX2N-1RM is approximately 3 ms. If relays or with-contact switches are used, a program other than the specified one may be executed while the bank change-over operation is being performed.

  | Specified program No. | B1 | B0 |
  |:---:|:---:|:---:|
  | 0 | OFF | OFF |
  | 1 | OFF | ON |
  | 2 | ON | OFF |
  | 3 | ON | ON |

  **< Bank specification by the PLC >**

  The bank specification write destination is provided in BFM #2. Write the program No. to be executed using a TO instruction.
  The effective values are 0 to 7.

# 6.3  Automatic angle advance function

The automatic angle advance function performs the output ON/OFF operation in advance by an arbitrary angle (angle advance quantity) in accordance with the rotation speed of the resolver.
By using this function, delay in the mechanical operation generated during rotation at high speed can be compensated.
The setting of this function becomes the common set point for the on angle and the off angle outputs Y00 to Y07 and Y10 to Y17.
The response speed can be used by 830 r/min (1 degree mode), 415 r/min (0.5 degrees mode).
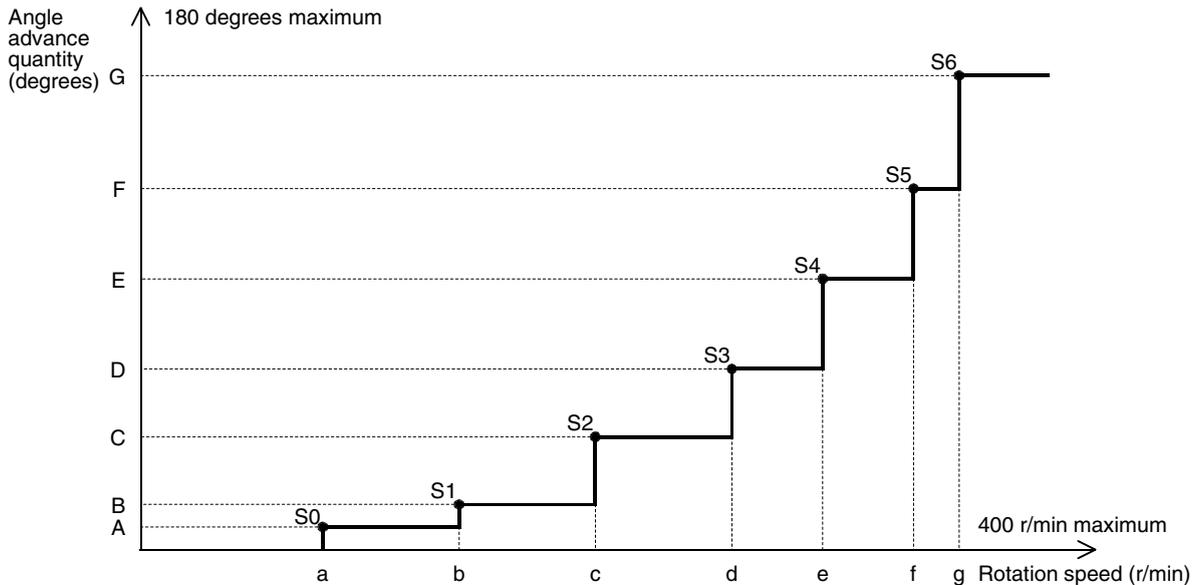


The automatic angle advance function can be set in 7 steps from S0 to S6 as shown in the figure above. Enter the rotation speed (a to g) and the angle advance quantity (A to G) for each step from the data setting panel or the PLC main unit.
The smallest rotation speed should be set in S0 with the settings increasing in sequential order of speed. (S0<S1<S2< . . . <S6)
When the automatic angle advance function is used, the rotation speed should be 400 r/min or less and the angle advance quantity should be 180 degrees or less.
When the rotation speed is 0 (initial value), the angle advance quantity is treated as 0.
Whether or not the automatic angle advance function is used can be set from the data operation panel and the PLC main unit.

> For the input procedure from the data setting panel, refer to Paragraph 8.3.5.
> For the input destination from the main unit, refer to Paragraphs 7.1 and 7.2.
> (Data is written to BFM #0 and BFM #13 to BFM #26 by a TO instruction.)

**< Assignment of FNC Nos. and BFM Nos. >**

|  |  | Input from data setting panel (FNC No.) | Input from main unit (BFM No.) |
|---|---|---|---|
| S0 | Rotation angle a | FNC 13 | BFM #13 |
| | Angle advance quantity A | FNC 14 | BFM #14 |
| S1 | Rotation angle b | FNC 15 | BFM #15 |
| | Angle advance quantity B | FNC 16 | BFM #16 |
| S2 | Rotation angle c | FNC 17 | BFM #17 |
| | Angle advance quantity C | FNC 18 | BFM #18 |
| S3 | Rotation angle d | FNC 19 | BFM #19 |
| | Angle advance quantity D | FNC 20 | BFM #20 |
| S4 | Rotation angle e | FNC 21 | BFM #21 |
| | Angle advance quantity E | FNC 22 | BFM #22 |
| S5 | Rotation angle f | FNC 23 | BFM #23 |
| | Angle advance quantity F | FNC 24 | BFM #24 |
| S6 | Rotation angle g | FNC 25 | BFM #25 |
| | Angle advance quantity G | FNC 26 | BFM #26 |

# 6.4 Individual automatic angle advance function

The automatic angle advance function performs the output ON/OFF operation in advance with an arbitrary angle (angle advance quantity) in accordance with the rotation speed of the resolver.
This setting does an individual setting to the on angle and the off angle of output Y00 to Y03.
The executed program number can be used from bank 0 to bank 6.
Bank 7 must not be used. (Bank 7 is used to store the data of the individual automatic angle advance function.)
The rotational speed response is as follows.

Response speed:1degree (360 degrees/revolution) mode . . . 415 r/min
　　　　　　　　 0.5 degrees (720 degrees/revolution) mode . . . 207 r/min
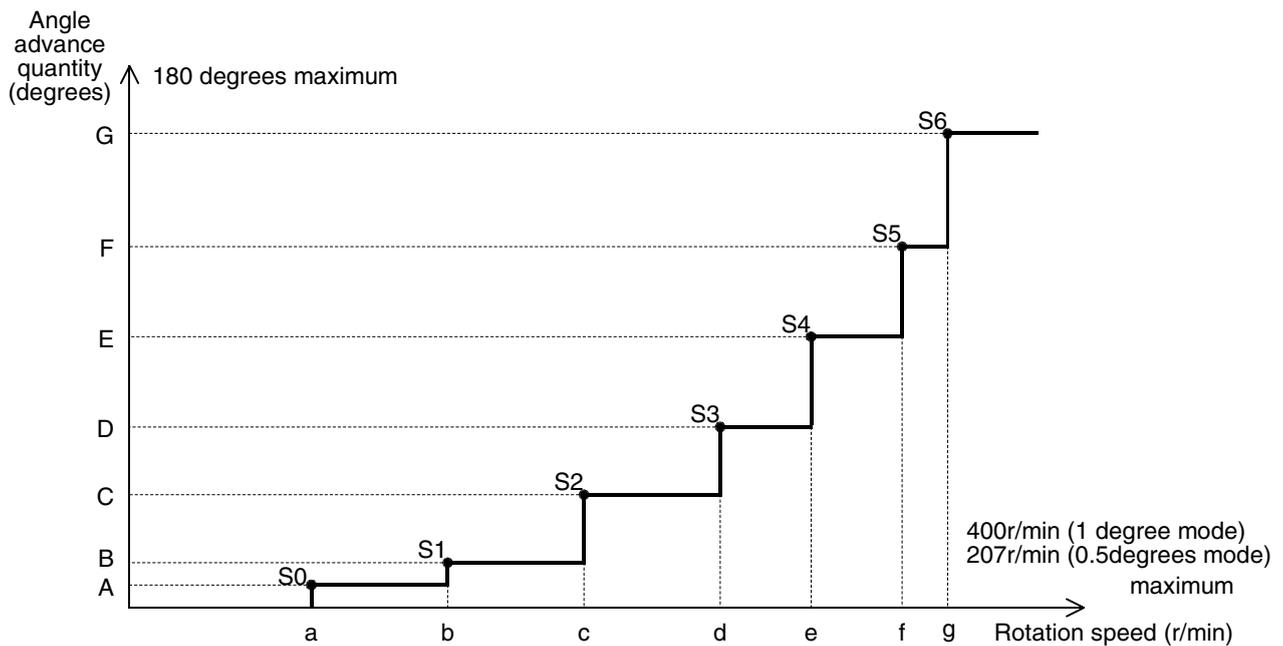


- The individual automatic angle advance function can be set in 7steps from S0 to S6 as shown in the figure above. Setting the rotation speed (a to g) and the angle advance quantity (A to G) for each step.
- Please set the smallest rotation speed to S0 and increase the settings sequentially. (S0<S1< . . . <S6)
- The rotation speed should be 400 r/min or less (1 degree mode), 207 r/min or less (0.5 degrees mode) and the angle advance quantity should be 180 degrees or less.
- When the rotation speed is 0 (initial value), the angle advance quantity is treated as 0.

- Please separate angle advance quantity from previous ON/OFF 1 degree (1 degree mode) or 0.5 degrees (0.5 degrees mode) or more. (Refer to the figure 1 below)

Figure 1
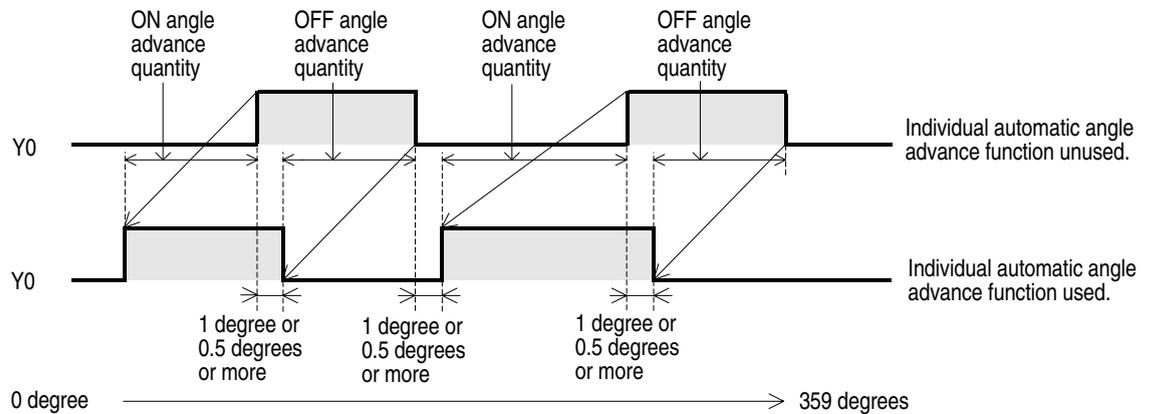


- Selection of use/do not use, input of the rotational speed, and angle advance quantity can be set by the data operation panel and the PLC main unit.

**Use specification of individual automatic angle advance function**

From the data setting panel: Set by FNC 05 → Refer to 8.3.6

From the PLC               : Bit5 of BFM #0 is turned ON → Refer to 7.2

**Setting of rotational speed and angle advance quantity**

From the data setting panel: Set by FNC 90 → Refer to 8.3.6
                                     Input by one time value

From the PLC               : Input to BFM #6376 to #6459 → Refer to the next page
                                     Input value equals advance angle (1 degree mode)
                                     Input value equals twice the advance angle (0.5 degrees mode)

Please input the rotational speed and angle advance quantity after specifying the use of the function.
(When the use of the function is not specified, it becomes an error.)

When individual automatic angle advance function is used, addition of the crack of rotation speed and angle advance quantity to buffer memory (BFM) is as follows.

| | BFM No. | | |
|---|---|---|---|
| | **Rotation speed** | **ON angle advance quantity** | **OFF angle advance quantity** |
| Y0 S0 | 6376 | 6377 | 6378 |
| S1 | 6379 | 6380 | 6381 |
| S2 | 6382 | 6383 | 6384 |
| S3 | 6385 | 6386 | 6387 |
| S4 | 6388 | 6389 | 6390 |
| S5 | 6391 | 6392 | 6393 |
| S6 | 6394 | 6395 | 6396 |
| Y1 S0 | 6397 | 6398 | 6399 |
| S1 | 6400 | 6401 | 6402 |
| S2 | 6403 | 6404 | 6405 |
| S3 | 6406 | 6407 | 6408 |
| S4 | 6409 | 6410 | 6411 |
| S5 | 6412 | 6413 | 6414 |
| S6 | 6415 | 6416 | 6417 |
| Y2 S0 | 6418 | 6419 | 6420 |
| S1 | 6421 | 6422 | 6423 |
| S2 | 6424 | 6425 | 6426 |
| S3 | 6427 | 6428 | 6429 |
| S4 | 6430 | 6431 | 6432 |
| S5 | 6433 | 6434 | 6435 |
| S6 | 6436 | 6437 | 6438 |
| Y3 S0 | 6439 | 6440 | 6441 |
| S1 | 6442 | 6443 | 6444 |
| S2 | 6445 | 6446 | 6447 |
| S3 | 6448 | 6449 | 6450 |
| S4 | 6451 | 6452 | 6453 |
| S5 | 6454 | 6455 | 6456 |
| S6 | 6457 | 6458 | 6459 |

- When the mode is selected 1 degree (360 degrees/ revolution), input equals advance angle value. When the mode is selected 0.5 degrees (720 degrees/ revolution), inputs equals twice the advance angle value. (input 10, advance angle=5)
- The executed program number can be used from

**Caution on batch transfer of programs**

When the batch transfer of the program is done with the personal computer and FX-20P-E when the Individual automatic angle advance function is used, all the data of the rotational speed, the turning ON angle, and the turning OFF angle is treated by the twice value.

## 6.5   Setting the reference angle

Originally, the brushless resolver has an absolute reference angle. In addition, a reference angle in accordance with a machine can be set.
Each set angle of the FX2N-1RM performs its operation based on the reference angle set in accordance with the machine.
The reference angle can be set by the data setting panel or by a TO instruction given by the PLC main unit.

< Setting by the data setting panel >
For the setting procedure using the data setting panel, refer to Paragraph 8.2.10.

< Setting by the PLC >
The reference angle data is provided in BFM #1. The reference angle setting command is provided in BFM #3 b2.

| Write the angle data to be treated as the reference to BFM #1. | $\rightarrow$ | Rotate the resolver, and stop it in an arbitrary position. | $\rightarrow$ | Write "1 (ON)" to BFM #3 b2 (rising edge).  By this operation, the current position of the resolver becomes the angle set to BFM #1. |
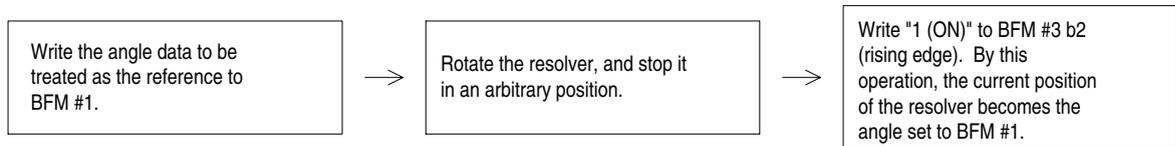
**Caution on batch transfer of programs**

Even if programs are transferred at a time by a personal computer or the FX-20P-E, the reference angle image set is not transferred.
Accordingly, set the reference angle again after the FX2N-1RM or the resolver is replaced.

# 6.6   Handling the keyword

### < Limitation of the function by the keyword >

When a keyword is registered, writing to the EEPROM is prohibited in the same way as the EEPROM protect function. When programs are read by a personal computer or the FX-20P-E, the registered keyword must be entered.

(Preventing theft of a program)
A keyword can be registered/deleted using the data setting panel, the personal computer software and the FX-20P-E.
At this time, a keyword in a personal computer or the FX-20P-E is treated as "BBBBB○○○" (○○○ indicates a numeric from 1 to 999.).
The writing of any data from the buffer memory to the EEPROM is prohibited. Only the operations shown in the table below are allowed to be set on the data setting panel.

### < Operations enabled while a keyword is registered >

| Operation by data setting panel | Operation by buffer memory (BFM) |
|---|---|
| Read | Writing from BFM to EEPROM is prohibited. Any modification of BFM is valid, and operation of FX2N-1RM can be modified. |
| Forced RUN/STOP | |
| Read of reference angle | |
| Write-protect of EEPROM | |
| Deletion of keyword | |

When the registered keyword is deleted, all the functions become available again.
An unknown keyword can be deleted by the entire program deletion procedure (Refer to Paragraph 9.2.5.). Keep in mind that all other registered data is also deleted.

## 6.7   Current angle transfer function

The current angle transfer function to transfers the current angle of the resolver to BFM#106 via turning ON input terminal B1.
(This function has been included since V2.40)
The PLC is used together, and a highly accurate sampling by which an external input is made a trigger can be done.
The response speed becomes 207r/min/0.5degree or 415r/min/degree.
Set to specify the bank from the PLC without fail when you use the current angle transfer function.

**< Setting by the data setting panel >**

- Set the method of specifying the bank by operating FNC3, "PLC".
  Refer to Paragraph 8.3.4
- Set the current angle transfer function by operating FNC7, "Effective".
  Refer to Paragraph 8.3.8

**< Setting by the PLC >**

- BFM#0 b3 is turned ON, and the method of specifying the bank selects "PLC".
- BFM#0 b7 is turned ON, and the Current Angle Transfer function is made effective.
    b7:  OFF → Current angle transfer function is Invalidity.
         ON   → Current angle transfer function is effective.

Program example

| Rung | Output | Description |
|---|---|---|
| M8000 (NC) | M0 | Resolution: 1 degree |
| M8000 (NC) | M1 | Rotation derection of resolver: Clockwise |
| M8000 (NC) | M2 | Write protect of EEPROM: Write is enabled |
| M8000 (NO) | M3 | Bank specification method: PLC |
| M8000 (NC) | M4 | Automatic angle advance function: Un used |
| M8000 (NC) | M5 | Individual automatic angle advance function: Un used |
| M8000 (NC) | M6 | Prohibition of RUN to PRG operation: Permission |
| M8000 (NO) | M7 | Current angle transfer function: Used |

| M8002 | TO | K0 | K0 | K2M0 | K1 | Parameter setting (BFM#0) |
|---|---|---|---|---|---|---|
| BFM#106 Reading instruction | FROM | K0 | K106 | D0 | K1 | BFM#106 → D0. |

< Action of current angle transfer function>



- Transfer the current angle of the resolver to BFM#106 by turning ON input terminal B1.
- The input signal to input terminal B1 is necessary for both 200μS or more the turning ON time and the turning OFF time.
- When input terminal B1 turns ON the power supply of FX2N-1RM while turned ON, the data storage in BFM#106 is not executed.
  (When the terminal B1 is turned OFF once, and the terminal B1 is turned ON again, the data storage in BFM#106 is executed.)
- When neither turning ON the power supply nor the current angle transfer function are used, "-1" is stored.

| 1 | Introduction |
|---|---|

| 2 | Installation |
|---|---|

| 3 | Specifications |
|---|---|

| 4 | External Wiring |
|---|---|

| 5 | Extension Block Specifications and External Wiring |
|---|---|

| 6 | Basic Setting |
|---|---|

| 7 | BFM Assignment |
|---|---|

| 8 | Program Operating Procedures |
|---|---|

| 9 | Monitor |
|---|---|

| 10 | Test |
|---|---|

| 11 | Diagnostics |
|---|---|

|  | Appendix |
|---|---|

# 7.    BFM Assignment

This section describes the buffer memory (BFM) of the FX2N-1RM.

When the FX2N Series PLC is connected to the FX2N-1RM, data can be read/written from/to the BFM by FROM/TO instructions. (Refer to Paragraph 7.3.)

When two or three FX2N-1RM units are connected, FROM/TO instructions are available in only the unit nearest to the PLC main unit.

The second and third FX2N-1RM units can write and read data from the PLC main unit via the first FX2N-1RM unit.

## 7.1    BFM list

| BFM No. | Name | Initial value | Remarks   R: For read   W: For write   K: Keep | | File register assignment No. |
|---|---|---|---|---|---|
| #0 | Initial setting | 0 | — | W, K | D7144 |
| #1 | Reference angle (ADJ) | 0 | ×1 value (1 degree), ×2 value (0.5 degree) Refer to Paragraph 6.5. | W, K | D7145 |
| #2 #8002 #9002 *1 | Bank No. specification (00 to 07) | 0 | Valid when bank specification is set to PLC. | W | — |
| #3 #8003 #9003 *1 | Command | 0 | — | W | — |
| #4 | Output prohibition (Y00 to Y17) | 0 | Prohibits output when each bit is set to ON. | W | — |
| #5 | Output prohibition (Y20 to Y37) | 0 | Prohibits output when each bit is set to ON. | W | — |
| #6 | Output prohibition (Y40 to Y57) | 0 | Prohibits output when each bit is set to ON. | W | — |
| #7 | Executed bank No. | — | — | W | — |
| #8 #8008 #9008 *1 | Current angle (degrees) | — | ×1 value (1 degree), ×2 value (0.5 degree) | R | — |
| #9 #8009 #9009 *1 | Rotation angle (r/min) | — | — | R | — |
| #10 #8010 #9010 *1 | Output status (Y00 to Y17) | — | Monitors output status when each bit is set to ON/OFF. | R | — |
| #11 #8011 #9011 *1 | Output status (Y20 to Y37) | — | Monitors output status when each bit is set to ON/OFF. | R | — |
| #12 #8012 #9012 *1 | Output status (Y40 to Y57) | — | Monitors output status when each bit is set to ON/OFF. | R | — |
| #13 | Speed of automatic angle advance S0 (r/min) | 0 | — | W, K | D7146 |
| #14 | Angle advance quantity of automatic angle advance S0 (degrees) | 0 | ×1 value (1 degree), ×2 value (0.5 degree) | W, K | D7147 |
| #15 | Speed of automatic angle advance S1 (r/min) | 0 | — | W, K | D7148 |
| #16 | Angle advance quantity of automatic angle advance S1 (degrees) | 0 | ×1 value (1 degree), ×2 value (0.5 degree) | W, K | D7149 |

| BFM No. | Name | Initial value | Remarks   R: For read   W: For write   K: Keep | | File register assignment No. |
|---|---|---|---|---|---|
| ⋮ | ⋮ | ⋮ | ⋮ | ⋮ | ⋮ |
| #25 | Speed of automatic angle advance S6 (r/min) | 0 | — | W, K | D7158 |
| #26 | Angle advance quantity of automatic angle advance S6 (degrees) | 0 | ×1 value (1 degree), ×2 value (0.5 degree) | W, K | D7159 |
| #27 | Undefined | — | — | — | — |
| #28 #8028 #9028 *1 | Status | 0 | — | R | — |
| #29 | Error code | 0 | — | R | — |
| #30 | Model code | K5410 | — | R | — |
| #31 | Unusable | — | — | — | — |
| ↓ | | | | | |
| #100 *2 | Written ON angle | — | ×1 value (1 degree), ×2 value (0.5 degree) | W | — |
| #101 *2 | Written OFF angle | — | ×1 value (1 degree), ×2 value (0.5 degree) | W | — |
| #102 *2 | Written BFM No. | — | Range of setting 1000 to 7142 (BFM number of output ON angle setting) | W | — |
| #103 *2 | Reading BFM No. | — | Range of setting 1000 to 7142 (BFM number of output ON angle setting) | W | — |
| #104 *2 | Reading ON angle | — | ×1 value (1 degree), ×2 value (0.5 degree) | R | — |
| #105 *2 | Reading OFF angle | — | ×1 value (1 degree), ×2 value (0.5 degree) | R | — |
| #106 *3 | Data transfer destination of current angle transfer function. Refer to paragraph 6.7 | -1 | ×1 value (1 degree), ×2 value (0.5 degree) | R | — |
| ↓ | | | | | |
| #1000 | ON angle of bank No. 0, Y00, step No. 0 | FFFF | ×1 value (1 degree), ×2 value (0.5 degree) | W, K | D1000 |
| #1001 | OFF angle of bank No. 0, Y00, step No. 0 | FFFF | ×1 value (1 degree), ×2 value (0.5 degree) | W, K | D1001 |
| #1002 | ON angle of bank No. 0, Y00, step No. 1 | FFFF | ×1 value (1 degree), ×2 value (0.5 degree) | W, K | D1002 |
| #1003 | OFF angle of bank No. 0, Y00, step No. 1 | FFFF | ×1 value (1 degree), ×2 value (0.5 degree) | W, K | D1003 |
| ⋮  ⋮ | | BFM #1000 to BFM #7143 are offered to set an angle. The initial value is "FFFF" respectively. Data is written by ×1 value (1 degree) and ×2 value (0.5 degree), and the set values are kept in the EEPROM. When a program is transferred by a personal computer or the FX-20P-E, BFM #1000 to BFM #7143 are assigned to file registers D1000 to D7143. For the bank Nos., output Nos., step Nos., ON angle and OFF angle assigned to BFM #1000 to BFM #7143, refer to the BFM No. Quick Reference Table for Angle Setting provided at end of this manual. | | | |
| #1766 | ON angle of bank No. 0, Y57, step No. 7 | | | | |
| #1767 | OFF angle of bank No. 0, Y57, step No. 7 | | | | |
| #1768 | ON angle of bank No. 0, Y00, step No. 0 | | | | |
| #1769 | OFF angle of bank No. 0, Y00, step No. 0 | | | | |
| ⋮  ⋮ | | | | | |
| #7142 | ON angle of bank No. 0, Y57, step No. 7 | FFFF | ×1 value (1 degree), ×2 value (0.5 degree) | W, K | D7142 |
| #7143 | OFF angle of bank No. 0, Y57, step No. 7 | FFFF | ×1 value (1 degree), ×2 value (0.5 degree) | W,K | D7143 |

*1: When two or more FX2N-1RM units are connected to the PLC main unit, data is read from and written to each unit via the buffer memory of the unit nearest to the PLC main unit.
The relationship between the BFM Nos. and the units is shown below.

      BFM Nos. of one or two digits: FX2N-1RM unit nearest to the PLC main unit
      BFM Nos. of 8000 to 8999: Second FX2N-1RM unit
      BFM Nos. of 9000 to 9999: Third FX2N-1RM unit

*2: BFM #100 to #105 has been included since version V2.00 (from 1998/2)

*3: BFM#106 has been included since version V2.40 (from 2002/1)

- All the buffer memories in the FX2N-1RM units accommodate 16-bit data. When using a FROM/TO instruction, use a 16-bit instruction.

- When two FX2N-1RM is connected, the monitor cycle of BFM #8002 to #8028 becomes about 12m seconds.
  When three is connected, the monitor cycle of BFM #8002 to #8028, #9002 to #9028 becomes about 27m seconds.
  However, the table is composed from PRG to RUN again at the switch and bank changing.
  Therefore, the time of 4 seconds or less is required. (Only at change)

# 7.2    Description on BFM

**< BFM #0: Initial setting >**

| Bit | Description | Initial value | Remarks |
|---|---|---|---|
| b0 | Resolution | 0 | 1: 0.5 degree (720 degrees/rotation),<br>0: 1 degree (360 degrees / rotation) *1 |
| b1 | Rotation direction of resolver | 0 | 1: Counterclockwise<br>0: Clockwise |
| b2 | Write-protect of EEPROM | 0 | 1: Write to EEPROM is disabled.<br>0: Write is enabled. (However, BFM #0 b2 can be modified.) |
| b3 *4 | Bank specification method | 0 | 1: PLC<br>0: FX2N-1RM external input          Refer to Paragraph 6.2. |
| b4 *2 | Automatic angle advance function | 0 | 1: Used (Y00 to Y17)<br>0: Unused                          Refer to Paragraph 6.3 |
| b5 *2 | Individual automatic angle advance function | 0 | 1: Used (Y00 to Y03)<br>0: Unused                          Refer to paragraph 6.4 |
| b6 *3 | Prohibition of RUN to PRG operation | 0 | 1:Prohibition<br>0:Permission |
| b7 *4 | Current angle transfer function | 0 | 1: Used<br>0: Unused                          Refer to paragraph 6.7 |
| b8~15 | Unusable | — | — |

*1:  When selecting "0.5 degree" as the resolution, enter a value twice the actual angle as the set data to BFM #1000 and later. For example, when the actual angle is 45 degrees, enter "K90" as the set data.
(For setting from the data setting panel, refer to Paragraph 8.2.1.) (Set range: 0 to 719)

*2:  When both b4 and b5 are turned on, b5 becomes effective.

*3:  The RUN to PRG operation with data setting panel is prohibited.
The RUN to PRG switch by the RUN / PRG change switch and BFM#3 is effective.
(This function is added from the product since V2.20.)

*4:  Set to specify the Bank from the PLC without fail when you use the current angle transfer function.
(This function has been included since V2.40)

**< BFM #3: Command >**

| Bit | Description | Remarks |
|-----|-------------|---------|
| b0 | RUN | Runs a program (on rising edge). Refer to Paragraph 6.1. |
| b1 | PRG | Turns off output by PRG command (received on rising edge). Refer to Paragraph 6.1. |
| b2 | ADJ | Sets reference angle on rising edge in PRG mode. Refer to Paragraph 6.5. *4 |
| b3 | Error reset | Resets error information (received on rising edge). |
| b4 | Write instruction in RUN mode | Writes modification of program contents of bank currently executed to EEPROM (on rising edge). *5 |
| b5 | Initialization of BFM keep area | Initializes BFM keep area (on rising edge in PRG mode). This command has priority over program protection actuated by code No. |
| b6 | Write instruction in PRG mode | Writes keep area contents to EEPROM in PRG mode (on rising edge). |
| b7~15 | Unusable | — |

*4: When an ADJ command is executed, the absolute value of the resolver is written to the EEPROM. Do not set the write-protect function of the EEPROM.

*5: BFM #13 to BFM #26 (setting of the automatic angle advance function) are also written at the same time.

- When two or more FX2N-1RM is connected and used for a main unit, the second command is allocated to BFM #8003, the third command is allocated to BFM #9003.
  It is similar to above-mentioned BFM #3 with the crack of each bit of BFM #8003, #9003.

### < BFM #4 to BFM #6: Output prohibition >

Example of BFM #4

| Bit | Description | Remarks |
|---|---|---|
| b0 | Y00 output prohibition | 1: Prohibits output., 0: Enables output. |
| b1 | Y01 output prohibition | 1: Prohibits output., 0: Enables output. |
| b2 | Y02 output prohibition | 1: Prohibits output., 0: Enables output. |
| b3 | Y03 output prohibition | 1: Prohibits output., 0: Enables output. |
| b4 | Y04 output prohibition | 1: Prohibits output., 0: Enables output. |
| b5 | Y05 output prohibition | 1: Prohibits output., 0: Enables output. |
| b6 | Y06 output prohibition | 1: Prohibits output., 0: Enables output. |
| b7 | Y07 output prohibition | 1: Prohibits output., 0: Enables output. |
| b8 | Y10 output prohibition | 1: Prohibits output., 0: Enables output. |
| b9 | Y11 output prohibition | 1: Prohibits output., 0: Enables output. |
| b10 | Y12 output prohibition | 1: Prohibits output., 0: Enables output. |
| b11 | Y13 output prohibition | 1: Prohibits output., 0: Enables output. |
| b12 | Y14 output prohibition | 1: Prohibits output., 0: Enables output. |
| b13 | Y15 output prohibition | 1: Prohibits output., 0: Enables output. |
| b14 | Y16 output prohibition | 1: Prohibits output., 0: Enables output. |
| b15 | Y17 output prohibition | 1: Prohibits output., 0: Enables output. |

The bits b0 to b15 of BFM #4 correspond to Y00 to Y17. When each bit is set to 1 (ON), the output of the corresponding output No. is prohibited.
BFM #5 and BFM #6 correspond to Y20 to Y37 and Y40 to Y57 respectively in the same way, and the output can be prohibited for each point.

**< BFM #10 to BFM #12: Output status >**

Example of BFM #10

| Bit | Description | Remarks |
|-----|-------------|---------|
| b0 | Y00 output status | 1: Y01 output ON operation, 0: Y01 output OFF operation |
| b1 | Y01 output status | 1: Y01 output ON operation, 0: Y01 output OFF operation |
| b2 | Y02 output status | 1: Y01 output ON operation, 0: Y01 output OFF operation |
| b3 | Y03 output status | 1: Y01 output ON operation, 0: Y01 output OFF operation |
| b4 | Y04 output status | 1: Y01 output ON operation, 0: Y01 output OFF operation |
| b5 | Y05 output status | 1: Y01 output ON operation, 0: Y01 output OFF operation |
| b6 | Y06 output status | 1: Y01 output ON operation, 0: Y01 output OFF operation |
| b7 | Y07 output status | 1: Y01 output ON operation, 0: Y01 output OFF operation |
| b8 | Y10 output status | 1: Y01 output ON operation, 0: Y01 output OFF operation |
| b9 | Y11 output status | 1: Y01 output ON operation, 0: Y01 output OFF operation |
| b10 | Y12 output status | 1: Y01 output ON operation, 0: Y01 output OFF operation |
| b11 | Y13 output status | 1: Y01 output ON operation, 0: Y01 output OFF operation |
| b12 | Y14 output status | 1: Y01 output ON operation, 0: Y01 output OFF operation |
| b13 | Y15 output status | 1: Y01 output ON operation, 0: Y01 output OFF operation |
| b14 | Y16 output status | 1: Y01 output ON operation, 0: Y01 output OFF operation |
| b15 | Y17 output status | 1: Y17 output ON operation, 0: Y17 output OFF operation |

- The bits b0 to b15 of BFM #10 correspond to Y00 to Y17, and each of b0 to b15 is turned on or off in accordance with each output status. This output status can be read to the PLC main unit by FROM instructions.
- BFM #11 and BFM #12 correspond to Y20 to Y37 and Y40 to Y57 respectively in the same way, and the output status can be checked for each point.
- When two or more FX2N-1RM is connected used for a main unit, the second state of output is allocated to BFM #8010 to #8012 the third state of output is allocated to BFM #9010 to #9012.

**< BFM #28: Status >**

| Bit | Description | Remarks |
|---|---|---|
| b0 | Operating | Turned on while operation is normal in RUN mode (Functions in same way as RUN LED.). |
| b1 | Rotating clockwise | Turned on while rotating in RUN mode with BFM #0 b1 set to 0. |
| b2 | Rotating counterclockwise | Turned on while rotating in RUN mode with BFM #0 b1 set to 1. |
| b3 | Error occurred | Turns off output. Turned off when error is reset (Functions in same way as ERROR LED.). |
| b4 | Writing in RUN mode | Turned on while contents of program of bank currently executed are written to EEPROM.<br>Never modify program of same bank while this bit is turned on. |
| b5 | Keep area being initialized | Never modify program in keep area while keep area is initialized. |
| b6 | Two or more FX2N-1RM units connected | When two FX2N-1RM units are connected, b6 is turned on and b7 is turned off. When three.FX2N-1RM units are connected, both b6 and b7 are turned on. |
| b7 | Three FX2N-1RM units connected | |
| b8 | FX2N-1RM communication error | When it is not possible to communicate with the right FX2N-1RM where two or more FX2N-1RM are connected, b8 turns on. |
| b9~15 | Unusable | — |

When two or more FX2N-1RM is connected and used for a PLC main unit, the second status is allocated to BFM #8028, the third status is allocated to BFM #9028.
It is similar to above-mentioned BFM #28 with the crack of each bit of BFM #8028, #9028.

**< BFM #29: Error code >**

| Code No. | Description |
|---|---|
| 20 | Data setting error (out of range) |
| 21 | Bank setting error (out of range) |
| 22 | Memory error (Data cannot be written to EEPROM.) |
| 23 | Resolver disconnection error |

### <BFM #100: Written on angle, BFM #101: Written off angle, BFM #102: Written BFM No>

The data of the turning on angle and the turning off angle can be indirectly set from a PLC main unit to two or more outputs of FX2N-1RM.
(It is a function added from version V2.00)
After the turning on angle and the turning off angle data are written in BFM #100, #101, the BFM number which wants to be written is written BFM #102. The turning on angle data of BFM #100 is written in the BFM number specified by BFM #102 by this work. The off angle data of BFM #101 is written in the old number which continues to the specified number.
(Give setting BFM #102 as a number allocated to output on angle setting of BFM #1000 to #7142. Refer to BFM No. Quick Reference Table for Angle setting in the end of a book.)
When the to instruction to BFM #102 is executed, the turning on angle and the turning off angle are written.

### <BFM #103:Reading BFM No., BFM #104: Reading on angle, BFM #105: Reading off angle>

The data of the turning on angle and the turning off angle can be indirectly read from a PLC main unit to two or more outputs of FX2N-1RM.
(It is a function added from version V2.00)
The BFM number which wants to be read to BFM #103 is written.
Then, output on angle data of the specified BFM number is read to BFM #104.
The turning off angle data allocated to BFM of the old number which continues to the specified number is read to BFM #105.
(Give setting BFM #103 as a number allocated to output on angle setting of BFM #1000 to #7142. Refer to BFM No. Quick Reference Table for Angle setting in the end of a book.)
When the to instruction to BFM #103 is executed, the angle data is read to BFM #104, #105.

### <BFM #106:Data transfer destination of current angle transfer function>

When the current angle transfer function is used, the current angle of the resolver is transferred to BFM#106 via turning ON (OFF Æ ON) input terminal B1.
When neither turning ON the power supply nor the current angle transfer function are used, "-1" is stored. (Function has been included since version V2.40)

### < Application operation (FNC function) >

When using a function with FNC (FNC 70 to 75, 90), write the FNC No. to be used added to 1000 (K1070 for FNC 70, for example) to the bank No., STEP0 of the output No. and the BFM No. (BFM #1000, BFM #1016, BFM #6376, etc.) of the ON angle to be used.

**< Timing at which a program is saved to the EEPROM >**

1 ) While the data setting panel is manipulated

Every time a program is modified using the data setting panel, the modified data is written to both the buffer memory and the EEPROM.

2 ) While the RUN mode is selected

When the bank is switched, the contents of a new bank are saved in the EEPROM.
When a write command in RUN mode (BFM #3 b4) is written from the PLC main unit to the FX2N-1RM (on the rising edge), the modified contents of the program of the bank currently executed are saved in the EEPROM. (At the same time, the modified contents of the automatic angle advance are also saved.)

3 ) While the PRG mode is selected

When a write command in PRG mode (BFM #3 b6) is written from the PLC main unit to the FX2N-1RM (on the rising edge), the contents of the BFM keep area are saved in the EEPROM.

4 ) When the mode is switched from PRG to RUN

When a RUN command (BFM #3 b0) is written from the PLC main unit to the FX2N-1RM (on the rising edge), the contents of the BFM keep area are saved in the EEPROM.

**< Timing at which the ON/OFF table is created >**

1 ) On the rising edge when the mode is switched from PRG to RUN

2 ) While the RUN mode is selected

When the bank is switched
When a command to write a program to the EEPROM is given (When data is not required to be written to the EEPROM, set the write-protect function of the EEPROM.)

• Even if a BFM program is modified in the RUN mode from the PLC, such modification is not reflected on the ON/OFF table.
The modified program is reflected when a command to write data to the EEPROM is given.
The contents of the setting of the automatic angle advance function are immediately reflected on the ON/OFF table when data is written to the buffer memory.
The contents of the setting are saved when a command to write data to the EEPROM is given.

## 7.3　Cautions on creation of a sequence program

When the ON/OFF angle of the FX2N-1RM is set using a program in the PLC main unit, a watchdog timer error may occur if many settings are performed at a time.

When a large value is written to D8000 while setting is performed using the initial pulse, a watchdog timer error may also occur because such a written value becomes valid only when an END instruction is given.

It is recommended to write the ON/OFF angle data after one operation cycle from the initial pulse as shown in the program below.



M1 ──┤├── | TO | K0 | K1000 | K0 | K1 |　　Writes "0 degree" to BFM #1000
(bank 0, Y0, STEP 0, ON angle).

Turned on after one operation cycle from modification of the watchdog timer.

M8002 ──┤├── | MOV | K300 | D8000 |　　Modifies the watchdog timer to "300 ms".

Initial pulse

( M1 )

| END |
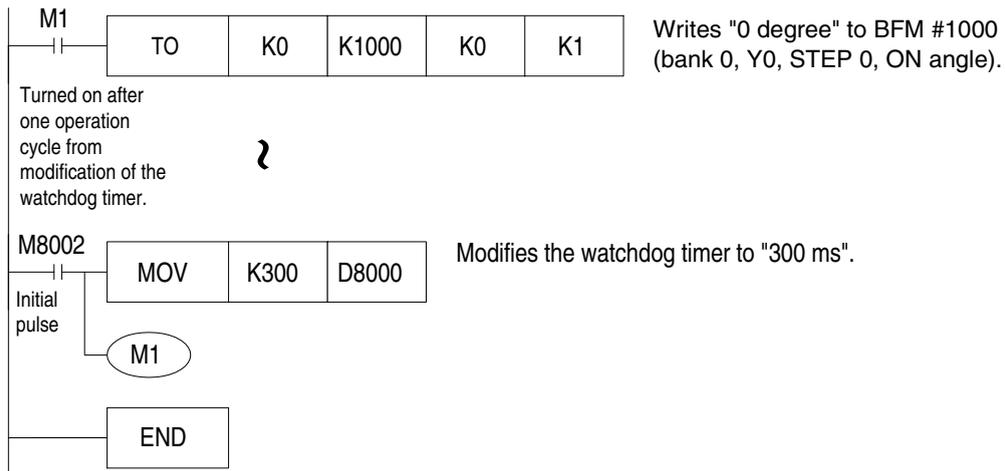
All the buffer memories (BFM) of the FX2N-1RM accommodate 16-bit data.

When reading or writing data from the PLC main unit, use 16-bit FROM/TO instructions.

(If 32-bit instructions ([D] FROM/[D] TO) are used, instructions are executed using 32-bit data for the specified BFM No. and the consecutive BFM No.)

# 7.4    Program example

7-12

### 7.4.1    Program example which uses FROM/TO instruction

A program example using FROM/TO instructions is shown below.
In this program, the FX2N-1RM is switched to the RUN mode by input to X000 in the PLC main unit, and switched to the PRG mode by input to X001.
When actual conditions differ from those in the program shown below, change the program to suit the application accordingly.

<Description>

Data is output to the PLC main unit, each data is read, and commands are written.
(Data and each statuses are read only.)

<Device assignment>

D0: BFM #8 (current angle)
D1: BFM #9 (rotation speed (rpm))

<Program>

| M8000 | FROM | K0 | K10 | K4Y0 | K3 |
|---|---|---|---|---|---|

Outputs the ON/OFF information of BFM #10 to BFM #12 (Y0 to Y57) to Y0 to Y57 of the programmable controller.

| | FROM | K0 | K8 | D0 | K2 |
|---|---|---|---|---|---|

Reads BFM #8 (current angle) to D0, and reads BFM #9 (rotation speed) to D1.

| | FROM | K0 | K28 | K2M0 | K1 |
|---|---|---|---|---|---|

Reads BFM #28 (status) to M0 to M7.

| | TO | K0 | K3 | K2M10 | K1 |
|---|---|---|---|---|---|

Writes the command M10 to M17 to BFM #3.

| X000 | RUN command | (M10) |
|---|---|---|

| X001 | PRG command | (M11) |
|---|---|---|

| X002 | Error reset | (M13) |
|---|---|---|
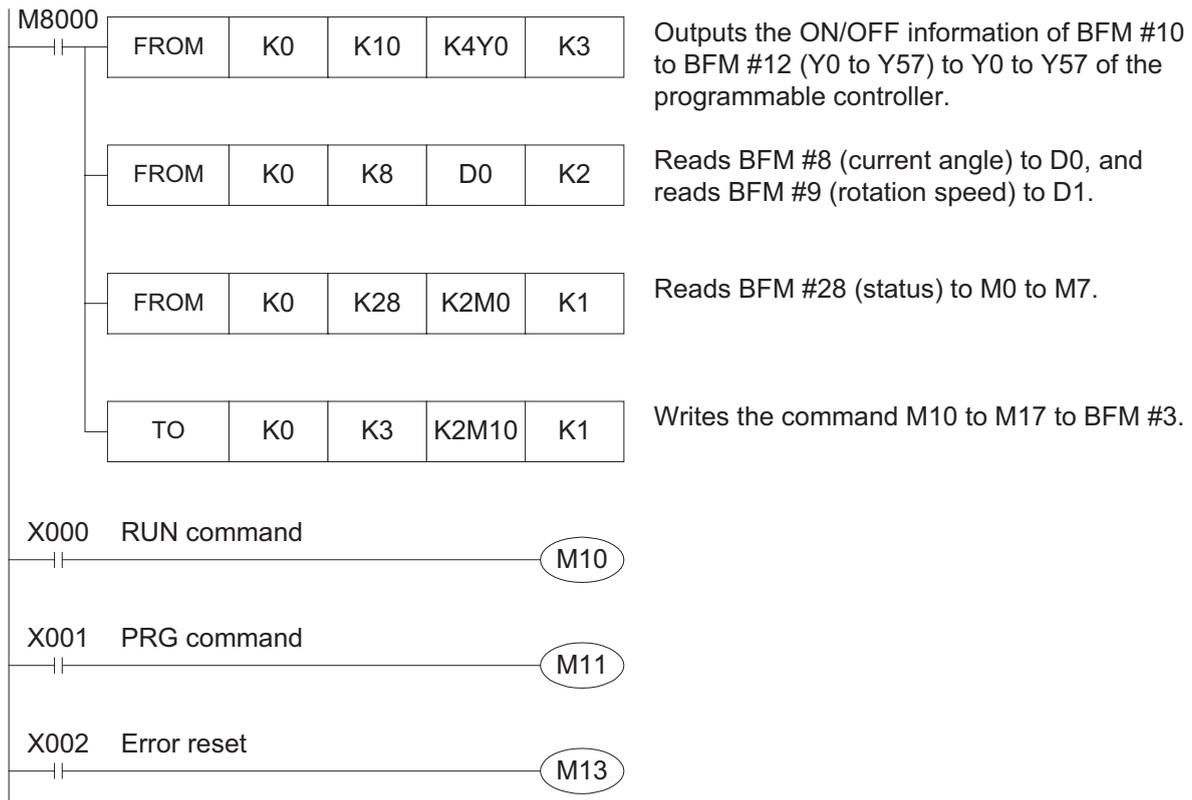
Use the program example shown below when the resolver rotation speed is low at startup, stop, etc. and the current angle and output status are unstable.

<Description>

Rotation direction: Clockwise only
Angle: Single angle
Angle proceeded in 1 scan: 1 to 59°

<Device assignment>

D0: BFM #8 (current angle)
D1: BFM #9 (rotation speed (rpm))
D10: Previous value of current angle
D11: Latest value of current angle
M350: FX2N-1RM output status stability confirmation flag

<Program>

| Ladder | Description |
|---|---|
| M8002 —[ FROM K0 K8 D10 K1 ] | When the programmable controller goes into RUN mode, the value stored in BFM #8 (current angle) is read to D10. |
| M8000 —[ FROM K0 K8 D11 K1 ] | The latest value stored in BFM #8 (current angle) is read to D11. |
| [ SUB D11 D10 D12 ] | The latest angle (stored in D11) is compared with the previous angle (stored in D10). |
| When the angle does not pass 0° 0<D12<60: When the angle has increased by 1 to 59° (*1*2) AND< K0 D12 — AND< D12 K60 *1*2 —( M350 ) | When the angle has increased, M350 is set to ON and the latest value of the current angle (stored in D11) is stored in D10 to update the previous value. |
| When the angle passes 0° -360<D12<-300: When the angle has increased by 1 to 59° (*1*2) AND< K-360 *1 D12 — AND< D12 K-300 *1*2 — MOV D11 D10 | |
| M350 —[ FROM K0 K10 K4Y0 K3 ] | Outputs the ON/OFF information of BFM #10 to BFM #12 (Y0 to Y57) to Y0 to Y57 of the programmable controller. |
| [ FROM K0 K8 D0 K2 ] | Reads BFM #8 (current angle) to D0, and reads BFM #9 (rotation speed) to D1. |
| M8000 —[ FROM K0 K28 K2M0 K1 ] | Reads BFM #28 (status) to M0 to M7. |
| [ TO K0 K3 K2M10 K1 ] | Writes the command M10 to M17 to BFM #3. |
| X000 RUN command —( M10 ) | |
| X001 PRG command —( M11 ) | |
| X002 Error reset —( M13 ) | |

*1: Double the value in the case of double angle.
*2: The figure below shows the variation of the rotation angle. Set a value larger than the angle proceeded in 1 scan.
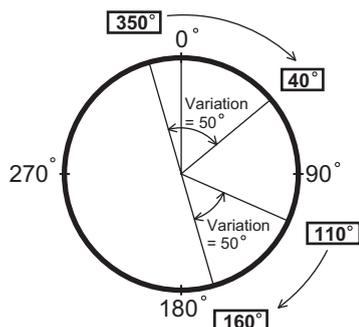
<Example>
- 110° → 160° (when the angle does not pass 0°)
  160 - 110 = 50
- 350° → 40° (when the angle passes 0°)
  40 - 350 = -310

## 7.4.2    Program example which uses indirect specification (BFM #100 to #105)

The bank number and the output number are specified with Graphic Operation Terminal GOT-F900 series connected with a PLC.
And, writing and reading are done to the ON/OFF angle of all patterns. (step 0 to step 7)
Writing and reading the ON/OFF angle are indirectly done. (BFM #100 to #105 is used.)

<System configuration>



F940GOT-SWD-E

PLC FX2N series                    FX2N-1RM

<Device assignment>
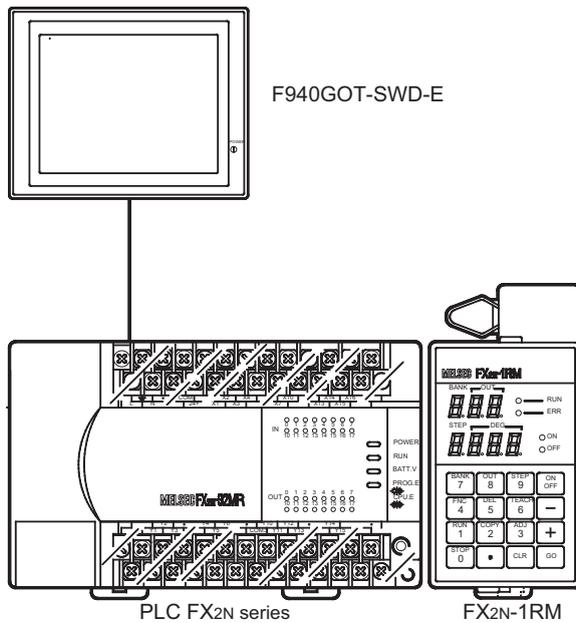
The device writes all data by F940GOT-SWD-E

D0              : Bank number specification      0 to 7
D1              : Output number specification    0 to 57(octal number)
D300 to D315 : ON/OFF angle input

|           | **Step 0** | **Step 1** | **Step 2** | **Step 3** | **Step 4** | **Step 5** | **Step 6** | **Step 7** |
|-----------|------------|------------|------------|------------|------------|------------|------------|------------|
| ON angle  | D300       | D302       | D304       | D306       | D308       | D310       | D312       | D314       |
| OFF angle | D301       | D303       | D305       | D307       | D309       | D311       | D313       | D315       |

M10              : Writing instruction
M11              : Reading instruction

&lt;Program&gt;
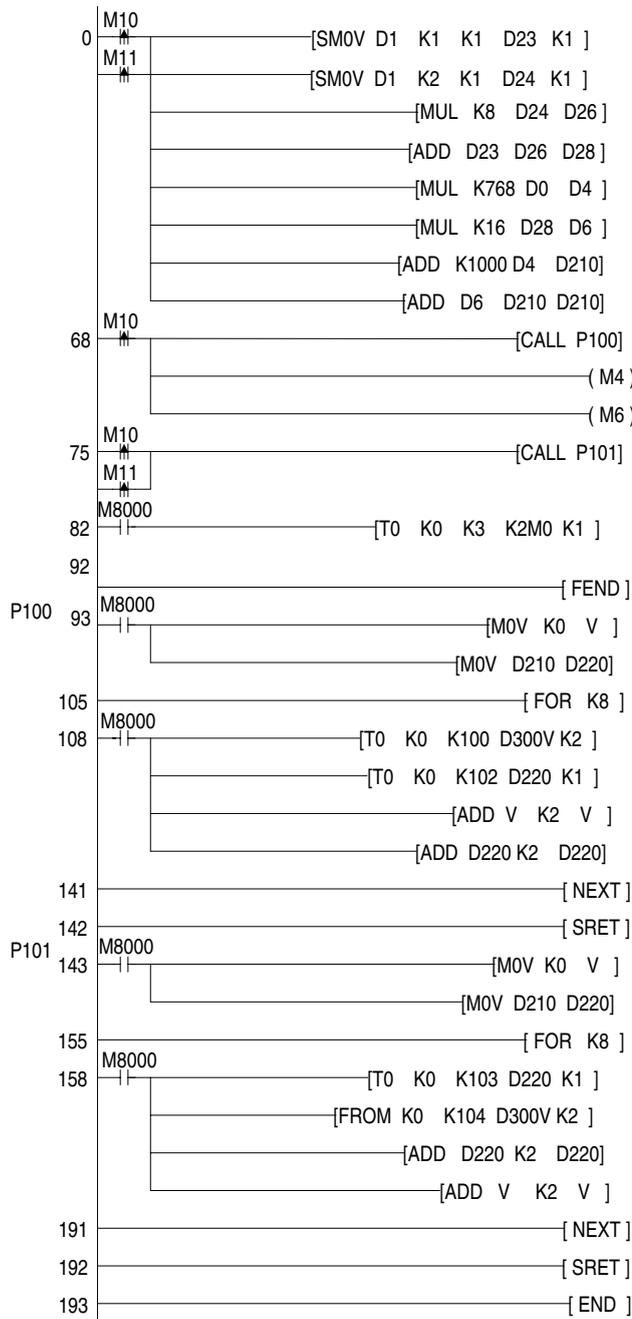
| Rung | Ladder instruction | Description |
|---|---|---|
| 0 | M10 / M11 — [SM0V D1 K1 K1 D23 K1 ] | • The BFM number is specified based on output number specification(D1: 0 to 57) Octal number→decimal number... place of 10 × 8 + place of 1 |
| | [SM0V D1 K2 K1 D24 K1 ] | |
| | [MUL K8 D24 D26 ] | |
| | [ADD D23 D26 D28 ] | |
| | [MUL K768 D0 D4 ] | • Bank specification BFM number (D210) = 768 × bank specification number(D0) + 1000 Output specification BFM number (D210) = 16 × specification of output number of decimal number(D28) + bank specification number(D210) |
| | [MUL K16 D28 D6 ] | |
| | [ADD K1000 D4 D210] | |
| | [ADD D6 D210 D210] | |
| 68 | M10 — [CALL P100] | |
| | ( M4 ) | ··· • Writing instruction to EEPROM (RUN mode) |
| | ( M6 ) | ··· • Writing instruction to EEPROM (PRG mode) |
| 75 | M10 / M11 — [CALL P101] | |
| 82 | M8000 — [T0 K0 K3 K2M0 K1 ] | ··· • Writing of command |
| 92 | [ FEND ] | |
| P100 93 | M8000 — [M0V K0 V ] | ··· • Initialization of index register |
| | [M0V D210 D220] | ··· • Shelter of data |
| 105 | [ FOR K8 ] | ··· • FOR to NEXT is repeated 8 times. |
| 108 | M8000 — [T0 K0 K100 D300V K2 ] | ··· • Writing of turning on angle and turning off angle of specified step |
| | [T0 K0 K102 D220 K1 ] | ··· • Writing address |
| | [ADD V K2 V ] | • Change in step number data and writing address (increases by two) |
| | [ADD D220 K2 D220] | |
| 141 | [ NEXT ] | |
| 142 | [ SRET ] | |
| P101 143 | M8000 — [M0V K0 V ] | ··· • Initialization of index register |
| | [M0V D210 D220] | ··· • Shelter of data |
| 155 | [ FOR K8 ] | ··· • FOR to NEXT is repeated 8 times. |
| 158 | M8000 — [T0 K0 K103 D220 K1 ] | ··· • Reading address |
| | [FROM K0 K104 D300V K2 ] | ··· • Reading of turning on angle and turning off angle of specified step |
| | [ADD D220 K2 D220] | • Change in step number data and reading address (increases by two) |
| | [ADD V K2 V ] | |
| 191 | [ NEXT ] | |
| 192 | [ SRET ] | |
| 193 | [ END ] | |

# Memo

| 1 | Introduction |
|---|---|

| 2 | Installation |
|---|---|

| 3 | Specifications |
|---|---|

| 4 | External Wiring |
|---|---|

| 5 | Extension Block Specifications and External Wiring |
|---|---|

| 6 | Basic Setting |
|---|---|

| 7 | BFM Assignment |
|---|---|

| 8 | Program Operating Procedures |
|---|---|

| 9 | Monitor |
|---|---|

| 10 | Test |
|---|---|

| 11 | Diagnostics |
|---|---|

| | Appendix |
|---|---|

# 8.   Program Operating Procedures

This section describes the program operating procedures in the FX2N-1RM using the data setting panel.

## 8.1   Functions offered by the data setting panel

**< Data setting panel function list >**

In addition to the following list. There is a monitor mode (refer to 9.1) and a test mode (refer to 10.1)

| Item | Function | Mode | Description page |
|---|---|---|---|
| Read | Reads a program. | PRG | 8-3 |
| Write | Writes and modifies a program. | PRG | 8-4 |
| Insertion | Inserts a program. | PRG | 8-5 |
| Deletion | Deletes a program. | PRG | 8-6 |
| Bank copy | Copies contents of existing bank to specified bank. | PRG | 8-8 |
| Output copy | Copies contents of existing output to specified output of same bank. | PRG | 8-8 |
| Teaching modification | Treats current position of resolver as set value. | PRG | 8-9 |
| Teaching insertion | Inserts current position of resolver as set value. | PRG | 8-10 |
| Forced RUN/PRG | Changes over mode between RUN (operation) and PRG (stop/program) from data setting panel to FX2N-1RM. | PRG | 8-11 |
| Read of reference angle | Reads and displays reference angle. | PRG | 8-12 |
| Setting of reference angle | Modifies reference angle. | PRG | 8-12 |
| Specification of resolution | Specifies resolution (0.5 degree or 1 degree). | PRG | 8-13 |
| Specification of rotation direction | Specifies rotation direction of resolver (counterclockwise or clockwise). | PRG | 8-13 |
| Write-protect of EEPROM | Specifies availability of write to EEPROM (prohibited or enabled). | PRG | 8-14 |
| Setting of bank specification method | Specifies bank specification method (external input or PLC). | PRG | 8-14 |
| Setting of automatic angle advance function | Specifies use of automatic angle advance function, and sets rotation speed and angle advance quantity. | PRG | 8-15 |
| Individual automatic angle advance function | The output number, rotational speed, and angle advance quantity of individual automatic angle advance function is set. | PRG | 8-17 |
| Prohibition of RUN to PRG operation | The RUN to PRG operation with data setting panel is prohibited. | PRG | 8-21 |
| Current angle transfer function | Current angle of the resolver is transferred to BFM#106 via turning ON input terminal B1. | PRG | 8-21 |
| Reverse of output pattern | Reverses output pattern of existing program. | PRG | 8-22 |
| Batch addition of output set angle | Adds specified angle to set angle of specified output pattern at a time. | PRG | 8-23 |
| Batch subtraction of output set angle | Subtracts specified angle from set angle of specified output pattern at a time. | PRG | 8-23 |
| Batch addition of ON output set angle | Adds specified angle to ON set angle of specified output at a time. | PRG | 8-24 |
| Batch subtraction of ON output set angle | Subtracts specified angle from ON set angle of specified output at a time. | PRG | 8-24 |

| Item | Function | Mode | Description page |
|---|---|---|---|
| Batch addition of OFF output set angle | Adds specified angle to OFF set angle of specified output at a time. | PRG | 8-25 |
| Batch subtraction of OFF output set angle | Subtracts specified angle from OFF set angle of specified output at a time. | PRG | 8-25 |
| BCD output (negative logic) | Outputs current angle as BCD from a certain output No. (negative logic). | PRG | 8-26 |
| BCD reverse output (positive logic) | Outputs current angle as BCD from a certain output No. (positive logic). | PRG | 8-26 |
| One-phase pulse output (180 pulses/rotation) | Outputs a pulse string from an arbitrary output No. (One-phase, 180 pulses/rotation). | PRG | 8-27 |
| Two-phase pulse output (90 pulses/rotation) | Outputs a pulse string from an arbitrary output No. (Two-phase, 90 pulses/rotation). | PRG | 8-27 |
| RUN output | Always outputs ON from an arbitrary output No. in RUN mode. | PRG | 8-28 |
| One-phase pulse output (60 pulses/rotation) | Outputs a pulse string from an arbitrary output No. (One-phase, 60 pulses/rotation). | PRG | 8-28 |
| Keyword registration | Registers keyword to prevent write to EEPROM and theft of a program. | PRG | 8-30 |
| Keyword deletion | Deletes keyword. | PRG | 8-30 |

# 8.2 Basic operating procedures

### 8.2.1 Common items

- When the power is turned on, the following initial screen is displayed on the data setting panel.

  **< When the PRG mode is selected >**

  | BANK | OUT | STEP | DEG | ON LED | OFF LED |
  |------|-----|------|-----|--------|---------|
  | 0 | 0 | 0 | Blank*1 | Lit | Exting-uished |

  *1: When an angle is already set to the output Y0, that ON angle is displayed.

  **< When the RUN mode is selected >**

  The display mode just before the power is turned off or just before the mode is switched to the PRG mode is displayed. (Refer to Paragraph 9.1.)

- When setting the ON/OFF angle of an output or the angle advance quantity of the automatic angle advance function from the data setting panel, use the [ · ] key to enter "0.5 degree". (For setting from the buffer memory, refer to Paragraph 6.2.)

  Example: When setting "90.5 degree"
  Press the [9], [0] and [ · ] keys. A decimal point is also displayed on the DEG display. (Refer to Paragraph 8.3.5.)

- In the FX2N-1RM, modification of a program can be prohibited by registering a keyword or setting the write-protect function of the built-in EEPROM.
  When "Prt" is displayed while a program is modified, delete the registered keyword or reset the write-protect function of the built-in EEPROM, then modify the program again.

- Handling of the [CLR] key
  1 ) After having performed an erroneous operation or erroneous input, the last operation can be undone by pressing the [CLR] key.
  2 ) The error indication can be cleared by pressing the [CLR] key. When the [CLR] key is pressed, the error indication currently displayed is cleared, and "STEP0" is displayed.
  3 ) When the [CLR] key is pressed after a read operation was performed and while an angle is displayed on the DEG display, the insertion mode is selected and the DEG display becomes blank.

- Timing to save a program to the EEPROM
  While the data setting panel is manipulated, data is written to both the buffer memory and the EEPROM when the [GO] key is pressed.

### 8.2.2 Read                                                    **[Power ON][PRG mode]**

Read the specified program bank, the specified output and the specified step No.

| BANK | 0 | GO | → | OUT | 0 | GO | → | STEP | 0 | GO |

Read the program bank No. 0.         Read the output Y00.         Read the step No. 0.
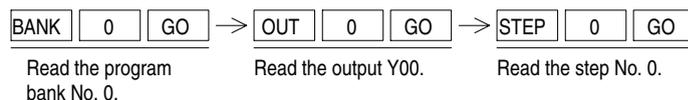
When the [-] key is pressed, the item is moved in the order of "OFF angle of the previous step" and "ON angle of the previous step" (, then stops at the step No. 0).
When the [+] key is pressed, the item is moved in the order of "OFF angle of the same step" and "ON angle of the next step" (, then stops at the step No. 7).
When the [+] key is pressed and held for 0.3 sec or more, the next item is displayed in turn.
When the [-] key is pressed and held for 0.3 sec or more, the previous item is displayed in turn.

### 8.2.3    Write and modification                    **[Power ON] [PRG mode]**

Read the step No. to be written or modified, then set the ON/OFF angle of the output.
When writing new data, perform the write operation in the order of "ON angle" and "OFF angle".
When modifying the existing data, the ON angle or the OFF angle can be modified separately.

< Key operation >

| BANK | 0 | GO | Read the program bank No. 0. |

↓

| OUT | 0 | GO | Read the output Y00. |

↓

| STEP | 0 | GO | Read the step No. 0. |

↓

| ON OFF | | | Start to set ON/OFF of the output Y00. |

↓

| 1 | 2 | 3 | Enter the ON angle of the output Y00. |

↓

| ON OFF | or | GO | Determine the ON angle. When data is newly written or the [ON OFF] key is pressed, the process proceeds to setting of the OFF angle. When the existing data is modified, the contents of modification are written to the EEPROM when the [GO] key is pressed. |

↓

| 1 | 3 | 5 | Enter the OFF angle of the output Y00. |

↓

| GO | | | Determine the OFF angle. The ON/OFF set angle of the output Y00 entered is written to the built-in EEPROM. |

● When the data entered is equivalent to (overlaps) the existing ON/OFF angle, the error indication "E02" is displayed.  At this time, the data entered is not written.

● When the [GO] key is pressed at the end of the OFF angle setting operation for the step No. 7, the step 0 of the same bank is displayed.

< Display >

| BANK | OUT | STEP | DEG | ON LED | OFF LED |
|------|-----|------|-----|--------|---------|
| 0 | 0 | 0 | Blank*1 | Lit | Extinguished |

*1    When a modification operation is performed, the ON angle of the output Y00 already registered is displayed.

On the DEG , "0" is displayed or an angle already registered flashes.
The ON LED is lit to indicate that the ON angle setting operation is being performed.

"123" flashes on the DEG.

The OFF LED is lit to indicate that the process has proceeded to the OFF angle setting operation of the same step.

"135" flashes on the DEG.

The data setting operation proceeds to the next step, and the data setting panel becomes the following status.

| BANK | OUT | STEP | DEG | ON LED | OFF LED |
|------|-----|------|-----|--------|---------|
| 0 | 0 | 1 | Blank*2 | Lit | Extinguished |

*2    When a modification operation is performed, the ON angle of the next step already registered is displayed.

•    When setting the ON/OFF angle of an output or the angle advance quantity of the automatic angle advance function from the data setting panel, use the [ · ] key to enter "0.5 degree".
Example: When setting "90.5 degree"
Press the [9], [0] and [ · ] keys. A decimal point is also displayed on the DEG display.

### 8.2.4　Insertion

Insertion is performed to the steps Nos. 0 to 6 of the same bank and the same output No.
When data is inserted into an arbitrary step, the steps after the specified step are shifted backward by 1 step respectively, and the set value is written. At this time, if a set value is already written to the step No. 7, shift backward is disabled and the error E06 occurs.
Read the head of a program at first, then insert the ON/OFF angle of the output.

< Key operation >

| BANK | 0 | GO | Read the program bank No. 0. |

↓

| OUT | 0 | GO | Read the output Y00. |

↓

| STEP | 0 | GO | Read the step No. 0. |

↓

| CLR | Select the insertion mode. |

↓

| ON OFF | Start to set ON/OFF of the output Y00. |

↓

| 2 | 4 | 6 | Enter the ON angle of the output Y00. |

↓

| ON OFF | or | GO | Determine the ON angle. Then, the process proceeds to setting of the OFF angle. |

↓

| 3 | 4 | 5 | Enter the OFF angle of the output Y00. |

↓

| GO | Determine the OFF angle. The existing set values of the step No. 0 and later are shifted backward by 1 step respectively, and the ON/OFF set angle of the output Y00 entered is written to the built-in EEPROM |

When the data entered is equivalent to (overlaps) the existing ON/OFF angle, the error indication "E02" is displayed. At this time, the data entered is not inserted.
When data is already present in the step No. 7, the error indication "E06" is displayed. At this time, the data entered is not inserted either.

< Display >

| BANK | OUT | STEP | DEG | ON LED | OFF LED |
|------|-----|------|-----|--------|---------|
| 0 | 0 | 0 | # # # *1 | Lit | Exting-uished |

*1　The ON angle of the output Y00 already registered is displayed.

Nothing is displayed on the DEG to indicate that the insertion mode is selected.

"0" flashes on the DEG.
The ON LED is lit to indicate that the ON angle setting operation is being performed.

"246" flashes on the DEG.

The OFF LED is lit to indicate that the process has proceeded to the OFF angle setting operation of the same step.
At this time, "0" flashes on the DEG.

"345" flashes on the DEG.

The data setting operation proceeds to the next step, and the data setting panel becomes the following status.

| BANK | OUT | STEP | DEG | ON LED | OFF LED |
|------|-----|------|-----|--------|---------|
| 0 | 0 | 1 | 000 *2 | Lit | Exting-uished |

*2　The step No. 1 (former step No. 0) shifted backward by insertion is displayed.

### 8.2.5    Deletion                                   **[Power ON] [PRG mode]**

Delete the entire program, the bank data, the output data or the step data (ON/OFF).
The entire program contains the bank data, the output data, the step data, the initial setting,
setting of reference angle, the setting of automatic angle advance and the keyword.

---

**Deleting the entire program**

< Key operation >

DEL

↓

GO
↓
GO

< Display >

| BANK | OUT | STEP | DEG | ON LED | OFF LED |
|------|-----|------|-----|--------|---------|
| "0" flashes | "0" flashes | "0" flashes | "# # #" flashes*1 | Exting-uished | Exting-uished |

*1   The ON angle of the output Y00 already
     registered flashes.

"dEL" flashes on the DEG.

| BANK | OUT | STEP | DEG | ON LED | OFF LED |
|------|-----|------|-----|--------|---------|
| 0 | 0 | 0 | Blank | Lit | Exting-uished |

---

**Deleting a specified bank**

< Key operation >
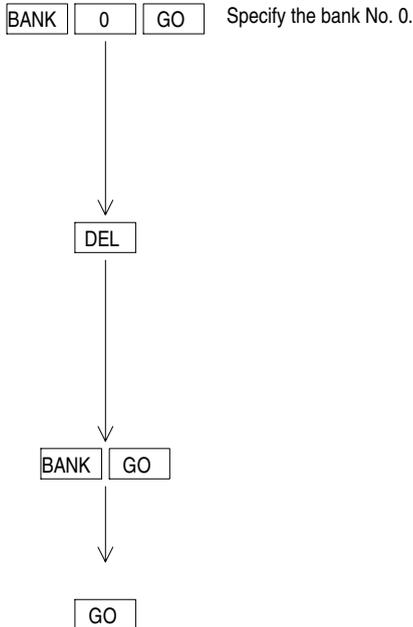
BANK   0   GO    Specify the bank No. 0.

↓

DEL

↓

BANK   GO

↓

GO

< Display >

| BANK | OUT | STEP | DEG | ON LED | OFF LED |
|------|-----|------|-----|--------|---------|
| 0 | 0 | 0 | # # # *1 | Lit | Exting-uished |

*1   The ON angle of the output Y00 already
     registered is displayed.

| BANK | OUT | STEP | DEG | ON LED | OFF LED |
|------|-----|------|-----|--------|---------|
| "0" flashes | "0" flashes | "0" flashes | # # # flashes*2 | Lit | Exting-uished |

*2   The ON angle of the output Y00 already
     registered flashes.

When the [BANK] key is pressed, only the BANK "0" flashes.

When the [GO] key is pressed, "dEL" flashes on the DEG.

| BANK | OUT | STEP | DEG | ON LED | OFF LED |
|------|-----|------|-----|--------|---------|
| 0 | 0 | 0 | Blank | Lit | Exting-uished |

## Deleting a specified output                                                                8-7
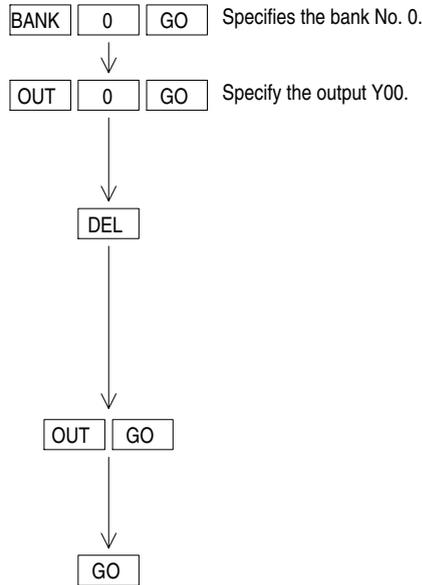
< Key operation >

| BANK | 0 | GO | Specifies the bank No. 0.

| OUT | 0 | GO | Specify the output Y00.

| DEL |

| OUT | GO |

| GO |

< Display >

| BANK | OUT | STEP | DEG | ON LED | OFF LED |
|------|-----|------|-----|--------|---------|
| 0 | 0 | 0 | # # #<br>*1 | Lit | Exting-<br>uished |

*1  The ON angle of the output Y00 already
    registered is displayed.

| BANK | OUT | STEP | DEG | ON LED | OFF LED |
|------|-----|------|-----|--------|---------|
| "0"<br>flashes | "0"<br>flashes | "0"<br>flashes | # # #<br>flashes*2 | Exting-<br>uished | Exting-<br>uished |

*2  The ON angle of the output Y00 already
    registered flashes.

When the [OUT] key is pressed, only the OUT "0" flashes.

(The BANK "0" is displayed.)

When the [GO] key is pressed, "dEL" flashes on the DEG.

| BANK | OUT | STEP | DEG | ON LED | OFF LED |
|------|-----|------|-----|--------|---------|
| 0 | 0 | 0 | Blank | Lit | Exting-<br>uished |

## Deleting the ON/OFF data of a specified step

< Key operation >

| BANK | 0 | GO | Specify the bank No. 0.

| OUT | 0 | GO | Specify the output Y00.

| STEP | 0 | GO | Specify the step No. 0.

| DEL | ←

Steps are deleted one by one
by repetitious operations.

| STEP | GO |

| GO |
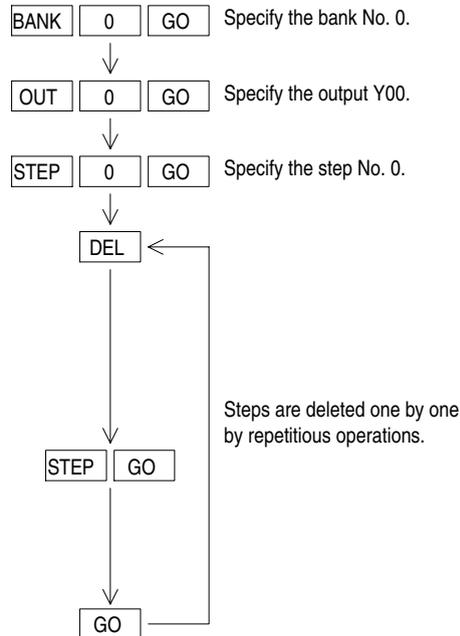
The ON/OFF data of the specified step is deleted,
and the ON/OFF data of the step after the specified
step and later is shifted forward respectively.

< Display >

| BANK | OUT | STEP | DEG | ON LED | OFF LED |
|------|-----|------|-----|--------|---------|
| 0 | 0 | 0 | # # #<br>*1 | Lit | Exting-<br>uished |

*1  The ON angle of the output Y00 already
    registered is displayed.

| BANK | OUT | STEP | DEG | ON LED | OFF LED |
|------|-----|------|-----|--------|---------|
| "0"<br>flashes | "0"<br>flashes | "0"<br>flashes | # # #<br>flashes*2 | Exting-<br>uished | Exting-<br>uished |

*2  The ON angle of the output Y00 already
    registered is displayed.

When the [STEP] key is pressed, only the STEP "0" flashes.
(The BANK "0" and the OUT "0" are displayed.)

When the [GO] key is pressed, "dEL" flashes on the DEG.

| BANK | OUT | STEP | DEG | ON LED | OFF LED |
|------|-----|------|-----|--------|---------|
| 0 | 0 | 0 | # # #<br>*3 | Lit | Exting-<br>uished |

The step No. 0 (former step No. 1) shifted
forward by deletion is displayed.

**8.2.6    Copy**                                            **[Power ON] [PRG mode]**

Copy the contents of an existing bank to a specified bank. Copy the contents of an existing output to a specified output of the same bank.

### Copying a bank

< Key operation >

BANK   0   GO    Specify the copy source.

↓

CPY

↓

BANK   1    Specify the copy destination.

↓

GO
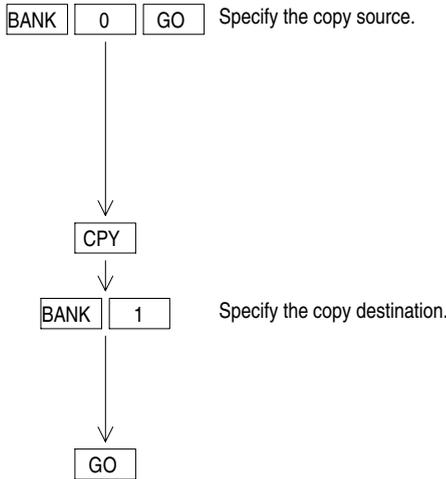
The error indication "E07" is displayed when the bank No. specified as source is equivalent to the bank No. specified as destination.  At this time, copy is not executed.

< Display >

| BANK | OUT | STEP | DEG | ON LED | OFF LED |
|------|-----|------|-----|--------|---------|
| 0 | 0 | 0 | # # #<br>*1 | Lit | Exting-<br>uished |

*1   The ON angle of the output Y00 already registered is displayed.

"CPY" flashes on the DEG.

When the [BANK] and [1] keys are pressed, the BANK "1" and "cpy" flash.

| BANK | OUT | STEP | DEG | ON LED | OFF LED |
|------|-----|------|-----|--------|---------|
| 1 | 0 | 0 | # # #<br>*2 | Lit | Exting-<br>uished |

*2   The ON angle of the output Y00 of the copy destination bank is displayed.

### Copying an output

< Key operation >

BANK   0   GO

OUT   0   GO    Specify the copy source.

↓

CPY

↓

OUT   1   GO    Specify the copy destination.
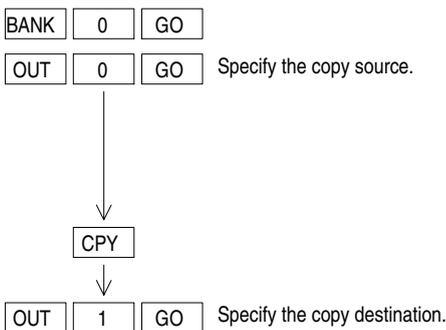
The error indication "E05" is displayed when the output No. specified as source is equivalent to the output No. specified as destination.  At this time, copy is not executed.

< Display >

| BANK | OUT | STEP | DEG | ON LED | OFF LED |
|------|-----|------|-----|--------|---------|
| 0 | 0 | 0 | # # #<br>*1 | Lit | Exting-<br>uished |

*1   The ON angle of the output Y00 already registered is displayed.

"CPY" flashes on the DEG.

| BANK | OUT | STEP | DEG | ON LED | OFF LED |
|------|-----|------|-----|--------|---------|
| 0 | 1 | 0 | # # #<br>*2 | Lit | Exting-<br>uished |

*2   The ON angle of the output Y00 of the copy destination output is displayed.

### 8.2.7　Write and modification of teaching

**[Power ON] [PRG mode]**

Treat the current position of the resolver as the set value.
Connect the resolver to the FX2N-1RM before turning on the power.

< Key operation >

| BANK | 0 | GO | Read the program bank No. 0. |

↓

| OUT | 0 | GO | Read the output Y00. |

↓

| STEP | 0 | GO | Read the step No. 0. |

↓

| TEACH | Start to set the ON angle of the output Y00. |

↓

Stop the resolver in a position in which it is to be rotated.

↓

| ON OFF | or | GO | Determine the ON angle. When data is newly written or the [ON OFF] key is pressed, the process proceeds to setting of the OFF angle. When the existing data is modified, the contents of modification are written to the EEPROM when the [GO] key is pressed. |

↓

Stop the resolver in a portion in which it is to be rotated.

↓

| GO | Determine the OFF angle. The ON/OFF set angle is written to the built-in EEPROM. |
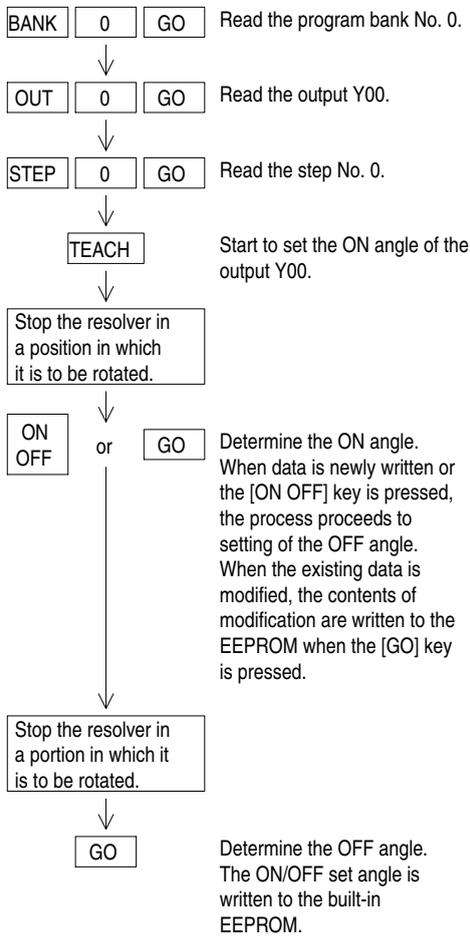
< Display >

| BANK | OUT | STEP | DEG | ON LED | OFF LED |
|---|---|---|---|---|---|
| 0 | 0 | 0 | Blank*1 | Lit | Extinguished |

*1　When a modification operation is performed, the ON angle of the output Y00 already registered is displayed.

The angle in the current position flashes on the DEG .
The OFF LED is lit to indicate that the process has proceeded to setting of the OFF angle of the same step.

| BANK | OUT | STEP | DEG | ON LED | OFF LED |
|---|---|---|---|---|---|
| 0 | 0 | 0 | # # # *2 | Extinguished | Lit |

*2　When the [GO] key is pressed while modification is performed, the OFF angle of the same step is displayed.
　　When the [ON OFF] or [GO] key is pressed while data is newly written or when the [ON OFF] key is pressed while the existing data is modified, the current angle flashes.

| BANK | OUT | STEP | DEG | ON LED | OFF LED |
|---|---|---|---|---|---|
| 0 | 0 | 1 | Blank*3 | Lit | Extinguished |

*3　When a modification operation is performed, the ON angle of the next step already registered is displayed.

## 8.2.8   Insertion of teaching                        **[Power ON][PRG mode]**

Insert the current position of the resolver as the set value.
Connect the resolver to the FX2N-1RM before turning on the power.

< Key operation >

| BANK | 0 | GO | Read the program bank No. 0. |

↓

| OUT | 0 | GO | Read the output Y00. |

↓

| STEP | 0 | GO | Read the step No. 0. |

↓

| CLR | Select the insertion mode. |

↓

| TEACH | Start to set the ON angle of the output Y00. |

↓

Rotate the resolver, and stop it in a position in which it is to be turned on.

↓

| ON OFF | or | GO | Determine the ON angle. Starts to set OFF of the output Y00. |

↓

Rotate the resolver, and stop it in a position in which it is to be turned on.

↓

| GO | Determines the OFF angle. |
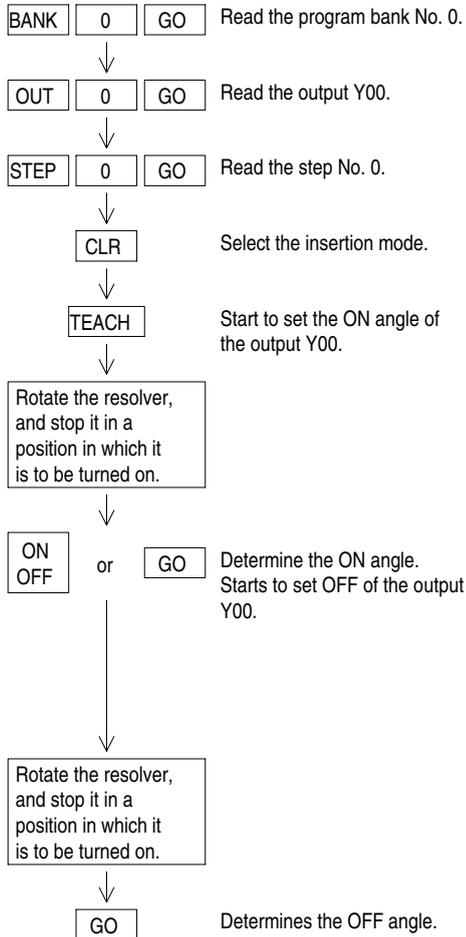
< Display >

| BANK | OUT | STEP | DEG | ON LED | OFF LED |
|------|-----|------|-----|--------|---------|
| 0 | 0 | 0 | Blank*1 | Lit | Extinguished |

*1  The ON angle of the output Y00 already registered is displayed.

Nothing is displayed on the DEG to indicate that the insertion mode is selected.

The angle in the current position flashes on the DEG.

| BANK | OUT | STEP | DEG | ON LED | OFF LED |
|------|-----|------|-----|--------|---------|
| 0 | 0 | 0 | # # # flashes*2 | Extinguished | Lit |

*2  The current angle flashes.

The OFF LED is lit to indicate that the process has proceeded to setting of the OFF angle of the same step.

| BANK | OUT | STEP | DEG | ON LED | OFF LED |
|------|-----|------|-----|--------|---------|
| 0 | 0 | 1 | # # # *3 | Lit | Extinguished |

*3  The step No. 1 (former step No. 0) shifted downward by insertion is displayed.

### 8.2.9    Changing over the mode between RUN and PRG          **[Power ON] [RUN/ PRG mode]**

Change-over the mode between RUN and PRG from the data setting panel.

#### RUN

< Key operation >

RUN

↓

GO

< Display >

| BANK | OUT | STEP | DEG |
|------|-----|------|-----|
| 0 | 0 | 0 | "RUN" flashes |

Example of current value display

| BANK | OUT | STEP | DEG | RUN LED |
|------|-----|------|-----|---------|
| 0 | Blank | Blank | # # # *1 | Lit |

*1   The current value is displayed.

When the mode is switched in the way "RUN → PRG → RUN", the monitor status just before the mode is switched from RUN to PRG is displayed.
(Refer to Paragraph 9.1)

#### PRG

< Key operation >

STOP

↓

GO

< Display >

| BANK | OUT | STEP | DEG |
|------|-----|------|-----|
| 0 | Blank | Blank | "StP" flashes |

| BANK | OUT | STEP | DEG | ON LED |
|------|-----|------|-----|--------|
| 0 | 0 | 0 | # # # *1 | Lit |

*1   The set value is displayed.

### 8.2.10   Reading/setting the reference angle                    **[Power ON][PRG mode]**

Set the current position of the resolver as the reference angle.
The reference angle is used as common in all the banks.
Connect the resolver to the FX2N-1RM before turning on the power.

---

**Read procedure**

< Key operation >

| ADJ |   Display the reference angle.

| CLR |   Return the display to the
          previous status.
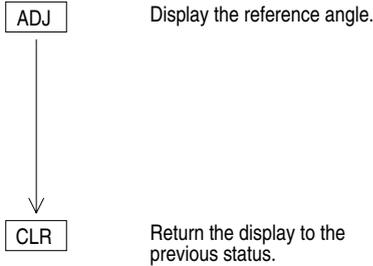
< Display >

| BANK | OUT | STEP | DEG | ON LED | OFF LED |
|------|-----|------|-----|--------|---------|
| b | Ad | Blank | ### flashes *1 | Exting- uished | Exting- uished |

*1   The reference angle already registered
     flashes.  The initial value is 0.

| BANK | OUT | STEP | DEG | ON LED | OFF LED |
|------|-----|------|-----|--------|---------|
| 0 | 0 | 0 | ### *2 | Lit | Exting- uished |

*2   The ON angle of the output Y00 already
     registered is displayed.

---

**Setting procedure**

< Key operation >

| ADJ |   Display the reference angle.

| 1 | 0 | 0 |   Enter a numeric to be treated as
              reference.

| Rotate the resolver,
  and stop it in an
  arbitrary position. |

| GO |
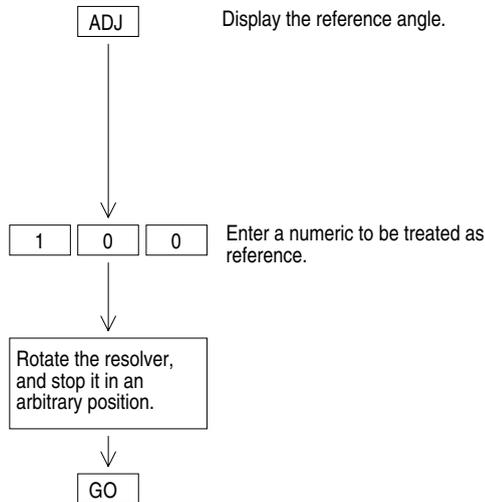
< Display >

| BANK | OUT | STEP | DEG | ON LED | OFF LED |
|------|-----|------|-----|--------|---------|
| b | Ad | Blank | ### flashes *1 | Lit | Exting- uished |

*1   The reference angle already registered
     flashes.  The initial

The numeric "100" entered flashes on the DEG.

The current position in which the resolver is
stopped is treated as set value.

| BANK | OUT | STEP | DEG | ON LED | OFF LED |
|------|-----|------|-----|--------|---------|
| 0 | 0 | 0 | ###*2 | Lit | Exting- uished |

*2   The ON angle of the output Y00 already
     registered is displayed.

# 8.3    Application operating procedures

An application operating procedure indicates a monitor operating procedure, a test operating procedure or an operating procedure using the [FNC] key. The contents when the [FNC] key is used vary depending on the FNC No. entered after the [FNC] key.

The FNC Nos. available are 0 to 6, 13 to 26, 50, 60 to 65, 70 to 75, 80, 84 and 90.

### 8.3.1    Specifying the resolution [FNC0]                    **[Power ON] [PRG mode]**

Specify the resolution.
The resolution can be selected between 1 degree (initial vale) and 0.5 degree.

< Key operation >

```
FNC    0    GO
         │
         ▼
       ON
       OFF
         │
         ▼
       GO
```

Confirm the setting by referring to the ON/OFF LED status.

The contents of the previous and later FNC Nos. can be displayed and confirmed in turn using the [-] and [+] keys.  (FNC0 to FNC4)

< Display >

| BANK | OUT | STEP | DEG | ON LED | OFF LED |
|------|-----|------|-----|--------|---------|
| 0 | 0 | 0 | F00 | Exting-uished | Lit*1 |

*1    Initial value (resolution = 1 degree)

| BANK | OUT | STEP | DEG | ON LED | OFF LED |
|------|-----|------|-----|--------|---------|
| 0 | 0 | 0 | F00 | Flashes | Exting-uished |

When setting is finished, the contents of the next FNC No. (FNC1) are displayed.

| While the OFF LED is lit: Resolution = 1 degree |
| While the ON LED is lit: Resolution = 0.5 degree |

### 8.3.2    Specifying the rotation direction of the resolver [FNC1]    **[Power ON] [PRG mode]**

Select the rotation direction of the resolver. When turned to the other direction, the ON/OFF angle is changed and output status is reversed.

< Key operation >

```
FNC    1    GO      Rotation direction
         │
         ▼
       ON
       OFF
         │
         ▼
       GO
```

CCW          CW

Output status

Output when turned to CW:   OFF   ON   OFF

Output when turned to CCW:   ON   OFF   ON

ON angle/OFF angle setting:   ON angle   OFF angle
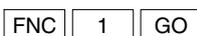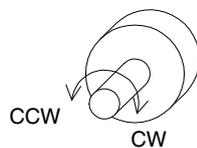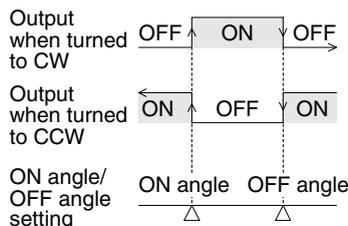
< Display >

| BANK | OUT | STEP | DEG | ON LED | OFF LED |
|------|-----|------|-----|--------|---------|
| 0 | 0 | 0 | F01 | Exting-uished | Lit*1 |

*1    Initial value (rotation direction = clockwise)

| BANK | OUT | STEP | DEG | ON LED | OFF LED |
|------|-----|------|-----|--------|---------|
| 0 | 0 | 0 | F01 | Flashes | Exting-uished |

When setting is finished, the contents of the next FNC No. (FNC2) are displayed.

| While the OFF LED is lit: Rotation direction = CW |
| While the ON LED is lit: Rotation direction = CCW |

### 8.3.3    Write-protect function of the EEPROM [FNC2]                    **[Power ON] [PRG mode]**

Enable or prohibit write of data to the EEPROM built in the FX2N-1RM.

< Key operation >

| FNC | 2 | GO |

↓

| ON |
| OFF |

↓

| GO |
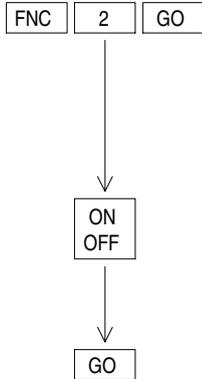
< Display >

| BANK | OUT | STEP | DEG | ON LED | OFF LED |
|------|-----|------|-----|--------|---------|
| 0 | 0 | 0 | F02 | Exting-uished | Lit*1 |

*1   Initial value (write enabled).

| BANK | OUT | STEP | DEG | ON LED | OFF LED |
|------|-----|------|-----|--------|---------|
| 0 | 0 | 0 | F 02 | Flashes | Exting-uished |

When setting is finished, the contents of the next FNC No. (FNC3) are displayed.

| While the OFF LED is lit: Write enabled |
|---|
| While the ON LED is lit: Write prohibited |

### 8.3.4    Bank specification method [FNC3]                    **[Power ON] [PRG mode]**

Select the program bank specification method.

< Key operation >

| FNC | 3 | GO |

↓

| ON |
| OFF |

↓

| GO |
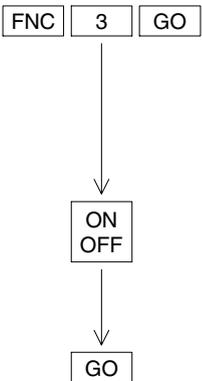
< Display >

| BANK | OUT | STEP | DEG | ON LED | OFF LED |
|------|-----|------|-----|--------|---------|
| 0 | 0 | 0 | F03 | Exting-uished | Lit *1 |

*1   Initial value (specifies by an external input of FX2N-1RM).

| BANK | OUT | STEP | DEG | ON LED | OFF LED |
|------|-----|------|-----|--------|---------|
| 0 | 0 | 0 | F03 | Flashes | Exting-uished |

When setting is finished, the contents of the next FNC No. (FNC4) are displayed.

| While the OFF LED is lit:Specifies by an external input of FX2N-1RM |
|---|
| While the ON LED is lit  :Specificat ion from programmable controller |

Set to specify the bank from the PLC without fail when you use the current angle transfer function.

### 8.3.5    Setting the automatic angle advance function [FNC4, 13 to 26]   [Power ON] [PRG mode]

Set use of the automatic angle advance angle, the rotation speed and the angle advance quantity.

Specifying the automatic angle advance function [FNC4]

< Key operation >
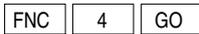
FNC   4   GO

↓

ON
OFF

Confirm the setting by referring to the ON/OFF LED status.

↓

GO

< Display >

| BANK | OUT | STEP | DEG | ON LED | OFF LED |
|---|---|---|---|---|---|
| 0 | 0 | 0 | F04 | Extinguished | Lit*1 |

*1   Initial value (invalid)

| BANK | OUT | STEP | DEG | ON LED | OFF LED |
|---|---|---|---|---|---|
| 0 | 0 | 0 | F04 | Flashes | Extinguished |

When setting is finished, the contents of the FNC5 are displayed.

> While the OFF LED is lit: Invalid
> While the ON LED is lit: Valid

Rotation speed (rpm) of S0 [FNC13]

< Key operation >

FNC   1   3   GO

↓

ON
OFF

↓

5   0

Set the rotation speed (400 rpm maximum).

↓

GO

The contents of the previous and later FNC Nos. can be displayed and confirmed in turn using the [+] and [-] keys.  (FNC13 to FNC26)

< Display >

| BANK | OUT | STEP | DEG |
|---|---|---|---|
| S | Pd | 0 *1 | "0" is displayed .*2 |

*1   It indicates that S0 is being set.
*2   The existing value is displayed.

Data flashes on the DEG to indicate that setting is ready.

| BANK | OUT | STEP | DEG |
|---|---|---|---|
| S | Pd | 0 | "50" flashes*1 |

When setting is finished, the contents of the next FNC No. (FNC14) are displayed.

Angle advance quantity (degrees) of S0 [FNC14]                                              8-16

< Key operation >                                               < Display >

| FNC | 1 | 4 | GO |

| BANK | OUT | STEP | DEG |
|------|-----|------|-----|
| d | EG | 0<br>*1 | "0" is<br>displayed<br>*2 |

*1  It indicates that S0 is being set.
*2  The existing value is displayed.

| ON |
| OFF |

| 1 | 0 | . |  Set the angle advance quantity
(180 degrees maximum).
A decimal point indicates 0.5
degree.

| BANK | OUT | STEP | DEG |
|------|-----|------|-----|
| d | EG | 0 | "10 ·"<br>flashes*3 |

| GO |

When setting is finished, the contents of the
next FNC No. (FNC15) are displayed.

*3  " · " (decimal point) indicates 0.5 degree.

---

Rotation speed (rpm) of S1 [FNC15]

< Key operation >                                               < Display >

| FNC | 1 | 5 | GO |

| BANK | OUT | STEP | DEG |
|------|-----|------|-----|
| S | Pd | 1<br>*1 | "0" is<br>displayed<br>*2 |

*1  It indicates that S1 is being set.
*2  The existing value is displayed.
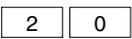
| ON |
| OFF |

| 2 | 0 |  Set the rotation speed
(400 r/min maximum).

| BANK | OUT | STEP | DEG |
|------|-----|------|-----|
| S | Pd | 1 | "20"<br>flashes*3 |

| GO |

When setting is finished, the contents of the
next FNC No. are displayed.

---

Manipulate FNC16 to FNC26 in the same way as FNC13 to FNC15.
The operating procedures for the FNC16 to the FNC26 are omitted here.

### 8.3.6    Individual automatic angle advance function [FNC5,90]          **[Power ON] [PRG mode]**

The use of individual automatic angle advance function is specified and the rotational speed and angle advance quantity are set.
Please make the specification of "use" before setting the rotational speed and angle advance quantity by the undermentioned operation.

The specification of use [FNC5]

< Key operation >

FNC  5  GO

↓

ON
OFF

↓

GO

Confirm the setting by referring to the ON/OFF LED status.

< Display >

| BANK | OUT | STEP | DEG | ON LED | OFF LED |
|------|-----|------|-----|--------|---------|
| 0 | 0 | 0 | F05 | Exting-uished | Lit*1 |

*1   Initial value (invalid)

| BANK | OUT | STEP | DEG | ON LED | OFF LED |
|------|-----|------|-----|--------|---------|
| 0 | 0 | 0 | F05 | Flashes | Exting-uished |

When setting is finished, the contents of the FNC6 are displayed.

While the OFF LED is lit: Invalid
While the ON LED is lit: Valid

Setting of rotational speed and angle advance quantity  [FNC90]　　　　　8-18

< Key operation >

| OUT | 0 | GO |

Specify the output No.
(Y00 to Y03)

| FNC | 9 | 0 | GO |

*5

| ON |
| OFF |

| 1 | 0 |

Rotational speed setting of S0.

MAX 400rpm(1 degree mode)
　　207rpm(0.5 degrees mode)

| GO |

*5
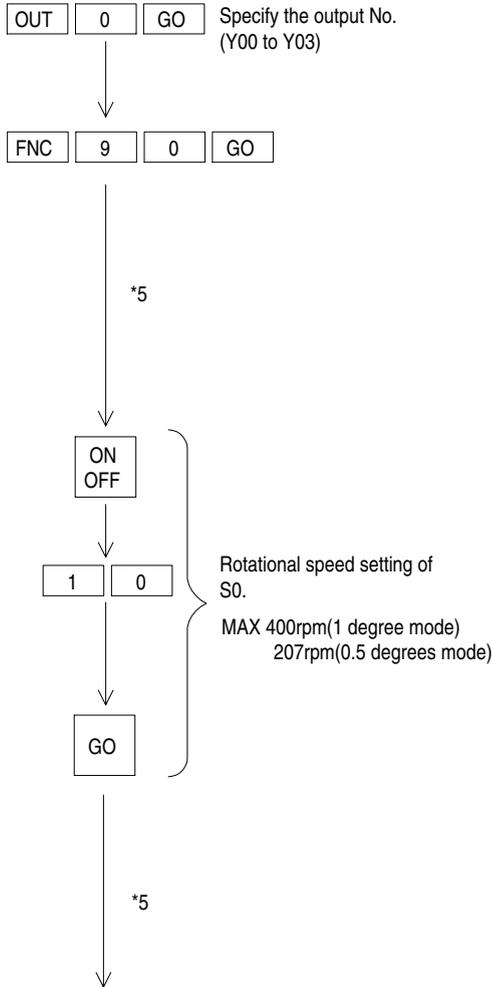
(Next page)

*5: Refer to 8-29

< Display >

| BANK | OUT | STEP | DEG | ON LED | OFF LED |
|------|-----|------|-----|--------|---------|
| 0 | 0 | 0 | 0 | Lit | Exting-uished |

The rotational speed setting of S0 is displayed
by the operation recorded left.

| BANK | OUT | STEP | DEG | ON LED | OFF LED |
|------|-----|------|-----|--------|---------|
| S | Pd | 0 | 0 Lit *1 | Exting-uished | Exting-uished |

*1: An existing value is displayed.

It is displayed that DEG display part becomes
a blinking display when the [ON OFF] key is
pushed, and setting is possible.

| BANK | OUT | STEP | DEG | ON LED | OFF LED |
|------|-----|------|-----|--------|---------|
| S | Pd | 0 | "10" flashes | Exting-uished | Exting-uished |

When the [GO] key is pushed, the ON angle
advance quantity setting of S0 is displayed.

| BANK | OUT | STEP | DEG | ON LED | OFF LED |
|------|-----|------|-----|--------|---------|
| d | EC | 0 | 0 Lit *2 | Lit | Exting-uished |

*2  ON angle advance quantity existing set
　　value of S0 is displayed.

< Key operation >

(From previous page)

```
   ↓
┌──────┐
│ ON   │
│ OFF  │
└──────┘
   ↓
┌───┬───┐        ON angle advance quantity
│ 4 │ 0 │        setting of S0
└───┴───┘
   ↓            MAX 180 degrees
                (Refer to paragraph 6.4)
┌──────┐
│ GO   │
└──────┘
   ↓
   *5
   ↓
```
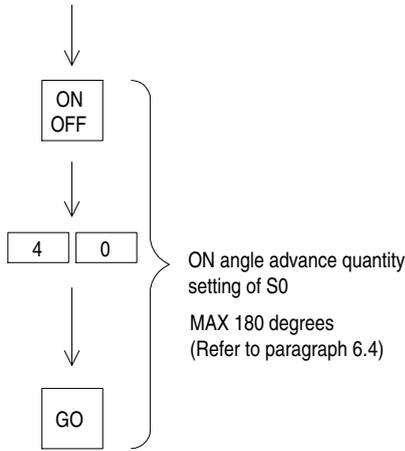
(Next page)

*5: Refer to 8-29

< Display >

It is displayed that DEG display part becomes a
blinking display when [ON OFF] key is pushed,
and setting is possible.

| BANK | OUT | STEP | DEG | ON LED | OFF LED |
|------|-----|------|-----|--------|---------|
| d | EC | 0 | "40" flashes | Lit | Exting-uished |

When the [GO] key is pushed, the OFF angle
advance quantity setting of S0 is displayed.

| BANK | OUT | STEP | DEG | ON LED | OFF LED |
|------|-----|------|-----|--------|---------|
| d | EC | 0 | 0 Lit *3 | Exting-uished | Lit |

*3: OFF angle advance quantity existing set
      value of S0 is displayed.

< Key operation >

(From previous page)

| ON |
| OFF |

| 5 | 0 |

OFF angle advance quantity setting of S0

MAX 180 degrees
(Refer to paragraph 6.4)

| GO |

*5
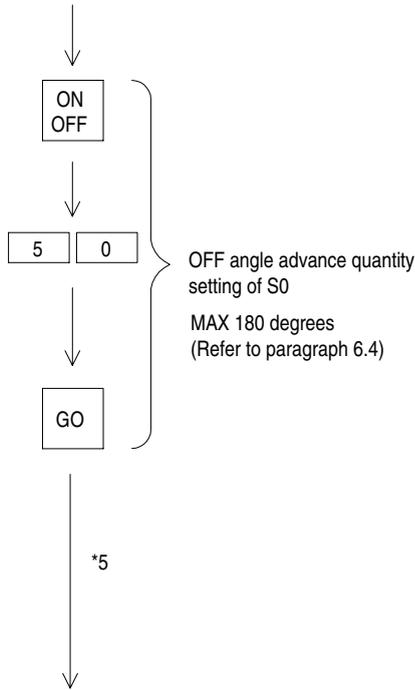
The rotational speed and angle advance quantity of S1 to S6 are set one by one as well as S0.

*5: The existing contents of S0 through S6 can be displayed by using the [+] / [-] key.

[+] key : The content of the following item setting is displayed.
(S0 → S1 . . . → S6)
[-] key : The content of the previous item setting is displayed.
(S6 → S5 . . . → S0)

< Display >

The DEG display becomes a blinking display when the [ON OFF] key is pushed, and setting is possible.

| BANK | OUT | STEP | DEG | ON LED | OFF LED |
|------|-----|------|-----|--------|---------|
| d | EC | 0 | "50" flashes | Exting-uished | Lit |

When the [GO] key is pushed, the rotational speed setting of S1 is displayed.

| BANK | OUT | STEP | DEG | ON LED | OFF LED |
|------|-----|------|-----|--------|---------|
| d | EC | 1 | <u>0</u> Lit *4 | Exting-uished | Exting-uished |

*4:  Rotational speed existing set value of S1 is displayed.

Returns to the display of the rotational speed setting about S0 when OFF angle advance quantity set operation of S6 ends.

### 8.3.7    Prohibition of RUN to PRG operation [FNC6]                    [Power ON] [PRG mode]

The RUN to PRG operation with data setting panel is prohibited.
The RUN to PRG switch by the RUN/PRG change switch and BFM#3 is effective.
(This function is added from the product since V2.20.).

Prohibition of RUN to PRG operathion [FNC6]

< Key operation >
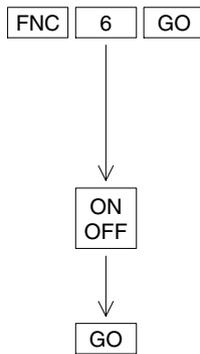
| FNC | 6 | GO |

↓

| ON |
| OFF |

↓

| GO |

Confirm the setting by referring
to the ON/OFF LED status.

< Display >

| BANK | OUT | STEP | DEG | ON LED | OFF LED |
|------|-----|------|-----|--------|---------|
| 0 | 0 | 0 | F06 | Exting-uished | Lit*1 |

*1   Initial value (Permission)

| BANK | OUT | STEP | DEG | ON LED | OFF LED |
|------|-----|------|-----|--------|---------|
| 0 | 0 | 0 | F06 | Flashes | Exting-uished |

When setting is finished, the contents of the
FNC0 are displayed.

While the OFF LED is lit: Permission
While the ON LED is lit: Prohibition

### 8.3.8    Current angle transfer function [FNC7]                    [Power ON] [PRG mode]

Current angle of the resolver is transferred to BFM#106 via turning ON input terminal B1.
Set to specify the Bank from the PLC without fail when you use the current angle transfer
function. (Function has been included since version V2.40)

< Key operation >
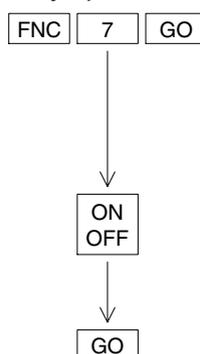
| FNC | 7 | GO |

↓

| ON |
| OFF |

↓

| GO |

Confirm the setting by referring
to the ON/OFF LED status.

< Display >

| BANK | OUT | STEP | DEG | ON LED | OFF LED |
|------|-----|------|-----|--------|---------|
| 0 | 0 | 0 | F07 | Exting-uished | Lit*1 |

*1   Initial value (Permission)

| BANK | OUT | STEP | DEG | ON LED | OFF LED |
|------|-----|------|-----|--------|---------|
| 0 | 0 | 0 | F07 | Flashes | Exting-uished |

When setting is finished, the contents of the
FNC0 are displayed.

While the OFF LED is lit: Permission
While the ON LED is lit: Prohibition

### 8.3.9   Inverting the output pattern [FNC50]        **[Power ON] [PRG mode]**

Invert the output pattern of an existing program except the fixed output patterns automatically generated by FNC70 to FNC75.

Outputs which are not set in a program cannot be inverted. (The error code "E03" is displayed.)

< Key operation >

BANK   0   GO

↓

OUT   0   GO

↓

FNC   5   0

↓

GO

↓

GO
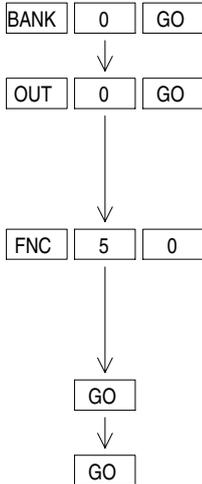
< Display >

| BANK | OUT | STEP | DEG | ON LED | OFF LED |
|------|-----|------|-----|--------|---------|
| 0 | 0 | 0 | # # #<br>*1 | Lit | Exting-uished |

*1  The angle of the output Y00 already registered is displayed.

| BANK | OUT | STEP | DEG | ON LED | OFF LED |
|------|-----|------|-----|--------|---------|
| 0 | 0 | 0 | "F50"<br>flashes | Exting-uished | Exting-uished |

"rEv" flashes on the DEG.

When setting is finished, flashing of "rEv" is changed into display of the set angle after invert.

### 8.3.10   Batch addition/subtraction of the output set angle [FNC60, 61]   **[Power ON] [PRG mode]**

Add or subtract a specified angle to/from all the steps of a specified output at a time (ON angle and OFF angle) except the fixed output patterns automatically generated by FNC70 to FNC75.

---

Batch addition [FNC60]

< Key operation >
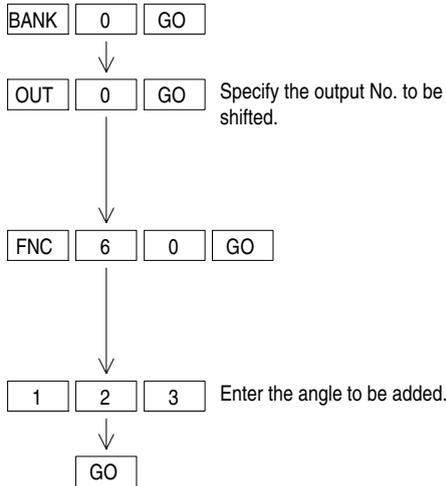
BANK | 0 | GO

↓

OUT | 0 | GO     Specify the output No. to be shifted.

↓

FNC | 6 | 0 | GO

↓

1 | 2 | 3     Enter the angle to be added.

↓

GO

< Display >

| BANK | OUT | STEP | DEG | ON LED | OFF LED |
|------|-----|------|-----|--------|---------|
| 0 | 0 | 0 | # # #<br>*1 | Lit | Exting-uished |

*1   The ON angle of the output Y00 already registered is displayed.

| BANK | OUT | STEP | DEG | ON LED | OFF LED |
|------|-----|------|-----|--------|---------|
| A | dd | 0 | "000"<br>flashes | Exting-uished | Exting-uished |

"123" flashes on the DEG.

| BANK | OUT | STEP | DEG | ON LED | OFF LED |
|------|-----|------|-----|--------|---------|
| 0 | 0 | 0 | # # #<br>*2 | Lit | Exting-uished |

*2   When setting is finished, flashing of data on the DEG is changed into display of a value shifted.

---

Batch subtraction [FNC61]

< Key operation >
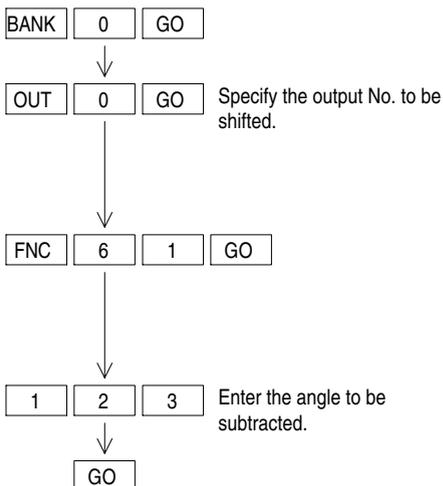
BANK | 0 | GO

↓

OUT | 0 | GO     Specify the output No. to be shifted.

↓

FNC | 6 | 1 | GO

↓

1 | 2 | 3     Enter the angle to be subtracted.

↓

GO

< Display >

| BANK | OUT | STEP | DEG | ON LED | OFF LED |
|------|-----|------|-----|--------|---------|
| 0 | 0 | 0 | # # #<br>*1 | Lit | Exting-uished |

*1   The ON angle of the output Y00 already registered is displayed.

| BANK | OUT | STEP | DEG | ON LED | OFF LED |
|------|-----|------|-----|--------|---------|
| S | ub | 0 | "000"<br>flashes | Exting-uished | Exting-uished |

"123" flashes on the DEG.

| BANK | OUT | STEP | DEG | ON LED | OFF LED |
|------|-----|------|-----|--------|---------|
| 0 | 0 | 0 | # # #<br>*2 | Lit | Exting-uished |

*2   When setting is finished, flashing of data on the DEG is changed into display of a value shifted.

### 8.3.11 Batch addition/subtraction of the ON output set angle[FNC62, 63] [Power ON][PRG mode]

Add or subtract a specified angle to/from the ON set angle of a specified output at a time (only the ON angle) except the fixed output patterns automatically generated by FNC70 to FNC75.
If the ON/OFF width becomes 0 by the setting entered, the error code "E08" is displayed.

Batch addition [FNC62]

< Key operation >
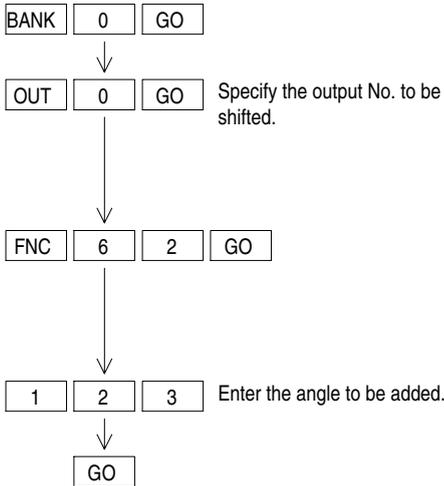
BANK  0  GO

↓

OUT  0  GO    Specify the output No. to be shifted.

↓

FNC  6  2  GO

↓

1  2  3    Enter the angle to be added.

↓

GO

< Display >

| BANK | OUT | STEP | DEG | ON LED | OFF LED |
|------|-----|------|-----|--------|---------|
| 0 | 0 | 0 | # # #<br>*1 | Lit | Exting-uished |

*1  The ON angle of the output Y00 already registered is displayed.

| BANK | OUT | STEP | DEG | ON LED | OFF LED |
|------|-----|------|-----|--------|---------|
| o | nP | 0 | "000"<br>flashes | Exting-uished | Exting-uished |

"123" flashes on the DEG.

| BANK | OUT | STEP | DEG | ON LED | OFF LED |
|------|-----|------|-----|--------|---------|
| 0 | 0 | 0 | # # #<br>*2 | Lit | Exting-uished |

*2  When setting is finished, flashing of data on the DEG is changed into display of a value shifted.

Batch subtraction [FNC63]

< Key operation >
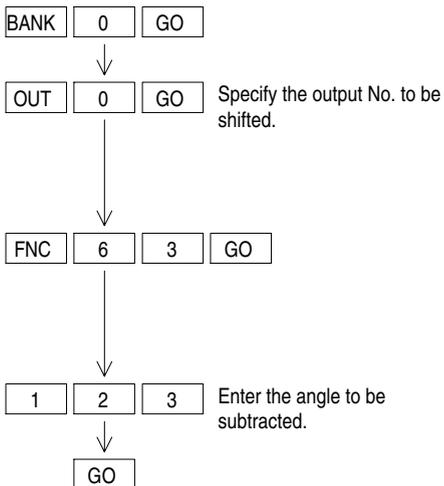
BANK  0  GO

↓

OUT  0  GO    Specify the output No. to be shifted.

↓

FNC  6  3  GO

↓

1  2  3    Enter the angle to be subtracted.

↓

GO

< Display >

| BANK | OUT | STEP | DEG | ON LED | OFF LED |
|------|-----|------|-----|--------|---------|
| 0 | 0 | 0 | # # #<br>*1 | Lit | Exting-uished |

*1  The ON angle of the output Y00 already registered is displayed.

| BANK | OUT | STEP | DEG | ON LED | OFF LED |
|------|-----|------|-----|--------|---------|
| o | nn̄ | 0 | "000"<br>flashes | Exting-uished | Exting-uished |

"123" flashes on the DEG.

| BANK | OUT | STEP | DEG | ON LED | OFF LED |
|------|-----|------|-----|--------|---------|
| 0 | 0 | 0 | # # #<br>*2 | Lit | Exting-uished |

*2  When setting is finished, flashing of data on the DEG is changed into display of a value shifted.

### 8.3.12   Batch addition/subtraction of the OFF output set angle [FNC64, 65]

**[Power ON] [PRG mode]**

Add or subtract a specified angle to/from the OFF set angle of a specified output at a time (only the OFF angle) except the fixed output patterns automatically generated by FNC70 to FNC75. If the ON/OFF width becomes 0 by the setting entered, the error code "E08" is displayed.

---

**Batch addition [FNC64]**

< Key operation >

BANK  0  GO

↓

OUT  0  GO   Specify the output No. to be shifted.

↓

+

↓

FNC  6  4  GO

↓

1  2  3   Enter the angle to be added.

↓

GO

< Display >

| BANK | OUT | STEP | DEG | ON LED | OFF LED |
|------|-----|------|-----|--------|---------|
| 0 | 0 | 0 | # # # *1 | Extinguished | Lit |

*1   The ON angle of the output Y00 already registered is displayed.

| BANK | OUT | STEP | DEG | ON LED | OFF LED |
|------|-----|------|-----|--------|---------|
| o | FP | 0 | "000" flashes | Extinguished | Extinguished |

"123" flashes on the DEG.

| BANK | OUT | STEP | DEG | ON LED | OFF LED |
|------|-----|------|-----|--------|---------|
| 0 | 0 | 0 | # # # *2 | Extinguished | Lit |

*2   When setting is finished, flashing of data on the DEG is changed into display of a value shifted.

---

**Batch subtraction [FNC65]**

< Key operation >

BANK  0  GO

↓

OUT  0  GO   Specify the output No. to be shifted.

↓

+

↓

FNC  6  5  GO

↓

1  2  3   Enter the angle to be subtracted.

↓

GO

< Display >

| BANK | OUT | STEP | DEG | ON LED | OFF LED |
|------|-----|------|-----|--------|---------|
| 0 | 0 | 0 | # # # *1 | Extinguished | Lit |

*1   The ON angle of the output Y00 already registered is displayed.

| BANK | OUT | STEP | DEG | ON LED | OFF LED |
|------|-----|------|-----|--------|---------|
| o | F$\bar{n}$ | 0 | "000" flashes | Extinguished | Extinguished |

"123" flashes on the DEG.

| BANK | OUT | STEP | DEG | ON LED | OFF LED |
|------|-----|------|-----|--------|---------|
| 0 | 0 | 0 | # # # *2 | Extinguished | Lit |

*2   When setting is finished, flashing of data on the DEG is changed into display of a value shifted.

### 8.3.13  Outputting the BCD current angle [FNC70, 71]          **[Power ON] [PRG mode]**

Output the BCD current angle. The portion after the decimal point is ignored.
The output Nos. of the current angle are Y00 to Y11 (three digits.) The strobe signal is fixed to Y12. (The strobe signal Y12 is used as a signal shared by the three digits.)
Only extension blocks dedicated to output can be connected to the FX2N-1RM.
When a program to set the ON/OFF angle is present in Y00 to Y12, output operations by that program are ignored.

---

**BCD output [FNC70]**

< Key operation >

| FNC | 7 | 0 | GO |

↓

| 2 | 0 |     Enter the strobe ON width "T".
Write the ON time of the signal required by the counterpart equipment.
(Set range: 10 to 90 ms, increment = 1 ms)

↓

| GO |

Data  ⟨⟩⟨⟩⟨⟩

OFF | ON | **Strobe** | OFF

├ T ┼ T ┼ T ┤     T: Strobe ON width
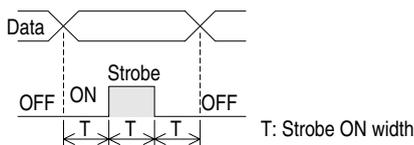
< Display >

| BANK | OUT | STEP | DEG | ON LED | OFF LED |
|------|-----|------|-----|--------|---------|
| b | cd | 0 | "000" flashes | Exting-uished | Exting-uished |

"20" flashes on the DEG.

| BANK | OUT | STEP | DEG | ON LED | OFF LED |
|------|-----|------|-----|--------|---------|
| 0 | 13 | 0 | # # # *1 | Lit | Exting-uished |

*1  When setting is finished, flashing of data on the DEG is changed into display of the ON output set angle of Y13.

---

**BCD invert output [FNC71]**          * FNC71 offers the same function as FNC70 except that ON and OFF are inverted both in the data output and the strobe output.

< Key operation >

| FNC | 7 | 1 | GO |

↓
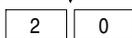
| 2 | 0 |     Enter the strobe ON width "T".
Write the OFF time of the signal required by the counterpart equipment.
(Set range: 10 to 90 ms, increment = 1 ms)

↓

| GO |

Data  ⟨⟩⟨⟩⟨⟩

ON | Strobe | ON
| OFF |

├ T ┼ T ┼ T ┤     T: Strobe OFF width
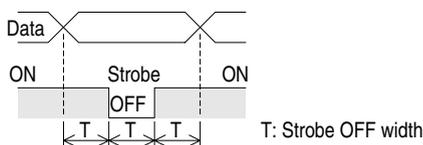
< Display >

| BANK | OUT | STEP | DEG | ON LED | OFF LED |
|------|-----|------|-----|--------|---------|
| b | cd | 0 | "000" flashes | Exting-uished | Exting-uished |

"20" flashes on the DEG.

| BANK | OUT | STEP | DEG | ON LED | OFF LED |
|------|-----|------|-----|--------|---------|
| 0 | 13 | 0 | # # # *1 | Lit | Exting-uished |

*1  When setting is finished, flashing of data on the DEG is changed into display of the ON output set angle of Y13.

### 8.3.14   Outputting the pulse string [FNC72, 73]          **[Power ON] [PRG mode]**

Output a one- or two-phase pulse string from an arbitrary output No.
The number of pulses output is 180 pulses/rotation (for one-phase) or 90 pulses/rotation (for two-phase). The rotation speed is determined by the resolution selected.
(When 1 degree is selected: 830 r/min, when 0.5 degree is selected: 415 r/min)

---

One-phase pulse output: 180 pulses/rotation [FNC72]
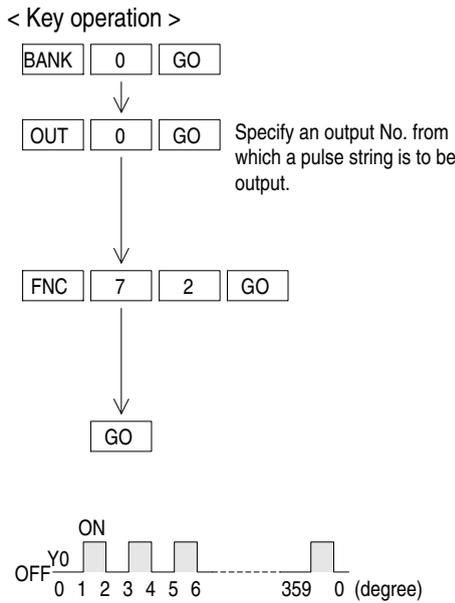
< Key operation >

BANK  0  GO

OUT  0  GO     Specify an output No. from which a pulse string is to be output.

FNC  7  2  GO

GO

ON
Y0
OFF
0 1 2 3 4 5 6      359  0 (degree)

< Display >

| BANK | OUT | STEP | DEG | ON LED | OFF LED |
|---|---|---|---|---|---|
| 0 | 0 | 0 | # # #  *1 | Lit | Exting-uished |

*1  The ON angle of the output Y00 already registered is displayed.

| BANK | OUT | STEP | DEG | ON LED | OFF LED |
|---|---|---|---|---|---|
| 0 | 0 | 0 | "F72" flashes | Exting-uished | Exting-uished |

| BANK | OUT | STEP | DEG | ON LED | OFF LED |
|---|---|---|---|---|---|
| 0 | 1 | 0 | # # #  *2 | Lit | Exting-uished |

*2  The ON angle of the output Y01 already registered is displayed.

---

Two-phase pulse output: 90 pulses/rotation [FNC73]
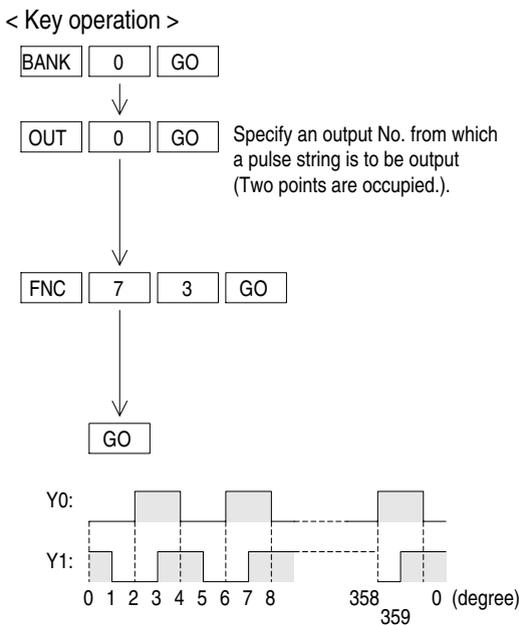
< Key operation >

BANK  0  GO

OUT  0  GO     Specify an output No. from which a pulse string is to be output (Two points are occupied.).

FNC  7  3  GO

GO

Y0:
Y1:
0 1 2 3 4 5 6 7 8    358   0 (degree)
                     359

< Display >

| BANK | OUT | STEP | DEG | ON LED | OFF LED |
|---|---|---|---|---|---|
| 0 | 0 | 0 | # # #  *1 | Lit | Exting-uished |

*1  The ON angle of the output Y00 already registered is displayed.

| BANK | OUT | STEP | DEG | ON LED | OFF LED |
|---|---|---|---|---|---|
| 0 | 0 | 0 | "F73" flashes | Exting-uished | Exting-uished |

| BANK | OUT | STEP | DEG | ON LED | OFF LED |
|---|---|---|---|---|---|
| 0 | 2 | 0 | # # #  *2 | Lit | Exting-uished |

*2  The ON angle of the output Y01 already registered is displayed.

### 8.3.15　RUN output [FNC74]　　　　　　　　　　**[Power ON] [PRG mode]**

Output always the ON signal from an arbitrary output No. in the RUN mode.

< Key operation >
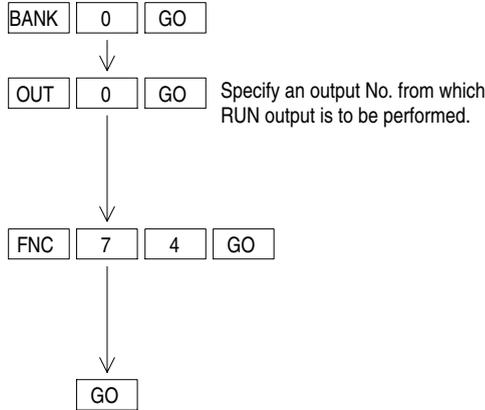
| BANK | 0 | GO |

↓

| OUT | 0 | GO | Specify an output No. from which RUN output is to be performed.

↓

| FNC | 7 | 4 | GO |

↓

| GO |

< Display >

| BANK | OUT | STEP | DEG | ON LED | OFF LED |
|------|-----|------|-----|--------|---------|
| 0 | 0 | 0 | # # # *1 | Lit | Exting-uished |

*1　The ON angle of the output Y00 already registered is displayed.

| BANK | OUT | STEP | DEG | ON LED | OFF LED |
|------|-----|------|-----|--------|---------|
| 0 | 0 | 0 | "F74" flashes | Lit | Exting-uished |

| BANK | OUT | STEP | DEG | ON LED | OFF LED |
|------|-----|------|-----|--------|---------|
| 0 | 1 | 0 | # # # *2 | Lit | Exting-uished |

*2　The ON angle of the output Y01 already registered is displayed.

### 8.3.16　**Outputting the one-phase pulse string [FNC75]**　　　**[Power ON] [PRG mode]**

Output a one-phase pulse string from an arbitrary output No.
The number of pulses output is 60 pulses/rotation. The rotation speed is determined by the resolution selected. (When 1 degree is selected: 830 r/min, when 0.5 degree is selected: 415 r/min)

< Key operation >
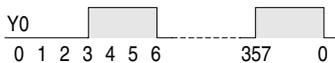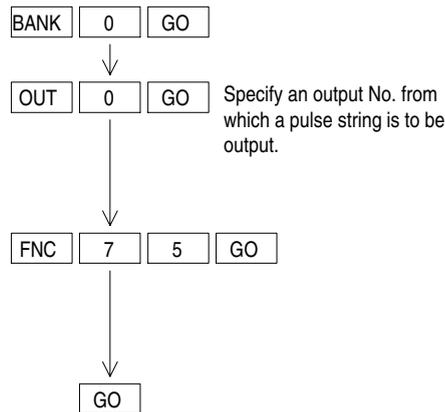
| BANK | 0 | GO |

↓

| OUT | 0 | GO | Specify an output No. from which a pulse string is to be output.

↓

| FNC | 7 | 5 | GO |

↓

| GO |

Y0
0 1 2 3 4 5 6　　357　0

< Display >

| BANK | OUT | STEP | DEG | ON LED | OFF LED |
|------|-----|------|-----|--------|---------|
| 0 | 0 | 0 | # # # *1 | Lit | Exting-uished |

*1　The ON angle of the output Y00 already registered is displayed.

| BANK | OUT | STEP | DEG | ON LED | OFF LED |
|------|-----|------|-----|--------|---------|
| 0 | 0 | 0 | "F75" flashes | Lit | Exting-uished |

| BANK | OUT | STEP | DEG | ON LED | OFF LED |
|------|-----|------|-----|--------|---------|
| 0 | 1 | 0 | # # # *2 | Lit | Exting-uished |

*2　The ON angle of the output Y01 already registered is displayed.

### 8.3.17 Confirming and deleting the setting                    [Power ON] [PRG mode]

When FNC70 to FNC75 are already set, the existing setting can be displayed or deleted using a usual read/deletion operation.

Displaying the existing setting [FNC70 to FNC75]

< Key operation > (Example of [FNC70])

| BANK | | 0 | | GO |

↓

| OUT | | 0 | | GO |   Specify an output No. from which the current value is to be output.

↓

| + |

↓

| + |
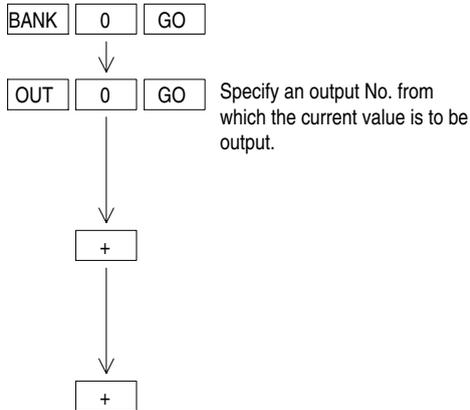
< Display >

| BANK | OUT | STEP | DEG | ON LED | OFF LED |
|------|-----|------|-----|--------|---------|
| 0 | 0 | 0 | F70 *1 | Lit | Exting-uished |

*1  The FNC No. to set the BCD current value already registered is displayed.

| BANK | OUT | STEP | DEG | ON LED | OFF LED |
|------|-----|------|-----|--------|---------|
| 0 | 0 | 0 | 20 *2 | Exting-uished | Lit |

*2  Existing strobe width set value

| BANK | OUT | STEP | DEG | ON LED | OFF LED |
|------|-----|------|-----|--------|---------|
| 0 | 0 | 1 | Blank | Lit | Exting-uished |

Deleting the existing setting [FNC70 to FNC75]

< Key operation >

By performing the procedure described in "8.2.5  Deletion", the output setting related to each of FNC70 to FNC75 is deleted.

### 8.3.18    Prohibiting write to the EEPROM and preventing theft of a program

**[Power ON] [PRG mode]**

Prohibit write to the EEPROM and prevent theft of a program using a keyword.
Reset the write-protect function of the built-in EEPROM (so that write is enabled).

---

**Registering a keyword [FNC80]**

< Key operation >

| FNC | 8 | 0 | GO |

↓

| 1 | 2 | 3 |   Enter a keyword
Set range: 001 to 999

↓

| GO |
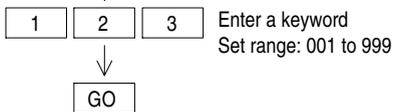
< Display >

| BANK | OUT | STEP | DEG |
|------|-----|------|-----|
| S | Et | 0 | "000" flashes*1 |

*1   When a keyword is already registered or the write-protect function of the EEPROM is set (so that write is disabled), "Prt" is displayed.

"123" flashes on the DEG.

| BANK | OUT | STEP | DEG | ON LED | OFF LED |
|------|-----|------|-----|--------|---------|
| 0 | 0 | 0 | # # # *2 | Lit | Extinguished |

*2   The ON angle of the output Y00 already registered is displayed.

---

**Deleting the registered keyword [FNC84]**

< Key operation >

| FNC | 8 | 4 | GO |
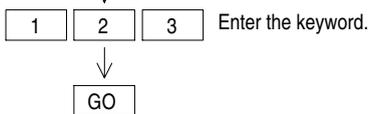
When a keyword is not registered, the [GO] key is not accepted.

↓

| 1 | 2 | 3 |   Enter the keyword.

↓

| GO |

< Display >

| BANK | OUT | STEP | DEG |
|------|-----|------|-----|
| d | EL | 0 | "0" flashes*1 |

"123" flashes on the DEG.

| BANK | OUT | STEP | DEG | ON LED | OFF LED |
|------|-----|------|-----|--------|---------|
| 0 | 0 | 0 | # # # *2 | Lit | Extinguished |

*2   The ON angle of the output Y00 already registered is displayed.

---

If a keyword is entered incorrectly while manipulating FNC80 or FNC84, "Err" is displayed and no input is accepted. In such a case, clear the error indication, and perform the setting procedure again.

| 1 | Introduction |
| 2 | Installation |
| 3 | Specifications |
| 4 | External Wiring |
| 5 | Extension Block Specifications and External Wiring |
| 6 | Basic Setting |
| 7 | BFM Assignment |
| 8 | Program Operating Procedures |
| 9 | Monitor |
| 10 | Test |
| 11 | Diagnostics |
| | Appendix |

# 9.    Monitor

The display on the data setting panel can be switched among the current value, the status and the rotation speed.
This section describes the display change-over procedure and the contents of display.


## 9.1    Changing over the monitor display        [Power ON] [PRG mode]

By pressing the [ON OFF] key, the monitor display is switched in the way "current value display →
output/status display → rotation speed display".

### < Initial display in the RUN mode >

When the power is turned on again, the screen displayed just before the power was turned off is displayed.
When the mode is switched in the way "RUN → PRG → RUN", the screen displayed just before the mode was switched from RUN to PRG is displayed.

| BANK | OUT | STEP | DEG | RUN |
|------|-----|------|-----|-----|
| Executed bank No. | Blank | Blank | Current value | Lit |

●●●●●●●  Press the [ON OFF] key to change over the screen.        ●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●


### < Output/status ON/OFF indication >
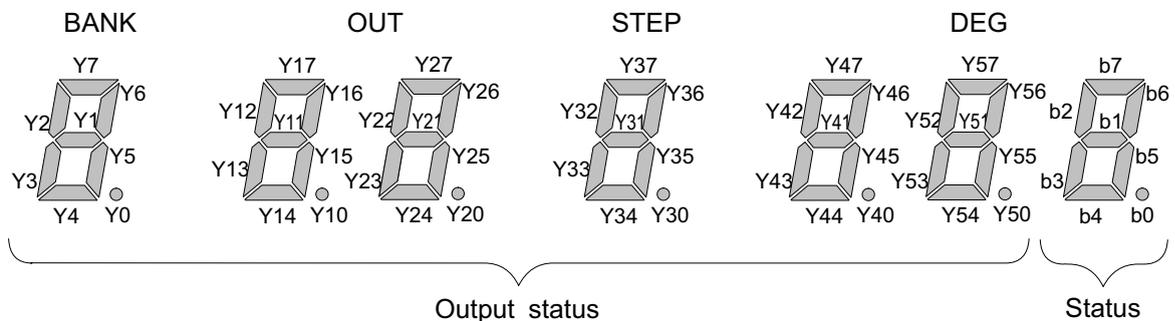


While LED is lit: The output/status bits are turned on.
While LED is extinguished: The output/status bits are turned off.


●●●●●●●  Press the [ON OFF] key to change over the screen.        ●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●

### < Rotation speed display >

| BANK | OUT | STEP | DEG | RUN |
|------|-----|------|-----|-----|
| Executed bank No. | rP | n | Rotation speed (r/min) | Lit |

●●●●●●●  Press the [ON OFF] key to change over the screen.        ●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●

The initial screen is displayed again.

# Memo

# 10. Test

This section describes the procedure to modify the set data while the FX2N-1RM is in the RUN mode.

## 10.1 Operating procedure of the test mode

The set data in a program can be modified in the test mode even if the FX2N-1RM is in the RUN mode. However, a program cannot be added or deleted.
The set data can be modified in the increment of 0.5 degree using the [+] and [-] keys. (Operations are in accordance with the resolution selected.) Numerics cannot be entered.

Changing over to the test mode

After executing a bank whose data is to be modified, change over to the test mode using the following procedure.

< Key operation >

| BANK | + | GO |     Press these keys at the same time.

< Display >

| BANK | OUT | STEP | DEG | ON LED | RUN LED |
|------|-----|------|-----|--------|---------|
| Executed bank No. | "0" is displayed | "0" is displayed | Set value is displayed | Lit | Lit |

BANK: Displays the bank No. monitored.
OUT: Displays "00".
STEP: Displays "0".
DEG: Displays the existing set value.
ON LED: Lit.
RUN LED: Lit.

Selecting an output No/step No. to be modified

< Key operation >

| OUT | 0 | GO |     Select the output No.

| STEP | 0 | GO |     Select the step No.

| + | / | - |     Display the ON/OFF angle to be modified using the [+] and [-] keys.

If an output No. for which a program is not present is specified, the error code "E15" is displayed.
When an output No. for which a fixed output pattern automatically generated by FNC70 to FNC75 is selected, the error code "E01" is displayed.

Modifying either the ON angle or the OFF angle 10-

< Key operation >

ON
OFF

↓

| + | The angle is increased by 0.5 degree every time the [+] key is pressed. |

| - | The angle is decreased by 0.5 degree every time the [-] key is pressed. |

↓

| GO | Determine the modified angle. The set value is written to the EEPROM, and the output is changed. |

< Display >

While the ON LED is lit: The ON angle is modified.
While the OFF LED is lit: The OFF angle is modified.

A value flashes on the DEG, and the value is changed.

A new value is displayed on the DEG.
When modification of the ON angle is finished, the OFF angle of the same step is displayed.
When modification of the OFF angle is finished, the ON angle of the next step is displayed.

Modifying the ON angle and the OFF angle consecutively

< Key operation >

ON
OFF

↓

| + | The angle is increased by 0.5 degree every time the [+] key is pressed. |

| - | The angle is decreased by 0.5 degree every time the [-] key is pressed. |

↓

ON
OFF

↓

| + | The angle is increased by 0.5 degree every time the [+] key is pressed. |

| - | The angle is decreased by 0.5 degree every time the [-] key is pressed. |

↓

| GO | Determine the modified angle. The set value is written to the EEPROM, and the output is changed. |

< Display >

While the ON LED is lit: The ON angle is modified.

A value flashes on the DEG, and the value is changed.

While the OFF LED is lit: The OFF angle is modified.

A value flashes on the DEG, and the value is changed.

A new value is displayed on the DEG.
When modification is finished, the ON angle of the next step is displayed.

### Cautions on modification of the ON/OFF angle

- The angle can be modified by up to +10 degrees at a time.
  If the angle entered is to become consecutive to a set angle in another program, the [+] or [-] key is not accepted just before the angle entered becomes consecutive.

## Modifying the rotation speed of the automatic angle advance function

< Key operation >

| FNC | 1 | 3 | GO | Set the FNC No. (odd No. among FNC13 to FNC26) |

After that, the contents of the FNC No. to be modified can be confirmed using the [+] and [-] keys.

↓

| ON OFF |

↓

| + | The rotation speed is increased by 1 r/min every time the [+] key is pressed. |

| - | The rotation speed is decreased by 1 r/min every time the [-] key is pressed. (Any numeric cannot be entered.) |

↓

| GO | Determine the rotation speed modified. The set value is written to the EEPROM, and the output is changed. |

< Display >

| BANK | OUT | STEP | DEG |
|------|-----|------|-----|
| S | Pd | 0 | # # # *1 |

*1  The rotation speed (rpm) already registered is displayed.

When the [ON OFF] key is pressed, data flashes on the DEG.

| BANK | OUT | STEP | DEG |
|------|-----|------|-----|
| d | EG | 0 | # # # *2 |

*2  The angle advance quantity (degrees) already registered is displayed.

The next angle advance quantity set value is displayed.

## Modifying the angle advance quantity of the automatic angle advance function

< Key operation >

| FNC | 1 | 4 | GO | Set the FNC No. (even No. among FNC13 to FNC26) |

After that, the contents of the FNC No. to be modified can be confirmed using the [+] and [-] keys.

↓

| ON OFF |

↓

| + | The angle advance quantity is increased by 0.5 degree every time the [+] key is pressed. |

| - | The angle advance quantity is decreased by 0.5 degree every time the [-] key is pressed.(Any numeric cannot be entered) |

↓

| GO | Determine the angle advance quantity modified. The set value is written to the EEPROM, and the output is changed. |

< Display >

| BANK | OUT | STEP | DEG |
|------|-----|------|-----|
| d | EG | 0 | # # # *1 |

*1  The angle advance quantity (degrees) already registered is displayed.

When the [ON OFF] key is pressed, data flashes on the DEG.

| BANK | OUT | STEP | DEG |
|------|-----|------|-----|
| S | Pd | 1 | # # # *2 |

*2  The rotation speed (r/min) already registered is displayed.

The next rotation speed set value is displayed.

Change in individual automatic angle advance function

< Key operation >

| OUT | 0 | GO |   Specify the output No.
(Y00 to Y03)

↓

| FNC | 9 | 0 | GO |

[+] / [-] the contents of the item which will be changed with the key the selection and setting can be confirmed.

↓

① → | ON OFF |

↓

| + | / | - |
• 1 rpm or 1 degree increase whenever [+] key is pushed.
• 1 rpm or 1 degree decrease whenever [-] key is pushed.
(The numerical value cannot be input.)

↓

| GO |
• The content of the change is fixed.
• The set value is written in EEPROM.
• The state of the output changes.

To change the setting of the next item, the operation is repeated from step 1.
An item can be selected with [+] / [-] key.

< Display >

| BANK | OUT | STEP | DEG | ON LED | OFF LED |
|------|-----|------|-----|--------|---------|
| 0 | 0 | 0 | ###<br>*1 | Lit | Exting-uished |

*1: The output set value which has already been resistered is displayed.

The rotational speed setting of S0 is displayed by the operation recorded left.

| BANK | OUT | STEP | DEG | ON LED | OFF LED |
|------|-----|------|-----|--------|---------|
| S | Pd | 0 | ###<br>*2 | Exting-uished | Exting-uished |

*2: An existing value is displayed.

The DEG display becomes a blinking display when the [ON OFF] key is pushed, and setting is possible.

1 r/min or 1 degree increase whenever [+] key is pushed.
1 r/min or 1 degree decrease whenever [-] key is pushed.

When the [GO] key is pushed, the next set item is displayed.

---

**Cautions on modification of the set value of the automatic angle advance function**

- The allowable modification range of the rotation speed is 1 to 400 r/min. If the value entered is to overlap the previous or next set value during modification, the [+] or [-] key is not accepted just before the value entered overlaps the previous or next set value.
- When the set value of the rotation speed is 0 (initial value), the angle advance quantity is treated as 0.
  When an FNC No. for which a program is not present is specified, the error code "E15" is displayed.
- The allowable modification range of the angle advance quantity is 0 to 180 degrees.

---

Confirming the contents of FNC0 to FNC5

< Key operation >

| FNC | 0 | GO |   Set the FNC No.
                      (FNC0 to FNC5)

< Display >

After that, the contents of the FNC No. specified can be confirmed using the [+] and [-] keys.

---

Terminating the test mode                                                    10-6

< Key operation >

| BANK | + | CLR | Press these keys at the same time.

< Display >

| BANK | OUT | STEP | DEG |
|---|---|---|---|
| Executed bank No. | Blank | Blank | Displays current value*1 |

The display status returns to the status before the test mode is selected.

*1   Example of the current value display

| 1 | Introduction |
|---|---|

| 2 | Installation |
|---|---|

| 3 | Specifications |
|---|---|

| 4 | External Wiring |
|---|---|

| 5 | Extension Block Specifications and External Wiring |
|---|---|

| 6 | Basic Setting |
|---|---|

| 7 | BFM Assignment |
|---|---|

| 8 | Program Operating Procedures |
|---|---|

| 9 | Monitor |
|---|---|

| 10 | Test |
|---|---|

| 11 | Diagnostics |
|---|---|

|  | Appendix |
|---|---|

# 11. Diagnostics

This section describes the error indication, the causes and the countermeasures.
Errors are classified into ones displayed on the data setting panel and the others written to the BFM #29.

## 11.1 Indication and causes of errors

### < Errors displayed o the data setting panel >

The errors shown in the table below are displayed on the data setting panel.
These errors are indicated so that erroneous settings entered using the data setting panel can be detected and displayed, and are different from the errors (BFM #29 error code) stored in the FX2N-1RM main body.

| Error indication | Causes | Countermeasures |
|---|---|---|
| E01 | Fixed output patterns had been already generated by FNC70 to FNC75, and the data of the corresponding output No. was to be modified or copied. | Delete the fixed output patterns. Or stop the copy operation. |
| E02 | When an ON/OFF angle was entered for new setting or modification, the value entered overlapped the existing ON/OFF angle. The same value was entered in the ON angle and the OFF angle. The ON/OFF angle data set by an BFM exceeded the set range. (When data is entered from the data setting panel, any data outside the set range is not accepted.) | Enter a correct ON/OFF angle. |
| E03 | When the ON/OFF output was inverted using FNC50, the ON/OFF data of the corresponding output had not been set. | Data not created cannot be inverted. |
| E05 | The same output No. was specified for source and destination while the output was to be copied. | The same output cannot be copied within the same bank. |
| E06 | A program was inserted while data was already present in the step No. 7. | Programs of 8 steps or more are not available. If required, output data to a different output No., and set "wired OR" outside. |
| E07 | The same bank No. was specified for source and destination in the batch copy operation for a bank. | The same bank cannot be copied. |
| E08 | The ON/OFF width became 0 by manipulating FNC62 to FNC65 (batch addition/subtraction of angle). | Add or subtract a smaller value. Or delete or modify the existing data. |
| E09 | Data could not be written to the EEPROM due to an abnormality in the memory. | Replace the unit. |
| E13 | The resolver was not connected while teaching was performed or the reference angle was set. Or something was wrong with the cable (disconnection, etc.). | Turn off the power, and connect the resolver. Or replace the cable. |
| E14 | An FNC No. not defined yet was entered. | Enter a correct numeric. |
| E15 | An output No. for which a program was not present was specified while the program was modified in the RUN mode. | Specify an output No. for which a program is present. |

### < Errors written to BFM #29 >

The errors shown in the table below are written to BFM #29.
Each of these errors is written as an error code to BFM #29 in the FX2N-1RM, and can be read from the PLC main body using a FROM instruction.
The same error code is also displayed on the data setting panel.

| Error indication | Causes | Countermeasures | Target BFM |
|---|---|---|---|
| E20 | Data outside the allowable range was set. | Reset the error status, and enter correct data. | BFM#1 BFM#1000~7144 |
| E21 | Any bank No. other than 0 to 7 was specified. | Reset the error status, and enter a correct bank No. | BFM#2 |
| E22 | Data was not able to be written to the EEPROM due to an abnormality in the memory. | The memory may be destroyed. Replace the unit. Or contact Mitsubishi Electric System Service | —— |
| E23 | The resolver was not connected while teaching was performed or the reference angle was set. Or something was wrong with the cable (disconnection, etc.). | Turn off the power, and connect the resolver. Or replace the cable. | —— |

### < Output status when an error has occurred >

| | |
|---|---|
| RUN LED | : Extinguished |
| ERR LED | : Lit |
| "Operating" flag (BFM #28 b0) | : OFF |
| Output | : OFF |
| "Error" flag (BFM #28 b3) | : ON |
| Error indication on data setting panel | : Each error code is displayed in accordance with the contents of the error occurred. |

### < Resetting an error >

The following three methods are available to reset an error.

1 )  Press the [CLR] key on the data setting panel.
2 )  Turn on the error reset (BFM #3 b3) by giving a TO instruction from the PLC main unit.
3 )  Turn off the power, then turn it on again.

| 1 | Introduction |
|---|---|

| 2 | Installation |
|---|---|

| 3 | Specifications |
|---|---|

| 4 | External Wiring |
|---|---|

| 5 | Extension Block Specifications and External Wiring |
|---|---|

| 6 | Basic Setting |
|---|---|

| 7 | BFM Assignment |
|---|---|

| 8 | Program Operating Procedures |
|---|---|

| 9 | Monitor |
|---|---|

| 10 | Test |
|---|---|

| 11 | Diagnostics |
|---|---|

| | Appendix |
|---|---|

# BFM No. Quick Reference Table for Angle Setting

< Bank 0 >

| Output No. | STEP0 ON | STEP0 OFF | STEP1 ON | STEP1 OFF | STEP2 ON | STEP2 OFF | STEP3 ON | STEP3 OFF | STEP4 ON | STEP4 OFF | STEP5 ON | STEP5 OFF | STEP6 ON | STEP6 OFF | STEP7 ON | STEP7 OFF |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Y00 | 1000 | 1001 | 1002 | 1003 | 1004 | 1005 | 1006 | 1007 | 1008 | 1009 | 1010 | 1011 | 1012 | 1013 | 1014 | 1015 |
| Y01 | 1016 | 1017 | 1018 | 1019 | 1020 | 1021 | 1022 | 1023 | 1024 | 1025 | 1026 | 1027 | 1028 | 1029 | 1030 | 1031 |
| Y02 | 1032 | 1033 | 1034 | 1035 | 1036 | 1037 | 1038 | 1039 | 1040 | 1041 | 1042 | 1043 | 1044 | 1045 | 1046 | 1047 |
| Y03 | 1048 | 1049 | 1050 | 1051 | 1052 | 1053 | 1054 | 1055 | 1056 | 1057 | 1058 | 1059 | 1060 | 1061 | 1062 | 1063 |
| Y04 | 1064 | 1065 | 1066 | 1067 | 1068 | 1069 | 1070 | 1071 | 1072 | 1073 | 1074 | 1075 | 1076 | 1077 | 1078 | 1079 |
| Y05 | 1080 | 1081 | 1082 | 1083 | 1084 | 1085 | 1086 | 1087 | 1088 | 1089 | 1090 | 1091 | 1092 | 1093 | 1094 | 1095 |
| Y06 | 1096 | 1097 | 1098 | 1099 | 1100 | 1101 | 1102 | 1103 | 1104 | 1105 | 1106 | 1107 | 1108 | 1109 | 1110 | 1111 |
| Y07 | 1112 | 1113 | 1114 | 1115 | 1116 | 1117 | 1118 | 1119 | 1120 | 1121 | 1122 | 1123 | 1124 | 1125 | 1126 | 1127 |
| Y10 | 1128 | 1129 | 1130 | 1131 | 1132 | 1133 | 1134 | 1135 | 1136 | 1137 | 1138 | 1139 | 1140 | 1141 | 1142 | 1143 |
| Y11 | 1144 | 1145 | 1146 | 1147 | 1148 | 1149 | 1150 | 1151 | 1152 | 1153 | 1154 | 1155 | 1156 | 1157 | 1158 | 1159 |
| Y12 | 1160 | 1161 | 1162 | 1163 | 1164 | 1165 | 1166 | 1167 | 1168 | 1169 | 1170 | 1171 | 1172 | 1173 | 1174 | 1175 |
| Y13 | 1176 | 1177 | 1178 | 1179 | 1180 | 1181 | 1182 | 1183 | 1184 | 1185 | 1186 | 1187 | 1188 | 1189 | 1190 | 1191 |
| Y14 | 1192 | 1193 | 1194 | 1195 | 1196 | 1197 | 1198 | 1199 | 1200 | 1201 | 1202 | 1203 | 1204 | 1205 | 1206 | 1207 |
| Y15 | 1208 | 1209 | 1210 | 1211 | 1212 | 1213 | 1214 | 1215 | 1216 | 1217 | 1218 | 1219 | 1220 | 1221 | 1222 | 1223 |
| Y16 | 1224 | 1225 | 1226 | 1227 | 1228 | 1229 | 1230 | 1231 | 1232 | 1233 | 1234 | 1235 | 1236 | 1237 | 1238 | 1239 |
| Y17 | 1240 | 1241 | 1242 | 1243 | 1244 | 1245 | 1246 | 1247 | 1248 | 1249 | 1250 | 1251 | 1252 | 1253 | 1254 | 1255 |
| Y20 | 1256 | 1257 | 1258 | 1259 | 1260 | 1261 | 1262 | 1263 | 1264 | 1265 | 1266 | 1267 | 1268 | 1269 | 1270 | 1271 |
| Y21 | 1272 | 1273 | 1274 | 1275 | 1276 | 1277 | 1278 | 1279 | 1280 | 1281 | 1282 | 1283 | 1284 | 1285 | 1286 | 1287 |
| Y22 | 1288 | 1289 | 1290 | 1291 | 1292 | 1293 | 1294 | 1295 | 1296 | 1297 | 1298 | 1299 | 1300 | 1301 | 1302 | 1303 |
| Y23 | 1304 | 1305 | 1306 | 1307 | 1308 | 1309 | 1310 | 1311 | 1312 | 1313 | 1314 | 1315 | 1316 | 1317 | 1318 | 1319 |
| Y24 | 1320 | 1321 | 1322 | 1323 | 1324 | 1325 | 1326 | 1327 | 1328 | 1329 | 1330 | 1331 | 1332 | 1333 | 1334 | 1335 |
| Y25 | 1336 | 1337 | 1338 | 1339 | 1340 | 1341 | 1342 | 1343 | 1344 | 1345 | 1346 | 1347 | 1348 | 1349 | 1350 | 1351 |
| Y26 | 1352 | 1353 | 1354 | 1355 | 1356 | 1357 | 1358 | 1359 | 1360 | 1361 | 1362 | 1363 | 1364 | 1365 | 1366 | 1367 |
| Y27 | 1368 | 1369 | 1370 | 1371 | 1372 | 1373 | 1374 | 1375 | 1376 | 1377 | 1378 | 1379 | 1380 | 1381 | 1382 | 1383 |
| Y30 | 1384 | 1385 | 1386 | 1387 | 1388 | 1389 | 1390 | 1391 | 1392 | 1393 | 1394 | 1395 | 1396 | 1397 | 1398 | 1399 |
| Y31 | 1400 | 1401 | 1402 | 1403 | 1404 | 1405 | 1406 | 1407 | 1408 | 1409 | 1410 | 1411 | 1412 | 1413 | 1414 | 1415 |
| Y32 | 1416 | 1417 | 1418 | 1419 | 1420 | 1421 | 1422 | 1423 | 1424 | 1425 | 1426 | 1427 | 1428 | 1429 | 1430 | 1431 |
| Y33 | 1432 | 1433 | 1434 | 1435 | 1436 | 1437 | 1438 | 1439 | 1440 | 1441 | 1442 | 1443 | 1444 | 1445 | 1446 | 1447 |
| Y34 | 1448 | 1449 | 1450 | 1451 | 1452 | 1453 | 1454 | 1455 | 1456 | 1457 | 1458 | 1459 | 1460 | 1461 | 1462 | 1463 |
| Y35 | 1464 | 1465 | 1466 | 1467 | 1468 | 1469 | 1470 | 1471 | 1472 | 1473 | 1474 | 1475 | 1476 | 1477 | 1478 | 1479 |
| Y36 | 1480 | 1481 | 1482 | 1483 | 1484 | 1485 | 1486 | 1487 | 1488 | 1489 | 1490 | 1491 | 1492 | 1493 | 1494 | 1495 |
| Y37 | 1496 | 1497 | 1498 | 1499 | 1500 | 1501 | 1502 | 1503 | 1504 | 1505 | 1506 | 1507 | 1508 | 1509 | 1510 | 1511 |
| Y40 | 1512 | 1513 | 1514 | 1515 | 1516 | 1517 | 1518 | 1519 | 1520 | 1521 | 1522 | 1523 | 1524 | 1525 | 1526 | 1527 |
| Y41 | 1528 | 1529 | 1530 | 1531 | 1532 | 1533 | 1534 | 1535 | 1536 | 1537 | 1538 | 1539 | 1540 | 1541 | 1542 | 1543 |
| Y42 | 1544 | 1545 | 1546 | 1547 | 1548 | 1549 | 1550 | 1551 | 1552 | 1553 | 1554 | 1555 | 1556 | 1557 | 1558 | 1559 |
| Y43 | 1560 | 1561 | 1562 | 1563 | 1564 | 1565 | 1566 | 1567 | 1568 | 1569 | 1570 | 1571 | 1572 | 1573 | 1574 | 1575 |
| Y44 | 1576 | 1577 | 1578 | 1579 | 1580 | 1581 | 1582 | 1583 | 1584 | 1585 | 1586 | 1587 | 1588 | 1589 | 1590 | 1591 |
| Y45 | 1592 | 1593 | 1594 | 1595 | 1596 | 1597 | 1598 | 1599 | 1600 | 1601 | 1602 | 1603 | 1604 | 1605 | 1606 | 1607 |
| Y46 | 1608 | 1609 | 1610 | 1611 | 1612 | 1613 | 1614 | 1615 | 1616 | 1617 | 1618 | 1619 | 1620 | 1621 | 1622 | 1623 |
| Y47 | 1624 | 1625 | 1626 | 1627 | 1628 | 1629 | 1630 | 1631 | 1632 | 1633 | 1634 | 1635 | 1636 | 1637 | 1638 | 1639 |
| Y50 | 1640 | 1641 | 1642 | 1643 | 1644 | 1645 | 1646 | 1647 | 1648 | 1649 | 1650 | 1651 | 1652 | 1653 | 1654 | 1655 |
| Y51 | 1656 | 1657 | 1658 | 1659 | 1660 | 1661 | 1662 | 1663 | 1664 | 1665 | 1666 | 1667 | 1668 | 1669 | 1670 | 1671 |
| Y52 | 1672 | 1673 | 1674 | 1675 | 1676 | 1677 | 1678 | 1679 | 1680 | 1681 | 1682 | 1683 | 1684 | 1685 | 1686 | 1687 |
| Y53 | 1688 | 1689 | 1690 | 1691 | 1692 | 1693 | 1694 | 1695 | 1696 | 1697 | 1698 | 1699 | 1700 | 1701 | 1702 | 1703 |
| Y54 | 1704 | 1705 | 1706 | 1707 | 1708 | 1709 | 1710 | 1711 | 1712 | 1713 | 1714 | 1715 | 1716 | 1717 | 1718 | 1719 |
| Y55 | 1720 | 1721 | 1722 | 1723 | 1724 | 1725 | 1726 | 1727 | 1728 | 1729 | 1730 | 1731 | 1732 | 1733 | 1734 | 1735 |
| Y56 | 1736 | 1737 | 1738 | 1739 | 1740 | 1741 | 1742 | 1743 | 1744 | 1745 | 1746 | 1747 | 1748 | 1749 | 1750 | 1751 |
| Y57 | 1752 | 1753 | 1754 | 1755 | 1756 | 1757 | 1758 | 1759 | 1760 | 1761 | 1762 | 1763 | 1764 | 1765 | 1766 | 1767 |

BFM No.

## BFM No. Quick Reference Table for Angle Setting

### < Bank 1 >

| Output No. | STEP0 ON | STEP0 OFF | STEP1 ON | STEP1 OFF | STEP2 ON | STEP2 OFF | STEP3 ON | STEP3 OFF | STEP4 ON | STEP4 OFF | STEP5 ON | STEP5 OFF | STEP6 ON | STEP6 OFF | STEP7 ON | STEP7 OFF |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Y00 | 1768 | 1769 | 1770 | 1771 | 1772 | 1773 | 1774 | 1775 | 1776 | 1777 | 1778 | 1779 | 1780 | 1781 | 1782 | 1783 |
| Y01 | 1784 | 1785 | 1786 | 1787 | 1788 | 1789 | 1790 | 1791 | 1792 | 1793 | 1794 | 1795 | 1796 | 1797 | 1798 | 1799 |
| Y02 | 1800 | 1801 | 1802 | 1803 | 1804 | 1805 | 1806 | 1807 | 1808 | 1809 | 1810 | 1811 | 1812 | 1813 | 1814 | 1815 |
| Y03 | 1816 | 1817 | 1818 | 1819 | 1820 | 1821 | 1822 | 1823 | 1824 | 1825 | 1826 | 1827 | 1828 | 1829 | 1830 | 1831 |
| Y04 | 1832 | 1833 | 1834 | 1835 | 1836 | 1837 | 1838 | 1839 | 1840 | 1841 | 1842 | 1843 | 1844 | 1845 | 1846 | 1847 |
| Y05 | 1848 | 1849 | 1850 | 1851 | 1852 | 1853 | 1854 | 1855 | 1856 | 1857 | 1858 | 1859 | 1860 | 1861 | 1862 | 1863 |
| Y06 | 1864 | 1865 | 1866 | 1867 | 1868 | 1869 | 1870 | 1871 | 1872 | 1873 | 1874 | 1875 | 1876 | 1877 | 1878 | 1879 |
| Y07 | 1880 | 1881 | 1882 | 1883 | 1884 | 1885 | 1886 | 1887 | 1888 | 1889 | 1890 | 1891 | 1892 | 1893 | 1894 | 1895 |
| Y10 | 1896 | 1897 | 1898 | 1899 | 1900 | 1901 | 1902 | 1903 | 1904 | 1905 | 1906 | 1907 | 1908 | 1909 | 1910 | 1911 |
| Y11 | 1912 | 1913 | 1914 | 1915 | 1916 | 1917 | 1918 | 1919 | 1920 | 1921 | 1922 | 1923 | 1924 | 1925 | 1926 | 1927 |
| Y12 | 1928 | 1929 | 1930 | 1931 | 1932 | 1933 | 1934 | 1935 | 1936 | 1937 | 1938 | 1939 | 1940 | 1941 | 1942 | 1943 |
| Y13 | 1944 | 1945 | 1946 | 1947 | 1948 | 1949 | 1950 | 1951 | 1952 | 1953 | 1954 | 1955 | 1956 | 1957 | 1958 | 1959 |
| Y14 | 1960 | 1961 | 1962 | 1963 | 1964 | 1965 | 1966 | 1967 | 1968 | 1969 | 1970 | 1971 | 1972 | 1973 | 1974 | 1975 |
| Y15 | 1976 | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 |
| Y16 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
| Y17 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 |
| Y20 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 | 2036 | 2037 | 2038 | 2039 |
| Y21 | 2040 | 2041 | 2042 | 2043 | 2044 | 2045 | 2046 | 2047 | 2048 | 2049 | 2050 | 2051 | 2052 | 2053 | 2054 | 2055 |
| Y22 | 2056 | 2057 | 2058 | 2059 | 2060 | 2061 | 2062 | 2063 | 2064 | 2065 | 2066 | 2067 | 2068 | 2069 | 2070 | 2071 |
| Y23 | 2072 | 2073 | 2074 | 2075 | 2076 | 2077 | 2078 | 2079 | 2080 | 2081 | 2082 | 2083 | 2084 | 2085 | 2086 | 2087 |
| Y24 | 2088 | 2089 | 2090 | 2091 | 2092 | 2093 | 2094 | 2095 | 2096 | 2097 | 2098 | 2099 | 2100 | 2101 | 2102 | 2103 |
| Y25 | 2104 | 2105 | 2106 | 2107 | 2108 | 2109 | 2110 | 2111 | 2112 | 2113 | 2114 | 2115 | 2116 | 2117 | 2118 | 2119 |
| Y26 | 2120 | 2121 | 2122 | 2123 | 2124 | 2125 | 2126 | 2127 | 2128 | 2129 | 2130 | 2131 | 2132 | 2133 | 2134 | 2135 |
| Y27 | 2136 | 2137 | 2138 | 2139 | 2140 | 2141 | 2142 | 2143 | 2144 | 2145 | 2146 | 2147 | 2148 | 2149 | 2150 | 2151 |
| Y30 | 2152 | 2153 | 2154 | 2155 | 2156 | 2157 | 2158 | 2159 | 2160 | 2161 | 2162 | 2163 | 2164 | 2165 | 2166 | 2167 |
| Y31 | 2168 | 2169 | 2170 | 2171 | 2172 | 2173 | 2174 | 2175 | 2176 | 2177 | 2178 | 2179 | 2180 | 2181 | 2182 | 2183 |
| Y32 | 2184 | 2185 | 2186 | 2187 | 2188 | 2189 | 2190 | 2191 | 2192 | 2193 | 2194 | 2195 | 2196 | 2197 | 2198 | 2199 |
| Y33 | 2200 | 2201 | 2202 | 2203 | 2204 | 2205 | 2206 | 2207 | 2208 | 2209 | 2210 | 2211 | 2212 | 2213 | 2214 | 2215 |
| Y34 | 2216 | 2217 | 2218 | 2219 | 2220 | 2221 | 2222 | 2223 | 2224 | 2225 | 2226 | 2227 | 2228 | 2229 | 2230 | 2231 |
| Y35 | 2232 | 2233 | 2234 | 2235 | 2236 | 2237 | 2238 | 2239 | 2240 | 2241 | 2242 | 2243 | 2244 | 2245 | 2246 | 2247 |
| Y36 | 2248 | 2249 | 2250 | 2251 | 2252 | 2253 | 2254 | 2255 | 2256 | 2257 | 2258 | 2259 | 2260 | 2261 | 2262 | 2263 |
| Y37 | 2264 | 2265 | 2266 | 2267 | 2268 | 2269 | 2270 | 2271 | 2272 | 2273 | 2274 | 2275 | 2276 | 2277 | 2278 | 2279 |
| Y40 | 2280 | 2281 | 2282 | 2283 | 2284 | 2285 | 2286 | 2287 | 2288 | 2289 | 2290 | 2291 | 2292 | 2293 | 2294 | 2295 |
| Y41 | 2296 | 2297 | 2298 | 2299 | 2300 | 2301 | 2302 | 2303 | 2304 | 2305 | 2306 | 2307 | 2308 | 2309 | 2310 | 2311 |
| Y42 | 2312 | 2313 | 2314 | 2315 | 2316 | 2317 | 2318 | 2319 | 2320 | 2321 | 2322 | 2323 | 2324 | 2325 | 2326 | 2327 |
| Y43 | 2328 | 2329 | 2330 | 2331 | 2332 | 2333 | 2334 | 2335 | 2336 | 2337 | 2338 | 2339 | 2340 | 2341 | 2342 | 2343 |
| Y44 | 2344 | 2345 | 2346 | 2347 | 2348 | 2349 | 2350 | 2351 | 2352 | 2353 | 2354 | 2355 | 2356 | 2357 | 2358 | 2359 |
| Y45 | 2360 | 2361 | 2362 | 2363 | 2364 | 2365 | 2366 | 2367 | 2368 | 2369 | 2370 | 2371 | 2372 | 2373 | 2374 | 2375 |
| Y46 | 2376 | 2377 | 2378 | 2379 | 2380 | 2381 | 2382 | 2383 | 2384 | 2385 | 2386 | 2387 | 2388 | 2389 | 2390 | 2391 |
| Y47 | 2392 | 2393 | 2394 | 2395 | 2396 | 2397 | 2398 | 2399 | 2400 | 2401 | 2402 | 2403 | 2404 | 2405 | 2406 | 2407 |
| Y50 | 2408 | 2409 | 2410 | 2411 | 2412 | 2413 | 2414 | 2415 | 2416 | 2417 | 2418 | 2419 | 2420 | 2421 | 2422 | 2423 |
| Y51 | 2424 | 2425 | 2426 | 2427 | 2428 | 2429 | 2430 | 2431 | 2432 | 2433 | 2434 | 2435 | 2436 | 2437 | 2438 | 2439 |
| Y52 | 2440 | 2441 | 2442 | 2443 | 2444 | 2445 | 2446 | 2447 | 2448 | 2449 | 2450 | 2451 | 2452 | 2453 | 2454 | 2455 |
| Y53 | 2456 | 2457 | 2458 | 2459 | 2460 | 2461 | 2462 | 2463 | 2464 | 2465 | 2466 | 2467 | 2468 | 2469 | 2470 | 2471 |
| Y54 | 2472 | 2473 | 2474 | 2475 | 2476 | 2477 | 2478 | 2479 | 2480 | 2481 | 2482 | 2483 | 2484 | 2485 | 2486 | 2487 |
| Y55 | 2488 | 2489 | 2490 | 2491 | 2492 | 2493 | 2494 | 2495 | 2496 | 2497 | 2498 | 2499 | 2500 | 2501 | 2502 | 2503 |
| Y56 | 2504 | 2505 | 2506 | 2507 | 2508 | 2509 | 2510 | 2511 | 2512 | 2513 | 2514 | 2515 | 2516 | 2517 | 2518 | 2519 |
| Y57 | 2520 | 2521 | 2522 | 2523 | 2524 | 2525 | 2526 | 2527 | 2528 | 2529 | 2530 | 2531 | 2532 | 2533 | 2534 | 2535 |

BFM No.

## BFM No. Quick Reference Table for Angle Setting

< Bank 2 >

| Output No. | STEP0 ON | STEP0 OFF | STEP1 ON | STEP1 OFF | STEP2 ON | STEP2 OFF | STEP3 ON | STEP3 OFF | STEP4 ON | STEP4 OFF | STEP5 ON | STEP5 OFF | STEP6 ON | STEP6 OFF | STEP7 ON | STEP7 OFF |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Y00 | 2536 | 2537 | 2538 | 2539 | 2540 | 2541 | 2542 | 2543 | 2544 | 2545 | 2546 | 2547 | 2548 | 2549 | 2550 | 2551 |
| Y01 | 2552 | 2553 | 2554 | 2555 | 2556 | 2557 | 2558 | 2559 | 2560 | 2561 | 2562 | 2563 | 2564 | 2565 | 2566 | 2567 |
| Y02 | 2568 | 2569 | 2570 | 2571 | 2572 | 2573 | 2574 | 2575 | 2576 | 2577 | 2578 | 2579 | 2580 | 2581 | 2582 | 2583 |
| Y03 | 2584 | 2585 | 2586 | 2587 | 2588 | 2589 | 2590 | 2591 | 2592 | 2593 | 2594 | 2595 | 2596 | 2597 | 2598 | 2599 |
| Y04 | 2600 | 2601 | 2602 | 2603 | 2604 | 2605 | 2606 | 2607 | 2608 | 2609 | 2610 | 2611 | 2612 | 2613 | 2614 | 2615 |
| Y05 | 2616 | 2617 | 2618 | 2619 | 2620 | 2621 | 2622 | 2623 | 2624 | 2625 | 2626 | 2627 | 2628 | 2629 | 2630 | 2631 |
| Y06 | 2632 | 2633 | 2634 | 2635 | 2636 | 2637 | 2638 | 2639 | 2640 | 2641 | 2642 | 2643 | 2644 | 2645 | 2646 | 2647 |
| Y07 | 2648 | 2649 | 2650 | 2651 | 2652 | 2653 | 2654 | 2655 | 2656 | 2657 | 2658 | 2659 | 2660 | 2661 | 2662 | 2663 |
| Y10 | 2664 | 2665 | 2666 | 2667 | 2668 | 2669 | 2670 | 2671 | 2672 | 2673 | 2674 | 2675 | 2676 | 2677 | 2678 | 2679 |
| Y11 | 2680 | 2681 | 2682 | 2683 | 2684 | 2685 | 2686 | 2687 | 2688 | 2689 | 2690 | 2691 | 2692 | 2693 | 2694 | 2695 |
| Y12 | 2696 | 2697 | 2698 | 2699 | 2700 | 2701 | 2702 | 2703 | 2704 | 2705 | 2706 | 2707 | 2708 | 2709 | 2710 | 2711 |
| Y13 | 2712 | 2713 | 2714 | 2715 | 2716 | 2717 | 2718 | 2719 | 2720 | 2721 | 2722 | 2723 | 2724 | 2725 | 2726 | 2727 |
| Y14 | 2728 | 2729 | 2730 | 2731 | 2732 | 2733 | 2734 | 2735 | 2736 | 2737 | 2738 | 2739 | 2740 | 2741 | 2742 | 2743 |
| Y15 | 2744 | 2745 | 2746 | 2747 | 2748 | 2749 | 2750 | 2751 | 2752 | 2753 | 2754 | 2755 | 2756 | 2757 | 2758 | 2759 |
| Y16 | 2760 | 2761 | 2762 | 2763 | 2764 | 2765 | 2766 | 2767 | 2768 | 2769 | 2770 | 2771 | 2772 | 2773 | 2774 | 2775 |
| Y17 | 2776 | 2777 | 2778 | 2779 | 2780 | 2781 | 2782 | 2783 | 2784 | 2785 | 2786 | 2787 | 2788 | 2789 | 2790 | 2791 |
| Y20 | 2792 | 2793 | 2794 | 2795 | 2796 | 2797 | 2798 | 2799 | 2800 | 2801 | 2802 | 2803 | 2804 | 2805 | 2806 | 2807 |
| Y21 | 2808 | 2809 | 2810 | 2811 | 2812 | 2813 | 2814 | 2815 | 2816 | 2817 | 2818 | 2819 | 2820 | 2821 | 2822 | 2823 |
| Y22 | 2824 | 2825 | 2826 | 2827 | 2828 | 2829 | 2830 | 2831 | 2832 | 2833 | 2834 | 2835 | 2836 | 2837 | 2838 | 2839 |
| Y23 | 2840 | 2841 | 2842 | 2843 | 2844 | 2845 | 2846 | 2847 | 2848 | 2849 | 2850 | 2851 | 2852 | 2853 | 2854 | 2855 |
| Y24 | 2856 | 2857 | 2858 | 2859 | 2860 | 2861 | 2862 | 2863 | 2864 | 2865 | 2866 | 2867 | 2868 | 2869 | 2870 | 2871 |
| Y25 | 2872 | 2873 | 2874 | 2875 | 2876 | 2877 | 2878 | 2879 | 2880 | 2881 | 2882 | 2883 | 2884 | 2885 | 2886 | 2887 |
| Y26 | 2888 | 2889 | 2890 | 2891 | 2892 | 2893 | 2894 | 2895 | 2896 | 2897 | 2898 | 2899 | 2900 | 2901 | 2902 | 2903 |
| Y27 | 2904 | 2905 | 2906 | 2907 | 2908 | 2909 | 2910 | 2911 | 2912 | 2913 | 2914 | 2915 | 2916 | 2917 | 2918 | 2919 |
| Y30 | 2920 | 2921 | 2922 | 2923 | 2924 | 2925 | 2926 | 2927 | 2928 | 2929 | 2930 | 2931 | 2932 | 2933 | 2934 | 2935 |
| Y31 | 2936 | 2937 | 2938 | 2939 | 2940 | 2941 | 2942 | 2943 | 2944 | 2945 | 2946 | 2947 | 2948 | 2949 | 2950 | 2951 |
| Y32 | 2952 | 2953 | 2954 | 2955 | 2956 | 2957 | 2958 | 2959 | 2960 | 2961 | 2962 | 2963 | 2964 | 2965 | 2966 | 2967 |
| Y33 | 2968 | 2969 | 2970 | 2971 | 2972 | 2973 | 2974 | 2975 | 2976 | 2977 | 2978 | 2979 | 2980 | 2981 | 2982 | 2983 |
| Y34 | 2984 | 2985 | 2986 | 2987 | 2988 | 2989 | 2990 | 2991 | 2992 | 2993 | 2994 | 2995 | 2996 | 2997 | 2998 | 2999 |
| Y35 | 3000 | 3001 | 3002 | 3003 | 3004 | 3005 | 3006 | 3007 | 3008 | 3009 | 3010 | 3011 | 3012 | 3013 | 3014 | 3015 |
| Y36 | 3016 | 3017 | 3018 | 3019 | 3020 | 3021 | 3022 | 3023 | 3024 | 3025 | 3026 | 3027 | 3028 | 3029 | 3030 | 3031 |
| Y37 | 3032 | 3033 | 3034 | 3035 | 3036 | 3037 | 3038 | 3039 | 3040 | 3041 | 3042 | 3043 | 3044 | 3045 | 3046 | 3047 |
| Y40 | 3048 | 3049 | 3050 | 3051 | 3052 | 3053 | 3054 | 3055 | 3056 | 3057 | 3058 | 3059 | 3060 | 3061 | 3062 | 3063 |
| Y41 | 3064 | 3065 | 3066 | 3067 | 3068 | 3069 | 3070 | 3071 | 3072 | 3073 | 3074 | 3075 | 3076 | 3077 | 3078 | 3079 |
| Y42 | 3080 | 3081 | 3082 | 3083 | 3084 | 3085 | 3086 | 3087 | 3088 | 3089 | 3090 | 3091 | 3092 | 3093 | 3094 | 3095 |
| Y43 | 3096 | 3097 | 3098 | 3099 | 3100 | 3101 | 3102 | 3103 | 3104 | 3105 | 3106 | 3107 | 3108 | 3109 | 3110 | 3111 |
| Y44 | 3112 | 3113 | 3114 | 3115 | 3116 | 3117 | 3118 | 3119 | 3120 | 3121 | 3122 | 3123 | 3124 | 3125 | 3126 | 3127 |
| Y45 | 3128 | 3129 | 3130 | 3131 | 3132 | 3133 | 3134 | 3135 | 3136 | 3137 | 3138 | 3139 | 3140 | 3141 | 3142 | 3143 |
| Y46 | 3144 | 3145 | 3146 | 3147 | 3148 | 3149 | 3150 | 3151 | 3152 | 3153 | 3154 | 3155 | 3156 | 3157 | 3158 | 3159 |
| Y47 | 3160 | 3161 | 3162 | 3163 | 3164 | 3165 | 3166 | 3167 | 3168 | 3169 | 3170 | 3171 | 3172 | 3173 | 3174 | 3175 |
| Y50 | 3176 | 3177 | 3178 | 3179 | 3180 | 3181 | 3182 | 3183 | 3184 | 3185 | 3186 | 3187 | 3188 | 3189 | 3190 | 3191 |
| Y51 | 3192 | 3193 | 3194 | 3195 | 3196 | 3197 | 3198 | 3199 | 3200 | 3201 | 3202 | 3203 | 3204 | 3205 | 3206 | 3207 |
| Y52 | 3208 | 3209 | 3210 | 3211 | 3212 | 3213 | 3214 | 3215 | 3216 | 3217 | 3218 | 3219 | 3220 | 3221 | 3222 | 3223 |
| Y53 | 3224 | 3225 | 3226 | 3227 | 3228 | 3229 | 3230 | 3231 | 3232 | 3233 | 3234 | 3235 | 3236 | 3237 | 3238 | 3239 |
| Y54 | 3240 | 3241 | 3242 | 3243 | 3244 | 3245 | 3246 | 3247 | 3248 | 3249 | 3250 | 3251 | 3252 | 3253 | 3254 | 3255 |
| Y55 | 3256 | 3257 | 3258 | 3259 | 3260 | 3261 | 3262 | 3263 | 3264 | 3265 | 3266 | 3267 | 3268 | 3269 | 3270 | 3271 |
| Y56 | 3272 | 3273 | 3274 | 3275 | 3276 | 3277 | 3278 | 3279 | 3280 | 3281 | 3282 | 3283 | 3284 | 3285 | 3286 | 3287 |
| Y57 | 3288 | 3289 | 3290 | 3291 | 3292 | 3293 | 3294 | 3295 | 3296 | 3297 | 3298 | 3299 | 3300 | 3301 | 3302 | 3303 |

BFM No.

# BFM No. Quick Reference Table for Angle Setting

## < Bank 3 >

| Output No. | STEP0 ON | STEP0 OFF | STEP1 ON | STEP1 OFF | STEP2 ON | STEP2 OFF | STEP3 ON | STEP3 OFF | STEP4 ON | STEP4 OFF | STEP5 ON | STEP5 OFF | STEP6 ON | STEP6 OFF | STEP7 ON | STEP7 OFF |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Y00 | 3304 | 3305 | 3306 | 3307 | 3308 | 3309 | 3310 | 3311 | 3312 | 3313 | 3314 | 3315 | 3316 | 3317 | 3318 | 3319 |
| Y01 | 3320 | 3321 | 3322 | 3323 | 3324 | 3325 | 3326 | 3327 | 3328 | 3329 | 3330 | 3331 | 3332 | 3333 | 3334 | 3335 |
| Y02 | 3336 | 3337 | 3338 | 3339 | 3340 | 3341 | 3342 | 3343 | 3344 | 3345 | 3346 | 3347 | 3348 | 3349 | 3350 | 3351 |
| Y03 | 3352 | 3353 | 3354 | 3355 | 3356 | 3357 | 3358 | 3359 | 3360 | 3361 | 3362 | 3363 | 3364 | 3365 | 3366 | 3367 |
| Y04 | 3368 | 3369 | 3370 | 3371 | 3372 | 3373 | 3374 | 3375 | 3376 | 3377 | 3378 | 3379 | 3380 | 3381 | 3382 | 3383 |
| Y05 | 3384 | 3385 | 3386 | 3387 | 3388 | 3389 | 3390 | 3391 | 3392 | 3393 | 3394 | 3395 | 3396 | 3397 | 3398 | 3399 |
| Y06 | 3400 | 3401 | 3402 | 3403 | 3404 | 3405 | 3406 | 3407 | 3408 | 3409 | 3410 | 3411 | 3412 | 3413 | 3414 | 3415 |
| Y07 | 3416 | 3417 | 3418 | 3419 | 3420 | 3421 | 3422 | 3423 | 3424 | 3425 | 3426 | 3427 | 3428 | 3429 | 3430 | 3431 |
| Y10 | 3432 | 3433 | 3434 | 3435 | 3436 | 3437 | 3438 | 3439 | 3440 | 3441 | 3442 | 3443 | 3444 | 3445 | 3446 | 3447 |
| Y11 | 3448 | 3449 | 3450 | 3451 | 3452 | 3453 | 3454 | 3455 | 3456 | 3457 | 3458 | 3459 | 3460 | 3461 | 3462 | 3463 |
| Y12 | 3464 | 3465 | 3466 | 3467 | 3468 | 3469 | 3470 | 3471 | 3472 | 3473 | 3474 | 3475 | 3476 | 3477 | 3478 | 3479 |
| Y13 | 3480 | 3481 | 3482 | 3483 | 3484 | 3485 | 3486 | 3487 | 3488 | 3489 | 3490 | 3491 | 3492 | 3493 | 3494 | 3495 |
| Y14 | 3496 | 3497 | 3498 | 3499 | 3500 | 3501 | 3502 | 3503 | 3504 | 3505 | 3506 | 3507 | 3508 | 3509 | 3510 | 3511 |
| Y15 | 3512 | 3513 | 3514 | 3515 | 3516 | 3517 | 3518 | 3519 | 3520 | 3521 | 3522 | 3523 | 3524 | 3525 | 3526 | 3527 |
| Y16 | 3528 | 3529 | 3530 | 3531 | 3532 | 3533 | 3534 | 3535 | 3536 | 3537 | 3538 | 3539 | 3540 | 3541 | 3542 | 3543 |
| Y17 | 3544 | 3545 | 3546 | 3547 | 3548 | 3549 | 3550 | 3551 | 3552 | 3553 | 3554 | 3555 | 3556 | 3557 | 3558 | 3559 |
| Y20 | 3560 | 3561 | 3562 | 3563 | 3564 | 3565 | 3566 | 3567 | 3568 | 3569 | 3570 | 3571 | 3572 | 3573 | 3574 | 3575 |
| Y21 | 3576 | 3577 | 3578 | 3579 | 3580 | 3581 | 3582 | 3583 | 3584 | 3585 | 3586 | 3587 | 3588 | 3589 | 3590 | 3591 |
| Y22 | 3592 | 3593 | 3594 | 3595 | 3596 | 3597 | 3598 | 3599 | 3600 | 3601 | 3602 | 3603 | 3604 | 3605 | 3606 | 3607 |
| Y23 | 3608 | 3609 | 3610 | 3611 | 3612 | 3613 | 3614 | 3615 | 3616 | 3617 | 3618 | 3619 | 3620 | 3621 | 3622 | 3623 |
| Y24 | 3624 | 3625 | 3626 | 3627 | 3628 | 3629 | 3630 | 3631 | 3632 | 3633 | 3634 | 3635 | 3636 | 3637 | 3638 | 3639 |
| Y25 | 3640 | 3641 | 3642 | 3643 | 3644 | 3645 | 3646 | 3647 | 3648 | 3649 | 3650 | 3651 | 3652 | 3653 | 3654 | 3655 |
| Y26 | 3656 | 3657 | 3658 | 3659 | 3660 | 3661 | 3662 | 3663 | 3664 | 3665 | 3666 | 3667 | 3668 | 3669 | 3670 | 3671 |
| Y27 | 3672 | 3673 | 3674 | 3675 | 3676 | 3677 | 3678 | 3679 | 3680 | 3681 | 3682 | 3683 | 3684 | 3685 | 3686 | 3687 |
| Y30 | 3688 | 3689 | 3690 | 3691 | 3692 | 3693 | 3694 | 3695 | 3696 | 3697 | 3698 | 3699 | 3700 | 3701 | 3702 | 3703 |
| Y31 | 3704 | 3705 | 3706 | 3707 | 3708 | 3709 | 3710 | 3711 | 3712 | 3713 | 3714 | 3715 | 3716 | 3717 | 3718 | 3719 |
| Y32 | 3720 | 3721 | 3722 | 3723 | 3724 | 3725 | 3726 | 3727 | 3728 | 3729 | 3730 | 3731 | 3732 | 3733 | 3734 | 3735 |
| Y33 | 3736 | 3737 | 3738 | 3739 | 3740 | 3741 | 3742 | 3743 | 3744 | 3745 | 3746 | 3747 | 3748 | 3749 | 3750 | 3751 |
| Y34 | 3752 | 3753 | 3754 | 3755 | 3756 | 3757 | 3758 | 3759 | 3760 | 3761 | 3762 | 3763 | 3764 | 3765 | 3766 | 3767 |
| Y35 | 3768 | 3769 | 3770 | 3771 | 3772 | 3773 | 3774 | 3775 | 3776 | 3777 | 3778 | 3779 | 3780 | 3781 | 3782 | 3783 |
| Y36 | 3784 | 3785 | 3786 | 3787 | 3788 | 3789 | 3790 | 3791 | 3792 | 3793 | 3794 | 3795 | 3796 | 3797 | 3798 | 3799 |
| Y37 | 3800 | 3801 | 3802 | 3803 | 3804 | 3805 | 3806 | 3807 | 3808 | 3809 | 3810 | 3811 | 3812 | 3813 | 3814 | 3815 |
| Y40 | 3816 | 3817 | 3818 | 3819 | 3820 | 3821 | 3822 | 3823 | 3824 | 3825 | 3826 | 3827 | 3828 | 3829 | 3830 | 3831 |
| Y41 | 3832 | 3833 | 3834 | 3835 | 3836 | 3837 | 3838 | 3839 | 3840 | 3841 | 3842 | 3843 | 3844 | 3845 | 3846 | 3847 |
| Y42 | 3848 | 3849 | 3850 | 3851 | 3852 | 3853 | 3854 | 3855 | 3856 | 3857 | 3858 | 3859 | 3860 | 3861 | 3862 | 3863 |
| Y43 | 3864 | 3865 | 3866 | 3867 | 3868 | 3869 | 3870 | 3871 | 3872 | 3873 | 3874 | 3875 | 3876 | 3877 | 3878 | 3879 |
| Y44 | 3880 | 3881 | 3882 | 3883 | 3884 | 3885 | 3886 | 3887 | 3888 | 3889 | 3890 | 3891 | 3892 | 3893 | 3894 | 3895 |
| Y45 | 3896 | 3897 | 3898 | 3899 | 3900 | 3901 | 3902 | 3903 | 3904 | 3905 | 3906 | 3907 | 3908 | 3909 | 3910 | 3911 |
| Y46 | 3912 | 3913 | 3914 | 3915 | 3916 | 3917 | 3918 | 3919 | 3920 | 3921 | 3922 | 3923 | 3924 | 3925 | 3926 | 3927 |
| Y47 | 3928 | 3929 | 3930 | 3931 | 3932 | 3933 | 3934 | 3935 | 3936 | 3937 | 3938 | 3939 | 3940 | 3941 | 3942 | 3943 |
| Y50 | 3944 | 3945 | 3946 | 3947 | 3948 | 3949 | 3950 | 3951 | 3952 | 3953 | 3954 | 3955 | 3956 | 3957 | 3958 | 3959 |
| Y51 | 3960 | 3961 | 3962 | 3963 | 3964 | 3965 | 3966 | 3967 | 3968 | 3969 | 3970 | 3971 | 3972 | 3973 | 3974 | 3975 |
| Y52 | 3976 | 3977 | 3978 | 3979 | 3980 | 3981 | 3982 | 3983 | 3984 | 3985 | 3986 | 3987 | 3988 | 3989 | 3990 | 3991 |
| Y53 | 3992 | 3993 | 3994 | 3995 | 3996 | 3997 | 3998 | 3999 | 4000 | 4001 | 4002 | 4003 | 4004 | 4005 | 4006 | 4007 |
| Y54 | 4008 | 4009 | 4010 | 4011 | 4012 | 4013 | 4014 | 4015 | 4016 | 4017 | 4018 | 4019 | 4020 | 4021 | 4022 | 4023 |
| Y55 | 4024 | 4025 | 4026 | 4027 | 4028 | 4029 | 4030 | 4031 | 4032 | 4033 | 4034 | 4035 | 4036 | 4037 | 4038 | 4039 |
| Y56 | 4040 | 4041 | 4042 | 4043 | 4044 | 4045 | 4046 | 4047 | 4048 | 4049 | 4050 | 4051 | 4052 | 4053 | 4054 | 4055 |
| Y57 | 4056 | 4057 | 4058 | 4059 | 4060 | 4061 | 4062 | 4063 | 4064 | 4065 | 4066 | 4067 | 4068 | 4069 | 4070 | 4071 |

## BFM No. Quick Reference Table for Angle Setting

< Bank 4>

| Output No. | STEP0 ON | STEP0 OFF | STEP1 ON | STEP1 OFF | STEP2 ON | STEP2 OFF | STEP3 ON | STEP3 OFF | STEP4 ON | STEP4 OFF | STEP5 ON | STEP5 OFF | STEP6 ON | STEP6 OFF | STEP7 ON | STEP7 OFF |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Y00 | 4072 | 4073 | 4074 | 4075 | 4076 | 4077 | 4078 | 4079 | 4080 | 4081 | 4082 | 4083 | 4084 | 4085 | 4086 | 4087 |
| Y01 | 4088 | 4089 | 4090 | 4091 | 4092 | 4093 | 4094 | 4095 | 4096 | 4097 | 4098 | 4099 | 4100 | 4101 | 4102 | 4103 |
| Y02 | 4104 | 4105 | 4106 | 4107 | 4108 | 4109 | 4110 | 4111 | 4112 | 4113 | 4114 | 4115 | 4116 | 4117 | 4118 | 4119 |
| Y03 | 4120 | 4121 | 4122 | 4123 | 4124 | 4125 | 4126 | 4127 | 4128 | 4129 | 4130 | 4131 | 4132 | 4133 | 4134 | 4135 |
| Y04 | 4136 | 4137 | 4138 | 4139 | 4140 | 4141 | 4142 | 4143 | 4144 | 4145 | 4146 | 4147 | 4148 | 4149 | 4150 | 4151 |
| Y05 | 4152 | 4153 | 4154 | 4155 | 4156 | 4157 | 4158 | 4159 | 4160 | 4161 | 4162 | 4163 | 4164 | 4165 | 4166 | 4167 |
| Y06 | 4168 | 4169 | 4170 | 4171 | 4172 | 4173 | 4174 | 4175 | 4176 | 4177 | 4178 | 4179 | 4180 | 4181 | 4182 | 4183 |
| Y07 | 4184 | 4185 | 4186 | 4187 | 4188 | 4189 | 4190 | 4191 | 4192 | 4193 | 4194 | 4195 | 4196 | 4197 | 4198 | 4199 |
| Y10 | 4200 | 4201 | 4202 | 4203 | 4204 | 4205 | 4206 | 4207 | 4208 | 4209 | 4210 | 4211 | 4212 | 4213 | 4214 | 4215 |
| Y11 | 4216 | 4217 | 4218 | 4219 | 4220 | 4221 | 4222 | 4223 | 4224 | 4225 | 4226 | 4227 | 4228 | 4229 | 4230 | 4231 |
| Y12 | 4232 | 4233 | 4234 | 4235 | 4236 | 4237 | 4238 | 4239 | 4240 | 4241 | 4242 | 4243 | 4244 | 4245 | 4246 | 4247 |
| Y13 | 4248 | 4249 | 4250 | 4251 | 4252 | 4253 | 4254 | 4255 | 4256 | 4257 | 4258 | 4259 | 4260 | 4261 | 4262 | 4263 |
| Y14 | 4264 | 4265 | 4266 | 4267 | 4268 | 4269 | 4270 | 4271 | 4272 | 4273 | 4274 | 4275 | 4276 | 4277 | 4278 | 4279 |
| Y15 | 4280 | 4281 | 4282 | 4283 | 4284 | 4285 | 4286 | 4287 | 4288 | 4289 | 4290 | 4291 | 4292 | 4293 | 4294 | 4295 |
| Y16 | 4296 | 4297 | 4298 | 4299 | 4300 | 4301 | 4302 | 4303 | 4304 | 4305 | 4306 | 4307 | 4308 | 4309 | 4310 | 4311 |
| Y17 | 4312 | 4313 | 4314 | 4315 | 4316 | 4317 | 4318 | 4319 | 4320 | 4321 | 4322 | 4323 | 4324 | 4325 | 4326 | 4327 |
| Y20 | 4328 | 4329 | 4330 | 4331 | 4332 | 4333 | 4334 | 4335 | 4336 | 4337 | 4338 | 4339 | 4340 | 4341 | 4342 | 4343 |
| Y21 | 4344 | 4345 | 4346 | 4347 | 4348 | 4349 | 4350 | 4351 | 4352 | 4353 | 4354 | 4355 | 4356 | 4357 | 4358 | 4359 |
| Y22 | 4360 | 4361 | 4362 | 4363 | 4364 | 4365 | 4366 | 4367 | 4368 | 4369 | 4370 | 4371 | 4372 | 4373 | 4374 | 4375 |
| Y23 | 4376 | 4377 | 4378 | 4379 | 4380 | 4381 | 4382 | 4383 | 4384 | 4385 | 4386 | 4387 | 4388 | 4389 | 4390 | 4391 |
| Y24 | 4392 | 4393 | 4394 | 4395 | 4396 | 4397 | 4398 | 4399 | 4400 | 4401 | 4402 | 4403 | 4404 | 4405 | 4406 | 4407 |
| Y25 | 4408 | 4409 | 4410 | 4411 | 4412 | 4413 | 4414 | 4415 | 4416 | 4417 | 4418 | 4419 | 4420 | 4421 | 4422 | 4423 |
| Y26 | 4424 | 4425 | 4426 | 4427 | 4428 | 4429 | 4430 | 4431 | 4432 | 4433 | 4434 | 4435 | 4436 | 4437 | 4438 | 4439 |
| Y27 | 4440 | 4441 | 4442 | 4443 | 4444 | 4445 | 4446 | 4447 | 4448 | 4449 | 4450 | 4451 | 4452 | 4453 | 4454 | 4455 |
| Y30 | 4456 | 4457 | 4458 | 4459 | 4460 | 4461 | 4462 | 4463 | 4464 | 4465 | 4466 | 4467 | 4468 | 4469 | 4470 | 4471 |
| Y31 | 4472 | 4473 | 4474 | 4475 | 4476 | 4477 | 4478 | 4479 | 4480 | 4481 | 4482 | 4483 | 4484 | 4485 | 4486 | 4487 |
| Y32 | 4488 | 4489 | 4490 | 4491 | 4492 | 4493 | 4494 | 4495 | 4496 | 4497 | 4498 | 4499 | 4500 | 4501 | 4502 | 4503 |
| Y33 | 4504 | 4505 | 4506 | 4507 | 4508 | 4509 | 4510 | 4511 | 4512 | 4513 | 4514 | 4515 | 4516 | 4517 | 4518 | 4519 |
| Y34 | 4520 | 4521 | 4522 | 4523 | 4524 | 4525 | 4526 | 4527 | 4528 | 4529 | 4530 | 4531 | 4532 | 4533 | 4534 | 4535 |
| Y35 | 4536 | 4537 | 4538 | 4539 | 4540 | 4541 | 4542 | 4543 | 4544 | 4545 | 4546 | 4547 | 4548 | 4549 | 4550 | 4551 |
| Y36 | 4552 | 4553 | 4554 | 4555 | 4556 | 4557 | 4558 | 4559 | 4560 | 4561 | 4562 | 4563 | 4564 | 4565 | 4566 | 4567 |
| Y37 | 4568 | 4569 | 4570 | 4571 | 4572 | 4573 | 4574 | 4575 | 4576 | 4577 | 4578 | 4579 | 4580 | 4581 | 4582 | 4583 |
| Y40 | 4584 | 4585 | 4586 | 4587 | 4588 | 4589 | 4590 | 4591 | 4592 | 4593 | 4594 | 4595 | 4596 | 4597 | 4598 | 4599 |
| Y41 | 4600 | 4601 | 4602 | 4603 | 4604 | 4605 | 4606 | 4607 | 4608 | 4609 | 4610 | 4611 | 4612 | 4613 | 4614 | 4615 |
| Y42 | 4616 | 4617 | 4618 | 4619 | 4620 | 4621 | 4622 | 4623 | 4624 | 4625 | 4626 | 4627 | 4628 | 4629 | 4630 | 4631 |
| Y43 | 4632 | 4633 | 4634 | 4635 | 4636 | 4637 | 4638 | 4639 | 4640 | 4641 | 4642 | 4643 | 4644 | 4645 | 4646 | 4647 |
| Y44 | 4648 | 4649 | 4650 | 4651 | 4652 | 4653 | 4654 | 4655 | 4656 | 4657 | 4658 | 4659 | 4660 | 4661 | 4662 | 4663 |
| Y45 | 4664 | 4665 | 4666 | 4667 | 4668 | 4669 | 4670 | 4671 | 4672 | 4673 | 4674 | 4675 | 4676 | 4677 | 4678 | 4679 |
| Y46 | 4680 | 4681 | 4682 | 4683 | 4684 | 4685 | 4686 | 4687 | 4688 | 4689 | 4690 | 4691 | 4692 | 4693 | 4694 | 4695 |
| Y47 | 4696 | 4697 | 4698 | 4699 | 4700 | 4701 | 4702 | 4703 | 4704 | 4705 | 4706 | 4707 | 4708 | 4709 | 4710 | 4711 |
| Y50 | 4712 | 4713 | 4714 | 4715 | 4716 | 4717 | 4718 | 4719 | 4720 | 4721 | 4722 | 4723 | 4724 | 4725 | 4726 | 4727 |
| Y51 | 4728 | 4729 | 4730 | 4731 | 4732 | 4733 | 4734 | 4735 | 4736 | 4737 | 4738 | 4739 | 4740 | 4741 | 4742 | 4743 |
| Y52 | 4744 | 4745 | 4746 | 4747 | 4748 | 4749 | 4750 | 4751 | 4752 | 4753 | 4754 | 4755 | 4756 | 4757 | 4758 | 4759 |
| Y53 | 4760 | 4761 | 4762 | 4763 | 4764 | 4765 | 4766 | 4767 | 4768 | 4769 | 4770 | 4771 | 4772 | 4773 | 4774 | 4775 |
| Y54 | 4776 | 4777 | 4778 | 4779 | 4780 | 4781 | 4782 | 4783 | 4784 | 4785 | 4786 | 4787 | 4788 | 4789 | 4790 | 4791 |
| Y55 | 4792 | 4793 | 4794 | 4795 | 4796 | 4797 | 4798 | 4799 | 4800 | 4801 | 4802 | 4803 | 4804 | 4805 | 4806 | 4807 |
| Y56 | 4808 | 4809 | 4810 | 4811 | 4812 | 4813 | 4814 | 4815 | 4816 | 4817 | 4818 | 4819 | 4820 | 4821 | 4822 | 4823 |
| Y57 | 4824 | 4825 | 4826 | 4827 | 4828 | 4829 | 4830 | 4831 | 4832 | 4833 | 4834 | 4835 | 4836 | 4837 | 4838 | 4839 |

BFM No.

## BFM No. Quick Reference Table for Angle Setting

< Bank 5 >

| Output No. | STEP0 ON | STEP0 OFF | STEP1 ON | STEP1 OFF | STEP2 ON | STEP2 OFF | STEP3 ON | STEP3 OFF | STEP4 ON | STEP4 OFF | STEP5 ON | STEP5 OFF | STEP6 ON | STEP6 OFF | STEP7 ON | STEP7 OFF |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Y00 | 4840 | 4841 | 4842 | 4843 | 4844 | 4845 | 4846 | 4847 | 4848 | 4849 | 4850 | 4851 | 4852 | 4853 | 4854 | 4855 |
| Y01 | 4856 | 4857 | 4858 | 4859 | 4860 | 4861 | 4862 | 4863 | 4864 | 4865 | 4866 | 4867 | 4868 | 4869 | 4870 | 4871 |
| Y02 | 4872 | 4873 | 4874 | 4875 | 4876 | 4877 | 4878 | 4879 | 4880 | 4881 | 4882 | 4883 | 4884 | 4885 | 4886 | 4887 |
| Y03 | 4888 | 4889 | 4890 | 4891 | 4892 | 4893 | 4894 | 4895 | 4896 | 4897 | 4898 | 4899 | 4900 | 4901 | 4902 | 4903 |
| Y04 | 4904 | 4905 | 4906 | 4907 | 4908 | 4909 | 4910 | 4911 | 4912 | 4913 | 4914 | 4915 | 4916 | 4917 | 4918 | 4919 |
| Y05 | 4920 | 4921 | 4922 | 4923 | 4924 | 4925 | 4926 | 4927 | 4928 | 4929 | 4930 | 4931 | 4932 | 4933 | 4934 | 4935 |
| Y06 | 4936 | 4937 | 4938 | 4939 | 4940 | 4941 | 4942 | 4943 | 4944 | 4945 | 4946 | 4947 | 4948 | 4949 | 4950 | 4951 |
| Y07 | 4952 | 4953 | 4954 | 4955 | 4956 | 4957 | 4958 | 4959 | 4960 | 4961 | 4962 | 4963 | 4964 | 4965 | 4966 | 4967 |
| Y10 | 4968 | 4969 | 4970 | 4971 | 4972 | 4973 | 4974 | 4975 | 4976 | 4977 | 4978 | 4979 | 4980 | 4981 | 4982 | 4983 |
| Y11 | 4984 | 4985 | 4986 | 4987 | 4988 | 4989 | 4990 | 4991 | 4992 | 4993 | 4994 | 4995 | 4996 | 4997 | 4998 | 4999 |
| Y12 | 5000 | 5001 | 5002 | 5003 | 5004 | 5005 | 5006 | 5007 | 5008 | 5009 | 5010 | 5011 | 5012 | 5013 | 5014 | 5015 |
| Y13 | 5016 | 5017 | 5018 | 5019 | 5020 | 5021 | 5022 | 5023 | 5024 | 5025 | 5026 | 5027 | 5028 | 5029 | 5030 | 5031 |
| Y14 | 5032 | 5033 | 5034 | 5035 | 5036 | 5037 | 5038 | 5039 | 5040 | 5041 | 5042 | 5043 | 5044 | 5045 | 5046 | 5047 |
| Y15 | 5048 | 5049 | 5050 | 5051 | 5052 | 5053 | 5054 | 5055 | 5056 | 5057 | 5058 | 5059 | 5060 | 5061 | 5062 | 5063 |
| Y16 | 5064 | 5065 | 5066 | 5067 | 5068 | 5069 | 5070 | 5071 | 5072 | 5073 | 5074 | 5075 | 5076 | 5077 | 5078 | 5079 |
| Y17 | 5080 | 5081 | 5082 | 5083 | 5084 | 5085 | 5086 | 5087 | 5088 | 5089 | 5090 | 5091 | 5092 | 5093 | 5094 | 5095 |
| Y20 | 5096 | 5097 | 5098 | 5099 | 5100 | 5101 | 5102 | 5103 | 5104 | 5105 | 5106 | 5107 | 5108 | 5109 | 5110 | 5111 |
| Y21 | 5112 | 5113 | 5114 | 5115 | 5116 | 5117 | 5118 | 5119 | 5120 | 5121 | 5122 | 5123 | 5124 | 5125 | 5126 | 5127 |
| Y22 | 5128 | 5129 | 5130 | 5131 | 5132 | 5133 | 5134 | 5135 | 5136 | 5137 | 5138 | 5139 | 5140 | 5141 | 5142 | 5143 |
| Y23 | 5144 | 5145 | 5146 | 5147 | 5148 | 5149 | 5150 | 5151 | 5152 | 5153 | 5154 | 5155 | 5156 | 5157 | 5158 | 5159 |
| Y24 | 5160 | 5161 | 5162 | 5163 | 5164 | 5165 | 5166 | 5167 | 5168 | 5169 | 5170 | 5171 | 5172 | 5173 | 5174 | 5175 |
| Y25 | 5176 | 5177 | 5178 | 5179 | 5180 | 5181 | 5182 | 5183 | 5184 | 5185 | 5186 | 5187 | 5188 | 5189 | 5190 | 5191 |
| Y26 | 5192 | 5193 | 5194 | 5195 | 5196 | 5197 | 5198 | 5199 | 5200 | 5201 | 5202 | 5203 | 5204 | 5205 | 5206 | 5207 |
| Y27 | 5208 | 5209 | 5210 | 5211 | 5212 | 5213 | 5214 | 5215 | 5216 | 5217 | 5218 | 5219 | 5220 | 5221 | 5222 | 5223 |
| Y30 | 5224 | 5225 | 5226 | 5227 | 5228 | 5229 | 5230 | 5231 | 5232 | 5233 | 5234 | 5235 | 5236 | 5237 | 5238 | 5239 |
| Y31 | 5240 | 5241 | 5242 | 5243 | 5244 | 5245 | 5246 | 5247 | 5248 | 5249 | 5250 | 5251 | 5252 | 5253 | 5254 | 5255 |
| Y32 | 5256 | 5257 | 5258 | 5259 | 5260 | 5261 | 5262 | 5263 | 5264 | 5265 | 5266 | 5267 | 5268 | 5269 | 5270 | 5271 |
| Y33 | 5272 | 5273 | 5274 | 5275 | 5276 | 5277 | 5278 | 5279 | 5280 | 5281 | 5282 | 5283 | 5284 | 5285 | 5286 | 5287 |
| Y34 | 5288 | 5289 | 5290 | 5291 | 5292 | 5293 | 5294 | 5295 | 5296 | 5297 | 5298 | 5299 | 5300 | 5301 | 5302 | 5303 |
| Y35 | 5304 | 5305 | 5306 | 5307 | 5308 | 5309 | 5310 | 5311 | 5312 | 5313 | 5314 | 5315 | 5316 | 5317 | 5318 | 5319 |
| Y36 | 5320 | 5321 | 5322 | 5323 | 5324 | 5325 | 5326 | 5327 | 5328 | 5329 | 5330 | 5331 | 5332 | 5333 | 5334 | 5335 |
| Y37 | 5336 | 5337 | 5338 | 5339 | 5340 | 5341 | 5342 | 5343 | 5344 | 5345 | 5346 | 5347 | 5348 | 5349 | 5350 | 5351 |
| Y40 | 5352 | 5353 | 5354 | 5355 | 5356 | 5357 | 5358 | 5359 | 5360 | 5361 | 5362 | 5363 | 5364 | 5365 | 5366 | 5367 |
| Y41 | 5368 | 5369 | 5370 | 5371 | 5372 | 5373 | 5374 | 5375 | 5376 | 5377 | 5378 | 5379 | 5380 | 5381 | 5382 | 5383 |
| Y42 | 5384 | 5385 | 5386 | 5387 | 5388 | 5389 | 5390 | 5391 | 5392 | 5393 | 5394 | 5395 | 5396 | 5397 | 5398 | 5399 |
| Y43 | 5400 | 5401 | 5402 | 5403 | 5404 | 5405 | 5406 | 5407 | 5408 | 5409 | 5410 | 5411 | 5412 | 5413 | 5414 | 5415 |
| Y44 | 5416 | 5417 | 5418 | 5419 | 5420 | 5421 | 5422 | 5423 | 5424 | 5425 | 5426 | 5427 | 5428 | 5429 | 5430 | 5431 |
| Y45 | 5432 | 5433 | 5434 | 5435 | 5436 | 5437 | 5438 | 5439 | 5440 | 5441 | 5442 | 5443 | 5444 | 5445 | 5446 | 5447 |
| Y46 | 5448 | 5449 | 5450 | 5451 | 5452 | 5453 | 5454 | 5455 | 5456 | 5457 | 5458 | 5459 | 5460 | 5461 | 5462 | 5463 |
| Y47 | 5464 | 5465 | 5466 | 5467 | 5468 | 5469 | 5470 | 5471 | 5472 | 5473 | 5474 | 5475 | 5476 | 5477 | 5478 | 5479 |
| Y50 | 5480 | 5481 | 5482 | 5483 | 5484 | 5485 | 5486 | 5487 | 5488 | 5489 | 5490 | 5491 | 5492 | 5493 | 5494 | 5495 |
| Y51 | 5496 | 5497 | 5498 | 5499 | 5500 | 5501 | 5502 | 5503 | 5504 | 5505 | 5506 | 5507 | 5508 | 5509 | 5510 | 5511 |
| Y52 | 5512 | 5513 | 5514 | 5515 | 5516 | 5517 | 5518 | 5519 | 5520 | 5521 | 5522 | 5523 | 5524 | 5525 | 5526 | 5527 |
| Y53 | 5528 | 5529 | 5530 | 5531 | 5532 | 5533 | 5534 | 5535 | 5536 | 5537 | 5538 | 5539 | 5540 | 5541 | 5542 | 5543 |
| Y54 | 5544 | 5545 | 5546 | 5547 | 5548 | 5549 | 5550 | 5551 | 5552 | 5553 | 5554 | 5555 | 5556 | 5557 | 5558 | 5559 |
| Y55 | 5560 | 5561 | 5562 | 5563 | 5564 | 5565 | 5566 | 5567 | 5568 | 5569 | 5570 | 5571 | 5572 | 5573 | 5574 | 5575 |
| Y56 | 5576 | 5577 | 5578 | 5579 | 5580 | 5581 | 5582 | 5583 | 5584 | 5585 | 5586 | 5587 | 5588 | 5589 | 5590 | 5591 |
| Y57 | 5592 | 5593 | 5594 | 5595 | 5596 | 5597 | 5598 | 5599 | 5600 | 5601 | 5602 | 5603 | 5604 | 5605 | 5606 | 5607 |

BFM No.

## BFM No. Quick Reference Table for Angle Setting

< Bank 6 >

BFM No.

| Output No. | STEP0 ON | STEP0 OFF | STEP1 ON | STEP1 OFF | STEP2 ON | STEP2 OFF | STEP3 ON | STEP3 OFF | STEP4 ON | STEP4 OFF | STEP5 ON | STEP5 OFF | STEP6 ON | STEP6 OFF | STEP7 ON | STEP7 OFF |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Y00 | 5608 | 5609 | 5610 | 5611 | 5612 | 5613 | 5614 | 5615 | 5616 | 5617 | 5618 | 5619 | 5620 | 5621 | 5622 | 5623 |
| Y01 | 5624 | 5625 | 5626 | 5627 | 5628 | 5629 | 5630 | 5631 | 5632 | 5633 | 5634 | 5635 | 5636 | 5637 | 5638 | 5639 |
| Y02 | 5640 | 5641 | 5642 | 5643 | 5644 | 5645 | 5646 | 5647 | 5648 | 5649 | 5650 | 5651 | 5652 | 5653 | 5654 | 5655 |
| Y03 | 5656 | 5657 | 5658 | 5659 | 5660 | 5661 | 5662 | 5663 | 5664 | 5665 | 5666 | 5667 | 5668 | 5669 | 5670 | 5671 |
| Y04 | 5672 | 5673 | 5674 | 5675 | 5676 | 5677 | 5678 | 5679 | 5680 | 5681 | 5682 | 5683 | 5684 | 5685 | 5686 | 5687 |
| Y05 | 5688 | 5689 | 5690 | 5691 | 5692 | 5693 | 5694 | 5695 | 5696 | 5697 | 5698 | 5699 | 5700 | 5701 | 5702 | 5703 |
| Y06 | 5704 | 5705 | 5706 | 5707 | 5708 | 5709 | 5710 | 5711 | 5712 | 5713 | 5714 | 5715 | 5716 | 5717 | 5718 | 5719 |
| Y07 | 5720 | 5721 | 5722 | 5723 | 5724 | 5725 | 5726 | 5727 | 5728 | 5729 | 5730 | 5731 | 5732 | 5733 | 5734 | 5735 |
| Y10 | 5736 | 5737 | 5738 | 5739 | 5740 | 5741 | 5742 | 5743 | 5744 | 5745 | 5746 | 5747 | 5748 | 5749 | 5750 | 5751 |
| Y11 | 5752 | 5753 | 5754 | 5755 | 5756 | 5757 | 5758 | 5759 | 5760 | 5761 | 5762 | 5763 | 5764 | 5765 | 5766 | 5767 |
| Y12 | 5768 | 5769 | 5770 | 5771 | 5772 | 5773 | 5774 | 5775 | 5776 | 5777 | 5778 | 5779 | 5780 | 5781 | 5782 | 5783 |
| Y13 | 5784 | 5785 | 5786 | 5787 | 5788 | 5789 | 5790 | 5791 | 5792 | 5793 | 5794 | 5795 | 5796 | 5797 | 5798 | 5799 |
| Y14 | 5800 | 5801 | 5802 | 5803 | 5804 | 5805 | 5806 | 5807 | 5808 | 5809 | 5810 | 5811 | 5812 | 5813 | 5814 | 5815 |
| Y15 | 5816 | 5817 | 5818 | 5819 | 5820 | 5821 | 5822 | 5823 | 5824 | 5825 | 5826 | 5827 | 5828 | 5829 | 5830 | 5831 |
| Y16 | 5832 | 5833 | 5834 | 5835 | 5836 | 5837 | 5838 | 5839 | 5840 | 5841 | 5842 | 5843 | 5844 | 5845 | 5846 | 5847 |
| Y17 | 5848 | 5849 | 5850 | 5851 | 5852 | 5853 | 5854 | 5855 | 5856 | 5857 | 5858 | 5859 | 5860 | 5861 | 5862 | 5863 |
| Y20 | 5864 | 5865 | 5866 | 5867 | 5868 | 5869 | 5870 | 5871 | 5872 | 5873 | 5874 | 5875 | 5876 | 5877 | 5878 | 5879 |
| Y21 | 5880 | 5881 | 5882 | 5883 | 5884 | 5885 | 5886 | 5887 | 5888 | 5889 | 5890 | 5891 | 5892 | 5893 | 5894 | 5895 |
| Y22 | 5896 | 5897 | 5898 | 5899 | 5900 | 5901 | 5902 | 5903 | 5904 | 5905 | 5906 | 5907 | 5908 | 5909 | 5910 | 5911 |
| Y23 | 5912 | 5913 | 5914 | 5915 | 5916 | 5917 | 5918 | 5919 | 5920 | 5921 | 5922 | 5923 | 5924 | 5925 | 5926 | 5927 |
| Y24 | 5928 | 5929 | 5930 | 5931 | 5932 | 5933 | 5934 | 5935 | 5936 | 5937 | 5938 | 5939 | 5940 | 5941 | 5942 | 5943 |
| Y25 | 5944 | 5945 | 5946 | 5947 | 5948 | 5949 | 5950 | 5951 | 5952 | 5953 | 5954 | 5955 | 5956 | 5957 | 5958 | 5959 |
| Y26 | 5960 | 5961 | 5962 | 5963 | 5964 | 5965 | 5966 | 5967 | 5968 | 5969 | 5970 | 5971 | 5972 | 5973 | 5974 | 5975 |
| Y27 | 5976 | 5977 | 5978 | 5979 | 5980 | 5981 | 5982 | 5983 | 5984 | 5985 | 5986 | 5987 | 5988 | 5989 | 5990 | 5991 |
| Y30 | 5992 | 5993 | 5994 | 5995 | 5996 | 5997 | 5998 | 5999 | 6000 | 6001 | 6002 | 6003 | 6004 | 6005 | 6006 | 6007 |
| Y31 | 6008 | 6009 | 6010 | 6011 | 6012 | 6013 | 6014 | 6015 | 6016 | 6017 | 6018 | 6019 | 6020 | 6021 | 6022 | 6023 |
| Y32 | 6024 | 6025 | 6026 | 6027 | 6028 | 6029 | 6030 | 6031 | 6032 | 6033 | 6034 | 6035 | 6036 | 6037 | 6038 | 6039 |
| Y33 | 6040 | 6041 | 6042 | 6043 | 6044 | 6045 | 6046 | 6047 | 6048 | 6049 | 6050 | 6051 | 6052 | 6053 | 6054 | 6055 |
| Y34 | 6056 | 6057 | 6058 | 6059 | 6060 | 6061 | 6062 | 6063 | 6064 | 6065 | 6066 | 6067 | 6068 | 6069 | 6070 | 6071 |
| Y35 | 6072 | 6073 | 6074 | 6075 | 6076 | 6077 | 6078 | 6079 | 6080 | 6081 | 6082 | 6083 | 6084 | 6085 | 6086 | 6087 |
| Y36 | 6088 | 6089 | 6090 | 6091 | 6092 | 6093 | 6094 | 6095 | 6096 | 6097 | 6098 | 6099 | 6100 | 6101 | 6102 | 6103 |
| Y37 | 6104 | 6105 | 6106 | 6107 | 6108 | 6109 | 6110 | 6111 | 6112 | 6113 | 6114 | 6115 | 6116 | 6117 | 6118 | 6119 |
| Y40 | 6120 | 6121 | 6122 | 6123 | 6124 | 6125 | 6126 | 6127 | 6128 | 6129 | 6130 | 6131 | 6132 | 6133 | 6134 | 6135 |
| Y41 | 6136 | 6137 | 6138 | 6139 | 6140 | 6141 | 6142 | 6143 | 6144 | 6145 | 6146 | 6147 | 6148 | 6149 | 6150 | 6151 |
| Y42 | 6152 | 6153 | 6154 | 6155 | 6156 | 6157 | 6158 | 6159 | 6160 | 6161 | 6162 | 6163 | 6164 | 6165 | 6166 | 6167 |
| Y43 | 6168 | 6169 | 6170 | 6171 | 6172 | 6173 | 6174 | 6175 | 6176 | 6177 | 6178 | 6179 | 6180 | 6181 | 6182 | 6183 |
| Y44 | 6184 | 6185 | 6186 | 6187 | 6188 | 6189 | 6190 | 6191 | 6192 | 6193 | 6194 | 6195 | 6196 | 6197 | 6198 | 6199 |
| Y45 | 6200 | 6201 | 6202 | 6203 | 6204 | 6205 | 6206 | 6207 | 6208 | 6209 | 6210 | 6211 | 6212 | 6213 | 6214 | 6215 |
| Y46 | 6216 | 6217 | 6218 | 6219 | 6220 | 6221 | 6222 | 6223 | 6224 | 6225 | 6226 | 6227 | 6228 | 6229 | 6230 | 6231 |
| Y47 | 6232 | 6233 | 6234 | 6235 | 6236 | 6237 | 6238 | 6239 | 6240 | 6241 | 6242 | 6243 | 6244 | 6245 | 6246 | 6247 |
| Y50 | 6248 | 6249 | 6250 | 6251 | 6252 | 6253 | 6254 | 6255 | 6256 | 6257 | 6258 | 6259 | 6260 | 6261 | 6262 | 6263 |
| Y51 | 6264 | 6265 | 6266 | 6267 | 6268 | 6269 | 6270 | 6271 | 6272 | 6273 | 6274 | 6275 | 6276 | 6277 | 6278 | 6279 |
| Y52 | 6280 | 6281 | 6282 | 6283 | 6284 | 6285 | 6286 | 6287 | 6288 | 6289 | 6290 | 6291 | 6292 | 6293 | 6294 | 6295 |
| Y53 | 6296 | 6297 | 6298 | 6299 | 6300 | 6301 | 6302 | 6303 | 6304 | 6305 | 6306 | 6307 | 6308 | 6309 | 6310 | 6311 |
| Y54 | 6312 | 6313 | 6314 | 6315 | 6316 | 6317 | 6318 | 6319 | 6320 | 6321 | 6322 | 6323 | 6324 | 6325 | 6326 | 6327 |
| Y55 | 6328 | 6329 | 6330 | 6331 | 6332 | 6333 | 6334 | 6335 | 6336 | 6337 | 6338 | 6339 | 6340 | 6341 | 6342 | 6343 |
| Y56 | 6344 | 6345 | 6346 | 6347 | 6348 | 6349 | 6350 | 6351 | 6352 | 6353 | 6354 | 6355 | 6356 | 6357 | 6358 | 6359 |
| Y57 | 6360 | 6361 | 6362 | 6363 | 6364 | 6365 | 6366 | 6367 | 6368 | 6369 | 6370 | 6371 | 6372 | 6373 | 6374 | 6375 |

# BFM No. Quick Reference Table for Angle Setting

< Bank 7 >

| Output No. | STEP0 ON | STEP0 OFF | STEP1 ON | STEP1 OFF | STEP2 ON | STEP2 OFF | STEP3 ON | STEP3 OFF | STEP4 ON | STEP4 OFF | STEP5 ON | STEP5 OFF | STEP6 ON | STEP6 OFF | STEP7 ON | STEP7 OFF |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Y00 | 6376 | 6377 | 6378 | 6379 | 6380 | 6381 | 6382 | 6383 | 6384 | 6385 | 6386 | 6387 | 6388 | 6389 | 6390 | 6391 |
| Y01 | 6392 | 6393 | 6394 | 6395 | 6396 | 6397 | 6398 | 6399 | 6400 | 6401 | 6402 | 6403 | 6404 | 6405 | 6406 | 6407 |
| Y02 | 6408 | 6409 | 6410 | 6411 | 6412 | 6413 | 6414 | 6415 | 6416 | 6417 | 6418 | 6419 | 6420 | 6421 | 6422 | 6423 |
| Y03 | 6424 | 6425 | 6426 | 6427 | 6428 | 6429 | 6430 | 6431 | 6432 | 6433 | 6434 | 6435 | 6436 | 6437 | 6438 | 6439 |
| Y04 | 6440 | 6441 | 6442 | 6443 | 6444 | 6445 | 6446 | 6447 | 6448 | 6449 | 6450 | 6451 | 6452 | 6453 | 6454 | 6455 |
| Y05 | 6456 | 6457 | 6458 | 6459 | 6460 | 6461 | 6462 | 6463 | 6464 | 6465 | 6466 | 6467 | 6468 | 6469 | 6470 | 6471 |
| Y06 | 6472 | 6473 | 6474 | 6475 | 6476 | 6477 | 6478 | 6479 | 6480 | 6481 | 6482 | 6483 | 6484 | 6485 | 6486 | 6487 |
| Y07 | 6488 | 6489 | 6490 | 6491 | 6492 | 6493 | 6494 | 6495 | 6496 | 6497 | 6498 | 6499 | 6500 | 6501 | 6502 | 6503 |
| Y10 | 6504 | 6505 | 6506 | 6507 | 6508 | 6509 | 6510 | 6511 | 6512 | 6513 | 6514 | 6515 | 6516 | 6517 | 6518 | 6519 |
| Y11 | 6520 | 6521 | 6522 | 6523 | 6524 | 6525 | 6526 | 6527 | 6528 | 6529 | 6530 | 6531 | 6532 | 6533 | 6534 | 6535 |
| Y12 | 6536 | 6537 | 6538 | 6539 | 6540 | 6541 | 6542 | 6543 | 6544 | 6545 | 6546 | 6547 | 6548 | 6549 | 6550 | 6551 |
| Y13 | 6552 | 6553 | 6554 | 6555 | 6556 | 6557 | 6558 | 6559 | 6560 | 6561 | 6562 | 6563 | 6564 | 6565 | 6566 | 6567 |
| Y14 | 6568 | 6569 | 6570 | 6571 | 6572 | 6573 | 6574 | 6575 | 6576 | 6577 | 6578 | 6579 | 6580 | 6581 | 6582 | 6583 |
| Y15 | 6584 | 6585 | 6586 | 6587 | 6588 | 6589 | 6590 | 6591 | 6592 | 6593 | 6594 | 6595 | 6596 | 6597 | 6598 | 6599 |
| Y16 | 6600 | 6601 | 6602 | 6603 | 6604 | 6605 | 6606 | 6607 | 6608 | 6609 | 6610 | 6611 | 6612 | 6613 | 6614 | 6615 |
| Y17 | 6616 | 6617 | 6618 | 6619 | 6620 | 6621 | 6622 | 6623 | 6624 | 6625 | 6626 | 6627 | 6628 | 6629 | 6630 | 6631 |
| Y20 | 6632 | 6633 | 6634 | 6635 | 6636 | 6637 | 6638 | 6639 | 6640 | 6641 | 6642 | 6643 | 6644 | 6645 | 6646 | 6647 |
| Y21 | 6648 | 6649 | 6650 | 6651 | 6652 | 6653 | 6654 | 6655 | 6656 | 6657 | 6658 | 6659 | 6660 | 6661 | 6662 | 6663 |
| Y22 | 6664 | 6665 | 6666 | 6667 | 6668 | 6669 | 6670 | 6671 | 6672 | 6673 | 6674 | 6675 | 6676 | 6677 | 6678 | 6679 |
| Y23 | 6680 | 6681 | 6682 | 6683 | 6684 | 6685 | 6686 | 6687 | 6688 | 6689 | 6690 | 6691 | 6692 | 6693 | 6694 | 6695 |
| Y24 | 6696 | 6697 | 6698 | 6699 | 6700 | 6701 | 6702 | 6703 | 6704 | 6705 | 6706 | 6707 | 6708 | 6709 | 6710 | 6711 |
| Y25 | 6712 | 6713 | 6714 | 6715 | 6716 | 6717 | 6718 | 6719 | 6720 | 6721 | 6722 | 6723 | 6724 | 6725 | 6726 | 6727 |
| Y26 | 6728 | 6729 | 6730 | 6731 | 6732 | 6733 | 6734 | 6735 | 6736 | 6737 | 6738 | 6739 | 6740 | 6741 | 6742 | 6743 |
| Y27 | 6744 | 6745 | 6746 | 6747 | 6748 | 6749 | 6750 | 6751 | 6752 | 6753 | 6754 | 6755 | 6756 | 6757 | 6758 | 6759 |
| Y30 | 6760 | 6761 | 6762 | 6763 | 6764 | 6765 | 6766 | 6767 | 6768 | 6769 | 6770 | 6771 | 6772 | 6773 | 6774 | 6775 |
| Y31 | 6776 | 6777 | 6778 | 6779 | 6780 | 6781 | 6782 | 6783 | 6784 | 6785 | 6786 | 6787 | 6788 | 6789 | 6790 | 6791 |
| Y32 | 6792 | 6793 | 6794 | 6795 | 6796 | 6797 | 6798 | 6799 | 6800 | 6801 | 6802 | 6803 | 6804 | 6805 | 6806 | 6807 |
| Y33 | 6808 | 6809 | 6810 | 6811 | 6812 | 6813 | 6814 | 6815 | 6816 | 6817 | 6818 | 6819 | 6820 | 6821 | 6822 | 6823 |
| Y34 | 6824 | 6825 | 6826 | 6827 | 6828 | 6829 | 6830 | 6831 | 6832 | 6833 | 6834 | 6835 | 6836 | 6837 | 6838 | 6839 |
| Y35 | 6840 | 6841 | 6842 | 6843 | 6844 | 6845 | 6846 | 6847 | 6848 | 6849 | 6850 | 6851 | 6852 | 6853 | 6854 | 6855 |
| Y36 | 6856 | 6857 | 6858 | 6859 | 6860 | 6861 | 6862 | 6863 | 6864 | 6865 | 6866 | 6867 | 6868 | 6869 | 6870 | 6871 |
| Y37 | 6872 | 6873 | 6874 | 6875 | 6876 | 6877 | 6878 | 6879 | 6880 | 6881 | 6882 | 6883 | 6884 | 6885 | 6886 | 6887 |
| Y40 | 6888 | 6889 | 6890 | 6891 | 6892 | 6893 | 6894 | 6895 | 6896 | 6897 | 6898 | 6899 | 6900 | 6901 | 6902 | 6903 |
| Y41 | 6904 | 6905 | 6906 | 6907 | 6908 | 6909 | 6910 | 6911 | 6912 | 6913 | 6914 | 6915 | 6916 | 6917 | 6918 | 6919 |
| Y42 | 6920 | 6921 | 6922 | 6923 | 6924 | 6925 | 6926 | 6927 | 6928 | 6929 | 6930 | 6931 | 6932 | 6933 | 6934 | 6935 |
| Y43 | 6936 | 6937 | 6938 | 6939 | 6940 | 6941 | 6942 | 6943 | 6944 | 6945 | 6946 | 6947 | 6948 | 6949 | 6950 | 6951 |
| Y44 | 6952 | 6953 | 6954 | 6955 | 6956 | 6957 | 6958 | 6959 | 6960 | 6961 | 6962 | 6963 | 6964 | 6965 | 6966 | 6967 |
| Y45 | 6968 | 6969 | 6970 | 6971 | 6972 | 6973 | 6974 | 6975 | 6976 | 6977 | 6978 | 6979 | 6980 | 6981 | 6982 | 6983 |
| Y46 | 6984 | 6985 | 6986 | 6987 | 6988 | 6989 | 6990 | 6991 | 6992 | 6993 | 6994 | 6995 | 6996 | 6997 | 6998 | 6999 |
| Y47 | 7000 | 7001 | 7002 | 7003 | 7004 | 7005 | 7006 | 7007 | 7008 | 7009 | 7010 | 7011 | 7012 | 7013 | 7014 | 7015 |
| Y50 | 7016 | 7017 | 7018 | 7019 | 7020 | 7021 | 7022 | 7023 | 7024 | 7025 | 7026 | 7027 | 7028 | 7029 | 7030 | 7031 |
| Y51 | 7032 | 7033 | 7034 | 7035 | 7036 | 7037 | 7038 | 7039 | 7040 | 7041 | 7042 | 7043 | 7044 | 7045 | 7046 | 7047 |
| Y52 | 7048 | 7049 | 7050 | 7051 | 7052 | 7053 | 7054 | 7055 | 7056 | 7057 | 7058 | 7059 | 7060 | 7061 | 7062 | 7063 |
| Y53 | 7064 | 7065 | 7066 | 7067 | 7068 | 7069 | 7070 | 7071 | 7072 | 7073 | 7074 | 7075 | 7076 | 7077 | 7078 | 7079 |
| Y54 | 7080 | 7081 | 7082 | 7083 | 7084 | 7085 | 7086 | 7087 | 7088 | 7089 | 7090 | 7091 | 7092 | 7093 | 7094 | 7095 |
| Y55 | 7096 | 7097 | 7098 | 7099 | 7100 | 7101 | 7102 | 7103 | 7104 | 7105 | 7106 | 7107 | 7108 | 7109 | 7110 | 7111 |
| Y56 | 7112 | 7113 | 7114 | 7115 | 7116 | 7117 | 7118 | 7119 | 7120 | 7121 | 7122 | 7123 | 7124 | 7125 | 7126 | 7127 |
| Y57 | 7128 | 7129 | 7130 | 7131 | 7132 | 7133 | 7134 | 7135 | 7136 | 7137 | 7138 | 7139 | 7140 | 7141 | 7142 | 7143 |

BFM No.

**BFM No. Quick Reference Table for Angle Setting**

< Please use this page as a allocation table>

| Output No. | STEP0 ON | STEP0 OFF | STEP1 ON | STEP1 OFF | STEP2 ON | STEP2 OFF | STEP3 ON | STEP3 OFF | STEP4 ON | STEP4 OFF | STEP5 ON | STEP5 OFF | STEP6 ON | STEP6 OFF | STEP7 ON | STEP7 OFF |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Y00 | | | | | | | | | | | | | | | | |
| Y01 | | | | | | | | | | | | | | | | |
| Y02 | | | | | | | | | | | | | | | | |
| Y03 | | | | | | | | | | | | | | | | |
| Y04 | | | | | | | | | | | | | | | | |
| Y05 | | | | | | | | | | | | | | | | |
| Y06 | | | | | | | | | | | | | | | | |
| Y07 | | | | | | | | | | | | | | | | |
| Y10 | | | | | | | | | | | | | | | | |
| Y11 | | | | | | | | | | | | | | | | |
| Y12 | | | | | | | | | | | | | | | | |
| Y13 | | | | | | | | | | | | | | | | |
| Y14 | | | | | | | | | | | | | | | | |
| Y15 | | | | | | | | | | | | | | | | |
| Y16 | | | | | | | | | | | | | | | | |
| Y17 | | | | | | | | | | | | | | | | |
| Y20 | | | | | | | | | | | | | | | | |
| Y21 | | | | | | | | | | | | | | | | |
| Y22 | | | | | | | | | | | | | | | | |
| Y23 | | | | | | | | | | | | | | | | |
| Y24 | | | | | | | | | | | | | | | | |
| Y25 | | | | | | | | | | | | | | | | |
| Y26 | | | | | | | | | | | | | | | | |
| Y27 | | | | | | | | | | | | | | | | |
| Y30 | | | | | | | | | | | | | | | | |
| Y31 | | | | | | | | | | | | | | | | |
| Y32 | | | | | | | | | | | | | | | | |
| Y33 | | | | | | | | | | | | | | | | |
| Y34 | | | | | | | | | | | | | | | | |
| Y35 | | | | | | | | | | | | | | | | |
| Y36 | | | | | | | | | | | | | | | | |
| Y37 | | | | | | | | | | | | | | | | |
| Y40 | | | | | | | | | | | | | | | | |
| Y41 | | | | | | | | | | | | | | | | |
| Y42 | | | | | | | | | | | | | | | | |
| Y43 | | | | | | | | | | | | | | | | |
| Y44 | | | | | | | | | | | | | | | | |
| Y45 | | | | | | | | | | | | | | | | |
| Y46 | | | | | | | | | | | | | | | | |
| Y47 | | | | | | | | | | | | | | | | |
| Y50 | | | | | | | | | | | | | | | | |
| Y51 | | | | | | | | | | | | | | | | |
| Y52 | | | | | | | | | | | | | | | | |
| Y53 | | | | | | | | | | | | | | | | |
| Y54 | | | | | | | | | | | | | | | | |
| Y55 | | | | | | | | | | | | | | | | |
| Y56 | | | | | | | | | | | | | | | | |
| Y57 | | | | | | | | | | | | | | | | |

BFM No.

## 「电器电子产品有害物质限制使用标识要求」的表示方式

(15)   Note: This symbol mark is for China only.

含有有害6物质的名称，含有量，含有部品
　　本产品中所含有的有害6物质的名称，含有量，含有部品如下表所示。

### 产品中有害物质的名称及含量

| 部件名称 | | 有害物质 | | | | | |
|---|---|---|---|---|---|---|---|
| | | 铅<br>(Pb) | 汞<br>(Hg) | 镉<br>(Cd) | 六价铬<br>(Cr (VI)) | 多溴联苯<br>(PBB) | 多溴<br>二苯醚<br>(PBDE) |
| 可编程<br>控制器 | 外壳 | ○ | ○ | ○ | ○ | ○ | ○ |
| | 印刷基板 | × | ○ | ○ | ○ | ○ | ○ |

本表格依据SJ/T 11364的规定编制。

○:表示该有害物质在该部件所有均质材料中的含量均在GB/T 26572规定的限量要求以下。
×:表示该有害物质至少在该部件的某一均质材料中的含量超出GB/T 26572规定的限量要求。

基于中国标准法的参考规格：GB/T15969.2

# USER'S MANUAL

**FX2N-1RM-E-SET PROGRAMMABLE CAM SWITCH**

## MITSUBISHI ELECTRIC CORPORATION

| MODEL | FX2N1RM-H-E |
|---|---|
| MODEL CODE | 09R614 |